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AMERICAN COLLEGE OF RHEUMATOLOGY
ABSTRACT SUPPLEMENT

November 9-14, 2012
Washington, D.C.

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The supplement was not financed by profit-making organizations or by organizations representing for-profit interests. The editorial and peer review processes were handled entirely by the American College of Rheumatology (ACR) according to its peer review process for abstracts submitted for presentation at the ACR Annual Meeting.
ACR/ARHP 2012 Annual Meeting Overall Needs Assessment/Practice Gaps

The American College of Rheumatology and the Association of Rheumatology Health Professionals are committed to providing comprehensive education to improve the knowledge and performance of physicians, health professionals and scientists. Through evidence-based educational programs, the organization strives to enhance practice performance and improve the quality of care in those with or at risk for arthritis, rheumatic and musculoskeletal diseases. The 2012 annual meeting program has been developed independent of commercial influence. The following groups were involved in the planning process: the ACR Committee on Education; the ACR Annual Meeting Planning Committee; the ARHP Education Committee and the ARHP Annual Meeting Program Planning Committee.

The program is the result of a planning process that identified educational needs to change or enhance the knowledge, competence or performance of rheumatology professionals. The program’s content was derived from both needs assessment and practice gap analysis based on professional activities, practice setting, ABIM recertification requirements and physician attributes.

Program Highlights

- Educational tracks to help attendees identify content targeted to them. Tracks include: basic science, business/administration, clinical practice, clinical science, pain management and patient safety.
- Latest science and best-practices presented through peer-reviewed and selected clinical and scientific abstracts, and invited speakers providing clinical, evidence-based and quality focused content;
- Diverse formats of education delivery, including: didactic lectures, debates, and interactive sessions, such as poster tours, Meet the Professors and Workshop sessions;
- A larger forum for discussion of practical management issues such as the Curbside Consults – Ask the Professors session and Medical Aspects lectures;
- Extensive learning opportunities in the basic science of rheumatology, an area of the program developed by a subcommittee of US and internationally prominent basic scientists. Offerings include: Basic Science Symposia, State-of-the-Art Lectures, a series of Immunology Updates for the Clinicians, and a Basic Science pre-meeting course;
- Clinical management sessions, including the Thieves’ Market, Curbside Consults – Ask the Professors, The Great Debate and the ACR Knowledge Bowl;
- Specific pediatric rheumatology content integrated throughout the program designed to provide a high-level educational program to pediatric rheumatologists; and relevant updates to adult rheumatologists;
- Formal presentations of new practice guidelines provided to alert the membership and explain, in an open forum, the data supporting the guidelines and propose approaches for implementation;
- Over 35 workshops designed to provide hands-on skills training.

For additional details, refer to the session level learning objectives at www.ACRannualmeeting.org.

Participation Statement

This annual meeting is sponsored by the American College of Rheumatology for educational purposes only. The material presented is not intended to represent the only or the best methods appropriate for the medical conditions being discussed, but rather is intended to present the opinions of the authors or presenters, which may be helpful to other healthcare professionals at arriving at their own conclusions and consequent application. Attendees participating in this medical education program do so with full knowledge that they waive any claim they may have against the College for reliance on any information presented during these educational activities. The College does not guarantee, warrant or endorse any commercial products or services.
The ACR’s CME purpose is to provide comprehensive education to improve the knowledge and performance of physicians, scientists and other health professionals. The ACR will offer evidence-based educational activities designed to enhance practice performance and improve the quality of care in those with or at risk for arthritis and rheumatic and musculoskeletal diseases.

Global Learning Objectives
At the conclusion of the 2012 ACR/ARHP annual meeting, participants should be able to:

- identify recent developments in the diagnosis and management of patients with rheumatic diseases
- outline new technologies for the treatment of rheumatologic problems
- describe potential challenges in the delivery of care to patients with rheumatic diseases and to specify possible solutions
- utilize new research data to improve the quality of care of patients with rheumatic diseases
- summarize recent rheumatology research findings

Certificates of CME Credit or Participation

Accreditation Statement: The American College of Rheumatology is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

Designation Statement: The ACR designates this live educational activity for a maximum of 49.75 AMA PRA Category 1 credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

International Physicians: International physicians who register as part of a group and require AMA PRA Category 1 Credit(s)™, must provide the following information to your tour leader: full name, mailing address, telephone and fax numbers, and e-mail address. The information will be used to verify your meeting attendance.

The American Medical Association has an agreement of mutual recognition of continuing medical education credit with the European Union of Medical Specialties. International physicians interested in converting AMA PRA Category 1 Credit ™ to EACCME credit should contact the UEMS.

Health Professionals: Participants may claim hours to receive a Certificate of Participation for an activity designated for AMA PRA Category 1 Credit(s)™. For non-CME sessions, attendees may also request a certificate of participation.

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Your evaluation of the meeting is very important. The ACR/ARHP annual meeting planning committees use feedback from attendees to assist in the development of future educational activities; therefore, we encourage you to complete your session evaluations and CME/Certificate application.

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Accepted abstracts are made available to the public online in advance of the meeting and are published in a special supplement of *Arthritis & Rheumatism*. Information contained in those abstracts may not be released until the abstracts appear online. Academic institutions, private organizations and companies with products whose value may be influenced by information contained in an abstract may issue a press release to coincide with the availability of an ACR abstract on the ACR website.

However, the ACR continues to require that information that goes beyond that contained in the abstract (e.g., discussion of the abstract done as part a scientific presentation or presentation of additional new information that will be available at the time of the meeting) is under embargo until 4:30 PM Eastern Time on Saturday, November 10, 2012. Violation of this policy may result in the abstract being withdrawn from the meeting and other measures deemed appropriate. Authors are responsible for notifying financial and other sponsors about this policy.
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Background/Purpose: Although osteoarthritis (OA) is commonly described as a non-inflammatory joint disease, synovial inflammation is increasingly recognized as contributing to the symptoms and progression of OA. The aim of this study is the evaluation of synovial inflammation degree by macroscopic and histological findings in patients with knee OA.

Methods: Samples of synovial tissue were obtained from 22 patients with knee OA. The arthroscopy was performed under local anesthesia with sedation. During arthroscopy the joint is distended by infusion of sterile saline with a motorized suction shaver. Each patient underwent a systematic examination of the synovium from the suprapatellar pouch, patellofemoral joint, lateral recesses and medial and lateral compartments of femoro-tibial joint. The arthrosopic findings were reflected in a data collection sheet. Biopsies of synovium were obtained from directly visualized areas with biopsy forceps. For macroscopic assessment of the synovial membrane we used a macroscopic semi-quantitative scoring system based on the existence of vascularization and proliferation. Vascularization was assessed by the absence or presence of hyperemia and increased vascularity (score of 0 or 1). Synovial proliferation scored 0, 1 or 2 depending on the presence or absence of granularity and villous hypertrophy. The total score of the two components ranged from 0–4. The histological samples were processed with hematoxylin-eosin for histological semi-quantitative scoring of synovitis. This scale was based on enlargement of the lining cell layer (0–3 points), density of the residents cells (0–3) and inflammatory infiltrate (0–3). According to the score the findings were classified in the absence of synovitis (0–1), low-grade synovitis (2–4) or high-grade synovitis (5–9 points).

Results: Samples were obtained from 20 of the 22 arthroscopies performed. Macroscopically, we observed pluricompartmental synovitis in 7 patients and localized in 6. In one patient, synovitis adjacent to chondral injury of the femoral condyle was found. Microcrystals were found in the synovium of 4 patients not previously diagnosed of microcrystalline arthritis. Regarding the total score of macroscopic semi-quantitative analysis, 10 patients (50%) scored between 2 and 4. No patient had scores of 0. Histological assessment was performed in 17 of the 20 patients, excluding those cases with presence of microcrystals or insufficient material. The macroscopic semi-quantitative score showed low-grade synovitis in 7 patients (41%) and high grade in 9 (53%). Only in one of the samples histological synovitis was not evidenced.

Conclusion: The frequency of synovitis in patients with osteoarthritis and synovial effusion assessed by macroscopic or histological criteria is high. Arthroscopic assessment of synovitis shows a good correlation between macroscopic dimension and microscopic histological analysis.

Disclosure: M. Romera-Baures Sr., None; R. Vallés-Garcia Sr., None; A. Rozadilla Sr., None; M. Terricabras Sr., None; J. M. Nolla Sr., None.

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Microrna-558 Regulates the Expression of Cyclooxygenase-2 and IL-1beta Responses in Human Articular Chondrocytes. Su Jin Park, Eun-Jeong Cheon and Hyun Ah Kim. Hallym University Sacred Heart Hospital, Kyunggi, South Korea

Background/Purpose: Osteoarthritis (OA) is a chronic degenerative joint disease in which multiple factors contribute to cartilage degradation. It is widely accepted that excess production of proinflammatory cytokine, interleukin-1β (IL-1β), is associated with in the initiation and progression of cartilage destruction. In OA cartilage, IL-1β-stimulated COX-2 expression strongly contributes to the inflammation and cartilage destruction via upregulating PGE2 production. The objective of this study was to address whether miR-558, one of IL-1β-responsive microRNAs, can control IL-1β-mediated induction of COX-2 and catabolic effects in human articular chondrocytes.

Methods: Total RNA was extracted from the cartilage tissues of normal and OA donors or cultured human articular chondrocytes. The expression of miR-558 was quantified by TaqMan assay. To investigate the repressive effect of miR-558 on COX-2 expression, human chondrocytes and chondrogenic SW1353 cells were transfected with mature miR-558 or their antisense inhibitor (anti-miR-558). The expression of COX-2 protein was determined by western blot analysis and the involvement of miR-558 on IL-1β-induced catabolic effects was examined by western blot analysis and ELISA. Direct interaction between miR-558 and the putative site in the 3’-UTR of COX-2 mRNA was validated by luciferase reporter assay.

Results: Normal human articular cartilages expressed miR-558, and this expression was significantly suppressed in OA cartilages. Stimulation with IL-1β caused a significant reduction of miR-558 expression in normal and OA chondrocytes. IL-1β-induced activation of MAPK and NF-κB decreased miR-558 expression and induced COX-2 expression in chondrocytes. The overexpression of miR-558 directly suppressed the lucerase activity of a reporter construct containing the 3’-UTR of human COX-2 mRNA and significantly inhibited IL-1β-induced upregulation of COX-2, while treatment with anti-miR-558 enhanced IL-1β-induced COX-2 expression and reporter activity in chondrocytes. Interestingly, IL-1β-induced activation of NF-κB and expression of MMP-1 and MMP-13 were significantly inhibited by miR-558 overexpression.

Conclusion: These findings demonstrated that cartilage homeostasis is modulated by an elaborate network of functional microRNAs such as miR-558 that directly targets COX-2 and regulates IL-1β-stimulated catabolic effects in human chondrocytes.

Disclosure: S. J. Park, None; E. J. Cheon, None; H. A. Kim, None.
Pro-Inflammatory Effect of Extracellular RNA On Synovial Fibroblasts From Patients With Rheumatoid Arthritis. Birgit Zimmermann, Silvia Fischer, Markus Rickert, Stefan Reharn, Angela Lehrt, Ulf Müller-Ladner, K. T. Preissner, Elena Neumann. 1Justus-Liebig-University of Giessen, Kerckhoff-Klinik, Bad Nauheim, Germany, 2Justus-Liebig-University of Giessen, Medical School, Giessen, Germany, 3University Hospital Giessen and Marburg, Giessen, Germany, 4Markus-Hospital, Frankfurt, Germany

Background/ Purpose: Extracellular RNA (exRNA) is present in the serum of patients suffering from different kinds of cancer. exRNA influences physiological processes like blood coagulation and endothelial cell permeability. In this study, we analyzed the presence of exRNA as well as RNase in joints and the effects of nucleic acids and nucleosides on synovial fibroblasts (SF) of patients with rheumatoid arthritis (RA). RA is a chronic inflammatory disease, characterized by the destruction of cartilage as well as bone. RASF are activated cells acting as key players in cartilage destruction.

Methods: exRNA in synovium of RA (n = 26), osteoarthritis (OA: n = 26) and psoriatic arthritis (PsA: n = 3) patients was stained in tissue sections with DAPI to locate DNA and SYTO® RNA Select™ Green Fluorescent Stain to locate RNA. RNase 1 was analyzed in synovium (RA n = 17; OA n = 7) immunohistocally. RNase activity was measured in synovial fluid (RA n = 14; OA: n = 5; PsA n = 10) and supernatants of SF (RA n = 3; OA: n = 3; PsA-SF n = 4; healthy donors (NSF) n = 3) using the Quant-iT™ RNA Assay Kit. Release of exRNA by cultured SF (RA n = 3; NSF n = 3; PsA-SF n = 4; NSF n = 3) was measured photometrically. The secretion of IL-6 was analyzed by ELISA after treating RASF (n = 3) with 10 µg or 25 µg isolated autologous RNA or DNA for 15 h. Alternatively RASF (n = 3) were pre-incubated for 24 h, then 5 U/ml RNase or DNase was added. In the SCID mouse model, the effect of RNase or DNase i.v. was analyzed towards migration and cartilage invasion (RNase n = 10; DNase n = 9; saline control n = 9).

Results: Synovium of all patient showed RNA and DNA signals co-localized within the nuclei. In RA, exRNA was detectable in the lining layer, exRNA in OA lining was present only in single defined regions. PSA showed no exRNA in lining. RNase 1 was increased in lining. RNase activity (units/mg protein) in synovial fluid was significantly increased in RA (31.6±2.45 vs. p = 0.0023) and OA (27.0±4.5 vs. p = 0.033) compared to PsA (18.2±2.3). RNase release (units/mg protein) by cultured cells was comparable (RA: 1.13±0.24; NSF: 1.01±0.15). RNase secretion of IL-6 was increased by RNA (10 µg 135±40%; 25 µg 118±18% vs. DNA (10 µg 156±33%; 25 µg 220±59%). Only RASF reduced IL-6 release (77%±14% of control, p = 0.136). In vivo, RASF invasion was reduced at the implantation site by both nucleases (control 1.92±0.24; RNase 1.22±0.21 p = 0.037; DNase 0.80±0.19 p = 0.002). Fibroblast migration was only reduced with DNase (control 1.51±0.28; RNase 1.28±0.39 p = 0.625; DNase 0.84±0.18 p = 0.042).

Conclusion: Increased exRNA in the lining and the RNase activity in the synovial tissue and fluid of OA and especially in RA patients could represent a new unbalanced regulatory system in chronic inflammation including RA. The increased exRNA but unchanged RNase release by RASF in vitro indicates that RASF contribute to secretion of pro-inflammatory exRNA. exRNA mediates an increased cytokine release by RNase and cartilage invasion which could be inhibited by RNase application. The results illustrate the pro-inflammatory and destructive effect of exRNA in RA.

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Adalimumab Inhibits TNF-Enhanced Human Osteoclast Development More Effectively Than Other Biologic Agents Under In Vitro Conditions of Chronic TNF Exposure. Bohdan P. Harvey1 and Zehra Kaymakcalan. 1Abbott Laboratories, Worcester, MA, 2Abbott, Worcester, MA

Background/ Purpose: TNF-alpha (TNFa) has been shown to contribute of osteoclastogenesis independently and in conjunction with M-CSF or RANKL, two key cytokines involved in osteoclast development. Both TNFα and RANKL have been concomitantly detected in the synovial fluid of RA patients. However, the role of TNFα in promoting human osteoclast differentiation and activity in the presence of RANKL is poorly understood. In this study, we sought to determine the impact of TNFa on RANKL-induced human osteoclast development and function under chronic conditions and to assess the effectiveness of various biologic agents in blocking the effect of TNF in this system.

Methods: Primary human osteoclast precursors (OCP) were exposed to various combinations of M-CSF, RANKL and TNFα (100 ng/ml) for up to 7 days. Prior to adding to the cells, the biologics were pre-incubated with the cytokine cocktail for 30 min. Osteoclast differentiation was determined by the presence of large multinucleated cells positive for tartrate-resistant acid phosphatase (TRAP) and by TRAP5b activity. Resorptive activity was assessed by measuring the release of either the degradation products of plate-bound Eu-labeled collagen (Eu-col) or the cross-linked C-terminal collagen type I (CTX-I) from human bone chips.

Results: In the absence of biologics, the addition of TNFα to OCP cultures with exogenous RANKL promoted earlier differentiation (increased TRAP5b activity by day 4) and enhanced osteoclast activity (increased CTX-I levels by day 7) compared to RANKL alone. Based on early time course assessments using Eu-col, TNFα enhanced the kinetics of osteoclast maturation by 13 hrs and maintained 3-fold higher levels of osteoclast activity for up to 122 hrs. Among the biologics, adalimumab restored the rate of osteoclast differentiation and activity to levels comparable to RANKL alone at concentrations 10-fold lower than etanercept (0.74 µg/ml and 20 µg/ml, respectively). Moreover, etanercept was unable to maintain this inhibitory effect even at the highest dose tested, while abatacept was ineffective in preventing TNF-mediated augmentation of osteoclast development at all concentrations tested. Interestingly, the levels of many TNFα-responsive pro-osteoclastogenic chemokines were similarly reduced in the presence of either adalimumab or etanercept, suggesting that both agents were able to neutralize TNF during early osteoclast development.

Conclusion: These findings demonstrate that TNFα can significantly enhance the kinetics of RANKL-induced osteoclast differentiation and activity. Moreover, under chronic in vitro exposure of OCP to TNF, adalimumab is more effective than etanercept (or abatacept) in mitigating the pro-osteoclastogenic effects of TNF. Overall, our results demonstrate the central role of TNF in RA joint destruction and the sustained potency of adalimumab as compared to other biologics in preventing bone erosion due to chronic TNF exposure.

Disclosure: B. P. Harvey, Abbott Laboratories, 3; Z. Kaymakcalan, Abbott Laboratories, 3.

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The Effect of Hydrogen Sulfide Donors On Inflammatory Mediators in Human Articular Chondrocytes. Elena F. Burguera1, Angela Vela Añero2, Rosa Meijide Failde2 and Francisco J. Blanco. 1Rheumatology Service, INIBIC-Hospital Universitario A Coruña, A Coruña, Spain, 2Department of Medicine, University of A Coruña, A Coruña, Spain

Background/ Purpose: Hydrogen sulfide (H2S) has recently been proposed as an endogenous mediator of inflammation in several pathology models. The aim of this work was to study the possible role of H2S as an anti-inflammatory and anti-oxidant agent in human articular chondrocytes (HCs) from osteoarthritic (OA) tissue.

Methods: We analyzed the effects of different concentrations of a fast (NaHS) or a slow (GY41437) release H2S donor on three key aspects of the inflammatory process in OA, namely: 1) Nitric oxide (NO) production and inducible NO synthase (iNOS) levels; 2) Production of reactive oxygen species (ROS) and antioxidant enzymes superoxide dismutase 2 (SOD2) and catalase (CAT); and 3) The production of prostaglandin E2 (PGE2) and cyclooxygenase (COX)-1, -2 and PGE synthase 1 (mPGES-1). NO production was quantified through the Griess reaction. Protein levels were visualized through immunocytochemistry and quantified with appropriate software; mRNA expression levels were detected with qRT-PCR. ROS levels were identified with a fluorescence microscope after dihydrodihydrodramine treatment. PGE-2-like prostaglandins were quantified with a specific EIA. For all studies cells were cultured in medium with 0.5% FBS and stimulated with 5 mg/ml of IL-1b and the different concentrations of NaHS and GY41473 (ranging from 50 mM to 1000 mM) for 48h. ANOVA tests were performed and differences were considered significant when p<0.05.

Results: The concentrations of H2S donors used did not significantly affect cell viability (p>0.05). Concentrations higher than 100 µM of the sulfur donors were effective in reducing NO production in IL-1b stimulated OA CHs in a dose-dependent manner, probably by ameliorating the induction

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of iNOS synthesis, since both iNOS mRNA and protein levels were also reduced. ROS levels were reduced when 50 and 200 μM GYY4137 were used, but not by 1000 μM, and this was accompanied, at 200 μM GYY4137, by a reduction in the expression of SOD2 and CAT. NaHS was not effective in reducing ROS directly, and no correlation was found with SOD2 and CAT expression. PGE-2 values were reduced by all concentrations of GYY4137 and NaSH (except 1000 μM) and, in the case of GYY4137, both COX-2 and nPGES-1 were also downregulated at the higher concentrations (>100 μM) whereas COX-1 expression was not affected. Collectively, GYY4137 was found to be more effective than NaHS to ameliorate the IL-1β-induced OA-like markers of inflammation and oxidative damage, particularly at a 200 μM.

Conclusion: Results obtained so far suggest an anti-inflammatory and antioxidative role of certain H₂S donors which might be of interest in the alleviation of OA-related inflammation processes and that should be further explored as a therapeutic approach.

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Lamin A Deregulation in Human Mesenchymal Stem Cells Promotes an Impairment in Their Chondrogenic Potential and Imbalance in Their Response to Oxidative Stress. Jesus Mateos1, Alexander De La Fuente2; Ivan A. Lesende-Rodriguez2, Maria Carmen Arufe2 and Francisco J. Blanco1.

Rheumatology Division, Proteomics Unit-ProteoRed/ISCIII, INIBIC-Hospital Universitario A Coruña, A Coruña, Spain, 2Department of Medicine, Area of Anatomy and Human Embryology, University of A Coruña-INIBIC, A Coruña, Spain

Background/Purpose: Previous work by our group and others indicated that an accumulation of lamin A (LMNA) was associated with the osteoarthritis (OA) chondrocyte phenotype. Mutations of this protein are linked to laminopathies and specifically to Hutchinson-Guilford Progeria Syndrome (HGPS), an accelerated aging disease. Some authors have proposed that a deregulation of LMNA affects the differentiation potential of stem cells. In the present study, we examined the effect of the over-expression of LMNA, or its mutant form progerin (PG), on the mesoderm differentiation potential of MSCs.

Methods: Mesenchymal stem cells (MSCs) from human umbilical cord (UC) stroma have previously been isolated, expanded and differentiated towards mesoderm cell lineages. For efficient gene delivery of wt LMNA, PG and GFP (Green Fluorescence Protein), we used a lentiviral expression system. GFP-transduced MSCs were used as control for the differentiation study since they present a differentiation capacity similar to that of untransduced MSCs. PG-transduced MSCs were studied by with alizarin red staining to assess calcium deposits as well as Real-Time PCR of ALP, OC and Runx2 to assess early and late osteogenic differentiation. Adipogenic potential was studied with Oil Red staining for lipid droplets and Real-Time PCR of PPARγ, FABP and ADIPOQ, for early and late adipogenic differentiation. Chondrogenesis and hypertrophy were studied using immunohistochemistry and Real-Time PCR of Aggrecan, MMP-13, Type II Collagen, Type I Collagen and Type I Collagen.

Results: We found that over-expression of LMNA or PG by lentiviral gene delivery leads to defects in differentiation potential. PG-transduced MSCs present defects in adipogenic and osteogenic potential. The chondrogenic potential is defective in PG-MSCs, which present a decrease in COL2 and Aggrecan as revealed by both immunohistochemistry and Real-Time PCR. LMNA and PG-transduced MSCs have an increase in hypertrophy markers (MMP-13 and Type X Collagen) during chondrogenic differentiation, as well as a decrease in manganese superoxide dismutase (MnSODMD) and an increase of mitochondrial MnSODM-dependent reactive oxygen species (ROS). ROS synthesis was partially (51%) and totally reverted by N-Acetyl Cystein, ROS scavenger, (NAC) at 20 and 40 μg/mL respectively for 1 hour in culture. In addition, defects in chondrogenesis detected by immunohistochemistry and Real-Time-PCR are partially reversed by incubations with NAC at 40 μg/mL for 1 hour.

Conclusion: Our results suggest that OA process could be enhanced by defects in stem cell differentiation, partially due to imbalance in oxidative stress.

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Supercharged Sox9 Protein Induces Chondrogenic Differentiation of Bone Marrow-Derived Mesenchymal Stem Cells. Yuan K. Chou1, Shili Wu1, Camilo Avendano2, Tom Caldwell3, Brian Maniaci2, Kentaro Yomogida3, Yong Zhu1 and Cong-Qiu Chu3. 1Oregon Health & Science University, Portland, OR, 2VivoScript, Inc, Costa Mesa, CA, 3Oregon Health & Science Univ and Portland VA Medical Center, Portland, OR.

Background/Purpose: Osteoarthritis (OA) is characterized by progressive breakdown of articular cartilage. Regeneration of cartilage has been an attractive approach to OA therapy. Sox9 is a transcription factor belonging to the Sox (Sry-type HMG box) gene family and has been identified as a “master regulator” of the chondrocyte phenotype. We investigated whether a super positively charged cell penetrating Sox9 fusion protein can induce bone marrow-derived mesenchymal stem cells (MSC) to differentiate into chondrocytes for potential use to promote cartilage regeneration in situ.

Methods: A bioactive supercharged Sox9 (scSox9) was generated by fusing Sox9 with a super positively charged fluorochrome protein (GFP) using molecular engineering technology. Human bone marrow-derived MSC at passage 5 were cultured with scSox9 in monolayer or in cell aggregate for differentiation into chondrocytes. Chondrogenesis was verified by toluidine blue staining for aggrecan and by RT-PCR and immunohistochemistry for collagen type I, II and X production.

Results: scSox9 could readily enter HFF cells, a human skin fibroblast-derived cell line and human bone marrow-derived MSC. After one hour incubation with scSox9, both HFF cells and MSC showed intracellular expression of green fluorescence indicating entry of scSox9 into these cells. scSox9 was able to induce MSC proliferation and differentiation with no requirement of additional growth factors. The number of scSox9 treated MSC was increased two folds after 72 hours in culture compared with sc GFP treated MSC. As early as 48 hours, scSox9 treated MSC started changing morphology to chondrocyte-like cells and the changed morphology maintained for 21 days in culture when observation was ended. These morphologically changed cells stained positive for toluidine blue, which suggests aggrecan production. Furthermore, scSox9 induced collagen type II expression and down-regulated collagen type I and type X production. Most importantly, one time addition of scSox9 at the initiation of chondrogenesis was sufficient to induce MSC chondrogenic differentiation and maintain the chondrocyte phenotype.

Conclusion: These in vitro data demonstrated that scSox9 is able to enter bone marrow-derived MSC and induce chondrogenesis and maintain chondrocyte phenotype. Further investigation is warranted for the potential therapeutic use in cartilage repair by promoting regeneration of hyaline cartilage.

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Function of the Chondrocyte PI3 Kinase-Akt Signaling Pathway Is Stimulus Dependent. Richard F. Loeser and Meredith Greene. Wake Forest School of Medicine, Winston-Salem, NC.

Background/Purpose: Previous studies have shown that activation of the chondrocyte PI3-kinase-Akt signaling pathway by IGF-1 promotes chondrocyte survival and matrix synthesis. However, other studies have shown activation of this pathway by cytokines such IL-1 plus oncostatin M (OSM) can promote chondrocyte MMP production. Based on the latter studies, some investigators have proposed targeting this pathway for treatment of OA. The purpose of the present study was to clarify the function of this important signaling pathway in chondrocytes by directly comparing the effects of anabolic and catabolic stimuli.

Methods: Human articular chondrocytes were isolated from normal adult ankle (tali) and knee articular cartilage and from knee cartilage removed at the time of joint replacement for OA (n=3 donors each) for normal and OA. Primary chondron cultures were made serum-free and stimulated with IGF-1 (100ng/ml), IL-1β (0.02ng/ml), OSM (10ng/ml) or IL-1β+OSM (0.02ng/ml+10ng/ml). The doses of IL-1 and OSM were based on previous studies demonstrating increased MMP production stimulated by the combination of these stimuli. Stimulus independent activation of Akt was achieved by lentiviral infection of constitutively active (CA) Akt. Activation of signaling proteins was measured at 30 minutes by immunoblots of cell lysates and MMP-13 production was measured in conditioned media after overnight stimulation.

Disclosure: R. F. Loeser, None; M. Greene, None.
Fibronectin Fragment Induces Procatabolic Effects Through TLR-2 Signaling Pathway in Human Articular Chondrocytes. Su Jin Park¹, Eun-Jeong Cheon¹ and Hyun Ah Kim². ¹Hallym University Sacred Heart Hospital, Kyunggi, South Korea, ²Hallym University Sacred Heart Hospital, Kyunggi, South Korea

Background/Purpose: Fibronectin fragments (FN-fs) are increased in the synovial fluid of osteoarthritis patients and have a potent chondrolytic effect. However, little is known about the cellular receptors and signaling mechanisms that are mediated by FN-fs. Here we investigated whether the 29-kDa amino-terminal fibronectin fragment (29-kDa FN-f) regulates cartilage metabolism through Toll-like receptor-2 (TLR-2) signaling pathway in human articular chondrocytes.

Methods: Human articular chondrocytes were enzymatically isolated from articular cartilage and cultured in monolayer. In order to investigate whether 29-kDa FN-f induces MMPs production through TLR-2, human chondrocytes were transfected with TLR-2 expression plasmid or small interfering RNAs (siRNAs) targeting TLR-2 and Myeloid differentiation factor 8 (MDMD8). In 29-kDa FN-f-stimulated chondrocytes, the relative levels of mRNA for matrix metalloproteinase 1 (MMP-1), MMP-3, and MMP-13 were analyzed by real-time quantitative reverse transcription-polymerase chain reaction. Protein expression levels of MMP-1 and MMP-3 and the regulatory effect of TLR-2 on 29-kDa FN-f-mediated signaling pathways were assessed by immunoblotting. MMP-13 production was measured by ELISA assay. Association of 29-kDa FN-f with human chondrocytes through TLR-2 was evaluated by fluorescence microscopic analysis.

Results: The expression levels of TLR-2, 3, 4, and 5 in TLR family were remarkably elevated in OA cartilage compared to normal cartilage. But, TLR-1 expression of normal and OA cartilages was not significantly different. When human chondrocytes were stimulated with various fibronectin fragments, TLR-2 expression was highly increased by 29-kDa FN-f stimulation. Knockdown of TLR-2 expression using siTLR-2 significantly suppressed 29-kDa FN-f-induced MMPs production in human normal and OA chondrocytes. Conversely, overexpression of TLR-2 enhanced 29-kDa FN-f-stimulated MMPs production. Moreover, we found that knockdown of MDMD8, a downstream adaptor in TLR-2 signaling pathways, led to marked reduction of MMPs production induced by 29-kDa FN-f. In addition, 29-kDa FN-f-mediated phosphorylation of IκBα and p38 was apparently inhibited by transfection of siTLR-2. However siTLR-2 treatment did not affect 29-kDa FN-f-induced activation of JNK and ERK. Notably, fluorescence microscopic analysis showed direct interaction between TLR-2 and 29-kDa FN-f in human chondrocytes.

Conclusion: MyD88-dependent TLR-2 signaling pathway plays an important role in 29-kDa FN-f-stimulated procatabolic responses of human chondrocytes. Modulation of TLR-2-mediated signaling may be as a potential therapeutic strategy for the prevention of cartilage degradation in OA.

Disclosure: S. J. Park, None; E. J. Cheon, None; H. A. Kim, None.


Background/Purpose: The aim of this study was to obtain cartilage-like constructs by chondrogenic differentiation of human bone marrow mesenchymal stem cells (hBM-MSCs) grown on different collagen scaffolds.

Methods: hBM-MSCs were characterized by flow cytometry using MSC markers and analysed for their multipotential differentiation capacity. These cells were cultured at a density of 200,000 cells/cm² on different collagen scaffolds: Col 1 + Col II (C1C2); Col 1 + Col II + Heparan Sulfate (C1C2HS); Col 1 + Col II + Chondroitin Sulfate (C1C2CS). Col 1 + Heparin (C1OLH3). hBM-MSCs were cultured during 30 days in a chondrogenic differentiation medium supplemented with TGFβ-3. These cells were cultured at a density of 200,000 cells/cm² on different collagen scaffolds: Col 1 + Col II (C1C2); Col 1 + Col II + Heparan Sulfate (C1C2HS); Col 1 + Col II + Chondroitin Sulfate (C1C2CS). Col 1 + Heparin (C1OLH3). hBM-MSCs were cultured during 30 days in a chondrogenic differentiation medium supplemented with TGFβ-3. We have analysed cell growth and cell morphology by histochemical analysis and Transmission (TEM) and Scanning (SEM) Electron Microscope. Chondrogenic differentiation was confirmed by histochemical and immunohistochemical analysis. Moreover, we have tested relative gene expression of characteristic chondrocyte genes such as SOX9 and COLII. Finally, collagen concentration in the cultures supernatant was measured using a collagen Assay.

Results: hBM-MSCs were able to grow in the surface and inside of all the scaffolds and they were able to synthesize extracellular matrix (ECM) around the cells. Cellular proliferation was observed in all the scaffolds by PCNA (Proliferating Cell Nuclear Antigen) immunostaining, obtaining the highest values in C1C2 and in C1C2HS scaffolds. The percentage of cells, regarding the area of the analysed scaffold, was more than 50% in C1C2 and C1OLH3 and higher than 75% in C1C2HS and C1C2CS scaffolds. By means of immunostainings we detected Col II in the ECM of C1C2HS constructs and in the cytoplasm of the cells in C1C2 constructs. Colagen was detected in culture supernatants of all the scaffolds obtaining the highest collagen release between 11–21 days of differentiation. These results indicated the beginning of the chondrogenic differentiation. TEM showed that cells had large number of lipid vesicles, mitochondrias and high secretory activity. SEM allowed us to study the adherence of cells, morphology and the ECM. We have detected the expression of two markers of early chondrogenesis, SOX9 and COLII, in all the constructs at 30 days.

Conclusion: Our data showed that the best results were obtained with C1C2HS constructs. hBM-MSCs cultured in chondrogenic medium over these scaffolds were able to differentiate better into chondrocyte-like cells and achieve best therapeutic target given the pro-anabolic and survival functions of Akt.

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to synthesize more ECM than over the other scaffolds. Resulting cartilage-like constructs may be suitable candidates for Tissue Engineering. Acknowledgements: Opocrin S.P.A.; CIBER-BBN BB01-0040; SAI-UDC.

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Articular Cartilage Expresses the IL-15 Receptor Alpha-Chain and Responds to IL-15 with Increased Matrix Metalloproteinase Release. Anjali Nar1, Michael Huvard1, Madeline Rollins1, Arnavaz Hakimiyan1, Lev Rappaport1, Arkady Margulis1, Susanna Chubinskaya1, and Carla R. Scanzello1. 1Rush University Medical Center, Chicago, IL, 2University of Illinois at Chicago, Chicago, IL, 3Northwestern University, Chicago, IL

Background/Purpose: IL-15, known for its effects on survival of lymphocyte subsets, plays a role in synovitis of Rheumatoid Arthritis. It is reported that IL-15 is also detectable in synovial fluid (SF) of patients with knee osteoarthritis (OA), and correlates with levels of matrix metalloproteinase (MMP)-1 and MMP-3. Serum levels have been associated with development and progression of radiographic OA changes, suggesting a possible role in cartilage loss. We investigated IL-15 and IL-15 receptor staining in synovium and cartilage, and tested whether cartilage can respond directly to IL-15.

Methods: Synovial membrane (SM) and cartilage samples from five organ donors collected within 24 hours of death were formalin-fixed and paraffin embedded. Additional SM biopsies from four patients with early-stage knee OA were also collected. Six-micron sections were stained for IL-15 and IL-15Rα using immunoperoxidase technique and polyclonal antibodies directed against IL-15 (rabbit anti-human IL-15, Abcam) or the IL-15Rα chain (goat anti-human IL-15 Rα, Santa Cruz Biotechnology). Non-immune rabbit IgG and goat IgG were used as negative controls. For explants culture, 4mm cartilage punch biopsies were prepared from the superficial zone of an additional organ donor; 2 explants per well were placed in a 24 well plate with DMEM (±100u/ml Penicillin-Streptomycin). After 24 hours, media was replaced with 1 ml of fresh media or media + rhIL-15 (10ng/ml, Peprotech, NJ) or TNFa and Oncostatin M (100ng/ml each, R & D Systems, MN ). Every two days for 12 days and again at 15 days, culture supernatants were collected and replaced with fresh media +/− cytokines. Consecutive supernatants were analyzed for MMP-1, -3 and -9 content using a human MMP-3-Plex Immunoassay (Meso Scale Discovery).

Results: IL-15 and IL-15Rα staining was observed in SM mononuclear infiltrates in the OA patients. IL-15 Rα staining was also identified in the synovial lining and sublining vessels in both patients and donors. Positive staining for IL-15 and IL-15Rα was observed in chondrocytes from all layers (superficial to deep). In vitro, IL-15 increased MMP-1 and MMP-3 release from cartilage explants compared to media controls at each time point up to 15 days. Maximum MMP-1 release reached 89.5 ±/− 5.1 ng/ml at day 15 (vs. media control 0.02 ±/− 0.003 ng/ml, p<0.05) while MMP-3 release reached 665.7 ±/− 13 ng/ml by day 12 (vs. media control 12.2 ±/− 0.2 ng/ml, p<0.001). Lesser magnitude MMP-9 release from cartilage was observed in response to IL-15, with peak concentration of 962.7 ±/− 1.8 pg/ml (p<0.05 vs. control) at day 15. TNFa and OSM induced substantial MMP-1, -3 and -9 release from explants, over 10 times higher than IL-15 induced levels.

Conclusion: Both IL-15 and IL-15Rα are expressed in SM and cartilage indicating that both tissues may respond to this cytokine in vivo. IL-15 induced MMP-1, -3, and -9 release from cartilage explants compared to control but of lesser magnitude than levels induced by TNFa + OSM. This is the first demonstration that cartilage is responsive to IL-15, and suggests a role for IL-15 in cartilage catabolism in various forms of arthritis including OA.

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Visfatin/Nampt in Osteoarthritis: Sites of Production in Human Joints and Role of Its Enzymatic Activity. Marie-Charlotte Laiguillon1, Carole Bougault1, Xavier Houard1, Marjolaine Gosset1, Geoffrey Nourissat1, Sabrina Priam1, Zvezdana Mladenovic1, Claire Jacques1, Francis Berenbaum3, and Jeremie Sellam1. 1Pierre et Marie Curie University Paris VI, Paris, France; 2Paris Descartes University, Montrouge, France; 3AP-HP, St Antoine Hospital, Paris, France; 4Hospital Saint-Antoine, Pierre et Marie Curie University Paris 6, AP-HP, 75012, France

Background/Purpose: The role of cytokines produced by obese-derived adipose tissue, namely adipokines, in the pathophysiology of osteoarthritis (OA) is now well established. We recently suggested that one of them, visfatin, may play a role in OA by activating chondrocytes (1,2). Along with its cytokine effect, visfatin has an enzymatic activity called nicotinamide phosphoribosyltransferase (Nampt), which is the rate-limiting enzyme in the salvage pathway of nicotinamide adenine dinucleotide (NAD) biosynthesis from nicotinamide, an intracellular pathway involved in many biological processes including TNFa and IL-6 synthesis. Thus, we aimed to i) characterize the local site(s) of production of visfatin/Nampt by the human OA joint tissues ii) further investigate the role of its enzymatic activity in the expression of pro-inflammatory cytokines by chondrocytes and iii) determine whether visfatin/Nampt may also play a role in subchondral bone.

Methods: Human OA joint tissues (synovial membrane, cartilage, subchondral bone) from patients undergoing surgical knee replacement were incubated for 24h in serum-free media. Visfatin/Nampt release in media by the different tissues was evaluated using Western Blot and ELISA. Primary cultures of mouse chondrocytes and osteoblasts were stimulated with recombinant visfatin/Nampt (5ug/ml) for 24h. To determine the role of the enzyme activity, cells were pretreated or not 4h before visfatin/Nampt stimulation with APO866 (10nM), a pharmacologic inhibitor of Nampt activity (3). Effects of stimulation on IL-6, IL-8/Kc, IL-1β, MCP-1, VEGF and TGFβ expression, and on IL-6 and IL-8/Kc release were examined by quantitative RT-PCR and ELISA, respectively.

Results: All human OA joint tissues released visfatin/Nampt (synovium: 429 ± 356, cartilage: 237 ± 380, subchondral bone: 200 ± 104 ng/g tissue) with higher level for the synovium compared to cartilage (p<0.01). Visfatin/Nampt significantly induced IL-6, IL-8/Kc, IL-1β and MCP-1 expression by chondrocytes (n=6) and osteoblasts (n=5) (Table). Visfatin/Nampt increased induction of IL-6 and IL-8/Kc proteins by both cell types. Nampt activity inhibition by APO866 decreased pro-inflammatory cytokines expression at mRNA level (up to 97 % of inhibition) as well as at protein level (up to 63 % of inhibition) and was especially efficient in chondrocytes (Table). Effect of visfatin/Nampt was selective since VEGF and TGFβ were not modulated upon stimulation.

Conclusions: Visfatin/Nampt is produced by the cartilage, the subchondral bone and mostly by the synovial membrane. We demonstrate that Nampt activity of visfatin plays a major role in chondrocytes and osteoblasts activation, suggesting that targeting the Nampt enzymatic activity with a compound like APO866 (being tested in hematological malignancies) may be a new therapeutic approach of OA.

References:
(1) Gosset M. Arthritis Rheum 2008
(2) Jacques C. J Biol Chem 2012

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EPAC1 Activation Is Required for NFkB Nuclear Translocation and Osteoclast Differentiation. Aranazzu Mediero1, and Bruce N. Cronstein2. 1NYU School of Medicine, New York, NY, 2NYU School of Medicine, Division of Rheumatology, New York, NY

Background/Purpose: Previous work demonstrated that one mechanism by which bisphosphonates inhibit osteoclast differentiation and function is via inhibition of Rap1A isoprenylation and, as a result, function. As Rap1 is the
effector of the cAMP-binding EPAC protein (exchange protein directly activated by cAMP), we determined the role of EPAC1 in osteoclast differentiation.

**Methods:** Osteoclast differentiation was studied as the M-CSF/RANKL stimulated formation of multinucleated TRAP-positive cells from primary murine (C57Bl/6) bone marrow-derived precursors or EPAC1 knockdown (lentiviral shRNA for EPAC1) RAW264.7 cells in the presence/absence of the EPAC-selective cAMP analog 8-CPT-cAMP 100nM and EPAC inhibitor BFA (10µM). Rap1 activity assay was carried out according to the manufacturers’ protocol. Signaling events (EPAC, NFkB and MAPK) were studied by Western Blot in EPAC1 KO RAW264.7 cells (scrambled shRNA transfection is control for these experiments). Osteoclast marker expression was studied by RT-PCR.

**Results:** The EPAC-selective cAMP analogue 8-CPT-cAMP did not significantly affect osteoclast maturation (106±4% of control, p=NS, n=5) but the EPAC inhibitor BFA inhibited differentiation (59±9% inhibition, p<0.001 vs control, n=5). Activation of Rap1 was maximal 10 minutes after RANKL stimulation (161±4% of control, p<0.001, n=4). NFkB nuclear translocation induced by RANKL was diminished 15 minutes after stimulation in EPAC1 KO cells (63±3% of scrambled shRNA infected cells, p<0.001, n=4) and TRAP staining revealed no osteoclast differentiation when EPAC1 was knocked down. Moreover, pERK1/2 and pJNK are marginally activated in control cells after RANKL stimulation (117±3% and 107±2% of control, respectively, p=0.5, n=4) and deletion of EPAC1 slightly decreased this activation (93±2% and 95±1% of control, respectively, p=NS, n=4). Interestingly, the MEK inhibitor U0126 restores RANKL-stimulated osteoclast formation in the EPAC1 KO cells (109±2% of control, p=NS, n=6). Finally, in EPAC1 knockdown cells inhibition of osteoclast differentiation is correlated with decreased expression of osteoclast differentiation markers Cathepsin K, NFATc1 and Osteopontin when compared to control (4±0.7, 2.3±0.5 and 3±0.4 fold decreased respectively, p<0.001, n=5).

**Conclusion:** EPAC1 is a critical intermediate in osteoclast differentiation which permits increased ERK1/2 activation and NFkB nuclear translocation. Targeting this signaling intermediate may diminish bone destruction in inflammatory arthritis.

**Disclosure:** A. Mediero, None; B. N. Cronstein, Canfiite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Arthritis Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.

## 15

**Adenosine A2A Receptor Stimulation Inhibits OC Formation by Suppressing NFkB Translocation to the Nucleus by a PKA-ERK1/2 Mediated Mechanism.** Aranzazu Mediero1 and Bruce N. Cronstein. 1NYU School of Medicine, New York, NY, 2NYU School of Medicine, Division of Rheumatology, New York, NY

**Background/Purpose:** Adenosine, a nucleoside released at sites of injury and hypoxia, mediates its effects via activation of G-protein-coupled receptors (A1, A2A, A2B, A3). Previously we reported that the A2A receptor agonist CGS21680 inhibits osteoclast (OC) differentiation in a dose-dependent manner. Here we dissected the intracellular pathways involved in A2A-R-mediated regulation of OC differentiation.

**Methods:** OC differentiation was studied as M-CSF/RANKL-stimulated differentiation of murine bone marrow precursors to TRAP+/multinucleated cells in the presence/absence of CGS21680 (A2A-R agonist) and ZM241385 (A2A-R antagonist) 1µM each, and PKA activators 8-Cl-cAMP and 6-Bnz-cAMP 100nM each and the PKA inhibitor PKI 10µM/mL. cAMP EIA assay and Signaling events (PKA, NFkB and MAPK) were studied by Western Blot in PKA knockdown (KO) (lentiviral shRNA for PKA) RAW264.7 cells (scrambled shRNA transfection is control for these experiments). OX marker expression was studied by RT-PCR.

**Results:** CGS21680 stimulated a maximal increase in cAMP 5–10 minutes after RANKL-CGS21680 activation (35±2.3 fmol for CGS21680 vs. 14.4±1.9 fmol for control, p<0.001, n=6) correlating with maximal PKA activity at 15 minutes (4.96±0.2 units/ml vs. 3.07±0.2 units/mL, CGS21680 vs control, p<0.001, n=4). PKA-selective cAMP analogues 8-Cl-cAMP and 6-Bnz-cAMP increase OC maturation to 58%±5% and 47±3% of control respectively (p<0.001, n=5) whereas a selective PKA inhibitor (PKI) increases OC differentiation (126±26% of control, p<0.001, n=5). Western Blot demonstrates that PKA activity increased over time in the presence of CGS21680, and CGS21680 inhibits NFkB nuclear translocation in control (25±1% inhibition, p<0.001, n=4) but not in PKA KO cells (110±2% of control, p<0.05, n=4). CGS21680 activates MAPKs (pERK1/2, p-p38 and pJNK), an effect which is blocked by ZM241385. ERK1/2 is activated by a PKA-dependent mechanism (130±6% of control, p<0.001, n=4), but p38 and pJNK activation is unaffected (112±1% and 110±2% of control, respectively, p<0.05, n=4). A2AR activation inhibits the expression of OC differentiation markers (2±0.05 and 1.6±0.06 fold decrease for Cathepsin K and Osteopontin respectively, p<0.0001, n=4) by a PKA-mediated mechanism (PKA KO cells).

**Conclusion:** Adenosine, acting at A2A-R, inhibits OC differentiation and regulates bone turnover via activation of PKA and inhibition of NFkB nuclear translocation. Because adenosine mediates the anti-inflammatory effects of methotrexate we speculate that the capacity of methotrexate to inhibit bone erosion in Rheumatoid Arthritis may be mediated by increases in adenosine which inhibit OC formation and function.

**Disclosure:** A. Mediero, None; B. N. Cronstein, Canfiite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Arthritis Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.

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**Adenosine A2A Receptor Diminishes Bone Destruction At Inflamed Sites, in Part, Via Downregulating Semaphorin4D-PlexinB1 Communication Between Osteoclasts and Osteoblasts.** Aranzazu Mediero1 and Bruce N. Cronstein. 1NYU School of Medicine, New York, New York, 2NYU School of Medicine, Division of Rheumatology, New York, NY

**Background/Purpose:** Communication between osteoclasts and osteoblasts is essential for bone homeostasis. Semaphorin4D (Sema4D), expressed on the surface of and secreted by osteoclasts, macrophages and T cells, is a potent inhibitor of bone formation; Sema4D binds to its receptor (PlexinB1) on osteoblasts which induces RhoA activation which suppresses osteoblast differentiation by attenuating insulin-like growth factor-1 (IGF-1) signaling. Adenosine, a nucleoside released at sites of injury and hypoxia, modulates cell function by interacting with specific cell-surface receptors (A1R, A2A-R, A2B-R, A3R). We have recently demonstrated that A2A-R stimulation inhibits wear particle-mediated bone destruction and sought to determine whether A2A-R-mediated regulation of Sema4D expression might play a role in preventing bone destruction.

**Methods:** C57Bl/6 mice mice age 6–8 weeks were anesthetized and a 1cm midline sagittal incision was made over the calvaria. 4 mice received no particles (Control), and the rest received 3mg of polyethylene particles (UHMWPE) together with 20µl of saline 0.9% or CGS21680 1µM (n=4 each). At 2 weeks, calvarial surgical sites were removed and mice were sacrificed. Calvaria and in vitro studies, RANKL-induced a 2.5±0.1 fold increase in Sema4D mRNA expression (p<0.001, n=4) that is completely blocked by CGS21680 in a protein kinase A-dependent fashion.

**Results:** As previously described, exposure to UHMWPE particles induces inflammatory infiltration that is significantly decreased in the presence of CGS21680. Exposure to UHMWPE particles significantly increased expression of both Sema4D (224±4 cells/lpF compared to 40±2 cells/lpF in control, p<0.001, n=4) and its receptor PlexinB1 (206±7 cells/lpF compared to 86±4 cells/lpF in control, p<0.001, n=4) on bone surfaces close to inflammatory infiltrates and CGS21680 treatment markedly diminished overexpression of both Sema4D and PlexinB1 (32±3 cells/lpF and 85±3 cells/lpF respectively, p<0.001, n=4). In in vitro studies, RANKL induced a 2.5±0.1 fold increase in Sema4D mRNA expression (p<0.001, n=4) that is completely blocked by CGS21680 in a protein kinase A-dependent fashion.

**Conclusion:** Inflammation promotes Sema4D secretion and PlexinB1 activation. Targeting osteoclasts via A2A-R activation prevents wear particle-stimulated bone resorption and the inhibition of Sema4D and PlexinB1 expression likely bone resorption by permitting greater osteoclast differentiation and bone formation. Moreover, these results suggest a novel approach to prevent bone resorption in inflammatory arthritis or infectious arthritides.

**Disclosure:** A. Mediero, None; B. N. Cronstein, Canfiite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Arthritis Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.
Synovial Overexpression of Wnt and Wnt-1-Induced Secreted Protein 1 Induces Cartilage Damage by Skewing of TGF-β Beta Signaling and Reduction of the Anti-Hypertrophy Factor Sox9. Martijn H. van den Bosch1, Arjen B. Blom1, Peter L. van Lent1, Henk M. van Beuningen1, Fons A. van de Loo2, Esmeralda N. Blaney Davidson3, Peter M. van der Kraan1 and Wim B. van den Berg2. 1Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 2Rheumatology Research and Advanced Therapeutics, Department of Rheumatology, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands.

Background/Purpose: Although many osteoarthrits (OA) patients show significant synovial involvement, consequences are largely unknown. We found highly increased expression of canonical Wnts 2b and 16 and Wnt1-induced secreted protein 1 (WISP1), a downstream protein, in knee joints in two experimental murine OA models. Wnt signaling has been implicated in OA incidence and modulation of the β-catenin pathway leads to OA-like changes in cartilage. TGF-β signaling is critical in cartilage maintenance. TGF-β signaling from the protective Smad 2/3 pathway to the chondrocyte hypertrophy-inducing Smad 1/5/8 pathway was enriched in the synovium of mice with collagenase-induced OA. To determine if synovial overexpression of canonical Wnts leads to cartilage damage, adenosaral vectors for Wnts 8a and 16 were injected into murine knee joints. A significant increase in the incidence of early OA-like lesions at the medial margin of the medial tibial plateau was found 7 days after overexpression. The incidence was 92% (n = 12) for Wnt8a overexpression compared to 17% (n = 5) for Wnt16 overexpression, but only 20% (n = 5) for the control virus. Because of their relatively small size, Wnts and WISP1 can enter the cartilage and possibly alter the chondrocyte phenotype. Synovial overexpression of Wnt8a and Wnt16 resulted in β-catenin accumulation in chondrocytes, a tell-tale sign of canonical Wnt signaling, indicating migration of Wnts to the cartilage. Moreover, pre-incubation with Wnt3a or WISP alone or Wnt3a + WISP1 together resulted in decreased TGF-β-induced phosphorylation of Smad 2/3, whereas phosphorylation of Smad 1/5/8 was increased in vitro. This implies a shift towards dominant TGF-β signaling via the hypertrophy-inducing ALK1 pathway. In addition, the expression of the anti-hypertrophic factor Sox9 was decreased after pre-incubation with Wnt3a and WISP1.

Conclusion: Canonical Wnts produced by synovial cells, probably via modulation of the TGF-β signaling pathway, which is crucial for cartilage homeostasis. This underlines the importance of canonical Wnt signaling in the synovium of mice with collagenase-induced OA. Although many osteoarthrits (OA) patients show significant synovial involvement, consequences are largely unknown. We aimed to identify soluble mediators released by compressed osteoblasts/osteocytes that could induce the release of pro-catabolic factors by chondrocytes by using a novel and unique bone/cartilage communication model.

Methods: Thanks to a three-dimensional (3D) culture model, murine osteoblasts were submitted to compression in Biopress Flexercell plates (1.7 MPa, 1Hz during 24h). Then, conditioned media from compressed (CM) or uncompressed (UCM) osteoblasts/osteocytes were used to stimulate mouse articular chondrocytes. Chondrocyte expression of matrix metalloproteinase 3 (MMP-3) and MMP-13, tissue inhibitors of metalloproteinases (TIMPs), and cartilage extracellular matrix components type II collagen and aggrecan were assessed by RT-PCR, western blot analysis and ELISA. Then, soluble mediators released by compressed osteoblasts/osteocytes were identified by iTRAQ®, a differential secretomic analysis approach.

Results: Media from compressed osteoblast (CM) strongly induced MMP-3 and -13, chondrocyte mRNA expression (Table). Consistently, CM also significantly stimulated the release of MMP-3 and -13 by chondrocytes (respectively 10.6±0.75 fold, p<0.001, and 6.5±2.1 fold, p<0.01 compared to control). In addition, CM enhances TIMP-1 expression whereas it strongly inhibited TIMP-2 and -3 expressions (Table). CM also affected chondrocyte matrix proteins expressions by downregulating aggrecan and type II collagen mRNA levels (Table). Effects of CM on cytosolic type II collagen protein amounts were confirmed by western blot (a decrease of 31.9±9%, p<0.01). In order to identify osteoblast soluble mediators responsible for this chondrocyte phenotype, osteoblast conditioned media were analyzed by iTRAQ®. This sophisticated proteomic technique allowed identification of 105 proteins secreted by osteoblasts among which only 10% were upregulated in response to compression. Among them, 14-3-3ε was dose-dependently induced the release of pro-catabolic factors by chondrocytes, mimicking the effects of CM osteoblasts/osteocytes media. Furthermore, 14-3-3ε was strongly released by human OA subchondral bone and stimulated MMP-3 expression in human OA chondrocytes.

Table. Effects of media from uncompressed or compressed osteoblasts on MMPs, TIMPs and matrix proteins chondrocyte mRNA expression.

<table>
<thead>
<tr>
<th>Protein</th>
<th>UCM</th>
<th>CM</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMP-3</td>
<td>10.6±0.75</td>
<td>6.5±2.1</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>MMP-13</td>
<td>10.6±0.75</td>
<td>6.5±2.1</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>TIMP-1</td>
<td>0.5±0.1</td>
<td>0.2±0.1</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>TIMP-2</td>
<td>0.5±0.1</td>
<td>0.2±0.1</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>TIMP-3</td>
<td>0.5±0.1</td>
<td>0.2±0.1</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Aggrecan</td>
<td>0.5±0.1</td>
<td>0.2±0.1</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

Results are expressed in fold compared to control (non-stimulated chondrocytes).

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Background/Purpose: The cartilage matrix breakdown in osteoarthritis (OA) is due to both abnormal mechanical stress and activation of catabolic processes involving metalloproteinases (MMPs). Currently, IL-Ibeta is thought to have a major role in shifting the metabolic balance toward degradation. IL-Ibeta is first synthesized as an inactive precursor, which is cleaved into the secreted active form. This maturation process mainly occurs in the "inflammasome", where initiators (including NLRP3) and adaptor molecules (ASC) oligomerize to recruit and activate caspase-1, which in turn processes IL-Ibeta precursor. We aimed to clarify the role of both inflammasome and IL-Ibeta in cartilage degradation.

Methods: First, amounts of IL-Iβ released from cartilage explants of 18 OA patients were assessed (ELISA). Second, in primary mouse articular chondrocytes cultures, LPS, IL-1α and TNF-α treatments were used to induce a pro-degradative phenotype, characterized by an increase in gene expression (real-time PCR) and in protein release of MMP-3, MMP-9 and MMP-13 (ELISA, zymography and Western-blot). Effects of a deficiency in NLRP3 (using NLRP3~/~ mice), of an inhibition of caspase-1 (using Z-YVAD-FMK) and of a blockade of IL-1 (using IL-1RA) were investigated.
At last, excessive dynamic compression was applied on mouse cartilage explants to trigger degradation (0.5 Hz and 1 MPa for 6 h). Load-induced GAG release and increase in MMP enzymatic activity were assessed in WT, NLRP3−/− or IL-1R1−/− mice, the latter being deficient in IL-1 receptor type 1.

Results: Despite the expression of NLRP3, ASC and caspase-1 in OA chondrocytes, OA cartilage was not able to produce active IL-1βeta. In mouse articular chondrocytes, LPS, IL-1-alph and TNF-alpha dose-dependently increased MMP-3, MMP-9 and MMP-13 both at gene and protein levels. This response was similar in NLRP3−/− chondrocytes and was unchanged by caspase-1 inhibition. These results demonstrate that the inflammatory-stress-induced degradation phenotype was inflammasome-independent. Furthermore, the catalytic response to LPS and TNF-alpha was unchanged when IL-1 was inhibited by IL-1RA. In cartilage explants, excessive load induced an increase in GAG release (3-fold) and MMP activity (3.7-fold). This response was similar in NLRP3−/− and IL-1R1−/− derived cartilage. Likewise, the load-induced degradative response was independent of NLRP3-inflammasome and of IL-1.

Conclusion: This study suggests that OA cartilage can be degraded independently of NLRP3- inflammasome activity. This result may explain, at least in part, why previous trials with IL-1beta inhibitors were all negative.

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Osteoclastogenesis Is Inhibited by Immune Complexes Through Activating Fcγ Receptors. Lilianyne C. Grevers1, Peter L.E.M. van Lent1, Teun J. de Vries2, Vincent Everts2, J. Sjef Verbeek3 and Wim B. van den Berg4.1Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 2ACTA, UVA, VU University Amsterdam, Amsterdam, Netherlands, 3Leiden University Medical Center, Leiden, Netherlands, 4Rheumatology Research and Advanced Therapeutics, Department of Rheumatology, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

Background/Purpose: Rheumatoid arthritis is characterized by chronic inflammation and osteoclast-mediated bone loss. Co-stimulatory signalling via ITAM- and ITIM-coupled receptors is essential for osteoclast formation and function. The ITAM- and ITIM-coupled Fcγ receptors (FcγR) play a crucial role in mediating inflammation and cartilage destruction in experimental arthritis, but their role in osteoclast-mediated bone loss is unknown.

The aim of the present study was to investigate the role of FcγRs in osteoclastogenesis and osteoclast function.

Methods: Bone destruction was analyzed in arthritic knee joints of FcγRIIB-deficient, FcγR-chain−/− (lacking expression of activating FcγRs), and wild type mice. Bone marrow-derived osteoclast precursors were differentiated in vitro towards osteoclasts in the absence or presence of immune complexes (ICs) and stimulated thereafter for 24 hrs with or without TNFα or LPS. Experiments were analyzed for the expression of FcγRs and osteoclast markers, osteoclast activation, and resorption pit formation on bone.

Results: Bone erosions and cathepsin K-positive osteoclast numbers were significantly increased (>2.6 fold) during antigen-induced arthritis in the knee joints of FcγRIIB-deficient mice. All FcγR classes were highly expressed on osteoclast precursors. Differentiation of osteoclast precursors in the presence of ICs significantly reduced osteoclast formation (37%), bone resorption (68%), and expression of the osteoclast markers cathepsin K, TRAP, CTR, DC-STAMP, and Nfatc1. In the presence of ICs, osteoclastogenesis of FcγRIIB−− precursors and bone resorption remained inhibited. In contrast, ICs could not inhibit osteoclast formation or bone resorption of FcγR-chain−− precursors. When IC-inhibited osteoclastogenesis was followed by stimulation with TNFα or LPS, the inhibitory effects of ICs were overruled, resulting in significantly increased osteoclast numbers and resorption levels as compared to unstimulated controls.

Conclusion: Activating FcγRs mediate IC-induced inhibition of osteoclastogenesis, which can be overruled in the presence of pro-inflammatory mediators like TNFα and LPS. This suggests that the balance of FcγR-mediated inflammation through pro-inflammatory cytokine production, as well as the direct inhibitory effect of ICs on osteoclastogenesis determines the net effect on bone loss.

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IL-32 and IL-17 Interact and Aggravate Osteoclastogenesis in Rheumatoid Arthritis. Bo Young Yoon1, Young-Mee Moon2, Yang-Mi Her2, Hye Jwa Oh2, Jae-Soon Lee2, Kyoung-Woon Kim3, Seon-Young Lee2, Yun-Ju Wang1, Su Park2, Sun Jin Park2, Ho-Youn Kim4, The Mi-Chae Cho5.1Inje University Ilsan Paik Hospital, Goyang, South Korea, 2Catholic University of Korea, Seoul, South Korea, 3The Catholic University of Korea, Seoul St. Mary’s Hospital, Seoul, South Korea

Background/Purpose: Interleukin (IL)-32 and IL-17 play critical roles in pro-inflammatory responses and are highly expressed in the synovium of patients with rheumatoid arthritis (RA). We investigated not only the related induction of IL-17 and IL-32 in fibroblast-like synoviocytes (FLSs) from RA patients and T cells from healthy donors, but also the summative ability of the two cytokines to stimulate osteoclastogenesis.

Methods: FLSs were isolated through surgical synovectomy obtained from patients with RA or osteoarthritis (OA) and peripheral blood mononuclear cells (PBMCs) were obtained from healthy donors. Bovine CD4+ and CD4− T cells and joint specimens were obtained from autoimmune arthritis mice. Real-time polymerase chain reactions were performed to evaluate the expression of IL-32, IL-17, orphan nuclear receptor Rorγt, tartrate-resistant acid phosphatase (TRAP), cathepsin K, calcitonin receptor (CTR), matrix metalloproteinase-9 (MMP9) mRNA. IL-17 protein was measured by enzyme-linked immunosorbent assay and the T-helper (Th)17 expression T cell count was detected by fluorescence-activated cell sorting. Immunohistochemical staining and TRAP staining were performed to determine the distribution of inflammatory cytokines and the presence of osteoclastogenesis.

Results: IL-17 induced the expression of IL-32 (4.3 fold) in the FLSs from RA patients, as assessed by microarray. The IL-32 and IL-17 levels in the FLSs from the RA patients were higher than those from the OA patients, and the expressions were colocalized. IL-32 production was increased by IL-17 through the nuclear factor (NF-κB)-κB and PI3 kinase signal pathways. When FLSs from RA patients and CD4+ T cells were cocultured, the CD4+ T cells differentiated into IL-17-producing Th17 cells, which stimulated the production of IL-32 in the FLSs. Moreover, IL-32 and IL-17 in human CD4+ T cells and also induced high expression levels of IL-17 in splenic CD4+ T cells of CIA mice. IL-32 and IL-17 were colocalized near TRAP-positive areas in joint specimens of autoimmune arthritis mouse models. IL-17 and IL-17 synergistically induced the differentiation of osteoclasts, as demonstrated by the expression of osteoclast-related genes such as TRAP, cathepsin K, CTR, and MMP9.

Conclusion: IL-17 affected the expression of IL-32 in FLSs of RA patients and IL-32 induced the production of IL-17 in CD4+ T cells. Both IL-17 and IL-32 cytokines can reciprocally influence each other’s production in RA and autoimmune arthritis models. Separately, IL-17 and IL-32 each stimulate osteoclastogenesis without RANKL. Together, the two cytokines synergistically amplified the differentiation of osteoclasts, independent of RANKL stimulation.

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Protective Properties of Conditioned Media From Adipose Stem Cells On Osteoarthritic Chondrocytes. Maria Isabel Guillen1, Julita Platias2, Vicente Mirabet1, Miguel Angel Castejon1, Francisco Gomara4 and Maria Jose Alcaraz1.1University of Valencia, Burjasot, Valencia, Spain, 2Generalitat Valenciana, Valencia, Spain, 3De la Ribera University Hospital, Alzira, Valencia, Spain, 4University of Valencia and University Hospital, Valencia, Spain

Background/Purpose: Adipose-derived mesenchymal stem cells (ASC) exhibit a high potential for cell therapy and they might also act as a cellular source for supplying soluble factors exerting anti-inflammatory or trophic effects on cells. Osteoarthritis (OA) involves the destruction of articular cartilage leading to disability. The purpose of this study was to investigate whether conditioned medium from adipose-derived mesenchymal stem cells (ASC-CM) improves the inflammatory and degradative response induced by interleukin-1β in OA chondrocytes and cartilage.

Methods: Adipose tissue from patients subjected to abdominal lipectomy surgery, was used for ASC isolation by collagenase treatment. Cells were incubated in DMEM/F12 containing 15% human serum. Cell phenotype was analyzed by flow cytometry with specific antibodies anti-CD105-PE, anti-
vascular endothelial growth factor (VEGF) and a wide range of chemokines, cultured to near confluency and incubated with TGF-\(\alpha\). Although both BMPs promote matrix synthesis (Glycosaminoglycans production), long term effects of both factors on cartilage will most likely differ due to their different effects on chondroprotective Smad2/3 signaling.

Disclosure: A. P. van Caam, None; E. N. Blaney Davidson, None; E. L. Vitters, None; L. de Kroon, None; E. W. van Geffen, None; P. ten Dijke, None; W. B. van den Berg, None; P. M. van der Kraan, None.

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The Negative Effects of Glucocorticoids On Bone Are Primarily Mediated by Genes Involved in Osteoblast Differentiation and Bone Remodelling. Katharina Blankenstein1, Tara C. Brennan-Speranza1, Karin Lyon1, Colin R. Dunstan1, Frank Buttgereit2, Hong Zhou1 and Markus J. Seibel1. 1Bone Research Program, Sydney, Australia, 2Charite University Medicine, Berlin, Germany, 3ANZAC Research Institute, The University of Sydney, Concord, Australia

Background/Purpose: Glucocorticoids are widely used as anti-inflammatory and immunosuppressive drug for the treatment of many inflammatory and auto-immune diseases. However, long-term and high-dose glucocorticoid treatment causes bone loss and can lead to secondary osteoporosis in both human and mice. The molecular mechanisms underlying the adverse effects of glucocorticoids on bone homeostasis are not well understood. We have recently demonstrated that osteoblast-targeted disruption of glucocorticoid signalling attenuates glucocorticoid-induced bone loss in mice, indicating that the detrimental skeletal effects of glucocorticoids are predominantly mediated by osteoblasts. To elucidate the role of the osteoblast in glucocorticoid-induced bone loss, in the present study we determined the effects of glucocorticoids on the gene expression profile in bone cells.

Methods: Seven-week-old male CD1 outbred mice were subcutaneously implanted with slow-release pellets containing either 1.5 mg corticosterone (CS) or placebo (PLC) over 28 days. Blood was obtained weekly and osteocalcin serum levels were measured by IRMA. RNA was isolated from tibia at endpoint (day 28) and Affymetrix Gene Array analysis (GeneSpring GX) was performed to assess changes in expression of genes associated with osteoblast differentiation and the regulation of bone remodelling. Genes considered to be regulated were at least 1.5-fold differentially expressed. Quantitative RT-PCR was employed to validate the gene array results on a selection of genes.

Results: By comparing gene expression profiles in tibial RNA from mice treated with CS or PLC, we found that CS specifically regulated 391 genes. To further investigate the genes targeted by corticosterone treatment we performed gene ontology analysis with the aid of heat maps. The expression of genes implicated in osteoblast differentiation and the regulation of bone remodelling was downregulated in mice treated with CS compared to the PLC-treated control group. More precisely, we observed a downregulation of the osteoblast markers Runx2, Col1a, osteocalcin and sclerostin in CS-treated mice compared to PLC. In addition, BMP4 and BMP7 followed the same pattern. Genes that were most profoundly downregulated in the array analysis were further validated by qRT-PCR. Consistent with mRNA levels, osteocalcin serum levels were suppressed to almost undetectable levels.

Conclusion: These results confirm that glucocorticoids primarily target genes involved in osteoblast differentiation and the regulation of bone remodelling. Gene expression profile analyses may point to the pathways involved in the negative effects of glucocorticoids on bone.

References:

Disclosure: K. Blankenstein, None; T. C. Brennan-Speranza, None; K. Lyon, None; C. R. Dunstan, None; F. Buttgereit, None; H. Zhou, None; M. J. Seibel, None.
25


Background/Title: Wnt signaling pathway is a major regulator of bone and cartilage remodeling. Modulation of this pathway has lead to controversial results on joint cartilage in murine osteoarthritis (OA) models. Therefore, this study aims to describe the in vivo activity of Wnt/β-catenin and the expression of Wnt antagonists in joint tissues during the development of OA.

Methods: Joint instability was induced by partial meniscectomy (MNX) at the right knee in TOPGAL mice, which express the lacZ gene under the control of Wnt-RE. Left knee was sham-operated. The mice were sacrificed at baseline, 2, 4, 6 and 9 weeks after surgery (n = 5 animals per time point).

Analysis of the bone microarchitecture of the tibial epiphyses were assessed (Skyscan® 1172) and then the samples were prepared for quantification of OA score, X-gal staining and immunohistochemistry for the expression of Dkk-1, sclerostin and SFRP-3.

Results: Compared to sham, the number of X-gal positive osteocytes per bone volume decreased at 4 weeks then progressively increased in the subsequent time points (p = 0.009, 0.50, 0.016, 0.896; 0.016, 0.43; 2.33 ± 0.81 for each time point, respectively). These changes paralleled those of bone volume/tissue volume. X-gal staining was strongly observed in growing osteophytes. The number of X-gal (+) chondrocytes was low in articular cartilage at baseline, indicating an inhibition of Wnt pathway, but their number increased in the superficial layers with MNX until 6 weeks. The synovium showed marked staining in MNX knees compared to sham operated knees. Dkk-1 was highly expressed in normal non calcified cartilage and dramatically decreased with OA. Sclerostin and SFRP-3 were only expressed in the calcified layers and moderately increased with OA. The synovium also expressed Dkk-1 and SFRP-3 in OA knees.

Conclusion: During the course of OA, the canonical Wnt signaling pathway is mainly activated in growing osteophytes, subchondral bone and synovium while this activation was moderate in chondrocytes of articular cartilage. Distinct patterns of expression of Wnt antagonists are observed in the joint tissues that indicated multiple mechanisms of regulation of the canonical Wnt signaling pathway.

Disclosure: T. Funck-Brentano, None; W. Bouazz, None; H. Lin, None; V. Geoffroy, None; E. Hay, None; M. Cohen-Solal, None.

26

Quantitative Analysis of Bone Damage/Morphological Changes in the Citrullinated Collagen Induced Arthritis Mouse Model Using Micro-CT. Anand Dusad1, Michael J. Duryee1, Dong Wang2, James R. O’Dell1, Ted R. Mikuls1, Geoffrey M. Thiele3 and Lynell W. Klassen4. 1University of Nebraska Medical Center, Omaha, NE, 2Univ of Nebraska Med Ctr, Omaha, NE, 3University of Nebraska Medical Center, Omaha, NE, 4Univ of Nebraska Medical Center, Omaha, NE.

Background/Title: Patients with rheumatic diseases given immuno-suppressive therapy are susceptible to various types of infections, especially pulmonary infection. We included demographic data and clinical data for rheumatic diseases at baseline, data for candidate risk factors for pulmonary infection at baseline and month 6, and usage of drugs throughout the observation period. Risk factors for pulmonary infection were investigated by univariate and multivariate analyses.

Results: Of 766 patients enrolled, 665 patients (87.2%) were observed for 12 months, 32 patients (4.2%) died, and 66 (8.6%) patients were lost-to-follow up by month 12. Sixty-one patients (8.0%) developed pulmonary infection: bacterial pneumonia, 25; Pneumocystis jiroveci pneumonia, 20; fungal pneumonia, 5; cytomegalovirus pneumonia, 3; tuberculosis, 3; others, 5. Kaplan-Meier curves showed a significantly lower cumulative survival rate in patients with pulmonary infection compared to those without pulmonary infection (p < 0.01, log-rank test). Because treatment for RA patients without active extra-articular manifestation (articular RA patients, n = 145) was significantly different from that for the rest of the patients, we performed multivariate analyses using COX hazard regression models in all patients (n = 621). Table 1. Older age (≥ 65 years-old), higher Brinkman index (≥ 400), higher serum creatinine (sCr) level, and higher maximum prednisolone dose (mg/kg/day) during the first two weeks of treatment were significantly associated with development of pulmonary infection in all patients. Older age, higher Brinkman index, higher sCr level, and disturbed performance status were significantly associated with development of pulmonary infection in patients excluding articular RA patients.

Conclusion: This is the first large-scale, prospective study identifying risk factors for pulmonary infection in patients with rheumatic diseases in the literature. Prophylactic measures should be taken accordingly for better benefit-risk balance of treatment.

Table 1. Micro-CT parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>C-II</th>
<th>FCA-C-II</th>
<th>CT-II-C-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone mineral density (BMD) (g/cm²)</td>
<td>0.460 ± 0.009</td>
<td>0.515 ± 0.068</td>
<td>0.460 ± 0.019</td>
</tr>
<tr>
<td>Bone volume density (BVT) (mm³/mg)</td>
<td>39.554 ± 1.903</td>
<td>28.220 ± 2.552*</td>
<td>38.090 ± 2.153*</td>
</tr>
<tr>
<td>Bone surface density (BS/T) (mm²/mg)</td>
<td>24.100 ± 0.541</td>
<td>19.291 ± 2.144**</td>
<td>21.818 ± 1.484*</td>
</tr>
<tr>
<td>Trabecular number (Tb. N) (mm/mg)</td>
<td>4.640 ± 0.280</td>
<td>4.021 ± 0.141**</td>
<td>5.340 ± 0.433*</td>
</tr>
<tr>
<td>Trabecular separation (Tb. Sp) (mm/2)</td>
<td>0.007 ± 0.034</td>
<td>0.109 ± 0.027**</td>
<td>0.100 ± 0.038*</td>
</tr>
<tr>
<td>Trabecular pattern index (Tb. Pf) (mm²/mg)</td>
<td>0.546 ± 0.170</td>
<td>0.203 ± 0.313**</td>
<td>2.888 ± 0.301**</td>
</tr>
<tr>
<td>Trabecular thickness (Tb. Th) (mm)</td>
<td>0.062 ± 0.162</td>
<td>1.146 ± 0.223**</td>
<td>50.9 ± 0.223**</td>
</tr>
<tr>
<td>Degree of Anisotropy (DA)</td>
<td>0.759 ± 0.074</td>
<td>0.720 ± 0.026 (NS)</td>
<td>0.815 ± 0.015*</td>
</tr>
<tr>
<td>Polar moment of inertia (Ipol) (mm⁴)</td>
<td>2.039 ± 0.072</td>
<td>2.914 ± 0.044 (NS)</td>
<td>2.914 ± 0.044 (NS)</td>
</tr>
<tr>
<td>Fractured dimension (FD)</td>
<td>2.640 ± 0.024</td>
<td>2.352 ± 0.049**</td>
<td>1.240 ± 0.015*</td>
</tr>
<tr>
<td>Number of Objects (Obj. N)</td>
<td>1.025 ± 0.580</td>
<td>2.424 ± 0.429 (NS)</td>
<td>14 ± 7.540</td>
</tr>
<tr>
<td>Connectivity Density (Conn. D) (mm/mg)</td>
<td>0.673 ± 0.614</td>
<td>0.484 ± 0.481</td>
<td>0.740 ± 0.481*</td>
</tr>
</tbody>
</table>

*Significantly different from C-II, p < 0.05; **Significantly different from C-II, p < 0.001; NS: not significant.

Disclosure: A. Dusad, None; M. J. Duryee, None; D. Wang, None; J. R. O’Dell, None; T. R. Mikuls, None; G. M. Thiele, None; L. W. Klassen, None.

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Anti-Citrullinated Protein Antibodies As an Indicator of Disease Activity in the Citrullinated Collagen Induced Arthritis Model. Anand Dusad1, Michael J. Duryee1, Dong Wang2, James R. O’Dell1, Ted R. Mikuls1, Lynell W. Klassen2 and Geoffrey M. Thiele3. 1University of Nebraska Medical Center, Omaha, NE, 2Univ of Nebraska Medical Center, Omaha, NE, 3University of Nebraska Medical Center and Omaha VA Medical Center, Omaha, NE, 4Univ of Nebraska Med Ctr, Omaha, NE, 5Omaha VA and University of Nebraska Medical Center, Omaha, NE.

Background/Title: Although the pathogenesis and cause of rheumatoid arthritis (RA) remains uncertain, various disease-driving auto-antigens and auto-antibodies with different specificities have been used as diagnostic tools. Anti-citrullinated protein antibody (ACPA) has been implicated in disease process and due to its high specificity also been used as a diagnostic tool. There have been many studies in the literature using ACPA as an indicator of radiological (X-Ray) joint damage in both RA patients and animal studies, although few have quantified bone damage using Micro-CT. This is important since this approach is increasingly considered the gold standard for analyzing and quantifying micro-structural changes in bone morphology. Therefore the purpose of this study was to correlate joint damage as quantified by micro-CT with ACPA using our novel citrullinated collagen induced arthritis (CCIA) model.

Methods: Thirty DBA/1 mice were randomly divided into three groups. Mouse collagen (C-II) was modified [citrullinated (Citr)] using peptylid arginine deiminase (PAD) and injected weekly for 5 weeks. As controls, mice were injected with unmodified C-II (negative control) and with Freund’s complete adjuvant (FCA) as an negative control. Mice were sacrificed at week 6 and micro-CT was done to quantitatively analyze bone damage. A commercially available anti-CCP antibody kit was used to measure ACPA levels in serum. Data was expressed as mean ± SD’s. Pearson’s 2-tailed correlation was used to correlate ACPA with measures of bone damage.

Results: Using ELISA, anti-CCP (ng/ml) was measured in serum and showed a significant increase in both Cit-C-II (29.03 ± 7.53, p = 0.03) and FCA-C-II (42.73 ± 4.56, p < 0.001) as compared to C-II (21.84 ± 5.20). Bone mineral density (BMD) showed significant loss in Cit-C-II (0.43 ± 0.04)
Satoshi Yamashita3, Hiroyuki Nakahara1, Koji Otabe1, Stuart Duffy1, Shawn Klassen1, Martin K. Lotz1 and Hiroshi Asahara1. 1The Scripps Research Institute, La Jolla, CA, 2Hiroshima University, Hiroshima, Japan, 3National Research Institute for Child Health and Development, Tokyo, Japan.

Table 1.

<table>
<thead>
<tr>
<th>ACPA (ng/ml)</th>
<th>Bone mineral density [BMD (g/cm³)]</th>
<th>Bone volume density [BV/TV (%)]</th>
<th>Bone surface density [BS/TV (mm⁻¹)]</th>
<th>Trabecular number [Tb. N (mm⁻¹)]</th>
<th>Trabecular separation [Tb. Sp. (mm)]</th>
<th>Trabecular pattern index [Tb. P (mm⁻¹)]</th>
<th>Structural mean index [SMI]</th>
<th>Fractal dimension [FD]</th>
<th>Connectivity Density [Conn. Dn (mm⁻³)]</th>
<th>Polar moment of inertia [MM² (mm)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>−0.530**</td>
<td>−0.654**</td>
<td>−0.662**</td>
<td>−0.628</td>
<td>0.573**</td>
<td>0.570**</td>
<td>0.510</td>
<td>−0.666**</td>
<td>−0.591**</td>
<td>−0.647**</td>
<td></td>
</tr>
</tbody>
</table>

Pearson Correlation (2-tailed, n = 21). **Correlation is significant at 0.01 level, *Correlation is significant at 0.05 level.

Conclusion: Due to the fact that no exogenous immunogenic factor such as non-self protein or any adjuvant is used in this novel model, CCIA closely mimics the auto-immunogenic origin of RA. Using this model, we observed significant inverse associations of circulating ACPA with measures of bone quality including density, volume, surface and mechanical properties of bone. In conclusion ACPA levels in serum can successfully predict bone morphological changes in RA. Further studies focused on identifying the mechanisms underpinning these relationships are ongoing.

Disclosure: A. Dusad, None; M. J. Duryee, None; D. Wang, None; C. D. Hunter, None; B. C. Hamilton III1, None; J. R. O’Dell, None; T. R. Mikuls, None; L. W. Klassen, None; G. M. Thiek, None.

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Role of Microrna-455 Networks in Mesenchymal Cell Differentiation and Osteoarthritis. Fumaki Ayabe1, Shigeru Miyaki2, Diana Brinson1, Satoshi Yamashita3, Hiroyuki Nakahara1, Koji Otabe1, Stuart Duffy2, Shawn Grogan1, Shuii Takada1, Martin K. Lotz2 and Hiroshi Asahara1. 1The Scripps Research Institute, La Jolla, CA, 2Hiroshima University, Hiroshima, Japan, 3National Research Institute for Child Health and Development, Tokyo, Japan.

Background/Purpose: The objectives of this study were to identify cartilage specific microRNAs (miRNAs, miR-) that are regulated by SOX9 and are increased in chondrogenesis, to determine changes in osteoarthritic (OA) cartilage, and to investigate the role of miR-455-5p and miR-455-3p (miR-455s) in human chondrocytes.

Methods: To identify miRNAs specifically expressed in chondrocytes, we performed microarray and quantitative polymerase chain reaction (qPCR) on cultured mouse chondrocytes using adenosinically induced SOX9 transcription. The expression of mature miR-455s was analyzed by qPCR on human articular cartilage. Hypermethylation of genomic DNA in OA chondrocytes positively correlates with the activity of pro-inflammatory genes. The aim of this study was to investigate whether IL-1β induces epigenetic changes in human chondrocytes obtained from upper, middle and deep zone cartilage.

Results: Chondrocytes were derived by enzymatic digestion of upper, middle and deep-zone cartilage obtained from OA patients (n = 10). Chondrocytes were stimulated with IL-1β (10ng/ml) in vitro for 24h. Global DNA methylation level was determined using MethylFlash™ Methylated DNA quantification kit (Epigentek). Total RNA was prepared and expression level of DNMT-1, DNMT-3A, DNMT-3B and HDAC-1 was quantified by TaqMan Assays. IL-1β-induced changes in the activity of total DNMT, DNMT-1, DNMT-3A, DNMT-3B, DNA demethylases and Thymine DNA glycosylase (TDG) was determined using ELISA-based assays (Epigentek). Un-stimulated and IL-1β-stimulated chondrocytes obtained from upper and deep zones were used to study the expression of 84 human epigenetic modification enzymes using miRNA array (SA Biosciences). Results were derived using Origin 6.1 software package and p < 0.05 was considered significant.

Conclusion: Global DNA methylation estimation showed the differential response of chondrocytes from different zones of the human cartilage to IL-1β. Total DNA methylation was significantly increased in the deep-zone chondrocytes (138%) and in upper-zone chondrocytes (18%) stimulated with IL-1β compared to controls. Expression levels of 84 key genes encoding enzymes known or predicted to modify genomic DNA and histones to regulate chromatin accessibility showed that 30 genes displayed significant differences upon IL-1β-stimulation. Among these, 29 genes were upregulated and 1 gene was downregulated. Interestingly, the miRNA array results showed a significant upregulation of DNMT-1, DNMT-3A and DNMT-3B expression in both upper and deep-zone chondrocytes stimulated with IL-1b and correlated with the increased total DNMT and DNMT-1 activity in the same chondrocytes. Activity of both DNA demethylases and TDG, enzymes essential for active DNA demethylation, was also increased in both deep and upper-zone chondrocytes by IL-1β suggesting a dynamic regulation of DNA methylation and demethylation in these chondrocytes. No significant difference in global DNA methylation, expression and activity of DNMT-1, DNMT-3A, DNMT-3B and demethylases was observed in chondrocytes from middle-zone in response to IL-1β.

Disclosure: N. Akhtar, None; T. M. Haqqui, None.

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A Mouse Myeloid Precursor with Osteoclastogenic Function in Vivo. Julia F. Charles1, Erene Niemi2, Mary C. Nakamura1 and Antonios O. Alprantis1,2. 1Brigham and Women’s Hospital, Harvard Medical School, Boston, MA; 2University of California, San Francisco; VA Medical Center, San Francisco, CA, 2SFVAMC/UCSF, San Francisco, CA, 3Brigham and Women’s Hospital, Boston, MA.

Background/Purpose: Osteoporosis and peri-articular erosions in patients with inflammatory arthritis are characterized by increased osteoclast resorptive activity. Although a great deal is known about how osteoclast differentiate from precursors and resorb bone, the identity of the osteoclast precursor (OCP) in vivo remains elusive. Using ex vivo assays of osteoclast...
Methods: Fluorescence activated cell sorting was used to examine multiple markers on OCP and to isolate OCP from mT/mG cathepsin K cre+ mice. mT/mG cathepsin K cre donor OCP are RFP+ at baseline and GFP+ in the presence of cre recombinase in mature osteoclasts. Donor OCP were transferred by intramedullary injection into NFATc1 II/II Mx1-Cre osteoclast deficient mice and donor derived osteoclasts were detected by IHC. Alternatively, donor OCP were injected intravenously into C57BL/6 mice 24 hrs after calvarial injection of 20mg/kg LPS. Ex vivo osteoclast, dendritic cell, and macrophage cultures and assays were performed according to standard techniques.

Results: Here we show that the CD11b+Ly6C+Kit+ OCP population can be distinguished from the recently described quiescent osteoclast precursor by their proliferative capacity and absence of RANK (receptor activator of nuclear factor kappa B) expression. Similar to other myeloid precursors, OCP retain plasticity in vitro, differentiating into dendritic cells or phagocytic macrophages when stimulated with GM-CSF or MCSF, respectively. Adopitve transfer of this OCP population into osteoclast deficient hosts resulted in the formation of donor-derived mature, multinucleated TRAP+ osteoclasts in vivo. By combining adoptive transfer with an inflammatory stimulus (lipopolysaccharide injection into the calvaria) we further show that these OCP can be recruited to and differentiate at sites of inflammatory osteolysis. Thus, we demonstrate that bone marrow OCP can migrate to stimuli known to promote osteoclastic bone resorption.

Conclusion: We demonstrate that the CD11b+Ly6C+Kit+ bone marrow population is a bona fide OCP. Furthermore, this work provides a model system to identify the chemokine and cytokine requirements for recruiting osteoclasts to sites of inflammatory bone loss in diseases such as rheumatoid and psoriatic arthritis.

Disclosure: J. F. Charles, None; E. Niemi, None; M. C. Nakamura, None; A. O. Aliprantis, None.

31 Anti Citrullinated Protein Antibodies From Synovial Fluid of Rheumatoid Arthritis Patients Enhance Osteoclastogenesis, Akilan Krishnamurthy1, Nancy Vivar Pomiano1, Catia Cerqueira1, Elena Ossipova1, Karin Lundberg1, Ulrike Harre2, Vivianne Malmsström3, Per Johan Jakobsson4, Lars Klareskog5, Georg Schett5 and Anca Irinel Catrina1. 1Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 3Karolinska Institute, Stockholm, Sweden

Background/Purpose: Presence of anti CCP2 antibodies identifies a subgroup of RA patients that are more prone to develop bone erosions. We hypothesized that anti CCP2 IgG might have a direct effect on bone, and thus investigated the ability of anti CCP2 IgG isolated from synovial fluid (SF) of RA patients on osteoclastogenesis and bone destruction in an in vitro system.

Methods: SF (n=26) samples were collected from RA patients with anti-CCP2 IgG levels above 300AU/ml. Total IgG was isolated on Protein G columns, before applied to CCP2 affinity columns, kindly donated by EuroDiagnostica. A pool of the purified anti-CCP IgG fractions, as well as a pool of the corresponding column flow through IgG fractions were tested for the ability to influence osteoclastogenesis and bone destruction. CD14 positive cells isolated by positive selection from peripheral blood of healthy individuals were cultured in the presence of GM-CSF and IL-4 to generate immature dendritic cells. After 6 days of culture, cells were incubated in the presence of RANKL and M-CSF, with or without CCP2 IgG or flow through IgG (at a final concentration of 100ng/ml) for an additional 12 days.

Results: Formation of OCP activity resides in the CD11b+Ly6Chi cKit- population. Furthermore, this work provides a model system to identify the chemokine and cytokine requirements for recruiting osteoclasts to sites of inflammatory bone loss in diseases such as rheumatoid and psoriatic arthritis.

Conclusion: We demonstrate that the CD11b+Ly6C+Kit+ OCP population can be distinguished from the recently described quiescent osteoclast precursor by their proliferative capacity and absence of RANK (receptor activator of nuclear factor kappa B) expression. Similar to other myeloid precursors, OCP retain plasticity in vitro, differentiating into dendritic cells or phagocytic macrophages when stimulated with GM-CSF or MCSF, respectively. Adopitve transfer of this OCP population into osteoclast deficient hosts resulted in the formation of donor-derived mature, multinucleated TRAP+ osteoclasts in vivo. By combining adoptive transfer with an inflammatory stimulus (lipopolysaccharide injection into the calvaria) we further show that these OCP can be recruited to and differentiate at sites of inflammatory osteolysis. Thus, we demonstrate that bone marrow OCP can migrate to stimuli known to promote osteoclastic bone resorption.

Conclusion: We demonstrate that the CD11b+Ly6C+Kit+ OCP population can be distinguished from the recently described quiescent osteoclast precursor by their proliferative capacity and absence of RANK (receptor activator of nuclear factor kappa B) expression. Similar to other myeloid precursors, OCP retain plasticity in vitro, differentiating into dendritic cells or phagocytic macrophages when stimulated with GM-CSF or MCSF, respectively. Adopitve transfer of this OCP population into osteoclast deficient hosts resulted in the formation of donor-derived mature, multinucleated TRAP+ osteoclasts in vivo. By combining adoptive transfer with an inflammatory stimulus (lipopolysaccharide injection into the calvaria) we further show that these OCP can be recruited to and differentiate at sites of inflammatory osteolysis. Thus, we demonstrate that bone marrow OCP can migrate to stimuli known to promote osteoclastic bone resorption.

Disclosure: J. F. Charles, None; E. Niemi, None; M. C. Nakamura, None; A. O. Aliprantis, None.


Background/Purpose: To facilitate an understanding of the biological factors involved in inflammation-mediated bone loss, in vitro systems and murine models of bone loss, such as endotoxin-induced calvarial erosion have been utilized. However, challenges exist with in vivo model robustness, throughput and quantitation of bone erosions. Assessment of erosion is typically determined via micro-computed tomography (MicroCT) but quantitation has been hampered by mouse to mouse variability in bone morphology and lack of consistent robust erosion obtained by endotoxin alone. We set out to develop a robust, quantitative in vivo endotoxin-induced calvarial erosion model that would be amenable for in vivo testing of potential therapeutic agents and would allow for gaining insight into processes involved in inflammatory bone loss.

Methods: Lipopolysaccharide (LPS) was injected with or without receptor activator of NF-kB ligand (RANKL), over the calvaria of mice. On day 5 or 8, mice were euthanized and processed for MicroCT analysis. Skulls were scanned at medium resolution, 70 kVp, 114 μA. Scans were rendered into 3-D. Optimal viewing angles were chosen for creation of TIFF images, which were then examined using Pax-IT imaging analysis software (MIS, Inc), using a 4-pass analysis to generate 4 areas of erosion representing each of the 4 calvarial plates. The values obtained in the 4 areas of erosion were summed to provide a measure of total area of calvarial erosion. For further validation aimed at demonstration of the quantitative nature of the model, in vivo testing of therapeutic agents known to play a role in osteoclastogenesis was implemented.

Results: Five-day dose-response studies using RANKL + LPS in B10.RIII mice resulted in severe erosive events, but dose-dependent relationships were not consistent. We compared 5-day and 8-day models. At Day 8, mice exhibited consistent and strong dose-dependent calvarial erosion with co-administration of 25 μg LPS and 10μg RANKL per mouse. We determined inclusion of RANKL was necessary for optimal erosion. Summating four 8-day studies using B10.RIII mice, co-administration of 25 μg LPS and 10 μg RANKL led to an average area of erosion of 4080 ± 259 mm², compared to the naive (untreated) average area of erosion of 506 ± 40 mm². The microCT-Pax-IT analysis method facilitated reproducible, quantitative scoring. Importantly, therapeutic agents known to play a role in osteoclastogenesis demonstrated statistically significant reductions in bone erosion further emphasizing the quantitative nature of this model.

Conclusion: We developed a robust, quantitative endotoxin plus RANKL-induced calvarial bone erosion model through use of MicroCT and Pax-IT analysis. This model and quantitation methodology allows for testing therapeutic agents to facilitate understanding of the biological factors and processes involved in bone erosion. The ultimate goal is to impact identification of better therapeutic options for patients.

Disclosure: D. Thome, Boehringer Ingelheim, 3; D. Souza, Boehringer Ingelheim, 3; A. Behera, Boehringer Ingelheim, 3; J. Zheng, Boehringer Ingelheim, 3; J. Swantek, Boehringer Ingelheim, 3; G. H. Nabozny, Boehringer Ingelheim, 3.

33 Novel Targets for Blocking Osteoclast-Mediated Resorption in Inflammatory Disorders, Kevin P. McHugh1, Tania N. Crotti1, Jun Li2, Jon Hill3, Gerald H. Nabozny4, Steven R. Goldring4 and P. Edward Purdue5. 1Center for Advanced Orthopedic Studies, Beth Israel Deaconess Medical Center, Boston, MA, 2Boehringer Ingelheim Pharmaceuticals Inc., Ridgefield, CT, 3Boehringer Ingelheim Pharmaceuticals Inc, Ridgefield, CT, 4Hospital for Special Surgery, New York, NY, 5Hospital for Special Surgery, Weill Cornell Medical Center, New York, NY

Background/Purpose: Osteoclasts are specialized myeloid lineage cells that mediate both pathologic and physiologic bone remodeling. Fully differentiated and functional osteoclasts are found exclusively associated with the bone surface, indicating that interaction with the bone substrate plays a pivotal
role in the regulation of osteoclast biology. Most in vitro studies on the formation and activation of osteoclasts have been performed using cells adhered to tissue culture plastic, and there is little information regarding the specific molecular mechanisms by which adherence to the bone surface regulates the terminal stages of osteoclast differentiation. To address this discrepancy, we have compared the transcriptional profiles of osteoclasts generated on a variety of substrates, including authentic bone and have identified unique molecular signatures that are dependent and independent of integrin beta 3, a prototypical osteoclast regulator of osteoclast function.

Methods: Bone marrow derived macrophages from wild-type and integrin beta 3 deficient mice were cultured in the presence or absence of RANKL on plastic, hydroxyapatite, or calvarial bone discs. RNA was isolated at different stages of osteoclast generation and microarray analysis and pathway mapping were utilized to identify osteoclast signaling pathways regulated by the cytokine RANKL, bone substrate, and integrin beta 3. Pathway analysis was performed using GSEA and Ingenuity pathway analysis.

Results: Microarray analysis revealed RANKL-induced molecular profiles that were uniquely and specifically regulated in osteoclasts differentiated on the authentic bone substrate compared to the other substrates. Pathway analysis revealed coordinated downregulation by bone of a cluster of genes associated with cell cycle progression. The expression level of integrin beta 3, which is induced by RANKL during osteoclast differentiation, is further modulated by culture on the bone substrate. Interestingly, bone regulated genes could be divided into those that were dependent and independent of integrin beta 3.

Conclusion: In addition to cytokines and growth factors, interaction of osteoclasts and their precursor with the bone substrate regulates pathways that are involved in osteoclast formation and activation. Although integrin beta 3 has been regarded as the essential mediator of osteoclast attachment and activation, molecular pathways independent of this integrin also modulate the genetic program during osteoclastogenesis. Analysis of these genes and their pathways provides novel targets and approaches for therapeutic targeting of osteoclast-mediated bone loss in inflammatory and related bone disorders.

Disclosure: K. P. McHugh, Boehringer Ingelheim, 2; T. N. Crotti, Boehringer Ingelheim, 2, J. Li, Boehringer Ingelheim, 3; S. J. Hill, Boehringer Ingelheim, 3; G. H. Nabozny, Boehringer Ingelheim, 3; S. R. Goldberg, Boehringer Ingelheim, 2; P. E. Purdue, Boehringer Ingelheim, 2.

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Rebamipide Attenuates Pain Severity and Cartilage Degeneration in a Rat Model of Osteoarthritis by Downregulating Oxidative Damage and Catabolic Activity in Chondrocytes. Su-Jin Moon1, Mi-La Cho2, Yeon-Sik Hong3, Sung-Hwan Park2 and Jun-Ki Min1. 1Division of Rheumatology, Korean University of Korea, Seoul, South Korea, 2Catholic University of Korea, Seoul, South Korea, 3Our Lady of Mercy Hospital, Inchon, South Africa

Background/Purpose: The development and progression of osteoarthri-

sis (OA) are characterized by the destruction of bone in the joints, even in the early stages of disease. Proinflammatory cytokines and chemokines are critical mediators of the disturbed homeostasis in the OA cartilage matrix. Also, OA is associated with oxidative stress. Excessive production of oxidants has been linked with apoptosis of cartilage chondrocytes both in vitro and in vivo. Rebamipide, a gastroprotective agent, exhibits an anti-inflammatory and radical-scavenging property. We investigated the effects of rebamipide on pain generation, cartilage destruction, and various indicators of local oxidative damage and inflammatory status in a monosodium iodoacetate (MIA)-induced OA rat model.

Methods: OA was induced in rats by intra-articular injection of MIA. Oral administration of rebamipide was initiated on the day of MIA injection or 3 days after. Limb nociception was assessed by measuring the paw withdrawal latency and threshold. We analyzed the samples macroscopically and histomorphologically, and used immunohistochemistry to investigate the expression of matrix metalloproteinase 13 (MMP-13), interleukin-1β (IL-1β), hypoxia-inducible factor-2α (HIF-2α), inductive nitric oxide synthase (iNOS), and nitrotyrosine in knee joints. Real-time quantitative reverse transcription-polymerase chain reaction was used to quantify the mRNA for catabolic and anti-catabolic factors in human OA chondrocytes.

Results: Rebamipide showed an antiinflammatory property and attenuated cartilage degeneration. Rebamipide reduced the expression of MMP-13, IL-1β, HIF-2α, iNOS, and nitrotyrosine in OA cartilage in a time-dependent manner. Nitrotyrosine expression in the subchondral bone region was decreased in the rebamipide-treated joints. mRNA expression of MMP-1, -3, and -13, and ADAMTS5 was attenuated in IL-1β-stimulated human OA chondrocytes. By contrast, rebamipide induced the mRNA expression of tissue inhibitor of metalloproteinase-1 and -3.

Conclusion: The results show the inhibitory effects of rebamipide on pain production and cartilage degeneration in experimentally induced OA. The suppression of oxidative damage and the restoration of extracellular matrix homeostasis of articular chondrocyte suggest that rebamipide is a potential therapeutic strategy for OA.

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Changes in Tibial Bone and Cartilage Structure in a Mouse Surgical Model of Osteoarthritis. Brett A. Tonkin1, Evangele Romas2, Natalie A. Sims3 and Nicole C. Walsh1. 1St Vincent’s Institute of Medical Research, Melbourne, Australia, 2St Vincent’s Hospital, Melbourne, Australia

Background/Purpose: The destabilisation of the medial meniscus (DMM) model of osteoarthritis (OA) is commonly used to study OA joint degeneration. In DMM-OA, the knee is stabilised by transecting the medial meniscus, resulting in increased loading on the medial tibial compartment. Similar to human OA, this leads to cartilage damage, subchondral bone accrual and osteophyte formation. We conducted a longitudinal study to define temporal changes in tibial bone structure and cartilage integrity in this model.

Methods: 12-week old male C57BL/6 mice underwent DMM or sham surgery on the right knee; left knees served as contra-lateral controls. In vivo micro-CT was performed prior to surgery, and at 4, 8, 12 weeks post-surgery. NRecon and CT-Analyser (Skyscan) were used for micro-CT data reconstruction and analysis; the latter was performed using a novel approach specifically developed for assessing bone of varying mineralisation states. Histologic assessment of cartilage damage was performed using the OARSI scoring matrix for mouse models of osteoarthritis. Statistics: 2-way ANOVA, Bonferroni post-hoc tests. Baseline bone volume/tissue volumes (BV/TV) and bone mineral density were similar in all limbs.

Results: Consistent with an increase in loading, micro-CT analyses demonstrated focal increases in medial subchondral bone in DMM-OA tibiae; BV/TV and bone mineral density were significantly increased at this site compared to sham from 4 weeks post-surgery (p<0.001). In contrast, the lateral subchondral bone BV/TV did not differ between DMM-OA and sham tibiae and the tibial trabecular BV/TV was similar in all limbs, indicating no systemic effects of DMM-OA on bone remodelling. Histologic assessment demonstrated proteoglycan loss in medial articular cartilage in DMM-OA tibiae from 4 weeks post-surgery, with cartilage erosion evident by 8 weeks post-surgery. Interestingly, medial subchondral bone BV/TV was similar between DMM-OA tibiae and their contra-lateral tibiae, suggesting alterations in gait may affect the subchondral bone structure in the contra-lateral knee; an observation also made in human OA. Articular cartilage was intact in these contra-lateral tibiae.

Conclusion: In summary, focal changes in subchondral bone structure occur early in DMM-OA in response to joint destabilisation, and precede proteoglycan loss and erosion of the articular cartilage. Altered bone structure in contra-lateral tibiae of DMM-OA mice, suggests that increased subchondral bone alone, does not necessarily impact overlying articular cartilage integrity, and also serves to highlight the need to include sham-operated mice when using this model.

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Role of Fk506 Binding Protein 5 in Osteoclast Differentiation. Miho Kimura1, Tatsuo Nagai1, Reiko Matsuhashi1, Atsushi Hashimoto2, Toshiyuki Miyashita3 and Shunrei Hihora1. 1Kitsato University School of Medicine, Sagamihara, Japan, 2Sagamihara National Hospital, National Hospital Organization, Sagamihara, Kanagawa, Japan, 3Kitsato University School of Medicine, Sagamihara

Background/Purpose: RA is a chronic, systemic inflammatory disease characterized by the destruction of bone in the joints. Moreover, it is well appreciated that systemic osteoporosis is common in RA. Previous studies have disclosed the enhanced expression of FK506 binding protein 5 (FKBP5) mRNA in bone marrow CD34+ cells in RA. Since bone marrow CD34+ cells are precursors of osteoclast, it is possible that overexpression of FKBP5 might
None; osteoporosis in RA as well as in glucocorticoid-induced osteoporosis. The current studies therefore explore the influences of FKBP5 in osteoclast differentiation from murine RAW264.7 cells.

Methods: We generated stable transfectant clones of FKBP5 gene of murine macrophage RAW264.7 cell line, using a plasmid containing pCAGGS-FKBP5(murine)-IRE-GFP-pA-Neo. FKBP5 expression was confirmed by Western blotting and RT-PCR. Osteoclast differentiation was induced by stimulation with receptor activator of nuclear factor kappa B ligand (RANKL) and was evaluated by TRAP staining and pit formation assay.

Results: FKBP5 transfectant clones of RAW264.7 cell line generated a higher number of TRAP positive multinucleated cells with higher activity of pit formation than mock transfectants (Figure 1). Threonine of osteoclast differentiation of FKBP5 transfectants was only partially reversible by transfection of a vector bearing a mutant form of IkB (NFkB super-repressor) (Figure 2). Consistently, the results of luciferase assay and NFkB p65 ELISA revealed only very modest increase in NFkB activity in the presence of RANKL in FKBP5 transfectants compared with mock transfectants. Finally, glucocorticoid-enhanced not only the osteoclast differentiation from nontransfectant RAW264.7 cells, but their expression of FKBP5 mRNA in a dose-dependent manner.

Fig 1. Effect of FKBP5 on the differentiation of osteoclasts.

Fig 2. Effect of NF-kB superrepressor on osteoclast differentiation.

Conclusion: These results indicate that FKBP5 promotes osteoclast differentiation by a mechanism distinct from NFkB activation. Moreover, the data also suggest that FKBP5 might play a role in the development of osteoporosis in RA as well as in glucocorticoid-induced osteoporosis.

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weeks, when strontium incorporation in mineralizing tissues was assessed using EPMA.

Results: EPMA maps at all time-points demonstrated scant strontium deposition on trabecular surfaces and epiphyseal growth plates, but was most prominently incorporated at sites of developing osteophytes - indicating intensive bone turnover and new bone formation (Fig 1). Joint effusion, synovitis and occasional subchondral cysts were readily visible at 4 weeks under MRI (Fig 2), however, only tiny areas of potential BML-like signal (ill-defined increased T2 signal) were detected in this animal model starting at 4 weeks. Those foci were not located at the sites of strontium incorporation, but were seen at the margins of sub-articular cysts that developed between 4–8 weeks.

Conclusion: In this animal model of PTOA, joint degeneration was associated with florid synovitis, joint effusion, minimal subchondral cyst formation, OA-associated loose body appearance and massive osteophyte formation. In humans, such dramatic arthropathy would generally be accompanied by extensive BML. Although all of the other features of severe OA were present in these animals and hypermetabolism was demonstrated at the joint margins, we detected virtually no BML at 9.4T MRI.

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SDF-1 Induces Osteoclastogenesis in Rheumatoid Arthritis by Upregulating of RANKL Expression in Synovial Fibroblasts and CD4+ T Cells. Hae-Rim Kim1, Kyoung-Woon Kim2, Bo-Mi Kim3, Mi La Cho1 and Sang-Heon Lee1. Konkuk University School of Medicine, Seoul, South Korea, The Catholic University of Korea, Seoul St. Mary’s Hospital, Seoul, South Korea, Catholic University of Korea, Seoul, South Korea, Konkuk University Hospital, Seoul, South Korea

Background/Purpose: Stromal cell-derived factor (SDF)-1 is involved in bone destructive process in rheumatoid arthritis (RA) and bony metastasis in malignancy, through inducing angiogenesis, producing matrix-degrading enzymes and increasing survival and migration of osteoclasts. This study aimed to determine the mechanism of SDF-1 on osteoclastogenesis in RA.

Methods: Synovial fibroblasts and CD4+ T cells were isolated from synovial tissues and peripheral blood of RA patients. The expression of SDF-1 and RANKL in the synovial tissues was evaluated using confocal microscopy. After synovial fibroblasts and CD4+ T cells were treated with rhSDF-1, the expression of RANKL mRNA was determined using real-time PCR. Osteoclastogenesis was analyzed in culture of human peripheral blood monocytes with SDF-1. Osteoclastogenesis was also determined after monocytes were co-cultured with rhSDF-1-stimulated RA synovial fibroblasts and CD4+ T cells.

Results: The expression of RANKL mRNA in RA synovial fibroblasts and CD4+ T cells was increased after SDF-1 stimulation. When RA synovial fibroblasts and CD4+ T cells were cultured with neutralizing antibody of TNF-a, the SDF-1-induced RANKL expression decreased, however, inhibition of IL-1b and IL-6 did not affect SDF-1-induced RANKL expression in both cell types. When CD4+ monocytes were cultured with SDF-1 in the absence of exogenous RANKL, the monocyes were differentiated into TRAP+ osteoclasts. Also, the monocytes were differentiated into TRAP+ osteoclasts when they were co-cultured with SDF-1-prestimulated RA synovial fibroblasts or CD4+ T cells in the absence of exogenous RANKL.

Conclusion: SDF-1 induced osteoclastogenesis by up-regulating RANKL expression in RA synovial fibroblasts and CD4+ T cells and this is mediated by TNF-a. The axis of SDF-1 and RANKL is a potential therapeutic target for bony destructive process in RA.

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Syndecan-4 Regulates Activation of WNT Signaling in Chondrocytes.

Jessica Bertrand1, Richard Stange2, Giovanna Nalesso2, Joanna Sherwood2, Lars Godmann3, Frank Echtermeyer4, Francesco Dell’Accio3 and Thomas Pap1. University Hospital Münster, Münster, Germany, Queen Mary University London, London, United Kingdom, University hospital Hanover, Hanover, Germany, William Harvey Research Institute, Barts and the London Queen Mary’s School of Medicine and Dentistry, Centre for Experimental Medicine and Rheumatology, London, United Kingdom

Background/Purpose: Blockade of syndecan-4 (Sdc4) signaling protects mice from cartilage degradation in experimentally induced osteoarthritis (OA). Cartilage damage results in changes of chondrocyte phenotype induced by various signaling pathways including the activation of WNT signaling. Here, we hypothesized that Sdc4 modulates chondrocyte phenotype by the specific modulation of WNT signaling.

Methods: In vitro analyses were performed using neonatal wild type (wt) and Sdc4−/− chondrocytes, or a blocking Sdc4 antibody on wt chondrocytes. The influence of 100 ng/ml WNT3a on glycosaminoglycan (GAG) production was analyzed using alcian blue staining of micromass cultures. The expression of chondrocyte marker genes (aggrecan, collagen 2, MMP13) was measured by quantitative RT-PCR. The effects of WNT3a on canonical
and noncanonical WNT signaling were analyzed using Western Blot detection of β-catenin, pLRP-6, pCamKII and pINK and a TCF/LEF reporter assay. To investigate the in vivo relevance of the investigated pathways induction of OA in wt and Sdc4−/− mice was performed using the DMM model and stainings for β-catenin and pCamKII were performed.

**Results:** Micromass cultures revealed a higher basal GAG production by Sdc4−/− than wt chondrocytes. Furthermore, WNT3a stimulation led to a decrease in GAG in wt, which was not observed in Sdc4−/− chondrocytes. These findings were confirmed by a 10% higher basal production of aggrecan and collagen 2 in Sdc4−/− compared to wt chondrocytes. The expression of both genes was 10 fold increased by stimulation with WNT3a, whereas WNT3a led to a decrease in the expression of both genes in wt chondrocytes. Inverse results were found for MMP13, which was significantly less expressed in Sdc4−/− chondrocytes and was not upregulated upon WNT3a stimulation. Western blot analyses of canonical WNT signaling showed that β-catenin was strongly reduced and not upregulated upon stimulation with WNT3a in Sdc4−/− chondrocytes. Confirming these findings we also found less phosphorylation of LRp6 and less activation of the TCF/Lef reporter upon WNT3a stimulation in Sdc4−/− chondrocytes. Noncanonical WNT signaling was increased in Sdc4−/− under basal conditions, but decreased upon WNT3a stimulation in Sdc4−/− and increased in wt chondrocytes. The same blockade of canonical and downregulation of noncanonical WNT signaling upon WNT stimulation were obtained by using a blocking Sdc-4 antibody. In vivo analyses of canonical WNT signaling confirmed the decreased basal activation and the missing increase after induction of OA in Sdc4−/− mice.

**Conclusion:** We conclude from our data that Sdc4 is a major regulator of cellular response to WNT through the prevention of the induction of canonical WNT signaling. Therefore, we suggest that the blockade of Sdc-4 protein in OA induced changes in chondrocyte phenotype by inhibiting WNT induced differentiation of chondrocytes.

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**Long-Distance Physical Connections Between Chondrocytes; Cell-to-Cell Communication within Articular Cartilage.** Maria Dolores Mayan1, Raquel Gago-Fuentes1, Paula Carpentero-Fernandez1, Patricia Fernandez-Puente1, Purificacion Filgueira-Fernandez1, Virgin Valinuas1, Peter Brink2, Gary Goldberg3 and Francisco J. Blanco Garcia1.

**Background/Purpose:** SDF-1 acts as a chemoattractant that recruits chondrocytes to hypertrophic zones, where they form cartilage. Our results reveal that SDF-1 is regulated in hypertrophic zone by SDF-1α-cell-derived factor-1 alpha (SDF-1α) is elevated in joint fluid of osteoarthritics and is implicated in osteoarthritics, but it’s exact function in cartilage metabolism and cell signalling is unclear. In this study, we investigated the roles of SDF-1α on the endochondral ossification.

**Methods:** Primary chondrocytes and ibal extractions from embryonic 15.5 day-old mice were cultured with PBS vehicle or recombinant mouse SDF-1α. Real-time PCR analysis was performed using Applied Biosystems 7900 HT Real-Time PCR System and TaqMan® Gene Expression Assays for Sox9, Col2a1, Acan, MMP3, Coll1a1, Runx2. Western blot was performed with MMP13, Runx2, type 10 collagen, proliferating chondrocyte nuclear antigen (PCNA), SOX9, p-Smad1/5/8, p-ERK and p-p38. Organ culture tissues were stained with safranin O/fast green and alcin blue/alizarin red. Immunohistochemical analysis was also performed on tissue sections with Capse3, MMP3, Runx2, type 10 collagen, PCNA and SOX9. For quantification of chondrocyte apoptosis and necrosis, cells were stained with FITC-conjugated annexin V-FITC positive staining was 9.35 and 14.77% in untreated and SDF-1α treated cells, respectively. To gain further insights into the role of SDF-1α in endochondral ossification, we examined the effects of SDF-1α in tibia organ cultures. The length of tibias, compared with the controls, was significantly increased in SDF-1α treatment group (p<0.05). Immunohistochemical staining of organ cultures showed the expression of PCNA, the marker for chondrocyte proliferation and Sox9 markedly increased in chondrocytes of proliferating zone. In addition to proliferation marker, type 10 collagen, Runx2 and caspase3, were up-regulated in hypertrophic zone by SDF-1α.

**Conclusion:** Our findings reveal that SDF-1α has an effect on chondrocyte proliferation, hypertrophy and apoptosis by up-regulation of Sox9 and Runx2 through Smad and MAPK pathway during endochondral ossification.

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Serum Amyloid A Level in Knee Osteoarthritis: Systemic and/or Local Production and Pro-Inflammatory Properties On Human Chondrocytes and Fibroblast-Like Synoviocytes. Dominique de Seny1, Gaël Cobraville2, Sophie Neuville1, Édith Chartier2, Biserka Relic1, Florence Quesada Calvo1, Olivier Malaise1, Denis Malaise2, Laurence Lutteri2, Jean-Paul Chapelle2 and Michel G. Malaise1. 1GIGA Research - University of Liège - CHU Liège, Liège, Belgium, 2University of Liège, Liège, Belgium, 3Medical Chemistry - CHU Liège, Liège, Belgium

Background/Purpose: Knee osteoarthritis (OA) is a disease frequently seen in obese patients, but the relationship might be more linked to fat than to weight. A-SAA is an adipokine known to be produced by adipose tissue. Fat surrounding joints, fat within the synovium, as well as mesenchymal progenitor joint cell types might contribute to the presence of A-SAA in the joint cavity. The purposes of this work are: a) to analyse spontaneous production of A-SAA by synovial adipocyte (SA), chondrocytes and fibroblast-like synoviocytes (FLS); b) to detect A-SAA in the synovial fluid (SF) and serum of osteoarthritic patients; c) to analyse the consequences of A-SAA exposure on chondrocytes and FLS on cytokine and metalloproteinase (MMPs) production.

Methods: Synovial adipocytes, primary chondrocytes and FLS were isolated respectively from cartilage and synovial membrane obtained from knee OA patients during joint replacement. A-SAA expression level was assessed by ELISA test. A-SAA levels in serum and synovial fluid were measured in knee OA (n=29) compared to matched healthy volunteers (n=20). A-SAA and MMPs were studied by ELISA test.

Results: Endogenous A-SAA secretion was observed by dedifferentiated chondrocytes and fat synovial explants. In primary chondrocytes and FLS, A-SAA was highly and selectively expressed in the presence of glucocorticoids and in a less extent in the presence of IL-1β. A-SAA SF levels of knee OA patients were each time higher than corresponding serum levels. Both serum and SF A-SAA levels were correlated with the Kellgren–Lawrence (K-L) grades. Lastly, in vitro, exogenous A-SAA was capable to enhance cytokines (IL-6, IL-8, GROα, MCP-1) and MMPs (MMP-1, MMP-3, MMP-13) expression by human chondrocytes and FLS.

Conclusion: 1. A-SAA can be secreted by mesenchymal progenitor joint cell types: synovial adipocyte, chondrocyte and FLS. 2. However, although easily detected in the synovial fluid of osteoarthritic patients, A-SAA corresponding serum levels were each time higher suggesting a predominant systemic origin. 3. Both serum and SF levels of A-SAA were related to the severity of knee OA. 4. Systemic or local A-SAA production may act locally to enhance, at least in vitro cytokine and MMPs production. 4. A-SAA is therefore a relevant target for a tight metabolic control.

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Inhibition of WNT Signaling Pathway by Sclerostin Maintains Cartilage Homeostasis. Wafa Bouaziz, Thomas Funck-Brentano, Hilene Lin, Eric Hay and Martine Cohen-Solal. INSERM U606 Paris 7 University, Paris, France

Background/Purpose: Cartilage homeostasis is regulated by several mechanisms that influence the anabolic and catabolic tissue balance. Among them, the local activation of Wnt signaling pathway plays a major role in chondrocyte metabolism. Sclerostin, a Wnt inhibitor mainly produced by osteocytes, might regulate chondrocyte differentiation. Therefore, we aim to assess the role of Sclerostin in chondrocyte maintenance.

Methods: Primary murine chondrocytes, isolated from long bone epiphysis of 6 day-old mice, were cultured in vitro without Wnt3a and in the presence or absence of mouse recombinant Sclerostin (20ng/ml). Protocols can be induced by Wnt was quantified in the supernatant of chondrocytes by a colorimetric assay. Activation of the Wnt pathway was analyzed by the translocation of β-catenin (IF, TOP-GAL activity). Chondrocyte proliferation and apoptosis were investigated by BrdU and Tunel assays. The mRNA gene expression of anabolic and catabolic genes was quantified by RT-qPCR. We assessed the expression of Sclerostin in normal and osteoarthritic cartilage in mice with joint instability induced by partial meniscectomy (immunohistochemistry).

Results: The proteoglycan amount released in the chondrocyte culture supernatants was reduced by Wnt while it was rescued in the presence of Sclerostin. Wnt inhibited the gene expression of collagen type II (X18-fold), Sox9 (X140-fold) and Aggrecan (X900-fold) and increased the gene expression of metalloproteinases such as Adams-4 (X5-fold), Adams-5 (X5.5-fold), MMP3 (X7-fold) and MMP13 (X6.6-fold). In contrast, Sclerostin significantly prevented the increase of the catabolic genes induced by Wnt (X1.7-fold Adams-4, X1.6-fold Adams-5, X3.4-fold MMP3 and X4-fold MMP13) and rescued partially the expression of the anabolic genes (X5-fold collagen type II, X6-fold Sox-9 and X11-fold Aggrecan). Furthermore, Wnt enhanced the gene expression of collagen type X (X3-fold) which was abolished by Sclerostin (X1.6-fold). However, Sclerostin failed to exert any effect on the proliferation or the apoptosis of chondrocytes regardless of the presence of Wnt. Finally, we found that Sclerostin is expressed only in the calcified zone of the normal articular cartilage and this is consistent with previously mentioned, suggesting that Sclerostin might participate to cartilage damage.

Conclusion: Herein, we showed that the inhibition of Wnt/β-catenin pathway by Sclerostin preserves chondrocyte maintenance by inhibiting chondrocyte catabolism and hypertrophy. These results further indicate the importance of Wnt antagonists in targeting cartilage degradation in OA.

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The Effects of Apremilast On Osteoclasts, Osteoblasts, and Osteocytes. Mary Adams and Peter Schafer. Celgene Corporation, Summit, NJ

Background/Purpose: Apremilast (APR), a small molecule specific inhibitor of phosphodiesterase 4, works intracellularly to modulate pro- and anti-inflammatory mediator production in both immune and non-immune cells. Here, the effects of APR on osteoclasts (OCL), osteoblasts (OBL), and osteocytes (OCY) were examined in vitro.

Methods: Human bone marrow mononuclear cells were differentiated into OCL using 10nM dexamethasone and 10nM vitamin D for 7 days. APR (0.1–10 μM) was added along with fresh medium on day 0 and day 3. OCL were stained for tartrate-resistant acid phosphatase 5 (TRAP5), and OBL were stained for alkaline phosphatase. OBL were differentiated into OCY using hydroxyapatite/tricalcium phosphate biphasic calcium phosphate ceramic particles (Graftys BCP), which was placed into polycarbonate filter well inserts and cell culture media changed every 3 days for a total of 28 days. Gene expression was measured by qRT-PCR for the following: receptor activator of nuclear factor kappa-B (RANK), RANK ligand (RANKL), sclerostin (SOST) and osteoprotegerin (OPG). Protein production was measured by enzyme-linked immunosorbent assay.

Results: In OCL cultures, the number of TRAP+5+ cells was reduced by APR by 21%, 49%, and 73% at 0.1 μM, 1 μM, and 10 μM, respectively. In the OCL cultures, APR significantly reduced the levels of sRANKL protein by 25%, 21%, and 38% at 0.1 μM, 1 μM, and 10 μM, respectively. APR 1 μM and 10 μM significantly inhibited RANK gene expression by 30% and 25%, respectively. Adalimumab inhibited RANK gene expression by 77%. In OBL, APR reduced sRANKL protein levels by 25% at both 1 μM and 10 μM. Rolipram, alendronate, and sulfasalazine all had no significant effect on sRANKL protein levels in the OBL supernatants. In addition, APR significantly increased OPG protein levels by 42% at 0.1 μM. Overall, APR decreased the sRANKL/OPG protein ratio by 39%, 32%, and 40% at 0.1 μM, 1 μM, and 10 μM, respectively. In OCY, APR significantly reduced sRANKL production by 18%, 14%, and 17% at 0.1 μM, 1 μM, and 10 μM. APR also significantly reduced sOST protein levels by 6%, 10%, and 14% at 0.1 μM, 1 μM, and 10 μM.

Conclusion: These results demonstrate that APR inhibits osteoclastogenesis in vitro at clinically relevant concentrations (0.1–1 μM). This effect was associated with a decrease in sRANKL protein expression by OBL, but also may involve decreased RANK expression on the OCL. Since the osteoclastogenesis studied in this system was driven in part by dexamethasone, these findings indicate that APR may be useful for counteracting the bone catabolic effects of corticosteroids.

Disclosure: M. Adams, Celgene, 3; P. Schafer, Celgene, 3.
Synovitis in Secondary Osteoarthritis Due to Rheumatoid Arthritis: A Proof-of-Concept Study

Stefan Vordenbaum1, Tim Lögters1, Philipp Sewerin1, Thomas Pauly2, Ellen Bleck2, Paulina Philippski1, Matthias Schneider1, Michael Schädel-Hüpffer1 and Benedikt Ostendorf1. 1Charité University Medicine, Berlin, Germany, 2Charité - Universitätsmedizin Berlin, Germany, 3Heidelberg University Hospital, Heidelberg, Germany, 4Charité University Medicine, Berlin, Germany

Background/Purpose: Rheumatoid arthritis (RA) is characterized by considerable synovial inflammation which may result in secondary osteoarthritis (sOA). Primary OA (pOA) occurs in patients without predisposing disorders such as RA and displays varying degrees of synovial inflammation. Although previous studies have shown that a major structural difference between sOA due to RA and pOA consists in synovial histology, direct research on such histological differences is limited. Moreover, the search for suitable biomarkers to distinguish OA subtypes is considered an important step in the search for medical treatments. We therefore investigated if synovitis in patients with sOA due to RA is different from pOA, and if it more closely resembles active RA.

Methods: Synovial tissue was collected and snap frozen at time of joint replacement in patients with (1) pOA (n = 8, hip), (2) sOA (defined as RA according to ACR/EULAR criteria plus OA in accordance with 2009 EULAR recommendations for diagnosis of knee OA (n = 4) or 1991 ACR criteria for hip OA (n = 3), and (3) active RA without any signs of OA (n = 8 metacarpophalangeal joints; mean DAS28 5.2 ± 1.4) by arthroscopically guided biopsy or open synovectomy. Hematoxylin and eosin stained sections were used for determination of the Synovitis Score according to Kremm. Immunohistochemically stained sections were used for determination of the Synovitis Score according to Kremm. Immunohistochemically stained sections were used for determination of the Synovitis Score according to Kremm. Immunohistochemically stained sections were used for determination of the Synovitis Score according to Kremm.

Results: High-grade synovitis was revealed by conventional histology in patients with sOA and RA (median scores: 6), but not in pOA where mild synovitis was predominant (median score 3; p = 0.012). This was largely due to the subscore on the inflammatory infiltrate with median scores of 3, 2, and 1 in sOA, RA, and pOA, respectively (p = 0.006), rather than subscores for lining layer hypertrophy (2, 2, 2.5; p = 0.013) or density of resident cells (1, 1.5, 2; p = 0.52). There was good agreement between semiquantitative scoring and digital image analysis for CD68 in all compartments (Spemann’s R 0.85, 0.8, and 0.7 with p < 0.001 for lining, sublining, and total CD68 scoring, respectively).

Conclusions: Synovial tissue analysis reveals considerable inflammation in sOA due to RA. Both conventional histology and CD68 staining confirm that sOA is histologically distinct from pOA and more closely resembles active RA. Sublining CD68 is a suitable biomarker to distinguish both OA entities.

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Accumulation of CD34+ Hematopoietic Stem Cells in the Initial Inflammatory Human Fracture Hematoma Is Mediated Via Chemokine Receptor Type 3 Ligands

Paula Hoff1, Timo Gaber1, Martin Hahne1, Cindy Streil1, Katharina Schmidt-Bleek1, Gerd R. Burmester2, Gerhard Schmidmaier1, Georg Duda1, Carsten Perka1 and Frank Buttgeriet1. 1Charité University Medicine, Berlin, Germany, 2Charité - Universitätsmedizin Berlin, Berlin, Germany, 3Heidelberg University Hospital, Heidelberg, Germany, 4Charité University Medicine, Berlin, Germany

Background/Purpose: We have previously shown the early phase of human fracture healing to be characterized by hypoxia which promotes inflammation and chemotraction. Hypoxia is also known to promote proliferation, survival and migration of different stem/progenitor cells like mesenchymal stem cells, endothelial progenitor cells or hematopoietic stem cells (HSC). However, the clinical relevance of hypoxia and inflammation in the early phase of fracture healing for HSC remains unclear.

To investigate immunological events in fracture healing, we quantified (i) CD34+ hematopoietic stem cells and (ii) inflammatory chemokines present in the early (<72h) human fracture hematoma (FH) at the fracture gap. To investigate the chronologic development, we also analyzed hematopoietic cell markers from the fracture hematoma from patients receiving a total hip arthroplasty (THA).

Methods: The proportion of HSC in the fracture hematoma from healthy patients (n=42) and patients receiving a THA (n=20) was analyzed by flow cytometry. Secreted factors were quantified by multiplex suspension array.

Results: A fracture destroys bone architecture and vascular network leading to bioenergetically restricted conditions such as hypoxia within the fracture hematoma. Although the cells present have to face those conditions, we were able to find a higher proportion of CD34+ hematopoietic stem cells in the FH as compared to THA-H (7.6±1.5 vs. 3.8±0.5 % of mononuclear cells) indicating proliferation and/or immigration of HSC in the FH. As CD34+ hematopoietic stem cells express CCR3, we investigated the concentrations of its ligands RANTES and Eotaxin. Indeed, both chemokines were present significantly increased at the fracture hematoma in comparison to THA-H (RANTES: 16867±1632 vs. 9830±1397 pg/ml, p<0.01; Eotaxin: 327±76 vs. 125±15 pg/ml, p<0.001). We also identified the macrophage migration inhibitory factor (MIF) to be significantly increased in the FH (17943±28538 vs. 21751±2973 pg/ml, p<0.001).

Conclusion: Hypoxia and other bioenergetically adverse conditions in a FH contribute to the induction of inflammation, including the secretion of RANTES, Eotaxin and MIF. We suggest the high concentrations of RANTES and Eotaxin to facilitate the immigration of CD34+ HSC. The initial hypoxic conditions also mediate the secretion of the proinflammatory MIF which has been already shown to be important for successful fracture healing. Thus, the inflammatory microenvironment in the FH is among the crucial factors determining fracture healing.

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Tissue Engineering for Articular Cartilage Repair, Culturing Bone Marrow Mesenchymal STEM CELLS On Collagen and Heparan Sulphate Scaffolds

Adela Helvia Martinez-Sanchez1, Clara Sanjurjo-Lopez1, Silvia Diaz-Prado1, Emma Iniesta1, Francisco J. De Torro2, Julia Bajan3 and Francisco J. Blanco1. 1Osteoarticular and Aging Res. Lab. CIBER-BBN. Rheumatology Div. INIBIC-Complejo Hosp. Univ. A Coruña, A Coruña, Spain, 2Osteoarticular and Aging Res. Lab. CIBER-BBN. Rheumatology Div. INIBIC-Complejo Hosp. Univ. A Coruña, A Coruña, Spain, 3Department of Medical Specialties. University of Alcalá de Henares, Madrid, Spain

Background/Purpose: The aim of this study was to evaluate the chondrogenic potential of bone marrow mesenchymal stem cells (BM-MSCs) grown on type I collagen and different concentrations of heparan sulfate (HS) scaffolds and the quality of the neosynthesized cartilaginous tissue.

Methods: BM-MSCs were cultured in chondrogenic differentiation medium or DMEM with 20% FBS (Fetal Bovine Serum), in both cases plus 100 nM PTHrP (Parathyroid hormone-related protein). Chondrogenic differentiation and neosynthesized cartilage quality were evaluated by histochemical and immunohistochemical analysis, transmission and scanning electron microscopy and molecular biology techniques. Culture supernatants were collected every 3–4 days to determine collagen presence by Elisa assays.

Results: Isolated cells were able to proliferate on type I collagen and various concentrations of HS scaffolds, showing high percentages of positivity for PCNA proliferation marker. Hematoxylin-eosin and Masson’s trichrome stainings showed that BM-MSCs proliferated better when cultured in chondrogenic medium than in growth medium (DMEM 20%). Stimulated cells spread throughout the biomaterials in high percentage, showing a good morphology at both times as well as a wide distribution of ECM. They showed high percentages of positivity for safranin O, Toluidine Blue, aggrecan and type II collagen. Degradation of biomaterials was gradual, as fibers were replaced with ECM. Molecular analysis indicated the expression
of cartilage-characteristic genes, such as Col II and Sox9. Scanning and transmission electron microscopy confirmed cell presence and ECM synthesis after 16 and 30 days of culture. Cells showed a high number of distended rough endoplasmic reticulum cisternae, electrodense vesicles and mitochondria. Finally, culture supernatants analysis showed the release of collagen in after 16 and 30 days of culture. Cells showed a high number of distended transmission electron microscopy confirmed cell presence and ECM synthesis, None; culture (I-L). White arrows: cells. Black arrows: ECM.

Figure 1. Analysis of BM-MSCs cultured over type I collagen and HS scaffolds on chondrogenic medium: Histochemical and immunohistochemical staining after 16 days in culture (A-D); transmission electron microscopy analysis after 16 days (E, F) and 30 days (G, H) in culture; scanning electron microscopy after 30 days in culture (I-L). White arrows: cells. Black arrows: ECM.

Conclusion: Our data demonstrated that type I collagen and HS scaffolds were optimal for BM-MSCs growth and differentiation towards chondrocytes-like cells after both 16 and 30 days in chondrogenic medium. Our scaffolds favour phenotypic maintenance of the differentiated cells and synthesis of cartilage-like tissue. Acknowledgements: Oporcin, S.P.A; CIBER BBn CB06-01-0040; SAI-UDC; P. Esbrit (Fundación Jiménez Díaz).

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The Spatial Energy Expenditure Configuration and Possible Applications in an Experimental Model of Arthritis. Susanne Klett1 and Rainer H. Straub2, 1 Laboratory of Exp. Rheumatology and Neuroendocrine Immunology, University Hospital, Regensburg, Germany; 2 University Hospital Regensburg, Regensburg, Germany

Background/Purpose: An autoimmune response with differentiation and proliferation of immune cells and the subsequent tissue-directed inflammatory process in the symptomatic phase of the disease are very energy-demanding. As recent calculations demonstrate, the activated immune system needs approximately 20% of the basal metabolic rate. Thus, energy regulation and cellular bioenergetics are of outstanding importance to serve a stimulated immune system. During inflammation, particularly during the chronic process of inflammation in long standing inflammatory diseases like rheumatoid arthritis, a reallocation of energy-rich fuels to the activated immune system is necessary in order to nourish the inflammatory process. Energy consumption and, thus, ATP generation can be measured by studying the consumption of oxygen. The energy expenditure in different organs at different time points has never been investigated during immunization (the symptomatic phase of the disease). We want to find out if, and how the energy expenditure in different organs changes during the course of experimental arthritis.

Methods: A new technique termed “spatial energy expenditure configuration (SEEC)” was developed to demonstrate bodily areas of high energy demand. SEEC is based on removal of tissue during the course of arthritis, and subsequent determination of oxygen consumption. For that purpose, small weighed pieces of the respective organ with a size of 4 mm are placed in 24-well multidishes with integrated oxygen sensors, which allows for non-invasive detection of oxygen consumption in vitro. SEEC was established in healthy control animals, arthritic animals and animals that underwent prior sympathectomy. The model of type II collagen arthritis in DBA/1 mice is used in order to develop an arthritic-specific SEEC. We determined the oxygen consumption in spleen, thymus, draining lymph nodes, liver, kidney, brain and knee joints during the course of experimental arthritis for 70 days. The values are given in μmol O2/l/h and refer to 4 mm sized pieces as percentage of mouse weight.

Results: Concerning the draining lymphoid nodes, we were able to observe a marked increase in oxygen consumption (200%) during the course of arthritis. Other investigated organs like liver or kidney decrease their oxygen consumption (control vs. arthritic animals).

Conclusion: The SEEC technique enables us to identify locations of high energy demand that are involved in the initiation and continuation of the autoimmune process in an animal model of arthritis. We identified the draining lymph nodes as target organ of the sympathetic nervous system, which will be further investigated. The technique will be applied to other chronic inflammatory disease models in order to detect further participating organs.

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Human Chondrocyte Dedifferentiation Is Accompanied by CD105 Endoglin Expression, ALK-1/Smad1/5 Phosphorylation and Leptin Production - Stimulation by Prednisolone and Aldosterone Through the Glucocorticoid Receptor. Olivier Malaise, Biserka Relic, Mustapha Zed-dou, Edith Charlier, Florence Quesada Calvo, Sophie Neuville, Dominique de Seny and Michel G. Malaise. GIIG Research - University of Liège - CHU Liège, Liège, Belgium

Background/Purpose: Leptin, mainly produced by the adipose tissue including fat neighboring the joint, is considered as pro-inflammatory in osteoarthritis (OA). Normal cartilage does not express leptin, while OA cartilage is a potential producer. We recently showed that joint-derived-cells such as synovial fibroblasts (SF), but also bone marrow mesenchymal stem cells, were able to spontaneously produce leptin in vitro, strongly enhanced by glucocorticoids (prednisolone and dexamethasone) involving the ALK-1/ Smad1/5 pathway as inducer and the ALK-5/Smad2 pathway as inhibitor. In this work, we have tested isolated human chondrocytes (CH) for leptin, leptin receptor (Ob-R) and balance ALK-5/Smad2 - ALK-1/Smad1/5, during dedifferentiation process. Secondly, we have studied if the glucocorticoid prednisolone and the mineralocorticoid aldosterone are able to induce leptin and Ob-R expression as well as the involvement of the glucocorticoid receptor (GR) or/and mineralocorticoid receptor (MR).

Methods: Human CH were obtained during joint replacement. To detect
surface antigens, cells were immunolabelled with the following anti-human antibodies: CD90-APC, CD105-PE, CD73-PE and analysed on a FACS-CANTO with the CellQuest software. Cells were stimulated with prednisolone, aldosterone, mifepristone (GR inhibitor), spironolactone and eplerone (MR inhibitors) or TGF-β1. Leptin was determined by ELISA, while Ob-R expression, Smad1/5 phosphorylation, Smad2 phosphorylation, ALK-1 and ALK-5 were determined by Western blot. Results: PCH and dedifferentiated (DCH) chondrocytes were similarly positive for CD90 (98.5% ± 1.5 and 99.4% ± 0.3, respectively) and CD73 (84.9% ± 24 and 98.9 ± 0.2, respectively), whereas DCH significantly increased their CD105 (endoglin) expression (33.7% ± 21 and 68.6% ± 17.8, P=0.004). PCH did not produce leptin nor expressed Ob-R. Opposite, DCH significantly expressed leptin and Ob-R. Both leptin and Ob-R expressions were markedly induced by prednisolone, TGF-β1 significantly downregulated prednisolone-induced leptin and Ob-R. With chondrocyte dedifferentiation, ALK-5/Smad2 phosphorylation was progressively decreasing, while ALK-1/Smad5/5 phosphorylation was increasing. ALK-1/Smad1 increased, while ALK-1/Smad5/5 phosphorylation was decreasing, while ALK-1/Smad1/5 phosphorylation was increasing.

Conclusion: 1. PCH expressed low levels of CD105 endoglin, exhibited an ALK-5/Smad2 phosphorylation and did not produce leptin nor Ob-R. 2. On the contrary, DCH significantly increased their capacity to express CD105 endoglin, exhibited an ALK-1/Smad5/5 phosphorylation, and spontaneously produced leptin and Ob-R. 3. Leptin and Ob-R expressions were inhibited by TGF-β1, but markedly increased by the glucocorticoid prednisolone and the mineralocorticoid aldosterone. 4. Prednisolone and aldosterone increased leptin and Ob-R expressions through GR but not MR stimulation.

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51 Phosphodiesterase 4 Expression in Rheumatoid Arthritis Synovium and Anti-Inflammatory Effects of Apremilast On Synovial Fibroblasts. Lei Wu, Mary Adams, Stacey Parton and Peter Schafer. Celgene Corporation, Summit, NJ

Background/Purpose: Apremilast (APR), a small molecule specific inhibitor of phosphodiesterase 4 (PDE4), works intracellularly to modulate pro- and anti-inflammatory mediator production in both immune and non-immune cells. The expression pattern of the major PDE4 enzymes was studied in rheumatoid arthritis (RA) synovium, in normal and RA synovial fibroblasts (RASF), and the effects of APR on the production of major destructive proteases by RASF were examined.

Methods: PDE4 protein expression was measured by semiquantitative immunohistochemistry (IHC) in synovium from individuals with RA (n=3) or normal controls (n=2). Quantitative analysis of PDE4 protein expression in normal (n=3) and RASF (n=3) was conducted using an iCyte Laser Scanning Cytometer. Gene expression in normal synovial fibroblasts (n=3), RASF (n=3), peripheral blood mononuclear cells from RA (n=10) and normal controls (n=10) was measured by qRT-PCR. RASF cell cultures (n=3) were treated with 0.1–10 μM APR and then stimulated with 10 ng/mL IL-1β, TNF-α, IL-17, or IL-6 for a total of 24 hours, then supernatants were collected for analysis of matrix metalloproteinase (MMP)1, MMP13, MMP14, and cathepsin K by ELISA.

Results: IHC staining of synovial samples showed that, compared with normal samples, the superficial synoviocytes and subsynovial histiocytes in RA samples had more prevalent and more intense staining of PDE4A, PDE4B, and PDE4D. PDE4B staining was slightly higher in fibroblasts from RA patients than in controls, while PDE4D staining was slightly lower. Laser scanning cytometry of normal synovial fibroblasts and RASF showed similar strong cytoplasmic staining of PDE4A in normal and RA samples. PDE4B showed abundant cytoplasmic staining, with 45% higher staining in RASF compared with controls (p<0.01). PDE4D showed moderate to strong cytoplasmic staining in normal samples, but 45% weaker expression in RASF samples (p<0.05). qRT-PCR analysis of PDE4A and PDE4B gene expression was similar in RASF and controls, but PDE4D gene expression was 60% lower in RASF compared with controls (p<0.01). In RASF cell cultures stimulated with IL-1β or TNF-α, APR significantly inhibited MMP1 and MMP14 production, while in the IL-17- or IL-6-stimulated cultures, no significant inhibition of these proteases was observed.

Conclusion: Overall, PDE4 protein expression was stronger in RA vs. normal synovium, largely due to increases in superficial synoviocytes, subsynovial histiocytes, and lymphoplasmacytic cells. In RASF, there is a shift in expression away from PDE4D toward PDE4B, and APR is capable of inhibiting MMP production in response to the IL-1β
tnφ-α. This study provides the preclinical rationale for using APR in RA.

Disclosure: L. Wu, Celgene, 3; M. Adams, Celgene, 3; S. Parton, Celgene, 3; P. Schafer, Celgene, 3.

52 The Validity of the Diagnosis Inflammatory Arthritis in Primary Care. Markus M.J. Nielen1, Jennie Ursun2, François G. Schellevis3 and Joke C. Korevaar1. 1NIVEL (Netherlands Institute for Health Services Research), Utrecht, Netherlands, 2VU University Medical Centre, Amsterdam, Netherlands

Background/Purpose: Large population-based databases, such as electronic medical records (EMRs) from patients in primary care, are useful data sources to investigate morbidity and health care utilization in patients with chronic diseases. These databases make it possible to study large groups of patients with the whole range of disease severity in a representative population, including control groups. In many countries, general practitioners (GPs) have a gatekeeper role for access to specialized care and therefore their EMRs include a complete record of all morbidty of their patients using a uniform method (PCH). Despite these advantages, EMRs and diagnoses which are usually not validated. In this study we investigated the validity of the diagnosis inflammatory arthritis (IA) in primary care based records.

Methods: Five general practices participating in the Netherlands Information Network of General Practice (LINH) were visited to collect diagnostic information. EMRs of 219 patients with a diagnostic code of IA (ICPC L88) in the LINH database were systematically reviewed on additional characteristics which are not routinely extracted for the LINH database: free text regarding contacts, prescriptions, medical history, referrals and correspondence with medical specialists. Based on coded and free text fields, all patient were categorized in one of the following groups: 1) IA, 2) osteoarthritis (OA), 3) gout, or 4) other diagnosis. These results were used to develop selection criteria to distinguish IA from non-IA in patients with all routinely available information in the LINH database.

Results: From the 219 patients diagnosed as IA in the database, the diagnosis IA was confirmed in 155 patients (70.8%), 18 patients were classified with OA (8.2%), 12 patients with gout (5.5%) and 34 patients with another diagnosis (15.5%). With these findings we developed selection criteria to include IA patients solely based on coded fields, starting with a first selection based on ICPC-code L88, followed by three sequential steps: 1) a repeat prescription for a disease-modifying antirheumatic drug (DMARD) or biological agent, 2) at least one episode with a diagnostic code for IA, combined with at least two prescriptions (excluding DMARDS/biological agents) with the IA diagnostic code, and 3) age at diagnosis ≤ 61 years. With these criteria it was not possible to distinguish between IA and OA patients with probable IA. Applying the selection criteria, resulted in a group of 139 IA patients including 77,7% IA patients and 7.9% OA patients with probable IA.

Conclusion: Based on additional diagnostic information, the diagnosis IA from EMRs of patients in primary care is sufficiently valid when using the proposed selection criteria. Since the group of IA patients still contain some patients without an IA related diagnosis, effects from studies with IA patients in primary care could be underestimated.

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Background/Purpose: Identification of RA cases in administrative healthcare databases is used to estimate disease frequency, healthcare util-
zation and cost for RA. However, the optimal methodology for achieving this is unclear. Our aim was to examine and validate a variety of decision rules which can be applied to administrative databases to identify patients with RA.

Methods: The study was conducted at a single academic medical center and utilized administrative health care data from a geographic area of approximately 1 million people who had access to a universal healthcare system. A retrospective cohort study was performed through the Population Health Research Unit at our institution and utilized data from existing administrative databases. These included information on hospital discharges and physician billings over a 10 year period. Each RA study subject was matched by age and gender to randomly selected control subjects in the same datasets but without a diagnosis of RA or other inflammatory arthropathies. A total of 7 decision rules, some derived from previous studies, were applied to the administrative data to identify RA cases. The sensitivity, specificity, overall accuracy, positive (PPV) and negative (NPV) predictive values of these rules was compared to the diagnosis of a rheumatologist in the academic medical center as determined by chart review.

Results: The performance of decision rules for the identification of RA cases in administrative healthcare databases in variable and should be considered when comparing data across studies. This variability may also be used to advantage in study design when, for example, either sensitivity or specificity is the most critical issue for different population health research questions.

Conclusion: Large health plan and registry databases appear useful to assess feasibility of large pragmatic trials and to assist in selection of rheumatology sites with the greatest number of eligible patients. This novel approach is applicable to trials with simple inclusion/exclusion criteria that can be readily assessed in these data sources.

Disclosure: J. Curtis, Roche/Genetech, UCBC; Centocor, Corrona,Apeng, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech,UCB, Centocor, CORRONA, Apeng, Pfizer, BMS, Crescendo, Abbott, 5, L. Chen, None; F. Xie, None; J. Zhang, None; K. G. Saag, AHRQ, NIH/NIAMS, 2, Amgen;Abbott;Ardea:Lilly:Merck:Novartis:Regeneron:Savient:URL, 5, NOF;ACR, 6; S. Colefi, Teva Neuroscence, Centocor Ortho-Biotech Svs LLC, Medimmune, american Shoulder and Elbow Society, Consortium of Multiple Sclerosis Centers, and Pythagorus, Inc, 5; K. L. Winthrop, Pfizer Inc, 5, Pfizer Inc, UC'B, Abbott, Amgen, 2, N. C. Wright, Amgen, 2; E. S. Delzell, Amgen, 2.

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Use of Health Plan Data to Assess Feasibility of Large Pragmatic Clinical Trials in Rheumatoid Arthritis, Jeffrey Curtis¹, Lang Chen¹, Fenglong Njie¹, Kenneth G. Saag², Stacey Cofield³, Kevin L. Winthrop³, Nicole C. Wright¹ and Elizabeth S. Delzell¹. ¹University of Alabama at Birmingham, Birmingham, AL; ²Univ of Alabama-Birmingham, Birmingham, AL; ³Univ of Alabama at Birmingham, Birmingham, AL; ⁴Oregon Health & Science University, Portland, OR

Background/Purpose: Large pragmatic clinical trials (PCTs) are increasingly used to conduct comparative effectiveness research (CER). PCTs typically have simple inclusion/exclusion criteria and hard outcomes (e.g. hospitalized infection, death) but can be challenging to conduct due to the large number of patients required. In the context of planning a safety PCT of the live zoster vaccine in older rheumatoid arthritis (RA) patients receiving anti-TNF therapy, we evaluated the use of various databases to assess the feasibility of recruiting the 4,000 patients needed for the trial (based upon sample size calculations required for 80% power) and to facilitate rheumatology site selection.

Methods: Using multiple health plan and registry databases (e.g. 100% sample of Medicare patients in 2009; younger RA patients enrolled in a commercial insurance health plan), we identified RA patients age >= 50 on the basis of physician diagnoses and receipt of received anti-TNF therapy in the last 90 days of 2009. Extrapolations were made to estimate the prevalence of anti-TNF use for patients whose pharmacy coverage data was not present in the available databases. These eligible individuals were linked to individual rheumatologists (e.g. using National Provider Identification numbers) and cross referenced against multiple sources of information (e.g. FDA 1572 registry, known participation in any U.S. RA registry or consortium) that that allowed identification of rheumatologists with research experience. Rheumatologists were grouped together into practices (offices) using billing information, and offices were sorted by size based upon having the greatest to the least number of eligible patients. The number of rheumatologist offices needed to fully recruit to the proposed PCT.

Results: More than 150,000 RA patients receiving anti-TNF therapy at the end of 2009 were identified and grouped into the rheumatologists’ offices at which they received care. The number of eligible RA patients was plotted for the largest 100 rheumatologists’ offices (figure solid line). A majority of the largest offices had evidence that they participated in research, as evidence by the dotted line being almost superimposed with the solid line for the first 6000+ patients). Even with a participation rate that was < 30%, fewer than 40 rheumatologist offices with a prior history of clinical research would be required in order to successfully recruit the proposed PCT.

Conclusion: Large health plan and registry databases appear useful to assess feasibility of large pragmatic trials and to assist in selection of rheumatology sites with the greatest number of eligible patients. This novel approach is applicable to trials with simple inclusion/exclusion criteria that can be readily assessed in these data sources.

Disclosure: J. Curtis, Roche/Genetech, UCBC; Centocor, Corrona,Apeng, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech,UCB, Centocor, CORRONA, Apeng, Pfizer, BMS, Crescendo, Abbott, 5, L. Chen, None; F. Xie, None; J. Zhang, None; K. G. Saag, AHRQ, NIH/NIAMS, 2, Amgen;Abbott;Ardea:Lilly:Merck:Novartis:Regeneron:Savient:URL, 5, NOF;ACR, 6; S. Colefi, Teva Neuroscence, Centocor Ortho-Biotech Svs LLC, Medimmune, american Shoulder and Elbow Society, Consortium of Multiple Sclerosis Centers, and Pythagorus, Inc, 5; K. L. Winthrop, Pfizer Inc, 5, Pfizer Inc, UC'B, Abbott, Amgen, 2, N. C. Wright, Amgen, 2; E. S. Delzell, Amgen, 2.

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Accuracy of Canadian Health Administrative Databases in Identifying Patients with Rheumatoid Arthritis Seen by Rheumatologists, Jessica Widdifield¹, Sasha Bernatsky², J. Michael Paterson³, Karen Tu⁴, Ryan Ng⁵, J. Carter Thorne¹, Janet E. Pope⁶ and Claire Bombardier⁷. ¹University of Toronto, Toronto, ON; ²Research Institute of the McGill University Health Cte, Montreal, QC; ³Institute for Clinical Evaluation Sciences, Toronto, ON; ⁴Southlake Regional Health Centre, Newmarket, ON; ⁵Western University of Canada, St. Joseph’s Health Care, London, ON

Background/Purpose: In a predominantly universal single-payer health system, Canadian health administrative data are a valuable tool and increasingly used for research. Few studies have rigorously evaluated the accuracy of administrative data for identifying patients with rheumatoid arthritis (RA). The aim of this study was to validate administrative data algorithms to identify RA in the Canadian province of Ontario.

Methods: We performed a retrospective chart abstraction study among a random sample of 450 patients (unselected by diagnoses), from 18 rheumatologists. Using rheumatologist-reported diagnosis as the reference standard, the RA and non-RA patients were then linked to administrative data to validate different combinations of physician billing diagnoses (P), hospitalization diagnoses (H) and pharmacy (drugs dispensed) data. We evaluated sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) in differentiating RA from non-RA patients.

Results: 149 rheumatology patients were classified as RA and 301 as
non-RA based on our reference standard definition. Most patients were female (77% RA cases; 65% non-RA cases) and the mean (SD) age for RA cases and non-cases was 62 (14) and 58 (17) years, respectively. Among non-RA cases, the most prevalent diagnoses were osteoarthritis (45%), seronegative spondyloarthropathies (19%) and connective tissue diseases (19%). Test characteristics of selected algorithms tested are reported in Table 1. Overall, using any physician-billing algorithms, sensitivity was very high (94–100%). Specificity and PPV were modest to excellent and increased when algorithms required multiple RA claims or claims by a specialist. There was a slight increase in sensitivity and decrease in specificity and PPV as the observation window for multiple billing diagnoses increased from 1 to 2 years. The addition of RA drugs (disease-modifying agents, biologics, or systemic steroids) in our algorithm had little impact on sensitivity but decreased both specificity and PPV.

Table 1. Test characteristics of selected algorithms

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
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<td>1 H ever</td>
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<td>75</td>
<td>72</td>
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<tr>
<td>1 P ever</td>
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<td>2 P in 1 year, any physician</td>
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<td>97</td>
<td>81</td>
<td>72</td>
<td>98</td>
</tr>
<tr>
<td>1 P ever by a specialist</td>
<td>99</td>
<td>77</td>
<td>68</td>
<td>100</td>
</tr>
<tr>
<td>2 P in 1 year at least 1 P by a specialist</td>
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<td>83</td>
<td>74</td>
<td>99</td>
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<tr>
<td>2 P in 2 years at least 1 P by a specialist</td>
<td>99</td>
<td>82</td>
<td>73</td>
<td>99</td>
</tr>
<tr>
<td>3 P in 3 years at least 1 P by a specialist</td>
<td>99</td>
<td>81</td>
<td>72</td>
<td>98</td>
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<tr>
<td>1 H or 3 P in 1 year at least 1 P by a specialist</td>
<td>95</td>
<td>87</td>
<td>78</td>
<td>97</td>
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<tr>
<td>1 H or 3 P in 2 years at least 1 P by a specialist</td>
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<td>85</td>
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<td>98</td>
</tr>
<tr>
<td>1 H or 3 P in 3 years at least 1 P by a specialist</td>
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<td>84</td>
<td>75</td>
<td>98</td>
</tr>
<tr>
<td>1 P AND 1 Rx</td>
<td>97</td>
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<td>63</td>
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<td>2 P AND 1 Rx</td>
<td>97</td>
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H: Hospitalization code; P: physician diagnostic code; Specialist: rheumatologist, internal medicine, orthopedic surgeon; Rx: oral corticosteroid, disease-modifying anti-rheumatic drug (DMARD) or biologic.

Conclusion: This study has demonstrated the accuracy of administrative data algorithms for identifying RA. We found that for RA patients that have seen a rheumatologist, physician-billing algorithms are highly sensitive in identifying these patients. Our findings suggest that pharmacy data do not improve the accuracy in identifying RA. One potential limitation is that our sample was drawn from rheumatology clinics, and thus our estimates may not improve the accuracy in identifying RA. One potential limitation is that our data algorithms for identifying RA. We found that for RA patients that have

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A British Survey of Time to Presentation and Treatment of Rheumatoid Arthritis in Subjects of Black and Minority Ethnic Origin. Sonia Panchal1, Ash Samanta1, Arunugam Moorthy2, Sawson Hayat2, Ira Pande2, Adewale O. Adebao1 and Kuntal Chakravarty3. University Hospitals of Leicester, Leicester, United Kingdom. 1Nottingham University Hospitals, Nottingham, United Kingdom, 2Academic Rheumatology Group, D. Shef- field, United Kingdom, 3University of Bedfordshire Post Graduate Medical School, Romford, United Kingdom.

Background/Purpose: National guidelines mandate urgent referral of rheumatoid arthritis (RA) for specialist treatment if more than three months from symptom onset; initial combination therapy with disease modifying anti-rheumatic drugs (DMARDs) and only if not appropriate, monotherapy with rapid escalation1. A national audit of patients with RA conducted by The British Society for Rheumatology (BSR) showed that there were considerable delays from symptom onset to referral, from referral to specialist review, and initiation of DMARD therapy2. There were also wide variations regionally and a perception that there may be a differential between black and minority ethnic (BME) groups in terms of time of onset of symptoms to referral to a specialist centre and starting DMARDs. This study aimed to investigate the above features in centres that are geographically located within areas containing a high BME population and to compare this with the white Caucasian population.

Methods: Four centres were identified based on a high local BME population. Data were collected prospectively for potential time delays in the following areas: symptom onset to GP (general practice) consultation, GP to specialist referral; referral to specialist review; diagnosis to DMARD treat- ment, combination therapy, and biologic therapy. All consecutive BME and Caucasian RA patients on DMARDS attending outpatient clinics were included over an 8 week period.
Results: In total 189 patients were analysed. 111 (59%) were Caucasian vs. 78 (41%) BME (60% Asian, 2% Afro-Caribbean). 146 (77%) were female with an average age between 50–59 years, and average disease duration of 6–10 years. 30 (38%) of the BME group compared with 40 (36%) of the Caucasian group had more than six-months delay from symptom onset to specialist referral. Time from referral to specialist review greater than three months was 10 (13%) BME group vs. 21 (19%) Caucasian group. 16 (21%) BME group vs. 18 (16%) Caucasian group had a delay of more than three months from diagnosis to initiation of DMARD therapy. Interestingly, 58 (74%) of the BME group had monotherapy in comparison to 79 (71%) of the Caucasian group. 17 (22%) of the BME group had biologic therapy with an average of 2–5 years post diagnosis, whilst 20 (18%) of Caucasians had biologic therapy.

Conclusion: Our results importantly highlight a significant delay in time from presentation and initiation of treatment for RA patients of BME origin. There may be a range of ethically specific culturally centred reasons for such delay. Culturally different migrant and non-migrant internal or national minorities may inadvertently be subjected to indirect discrimination and exclusion. It is paramount to gain a deeper understanding of potential underlying cultural differences in order to educate and facilitate appropriate healthcare and support within minority populations. The empowerment of patients of minority communities through culturally appropriate health education initiatives can encourage such persons to seek early medical advice and treatment thereby promoting equity amongst diverse populations.

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5 Million Patients and Not 0.34% Is Worrisome: Burden of Rheumatoid Arthritis in India Based On a Bone and Joint Decade India Community Oriented Program for Control of Rheumatic Disease. Arvind Chopra1, R. Gharpade2, S. Sarmukkadam3, VL Joshi4, AJ. Mathews4, L. Gauri4, A. Rahim5, K. Datta6, S. Chaturvedi7, B. Thakuria7, A. Mahajan8, R. Singh9, A. Ghosh1, R. Handa11, M. Saluja1, A. Venugopalan1, V. Kunjeer1, B. Paul1, S. Pal1, K. Wangjam10, T. Kumar11, K. Mahendranath13.

Background/Purpose: The 1% prevalence of RA Worldwide is a deep rooted ancient dogma. None of the recent WHO ILAR COPCORD (Community Oriented Program for Control of Rheumatic Diseases) surveys Worldwide support this contention (Best Pract Res Clin Rheumatol 2008; 22:583–604); Cuba & Mexico being exception (J Clin Rheumatol 2012; 18: 167-69). COPCORD Bhigwan (India) reported (J Rheumatol 2002; 29: 614-21) an unusually high rural prevalence of RA 0.55% (ACR 1987) and 167-69). COPCORD Bhigwan (India) reported a crude point prevalence of 0.45% RA which when reclassified as per ACR 1987 criteria and further standardized was reduced to 0.19% (J Rheumatol 2009; 36: 614-22).

We believe that the true prevalence of RA in India is likely to be even less than 0.34% and that may bring some solace.

Conclusion: Though the prevalence of RA 0.34% in India is several folds less than the elusive 1% that has been taught for years, the burden of RA nonetheless is extremely high and needs to be seriously addressed at a national level.

Disclosure: A. Chopra, None; R. Gharpade, None; S. Sarmukkadam, None; V. Joshi, None; A. Mathews, None; L. Gauri, None; A. Rahim, None; K. Datta, None; S. Chaturvedi, None; B. Thakuria, None; A. Mahajan, None; R. Singh, None; A. Ghosh, None; R. Handa, None; M. Saluja, None; A. Venugopalan, None; V. Kunjeer, None; B. Paul, None; S. Pal, None; K. Wangjam, None; T. Kumar, None; K. Mahendranath, None.

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Background/Purpose: The maiden COPCORD (Community Oriented Program for Control of Rheumatic Diseases) population survey in village Bhigwan (Pune) findings proposed a high burden of pain and arthritis in India (J Rheumatol 2002; 29: 614-21). We carried out a national survey using COPCORD Bhigwan fast track model.

Conclusion: The prevalence of RA 0.34% in India is several folds less than the elusive 1% that has been taught for years, the burden of RA nonetheless is extremely high and needs to be seriously addressed at a national level.
Methods: COPCORD population survey (Stage I) was completed in 3 parallel phases: 1(cross sectional house to house survey for demographics and screening), 2 [record pain (human mannequin) and disability (validated Indian HAQ)], 3 (standard of care rheumatology evaluation). 12 volunteer rheumatologists chose non-random sites (Fig) and survey sample as per COPCORD diktat (http://www.copcord.org). Population was essentially screened for current (last 7 days) and/or past pain in joints or musculoskeletal (MSK) soft tissues. Trained volunteers from the community completed phases 1 & 2. The classification/diagnosis were essentially clinical with minimal supporting investigations. Indigenously designed Windows based program was used for a central data entry and analysis using std stat software (SPSS & Epi Info v6). Prevalence rates were age-sex standardized to India census population 2001; 95% confidence intervals shown in parenthesis. Response rate at all sites > 80%.

Results: 56,541 populations surveyed.16% (14.2, 18.3) self reported MSK pain(current &/or past, any site); frequent sites-knee 8.5%, back 6.2%, ankle/feet 3.8%,shoulder 3.2%, elbow 2.9%, hand/wrist 2.9%, neck 1.5%. The frequency of pain at several sites and overall in rural was nearly twice urban. Self reported MSK pain was the predominant ailment in the community.

Table shows the point prevalence of selected clinical disorders.

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatoid arthritis</td>
<td>0.34 (0.08, 0.79)</td>
</tr>
<tr>
<td>Undifferentiated inflammatory arthritis</td>
<td>0.22 (0.05, 0.68)</td>
</tr>
<tr>
<td>Sero-negative Spondylarthritis</td>
<td>0.23 (0.05, 0.68)</td>
</tr>
<tr>
<td>Ankylosing Spondylitis</td>
<td>0.03 (0.02, 0.05)</td>
</tr>
<tr>
<td>Osteoarthritis, any form</td>
<td>4.39 (3.30, 5.61)</td>
</tr>
<tr>
<td>Osteoarthritis knee</td>
<td>3.34 (2.43, 4.47)</td>
</tr>
<tr>
<td>Gout</td>
<td>0.04 (0.03, 0.05)</td>
</tr>
<tr>
<td>Soft tissue rheumatism, any form</td>
<td>1.31 (0.77, 2.11)</td>
</tr>
<tr>
<td>Ill defined symptoms, non specific arthralgias</td>
<td>4.25 (3.23, 5.53)</td>
</tr>
<tr>
<td>Lupus &amp; other connective tissue disorders</td>
<td>0.02 (0.01, 0.03)</td>
</tr>
</tbody>
</table>

Conclusion: In this 1.2 billion population country, the prevalence of MSK pain and several rheumatic disorders reported by this first ever national COPCORD survey confers a huge burden in millions of patients and paves way for a national prevention and control program.

Disclosure: A. Chopra, None; R. Gharpade, None; S. Sarmukkadam, None; V. Joshi, None; A. Mathews, None; L. Gauri, None; A. Rahim, None; K. Datta, None; S. Chaturvedi, None; B. Thakuria, None; A. Mahajan, None; R. Singh, None; A. Ghosh, None; R. Handa, None; M. Saluja, None; A. Venugopalan, None; V. Kunjeer, None; B. Paul, None; S. Pal, None; K. Wangjam, None; T. Kumar, None; C. Rajendran, None; V. Gajalakshmi, None; K. Mahendranath, None.

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The Burden of Early Arthritis in Latin America: Utility Analysis Using Patient-Level Data From the Argentinian Consortium for Early Arthritis.

Background/Purpose: Rheumatoid arthritis (RA) is estimated to be one of the leading causes of non-fatal burden in the world. However, data from developing countries including Latin America are limited, and the real burden of inflammatory arthritis in this population is unknown. The aim of our study was to evaluate the impact of disease activity on health-related quality of life (HRQOL) using a large cohort of Argentinian patients with early inflammatory arthritis.

Methods: We included patients with diagnosis of early RA (American College of Rheumatology 1987 criteria) or undifferentiated arthritis (UA) belonging de Arthritis TCT (Consortium Argentina - Argentine Consortium for Early Arthritis). CONAART is a prospective cohort of Argentinian patients with diagnosis of early arthritis (<2 years of disease duration). Data are collected every 3 months, including Health Assessment Questionnaire (HAQ), Clinical Disease Activity Index (CDAI) and pharmaco-economic data. The generic EuroQol EQ-5D was derived from HAQ and patient’s visual analogue scale of pain using previously validated regression models. Patients were stratified and compared according to diagnosis and disease activity levels (CDAI). All comparisons were adjusted for sex, age and comorbidities.

Results: We included 777 patients (RA=628; UA=149). Mean follow-up 14.5 ± 10.1 months (990 patients-year). Mean age was 48 ± 14 years, 82% were female and disease duration was 8.6 ± 6.3 months. On baseline visit CDAI and HAQ were 24.6 ± 14.4 and 1.2 ± 0.9, respectively. Mean EQ-5D score during follow-up was 0.74 ± 0.13. No difference regarding HRQOL was observed between RA and UA (0.73 ± 0.12 and 0.75 ± 0.13, respectively). EQ-5D showed a negative correlation with disease activity (rho spearman = -0.47, p<0.0001). Mean EQ-5D in patients in remission was 0.91 ± 0.04, low disease activity=0.82 ± 0.81, moderate disease activity=0.72 ± 0.09 and high disease activity=0.61 ± 0.11 (Graph 1). Considering remission as the ideal situation, patients with early RA or UA in low disease activity entail a disease burden of 0.07 (95%CI = 0.06 – 0.08) quality-adjusted life-years (QALYs) after one year of follow-up. In similar conditions, patients with moderate disease activity lose 0.17 (95%CI = 0.16 – 0.18) QALYs, and those with high disease activity lose 0.28 (95%CI = 0.27–0.30) QALYs.

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Conclusion: Regardless of the diagnosis of UA or RA, patients with early inflammatory arthritis and active disease inflict a substantial disease burden. The impact of arthritis in HRQL showed a linear relationship with disease activity level. This remarks the importance of an early and aggressive treatment with this condition.

Disclosure: C. A. Waimann, Pfizer Inc, 2; G. Citera, Pfizer Inc, 2; H. Maldonado Fico, Pfizer Inc, 2; O. L. Killo, Pfizer Inc, 2; M. Benegas, Pfizer Inc, 2; R. Chaparro del Moral, Pfizer Inc, 2; A. Catalan Pellet, Pfizer Inc, 2; A. Secco, Pfizer Inc, 2; L. Marino, Pfizer Inc, 2; A. Berman, Pfizer Inc, 2; H. Berman, Pfizer Inc, 2; A. L. Barbería, Pfizer Inc, 2; J. C. Marcos, Pfizer Inc, 2; J. M. Peña, Pfizer Inc, 2; F. Caiero, Pfizer Inc, 2; M. Haya Salinas, Pfizer Inc, 2; A. C. Alvarez, Pfizer Inc, 2; E. Soriano, Pfizer Inc, 2; Z. Bedran, None; S. Paéra, Pfizer Inc, 2; F. Cecatto, Pfizer Inc, 2; G. Salvatierra, Pfizer Inc, 2; A. Quinteros, Pfizer Inc, 2; E. Buschiazzo, Pfizer Inc, 2; E. J. Veloso, Pfizer Inc, 2.

Role of Health Literacy in Population Estimates of Musculoskeletal Disorders

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Background/Purpose: Disease diagnosis carries with it implications for self care and for healthful action. Public health campaigns, for example, are regularly launched to raise awareness of disease symptoms and new developments in medication and self management. In addition, self-report of musculoskeletal conditions is often used to provide population prevalence estimates and to determine disease burden and influence policy. However, self-report of certain conditions such as rheumatoid arthritis (RA) and osteoporosis are frequently inaccurate, suggesting that there is inadequate FHL (2–3) and adequate FHL (4–6)). Participants were also administered questionnaire. Functional health literacy was measured using Newest Vital Sign (scored as inadequate FHL (score 0–1), at risk or inadequate FHL (2–3) and adequate FHL (4–6)).

Methods: A cross-sectional random population survey was conducted in 2008 of 2824 participants aged 15 years and over, using an interviewer-administered questionnaire. Functional health literacy was measured using the Newest Vital Sign (scored as inadequate FHL (score 0–1), at risk or inadequate FHL (2–3) and adequate FHL (4–6)). Participants were also asked about self-reported medically diagnosed arthritis (including subtype: rheumatoid arthritis, osteoarthritis, ‘other’, ‘don’t know’), gout, and osteoporosis. Multiple logistic regression was performed using adjustment for age and sex.

Results: Of the 2824 participants, the prevalence of self-reported medically-diagnosed arthritis, gout and osteoporosis were 25.2%, 4.9% and 5.6%, respectively. The prevalence of those at-risk for inadequate FHL was 24.0% and of a high likelihood of inadequate FHL was 21.0%. However, over 50% of respondents with arthritis or gout had at risk or inadequate FHL, increasing to 70% of those self-reporting osteoporosis. After adjustment for age and sex, respondents in the arthritis subgroup of ‘don’t know’, and self-reported osteoporosis were significantly more likely to have inadequate FHL than the general population (Table 1).

Table 1. Associations of musculoskeletal conditions with limitations in functional health literacy.

<table>
<thead>
<tr>
<th>At risk or inadequate FHL</th>
<th>Inadequate FHL</th>
</tr>
</thead>
<tbody>
<tr>
<td>All arthritis</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>% (n)</td>
<td>Adjusted*</td>
</tr>
<tr>
<td>% (n)</td>
<td>Adjusted*</td>
</tr>
<tr>
<td>No arthritis</td>
<td>Yes</td>
</tr>
<tr>
<td>No arthritis</td>
<td>Yes</td>
</tr>
<tr>
<td>OA</td>
<td>Yes</td>
</tr>
<tr>
<td>RA</td>
<td>Yes</td>
</tr>
<tr>
<td>“don’t know” type</td>
<td>Yes</td>
</tr>
<tr>
<td>other</td>
<td>Yes</td>
</tr>
<tr>
<td>Gout</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Adjusted for age and sex

Conclusion: This cross sectional population survey indicates a substantial burden of low health literacy among people with musculoskeletal disease in the general population. Those participants who ‘don’t know’ the type of arthritis or who self-report osteoporosis are more likely to have poor FHL, suggesting that inadequate health literacy may influence communication and understanding of musculoskeletal diagnoses. This has implications for provider-patient communication, individual health care, population estimates of musculoskeletal disease, and for the potential impact of public health messages.

Disclosure: C. L. Hill, None; S. L. Appleton, None; T. K. Gill, None; J. Black, None; R. E. Rudd, None; R. J. Adams, None.

Clinical Implication of Rheumatoid Factor Formation According to Various Hepatitis B Virus Infection Status and Vaccination. Sang Tae Choi1, Hyun Woong Lee1, Jung-Soo Song2, Soo Kon Lee and Yong-Beom Park3. 1Chung-Ang University School of Medicine, Seoul, South Korea, 2Chung-Ang University College of Medicine, Seoul, South Korea, 3Yong University College of Medicine, Seoul, South Korea

Background/Purpose: Rheumatoid factor (RF) is produced as a result of polyclonal B cell activation, but the reasons for its production are still unknown. RF positivity can be seen in several diseases other than rheumatoid arthritis (RA), such as other rheumatic diseases and viral infection as well as in normal individuals. It was reported that RF was present in hepatitis B virus (HBV) infection. However, the types of antigens or antibodies of HBV and the hepatitis B viral load that play an important role in the development of RF remain obscure. In this study, we investigated the RF positive rates and titers of RF according to various HBV infection status and vaccination, and the relationship between the titers of RF and serum HBV DNA levels in HBV endemic areas.

Methods: The subjects were 13,670 individuals who visited the Severance Hospital Health Promotion Center in Seoul, Korea, for routine health check-up from January 2004 to December 2004. The samples were tested for RF (IgM type) and HBV infection by screening for the presence of HBsAg, anti-HBs (IgG type), and anti-HBe (IgM type). The HBsAg, anti-HBe (IgM type), and HBV DNA were analyzed in subjects positive for HBsAg. The RF positive rates and the titers of RF were evaluated based on the presence of each HBV viral marker, and correlation between the titers of RF and the serum HBV DNA levels was assessed.

Results: RF was positive in 3.5% of all subjects, and HBsAg was positive in 4.3%. HBsAg was positive in 21.7% of RF positive subjects. The HBsAg positive group had higher RF positive rate than negative group (17.5% vs 2.9%, p < 0.001). The RF positive rate was lower in those who had anti-HBs
after HBV vaccination than in HBsAg positive subjects (2.7% vs 17.5%, \( p < 0.001 \)). Among HBsAg positive subjects, the RF positive rate in the anti-HBs positive group was higher than that in the anti-HBs negative group (30.3% vs 16.8%, \( p = 0.047 \)). However, there was no significant difference in the RF positive rate between the anti-HBC positive and negative groups, and HBcAg positive and negative groups. In multiple logistic regression analysis, the RF positive rate was increased in positive HBsAg (PR = 7.82, 95% CI 5.74 to 10.60, \( p = 0.001 \)), whereas those with positive HBcAg (PR = 1.21, 95% CI 1.0 to 1.46, \( p = 0.019 \)) and older age (PR = 1.01, 95% CI 1.001 to 1.019, \( p = 0.027 \)). Among the RF positive patients, the titer of RF in HBsAg positive patients was higher than those in HBcAg negative patients (159.7 ± 217.1 IU/mL vs 83.0 ± 179.2 IU/mL, \( p = 0.001 \)). However, there were no significant differences in the titer of RF between anti-HBC positive and negative groups, and between HBcAg positive and negative groups. The load of HBV DNA may be closely correlated with the titer of RF in patients with chronic hepatitis B (\( r = 0.508, p = 0.005 \)).

**Conclusion:** HBV infection is an important cause of the false positive RF in HBV endemic area. Especially hepatitis B viral load may be associated with the titer of RF. Therefore, HBV vaccination may decrease the risk of RF formation.

**Disclosure:** S. T. Choi, None; H. W. Lee, None; J. S. Song, None; S. K. Lee, None; Y. B. Park, None.

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**The Association Between Silica and the Risk of Anti-Citrullinated Protein Antibody Positive RA in the Malaysian and Swedish Epidemiological Investigation of Rheumatoid Arthritis Studies.** Abqaryyah Yahya1, Camilla Bengtsson1, Lars Klareskog2, Chan Lai Too3, Shahnaz Murad4 and Lars Alfredsson1. 1Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, 2Karolinska Institute, Stockholm, Sweden, 3Karolinska Institutet, Stockholm, Sweden, 4Institute for Medical Research, Kuala Lumpur, Kuala Lumpur, Malaysia

**Background/Purpose:** Silica exposure has been associated with an increased risk of developing ACPA+ (anti-citrullinated protein antibody) RA, especially among smokers (1). These findings were based on a Caucasian population. In this study we aimed at examining the association between silica exposure (and its interaction with smoking) and the risk of ACPA+RA in an Asian population. In addition, we examined possible interaction between silica exposure and the major genetic risk factor for ACPA+RA, i.e. the HLA-DRB1 shared epitope (SE) alleles, in both a Caucasian and an Asian population.

**Methods:** Data from the Malaysian EIRA (MyEIRA) and its sister study, the Swedish EIRA study were used. In total, 149 incident cases and 213 controls from MyEIRA and 823 incident cases and 1161 controls from EIRA, all men, were included. Self-reported silica exposure, defined as exposure to dust, rock-drilling or stone crushing were taken into consideration. Smoking was defined as ever/never cigarette smokers. We examined the association between exposure to silica with the risk of ACPA+RA, by calculating odds ratios (OR) with 95% confidence intervals (CI), using logistic regression. Analyses were adjusted for age and residential place. Interaction was evaluated by calculating the attributable proportion (AP) due to interaction and its 95% confidence interval (CI).

**Results:** In MyEIRA, an increased risk of ACPA+RA (OR=2.88, 95%CI 1.02–8.14) was observed among those exposed to silica. Ever smokers exposed to silica had a particularly high risk of ACPA+RA (OR=8.27, 95%CI 1.64–41.44), compared with never smokers not exposed to silica. No association was found regarding ACPA-RA. When data from both studies were combined, we found that silica-exposed individuals with SE alleles had almost eleven times higher risk of ACPA+RA (OR=179.2 IU/mL, \( p = 0.001 \)). However, there were no significant differences in the titer of RF between anti-HBC positive and negative groups, and between HBcAg positive and negative groups. The load of HBV DNA may be closely correlated with the titer of RF in patients with chronic hepatitis B (\( r = 0.508, p = 0.005 \)).

**Conclusion:** Silica exposure in combination with smoking among men increased the risk of ACPA+RA in an Asian population. These data extend previous results based on a Caucasian population reported from the Swedish EIRA study (1). In the combined analyses of these studies, there was an indication of interaction between silica and SE, though it was insignificant. We believe that this finding strengthens the hypothesis of modifiable lung exposure and risk for ACPA+. RA

**Reference**


**Disclosure:** A. Yahya, None; C. Bengtsson, None; L. Klareskog, None; C. L. Too, None; S. Murad, None; L. Alfredsson, None.

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**Use of Moist Snuff and the Risk of Developing Rheumatoid Arthritis: Results From the Swedish Epidemiological Investigation of Rheumatoid Arthritis Study.** Lars Alfredsson1, Lars Klareskog2 and Camilla Bengtsson1. 1Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, 2Karolinska Institute, Stockholm, Sweden

**Background/Purpose:** Smoking is the major known environmental risk factor for RA, and notably this risk factor is exclusively seen in ACPA-positive RA. Whether this increased risk is due to nicotine or inhaled tobacco smoke is unclear. Smokeless tobacco contains nicotine and is often used as an alternative to smoking. The role of smokeless tobacco in the etiology of RA has to date only been reported from a Swedish study based on male construction workers, where no association was observed between the use of moist snuff and the risk of RA. However, whether smokeless tobacco is related to the ACPA-positive or ACPA-negative RA remains to be elucidated. In this report we aimed at investigating the association between the use of moist snuff and the risk of RA, and if this exposure has different impact on ACPA-positive and ACPA-negative disease.

**Methods:** Data from EIRA (Epidemiological Investigation of Rheumatoid Arthritis), a population-based case-control study from Sweden, was used. In total, information from 1962 incident cases and 2247 randomly selected controls (matched on age, sex and residency), aged 18–70 years, was analysed. Ever, current and past moist snuff users were compared with never users. We calculated RRs and 95% confidence intervals (CI) for RA overall and the ACPA-positive and ACPA-negative subsets, by means of unconditional logistic regression models. All analyses were adjusted for age, sex, residency, pack-years of cigarette smoking and alcohol consumption.

**Results:** In total, 254 (13%) cases were ever moist snuff users compared with 290 (13%) controls, resulting in an odds ratio of 1.0 (95% CI 0.8–1.2). When exposure to moist snuff was analysed in relation to the incidence of ACPA-positive and ACPA-negative disease, no associations were observed. Furthermore, neither current nor past moist snuff use was related to the risk of RA, or the two sub-groups of the disease.

**Conclusion:** The use of moist snuff was not associated with RA risk, neither with regard to ACPA-positive nor ACPA-negative RA. The increased risk of RA associated with smoking may thus not be due to nicotine.


**Disclosure:** L. Alfredsson, None; L. Klareskog, None; C. Bengtsson, None.

### 65

**Serum Inflammatory Biomarkers Correlated Stronger with a Panel of Serum Steroid and Pituitary Hormones in a Cohort of Pre-Rheumatoid Arthritis (pre-RA) Than in Non-RA Control (CN) Subjects.** Alfonse T. Massi1, Kevin B. Elmore1, Azeeem A. Rehman1, Jean C. Aldag1 and Robert T. Chatterton1. 1University of Illinois College of Medicine at Peoria, Peoria, IL, 2Northwestern University, Chicago, IL

**Background/Purpose:** Inflammatory cytokines influence steroid hormone production in tissue culture and affect serum levels and synovial fluid of active RA patients. Inflammatory biomarker and hormonal network correlations were compared in this nested prospective study of pre-RA and CN subjects, to identify differences in their associations prior to clinical RA onset.

**Methods:** Residents of Washington County, MD (21,061 F, 8,680 M) enrolled in the Project CLUE cohort in 1974 and donated serum samples. After 3 to 20 (median 11) years, 54 cohorts were diagnosed ACR-definite RA (36 F, 18 M). Each pre-RA was matched on entry features with 290 (13%) controls, resulting in an odds ratio of 1.0 (95% CI 0.8–1.2). When exposure to moist snuff was analysed in relation to the incidence of ACPA-positive and ACPA-negative disease, no associations were observed. Furthermore, neither current nor past moist snuff use was related to the risk of RA, or the two sub-groups of the disease.

**Conclusion:** The use of moist snuff was not associated with RA risk, neither with regard to ACPA-positive nor ACPA-negative RA. The increased risk of RA associated with smoking may thus not be due to nicotine.

**Disclosure:** L. Alfredsson, None; L. Klareskog, None; C. Bengtsson, None.

**Reference**


**Disclosure:** None.

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**Conclusion:** The use of moist snuff was not associated with RA risk, neither with regard to ACPA-positive nor ACPA-negative RA. The increased risk of RA associated with smoking may thus not be due to nicotine.
Study of pre-RA vs CN immunomarkers and hormonal values, stratified by entry pre- vs post-menopausal and sex status, were compared to identify range differences (p<0.050). Next, matrix correlation tables of 8 inflammatory biomarkers and 18 hormones, and their P-P ratios (18 F, 5 M) were constructed using log-transformation and analyzed by age- and sex-adjusted partial Pearson (r_p) and unadjusted rank order Spearman (rho) methods to identify subject group differences (p<0.050). Principal component analysis (PCA) was performed on 148 subjects having values on 8 hormones, 6 immunologic markers, sex, entry age, and the study group variable (CN vs pre-RA).

**Results:** Among 225 total subjects with at least one paired immunologic and hormonal (I-H) test (46 pre-RA, 179 CN), 6 significant differences in correlations (deltas) were found, all stronger in the pre-RA vs CN (Table). PCA on 148 total subjects yielded 6 components, explaining 71.7% variance, which may be labeled as: (1) male sex-related hormones and sTNF-R1 (22.9%); (2) precursor hormones and estradiol (18.0%); (3) IL-1β and IL-1α (10.2%); (4) cortisol, TNF-α, and entry age (7.7%); (5) CN vs pre-RA (6.9%); and (6) IL-2Rα (6.1%).

**Conclusion:** Stronger correlations of inflammatory biomarker and hormonal panels were found in pre-RA than in CN, and PCA indicated CN vs pre-RA as an independent component. These new data may lend support to a concept of neuroendocrine-immune dysregulation preceding clinical onset of RA, which deserves further investigation.

**Disclosure:** A. T. Masi, None; K. B. Elmore, None; A. A. Rehman, None; J. C. Aldag, None; R. T. Chatterton, None.

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**Pre-Rheumatoid Arthritis (pre-RA) Subjects Had a Minority Excess with Clearly Low Serum Cortisol Levels and Females Had Lower Mean Androstenedione Levels Than Control (CN) Cohorts in Analysis of a Large Panel of Serum Steroids and Pituitary Hormones.** Alfonse T. Massi^1, Kevin B. Elmore^2, Azeem A. Rehman^1, Jean C. Aldag^1 and Robert T. Chatterton^1.

1University of Illinois College of Medicine at Peoria, Peoria, IL, 2Division of Cardiology, Helsinki University Central Hospital, Helsinki, Finland, 3Department of Medicine, South Karelia Central Hospital, Lappeenranta, Finland, 4Unit of Primary Health Care, Kuopio University Hospital, Kuopio, Finland, 5Department of Medicine, South Karelia Central Hospital, Lappeenranta, Finland, 6Research Department, the Social Insurance Institution, Turku, Finland.

**Background/Purpose:** Low serum DHEAS may predispose a minority of premenopausal women to RA. A comprehensive panel of serum steroids, their related product-to-precursor (P-P) ratios and pituitary hormones has not been reported in pre-RA vs non-RA control (CN) subjects. This nested case-control prospective study permitted such comparison to assess adrenal and gonadal hormone alterations prior to clinical onset of RA.

**Methods:** Residents of Washington County, MD (21,061: 12,381 F, 8,680 M) enrolled in the Project CLUE cohort in 1974 and donated serum samples. After 3 to 20 (median 11) years, 54 cohorts were diagnosed as ACR-definite RA (36 F, 18 M). Each pre-RA was matched on entry features with 4 non-RA (216 total: 144 F, 72 M) cohort members. Stored (−70°C) sera were available on most subjects for assays of a comprehensive panel of hormones (15 F, 8 M) by immunoassay methods in a Northwestern University research laboratory. Histograms were compared of pre-RA vs CN hormonal levels and P-P ratios, stratified by entry pre- vs post-menopausal and sex status to identify range differences (p<0.050). Hormonal correlations were also compared on age-adjusted, log-transformed values by partial Pearson and by Spearman methods. Principal component analysis (PCA) included 8 hormonal values, entry age, sex, and the study group variable (CN vs pre-RA).

**Results:** In 54 total pre-RA, 6 (11%) had abnormally low cortisol (<120 nmol/L) levels vs 2 (0.93%) of 215 CN (p = 0.001). The respective P-P ratio of cortisol product to deoxycortisol precursor did not differ between study groups, or the preceding hydroxylated steroid P-P ratios. In females, mean (SEM) androstenedione (Δ4A) level (nmol/L) was 2.01 (0.44) in 28 pre-RA vs 3.52 (0.30) in 108 CN (p = 0.017). The lower Δ4A level in pre-RA was consistent with a lower ratio of < 0.700 for the Δ4A product to 17OH-progesterone precursor, found in 61% of pre-RA vs 54% of CN (p = 0.031). PCA of 11 variables yielded 4 components, explaining 75.2% of total variance: (1) sex and male-related hormones (30.2%); (2) precursor hormones, entry age, and estradiol (25.0%); (3) cortisol (10.5%); and (4) CN vs pre-RA (9.5%).

**Conclusion:** An excess minority of pre-RA had deficient cortisol levels, females had lower mean androstenedione than CN, and PCA identified cortisol and the CN vs pre-RA variable as independent components, findings which deserve further investigation.

**Disclosure:** A. T. Masi, None; K. B. Elmore, None; A. A. Rehman, None; J. C. Aldag, None; R. T. Chatterton, None.

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**Increased Prevalence of Hypothyroidism Preceding Rheumatoid Arthritis - an Epidemiological Study.** Anne M. Kerola^1, Tuomo Nieminen^2, Markku J. Kauppi^1, Hannu Kauhtianen^1, Kari Puolakkia^3, Lauri J. Virta^4 and Tuomas Kerola^5.

1Medical School, University of Helsinki, Helsinki, Finland, 2Division of Cardiology, Helsinki University Central Hospital, Helsinki, Finland, 3Department of Internal Medicine, Päijät-Häme Central Hospital, Lahti, Finland, 4Unit of Primary Health Care, Kuopio University Hospital, Kuopio, Finland, 5Department of Medicine, South Karelia Central Hospital, Lappeenranta, Finland, 6Research Department, the Social Insurance Institution, Turku, Finland.

**Background/Purpose:** Rheumatoid arthritis (RA) is associated with a wide set of comorbidities, including several autoimmune diseases such as autoimmune thyroiditis, which is a common cause of hypothyroidism. Whether the prevalence of hypothyroidism is elevated during the preclinical phase of RA when several autoimmune processes are already activated is not yet known. The aim of the study was to compare the prevalence of hypothyroidism among RA patients and non-RA-subjects at the time of RA diagnosis, and to determine whether the risk of hypothyroidism varies by age at the onset of RA, or by sex or rheumatoid factor (RF) status.

**Methods:** We identified 7,209 incident RA patients diagnosed between January 2004 and December 2007 from a Finnish nationwide register of special reimbursements for medication costs. The presence of hypothyroidism was identified from the same register based on special reimbursement decisions for thyroid hormone substitution. The prevalence of hypothyroidism at the onset of RA was compared to that of an age- and sex-matched Finnish population, and a standardized rate ratio (SRR) for hypothyroidism was calculated.

**Results:** The SRR for hypothyroidism preceding RA was 1.51; 95% confidence interval (CI): 1.35-1.67. The SRR was highest among younger RA patients, the excess prevalence of hypothyroidism decreasing steadily and wearing off among patients who were older at the time of diagnosis (Figure). The SRR for hypothyroidism was almost 2.5 among women between 20 and 49 years of age at RA diagnosis. The absolute prevalence of hypothyroidism, however, increased with age as it does in the general population. The SRR was similar between RF-positive and RF-negative patients: 1.46 (95% CI: 1.27-1.66) and 1.61 (95% CI: 1.34-1.91), respectively. Sex also did not modify the SRR point estimates, although the results did not reach statistical significance among men.
Conclusion: The prevalence of hypothyroidism is already increased among RA patients at the disease onset, especially among young women. This calls for attention to screening for hypothyroidism in younger RA patients. Furthermore, the clinician should be mindful of the possibility of RA as the underlying cause of joint symptoms in young female patients with hypothyroidism.

Disclosure: A. M. Kerola, None; T. Nieminen, None; M. J. Kauppi, None; H. Kautiainen, None; K. Puolakkka, None; L. J. Virta, None; T. Kerola, None.

Cardiovascular Comorbidities Antedating the Diagnosis of Rheumatoid Arthritis. Anne M. Kerola¹, Tuomas Kerola¹, Markku J. Kauppi², Hannu Kautiainen³, Lauri J. Virta⁴, Kari Puolakk⁵ and Tuomo Nieminen⁶. ¹Medical School, University of Helsinki, Helsinki, Finland, ²Department of Internal Medicine, Päijät-Häme Central Hospital, Lahti, Finland. ³Unit of Primary Health Care, Kuopio University Hospital, Kuopio, Finland, ⁴Research Department, the Social Insurance Institution, Turku, Finland, ⁵Department of Medicine, South Karelia Central Hospital, Lappeenranta, Finland, ⁶Division of Cardiology, Helsinki University Central Hospital, Helsinki, Finland

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory disease associated with increased cardiovascular morbidity. Evidence suggests that RA patients are at an increased risk of coronary heart disease (CHD) early in the disease process. Whether the risk of CHD is elevated before the onset of RA symptoms remains to be ascertained. The aim of the study was to assess the prevalence of CHD, chronic hypertension and chronic congestive heart failure among incident RA patients at the time of diagnosis in comparison to age- and sex-matched non-RA-subjects. Furthermore, the impact of age at the onset of RA as well as sex and the presence of rheumatoid factor (RF) on the risk of cardiovascular diseases was evaluated.

Methods: A cohort of 7,209 incident RA patients diagnosed between January 2004 and December 2007 was identified from a Finnish nationwide register of special reimbursements for medication costs. The presence of cardiovascular diseases antedating the reimbursement decision for RA was identified from the same register. The prevalence of cardiovascular comorbidities at RA diagnosis was compared to the general Finnish population, and a standardized rate ratio (SRR) for each cardiovascular disease was calculated.

Results: The risk of having CHD at RA diagnosis was slightly elevated, the SRR being 1.10 (95% confidence interval [CI]: 1.01-1.20). Patients who were younger at the onset of RA had a trend towards a higher CHD rate ratio than older patients, although the risk was not significantly elevated in most age subgroups (Figure). The CHD rate ratio was essentially similar irrespective of RF status - 1.15 (95% CI: 1.00-1.32) among RF-negative and 1.08 (95% CI: 0.97-1.19) among RF-positive patients. The SRR of chronic hypertension was significantly increased only among the RF-negative RA cases (1.19, 95% CI: 1.10-1.30). The prevalence of chronic congestive heart failure did not differ between the incident RA patients and the general population.

Conclusion: The CHD rate ratio is already augmented in RA patients at disease onset; the increase is more pronounced among younger patients and similar between RF-positive and RF-negative patients. The findings highlight the importance of early prevention of atherosclerosis regardless of RF status.

Disclosure: A. M. Kerola, None; T. Kerola, None; M. J. Kauppi, None; H. Kautiainen, None; L. J. Virta, None; K. Puolakkka, None; T. Nieminen, None.
The Presence of Asymptomatic Carotid Plaques in Patients with Inflammatory Joint Disease Results in Inadequate Treatment to Lipid Targets in Cardiovascular Disease Prevention. Anne G. Semb1, Silvia Rollefstad2, Inge C. Olsen3, Desire van der Heijde3, and Tore K. Kvien2. 1Diakonhjemmet Hospital, Oslo, Norway, 2Diakonhjemmet Hospital, Oslo, Norway, 3Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: The prevalence of asymptomatic carotid plaque (a-CP) is high in patients with inflammatory joint disease (IJD). Patients with a-CP should receive intensive lipid lowering (LL) treatment in cardiovascular prevention. Our aim was to evaluate presence of a-CP, if CV risk calculators predict presence of a-CP in patients with IJD and if optimizing cut off points in various risk calculators will improve this prediction.

Methods: We performed CV risk stratification in patients with IJD (n = 345), (rheumatoid arthritis (RA) = (210), ankylosing spondylitis (AS) (n = 87) and psoriatic arthritis (PsA) (n = 49)) by using SCORE, Framingham and Reynolds CV risk algorithms with recommended cut off points at 5%, 10% and 10% respectively. Ultrasound of the carotid arteries was performed. Cross-tabulations, Chi² and ROC curves were used to calculate sensitivity/ specificity, odds- and likelihood ratio (LR) for identifying a-CP. The ROC closest point (0.1) and 80% sensitivity was used for optimizing the identification of a-CP.

Results: A-CP was present with similar frequency in RA, AS and PsA (48.3%, 41.4% and 41.7% (p = 0.46). Two hundred and eleven patients had SCORE<5% indicating no need for LL prevention (Table 1). However, 72 (34.1%) of these patients had a-CP and should therefore be categorized to intensive LL treatment. The sensitivity for identifying a-CP was 0.53, the specificity: 0.76 and LR+: 2.24. Optimizing the cut off value by using closest point (0, 1) (SCORE: 4% specificity: 0.65, specificity: 0.72, LR+:2.33) or 80% specificity (SCORE: 2.65; sensitivity: 0.80 specificity: 0.56 LR+1.83) did not improve the ability of SCORE to identify a-CP. According to the new guidelines for prevention of CV disease (2011), the sensitivity, specificity and LR+ for identifying a-CP was 0.47, 0.77 and 2.05 respectively. The associations between a-CP and cut off values for other risk calculators are shown in Table 2.

Conclusion: Carotid ultrasound will assist in the correct classification of patients with IJD into intensive LL in about 1/3 of patients with SCORE<5% and 2/3 of patients with SCORE≥5%. The CV risk calculators are poor predictors of a-CP in patients with IJD.

Reference

Disclosure: A. G. Semb, None; S. Rollefstad, None; I. C. Olsen, None; D. van der Heijde, None; T. K. Kvien, Abbott Immunology Pharmaceuticals, 8, AstraZeneca, 8, Merck Pharmaceuticals, 8, NiCox, S.A., 8, Pfizer Inc, 8, Roche Pharmaceuticals, 8, UC, 8, BMS, 5, Abbott Immunology Pharmaceuticals, 5, Merck Pharmaceuticals, 5, NiCox, S.A., 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5, UCB, 2, Bristol-Myers Squabb, 2, Merck Pharmaceuticals, 2, Pfizer Inc, 2, Roche Pharmaceuticals, 2, UCB, 2.

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Background/Purpose: Little is known about the prevalence of systemic autoimmune rheumatic diseases (SARDs) in patients with congestive heart failure (CHF) and its contribution to long-term adverse events. Therefore, we developed a multivariable logistic regression model to quantify the association of SARDs and other comorbidities with 1-year mortality in CHF patients hospitalized with CHF in the province of Alberta, Canada and examined the association between SARDs and 1-year mortality after adjusting for traditional cardiovascular risk factors.

Methods: This retrospective cohort study examined all Alberta residents, aged 20 years and older, hospitalized with incident CHF between April 1, 1999 and December 31, 2008. Definitions of CHF, SARDs and other comorbidities were based on established ICD-9 861-10 codes. SARDs included rheumatoid arthritis, systemic lupus erythematosus, inflammatory myositis, systemic sclerosis, Sjögren’s syndrome, overlap syndromes and other connective tissue diseases. Hospitalization records in the five years prior to the incident CHF hospitalization were examined to identify the presence of SARDs and other comorbidities. Baseline characteristics and comorbidity rates of SARDs/non-SARDs patients were described. The independent association of SARDs and mortality after adjusting for demographic and traditional cardiovascular risk factors was calculated with logistic regression. Kaplan-Meier analysis and the log-rank statistic examined the unadjusted one-year mortality between SARDs/non-SARDS patients.

Results: SARDs prevalence was 3.1% (1208 patients) out of 38,668 patients hospitalized with CHF. Patients with SARDS were younger, more likely female, and had lower rates of diabetes, hypertension, COPD, anemia and renal disease (Table 1). After multivariate adjustment, SARDS was associated with higher odds of one-year mortality (adjusted Odds Ratio 1.3 (95% Confidence Interval 1.2–1.5) (Table 2). Kaplan-Meier analysis showed greater 1-year mortality in SARDS versus non-SARDS hospitalized CHF patients (not shown in abstract).

Table 1. Baseline characteristics of SARDS versus non-SARDS CHF patients

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SARDS</th>
<th>Non-SARDS</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean (STD))</td>
<td>74.8 (13.2)</td>
<td>72.9 (12.7)</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>Male sex</td>
<td>18,842 (50.3%)</td>
<td>347 (28.7%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Diabetes</td>
<td>12624 (33.7%)</td>
<td>331 (27.4%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Hypertension</td>
<td>28432 (75.9%)</td>
<td>885 (73.3%)</td>
<td>0.04</td>
</tr>
<tr>
<td>Dementia</td>
<td>4832 (12.9%)</td>
<td>108 (8.9%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>COPD</td>
<td>17756 (47.4%)</td>
<td>628 (52.0%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Anemia</td>
<td>14560 (38.9%)</td>
<td>724 (59.9%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>8016 (21.4%)</td>
<td>259 (21.4%)</td>
<td>0.95</td>
</tr>
<tr>
<td>Renal disease</td>
<td>6181 (16.5%)</td>
<td>248 (20.5%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Cancer</td>
<td>7042 (18.8%)</td>
<td>216 (17.9%)</td>
<td>0.40</td>
</tr>
<tr>
<td>PVD</td>
<td>6780 (18.1%)</td>
<td>236 (19.5%)</td>
<td>0.22</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>12549 (33.5%)</td>
<td>393 (32.5%)</td>
<td>0.46</td>
</tr>
<tr>
<td>1-year mortality</td>
<td>11238 (30.0%)</td>
<td>422 (34.9%)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

*p-value was based on Kruskal-Wallis one-way analysis of variance. P-values of categorical variables are based on Chi-square test.
**Table 2. Logistic regression of 1-year mortality in incident CHF**

<table>
<thead>
<tr>
<th>Effect</th>
<th>OR (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1.2 (1.1–1.2)</td>
</tr>
<tr>
<td>Age</td>
<td>1.0</td>
</tr>
<tr>
<td>SARDs</td>
<td>1.3 (1.2–1.5)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.7 (0.6–0.7)</td>
</tr>
<tr>
<td>Dementia</td>
<td>1.8 (1.7–2.0)</td>
</tr>
<tr>
<td>COPD</td>
<td>1.1 (1.0–1.1)</td>
</tr>
<tr>
<td>Anemia</td>
<td>1.3 (1.2–1.3)</td>
</tr>
<tr>
<td>Cerebrovascular</td>
<td>1.3 (1.2–1.4)</td>
</tr>
<tr>
<td>Renal disease</td>
<td>1.7 (1.6–1.8)</td>
</tr>
<tr>
<td>Cancer</td>
<td>2.5 (2.4–2.6)</td>
</tr>
<tr>
<td>PVD</td>
<td>1.2 (1.1–1.2)</td>
</tr>
</tbody>
</table>

**Conclusion:** Significant mortality risk exists among SARDs patients hospitalized with CHF despite lower rates of factors such as diabetes and hypertension. Agressive recognition and management of CHF in SARDs patients may improve survival rates. Further work is needed to examine the outpatient prevalence of SARDs in this population.

**Disclosure:** S. O. Keeling, None; A. Bissonauth, None; B. Leung, None; P. Kaul, None.

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**Table 3. CVD-related measures by RA-related autoantibody positivity. CVD variables are back-transformed after adjusting for age and gender using linear regression.**

<table>
<thead>
<tr>
<th>Ab Positive (n=16 Mean)</th>
<th>Ab Negative (n=14 Mean)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)*</td>
<td>48.0</td>
<td>54.3</td>
</tr>
<tr>
<td>Gender (% Female)*†</td>
<td>81.3</td>
<td>57.1</td>
</tr>
<tr>
<td>Current Smoker (% Yes)*†</td>
<td>0%</td>
<td>14.3%</td>
</tr>
</tbody>
</table>

**Blood Pressure**

- Systolic (mmHg): 118.79, Ab Positive: 118.16, Ab Negative: 0.92
- Diastolic (mmHg): 72.99, Ab Positive: 72.91, Ab Negative: 0.98

**Lipids, lipoproteins and adipokines**

- Triglycerides (mg/dL): 178.86, Ab Positive: 194.16, Ab Negative: 0.41
- Cholesterol (mg/dL): 117.96, Ab Positive: 115.85, Ab Negative: 0.98
- ApoB (mg/dL): 83.03, Ab Positive: 94.26, Ab Negative: 0.11
- ApoA1 (mg/dL): 155.12, Ab Positive: 151.15, Ab Negative: 0.70
- HDL (mg/dL): 52.24, Ab Positive: 51.14, Ab Negative: 0.87
- LDL (mg/dL): 178.86, Ab Positive: 194.16, Ab Negative: 0.41
- Leptin (ug/mL): 9.08, Ab Positive: 9.82, Ab Negative: 0.74
- Adiponectin (ug/mL): 13.49, Ab Positive: 12.82, Ab Negative: 0.91
- c-reactive protein (mg/L): 1.56, Ab Positive: 2.83, Ab Negative: 0.18

**Adiposity**

- BMI (kg/m²): 28.70, Ab Positive: 27.47, Ab Negative: 0.63
- Subcutaneous Fat Area (cm²) at L4/5: 271.54, Ab Positive: 317.52, Ab Negative: 0.48
- Visceral Fat Area (cm²) at L4/5: 82.73, Ab Positive: 102.78, Ab Negative: 0.54

**Carotid Intima Media Thickness**

- cIMT, internal carotid artery (avg mm): 0.86, Ab Positive: 0.98, Ab Negative: 0.19
- cIMT, internal carotid artery (max mm): 0.70, Ab Positive: 0.78, Ab Negative: 0.26
- cIMT, common carotid artery (max mm): 0.72, Ab Positive: 0.75, Ab Negative: 0.50
- cIMT, common carotid artery (avg mm): 0.59, Ab Positive: 0.63, Ab Negative: 0.34
- cIMT, internal carotid artery (max mm): 0.65, Ab Positive: 0.81, Ab Negative: 0.02
- cIMT, internal carotid artery (avg mm): 0.52, Ab Positive: 0.64, Ab Negative: 0.03

**Measures of Carotid Stiffness**

- Peterson's Elastic Model (mmHg): 525.39, Ab Positive: 524.63, Ab Negative: 0.99
- Circumferential Arterial Strain (no units): 0.909, Ab Positive: 0.094, Ab Negative: 0.91
- Beta Stiffness Index (no units): 5.59, Ab Positive: 5.60, Ab Negative: 0.99

**Elastic Modulus, Incremental (mmHg)**

- Young's Elastic Pressure Modulus (mmHg/mm): 466.90, Ab Positive: 455.57, Ab Negative: 0.94
- Arterial Compliance (mm2/mmHg): 0.103, Ab Positive: 0.103, Ab Negative: 0.99

**Flow Mediated Dilatation (15′)**

- 5.01, Ab Positive: 3.92, Ab Negative: 0.21

**Conclusion:** This preliminary analysis suggests that the autoantibody-positive FDRs did not have worse indicators of vascular health compared to autoantibody-negative FDRs, which is contrary to our *a priori* hypothesis. These results tentatively indicate that the increased risk for CVD that is seen in RA is not detectable in the preclinical autoantibody phase of the disease, using the structural or functional vascular changes measured herein. Analysis of the larger cohort is warranted to confirm these results.

**Disclosure:** R. W. Gan, None; J. M. Hughes-Austin, None; K. D. Deane, None; E. M. Urbina, None; P. K. Gregersen, None; M. H. Weisman, None; V. M. Holers, None; J. M. Norris, None.

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**Background/Purpose:** Rheumatoid arthritis (RA) is characterized by systemic inflammation and immune dysregulation, including the presence of autoantibodies and elevated inflammatory markers in subjects with classifiable RA as well as in those who have yet to progress to clinically-apparent RA. In addition, the risk for cardiovascular disease (CVD) is greatly increased in patients with RA, with autoantibodies and systemic inflammation believed to be a major contributor to the pathogenesis of CVD in patients with RA. Furthermore, Maradit-Kremers and colleagues have shown that the increased risk for CVD may precede the development of classifiable RA, leading to the hypothesis that autoantibodies and systemic inflammation are influencing the development of CVD in subjects even prior to the onset of joint symptoms in RA. The Studies of the Etiology of RA (SERA) demonstrated previously an association between autoantibody positivity and increased levels of circulating cytokines in subjects without RA but at elevated risk for future RA, as they are first-degree relatives (FDRs) of probands with RA. We utilized these SERA FDRs to test the hypothesis that CVD may be apparent in FDRs at-risk for future RA, and may also be related to systemic RA-related autoantibodies.

**Methods:** RA-related autoantibody (Ab) positivity is defined as positivity for one of the following autoantibodies: rheumatoid factor by nephelometry (RF), RF isotype-lgM, IgA, IgG, or anti-cyclic citrullinated peptide (anti-CCP2). Ab positive and negative FDRs from the SERA parent cohort were evaluated after a 10-hour fast for the following outcome measures related to CVD: carotid intima media thickness (cIMT), carotid stiffness, flow-mediated dilation (FMD) of the brachial artery, abdominal adipose tissue using computed tomography (CT), blood pressure, lipids, lipoproteins and adipokines. Levels of these pre-clinical CVD phenotypes were log-transformed and compared by current autoantibody positivity status using linear regression.

**Results:** The Table presents data from the first 30 FDRs undergoing the CVD evaluation (planned enrollment n=100). Overall, Ab positive FDRs had lower (ie, better) intima media thickness of the internal carotid artery (both max and average measures) than Ab negative FDRs; there were no other significant differences between CVD-related measures and Ab status.

**Conclusion:** Significant mortality risk exists among SARDs patients hospitalized with CHF despite lower rates of factors such as diabetes and hypertension. Agressive recognition and management of CHF in SARDs patients may improve survival rates. Further work is needed to examine the outpatient prevalence of SARDs in this population.

**Disclosure:** S. O. Keeling, None; A. Bissonauth, None; B. Leung, None; P. Kaul, None.

---

**Table 5. The Association Between Preclinical Markers for Cardiovascular Disease and Rheumatoid Arthritis-Related Autoantibodies in First-Degree Relatives without Rheumatoid Arthritis.**

<table>
<thead>
<tr>
<th>Effect</th>
<th>OR (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1.2 (1.1–1.2)</td>
</tr>
<tr>
<td>Age</td>
<td>1.0</td>
</tr>
<tr>
<td>SARDs</td>
<td>1.3 (1.2–1.5)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.7 (0.6–0.7)</td>
</tr>
<tr>
<td>Dementia</td>
<td>1.8 (1.7–2.0)</td>
</tr>
<tr>
<td>COPD</td>
<td>1.1 (1.0–1.1)</td>
</tr>
<tr>
<td>Anemia</td>
<td>1.3 (1.2–1.3)</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>1.3 (1.2–1.4)</td>
</tr>
<tr>
<td>Renal disease</td>
<td>1.7 (1.6–1.8)</td>
</tr>
<tr>
<td>Cancer</td>
<td>2.5 (2.4–2.6)</td>
</tr>
<tr>
<td>PVD</td>
<td>1.2 (1.1–1.2)</td>
</tr>
</tbody>
</table>

**Conclusion:** Significant mortality risk exists among SARDs patients hospitalized with CHF despite lower rates of factors such as diabetes and hypertension. Agressive recognition and management of CHF in SARDs patients may improve survival rates. Further work is needed to examine the outpatient prevalence of SARDs in this population.

**Disclosure:** S. O. Keeling, None; A. Bissonauth, None; B. Leung, None; P. Kaul, None.
future RA development in currently unaffected individuals. The specific etiology of RA is unknown; however, studies have suggested that respiratory exposures such as smoking and proximity to road traffic may be associated with development of RA. To elucidate the relationship between respiratory exposures and explore the potential that inhaled exposures may act early in the pathogenesis of RA, leading to early generation of RA-related autoimmunity, we evaluated the association between exposure to air pollution, measured by yearly average particulate matter (PM) 2.5 and 10, and presence of RA-related autoantibodies.

Methods: The Studies of the Etiology of Rheumatoid Arthritis (SERA) is a multicenter study evaluating first-degree relatives (FDRs) of a proband with RA. FDRs lack classifiable RA at enrollment and are serially assessed for the presence of RA-related autoimmunity and potential risk factors for RA development. Outcomes assessed were presence of rheumatoid factor (RF), and the High Risk profile (positive for anti-CCP autoantibody and/or ≥2 RF isotypes), demonstrated to be >96% specific for future RA. Exposure to PM was assigned using the Environmental Protection Agency Air Quality System and interpolated with inverse distance weighted spatial analyses using Geographic Information Systems. PM exposures were linked to resident zip codes of FDRs living within 50 km of an air monitoring station in five states. PM exposures were categorized by tertiles (low, moderate, high levels) due to evidence of nonlinear associations with autoantibodies. RA-related autoantibody status and PM tertiles were analyzed using nonlinear mixed models to account for repeated measures.

Results: Our study population had a mean age of 45 years, was 70% female, 72% non-Hispanic White, and mostly non-smokers (88%). A majority of our study population lived in Colorado (39.1%) followed by California (29.4%), Nebraska (12.6%), Washington (10.6%), and New York (8.3%). No significant associations were observed between RA-related autoantibody outcomes and PM 2.5 or PM10 tertiles (Table).

Table. Odds ratios (OR) for rheumatoid factor and high risk profile in relation to tertiles of PM 2.5 microns in diameter and PM 10 microns in diameter.

<table>
<thead>
<tr>
<th>PM 2.5 (n=860 FDRs, 1743 visits)</th>
<th>OR 95% CI</th>
<th>OR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (&lt; 8.2 μg/m³)</td>
<td>1.00 ref</td>
<td>1.00 ref</td>
</tr>
<tr>
<td>Moderate (8.2 to 9.9 μg/m³)</td>
<td>0.74 0.34-1.63</td>
<td>0.41 0.16-1.07</td>
</tr>
<tr>
<td>High (&gt; 9.9 μg/m³)</td>
<td>1.26 0.40-3.94</td>
<td>0.50 0.15-1.68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PM 10 (n = 728 FDRs, 1473 visits)</th>
<th>n = 93 cases</th>
<th>n = 96 cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (&lt; 23.8 μg/m³)</td>
<td>1.00 Ref</td>
<td>1.00 Ref</td>
</tr>
<tr>
<td>Moderate (23.8 to 26.7 μg/m³)</td>
<td>0.95 0.42-2.05</td>
<td>0.59 0.25-1.40</td>
</tr>
<tr>
<td>High (&gt; 26.7 μg/m³)</td>
<td>0.98 0.44-2.19</td>
<td>0.48 0.20-1.15</td>
</tr>
</tbody>
</table>

Adjusted for age, ethnicity, gender, current smoking status, education, and recruitment site. The reduced sample size for the PM10 analysis is due to a smaller number of air monitoring stations measuring PM10.

Conclusion: These results suggest that exposure to PM is not significantly associated with autoantibody positivity in individuals without RA, although there is a trend towards an inverse association between PM and the High Risk Profile, which is contrary to our a priori hypothesis that PM is associated with increased risk of RA-related autoimmunity. The observed results could be due to the aggregate nature of our exposure variable. Alternatively, exposure to PM may not be an initial trigger of autoimmunity but may act later to facilitate the development of clinically-apparent RA. Continued observation of this cohort is important to investigate the exact role of air pollution in the etiology of RA.

Disclosure: R. W. Gan, None; K. D. Deane, None; G. O. Zerbe, None; M. H. Weisman, None; J. H. Buckner, None; P. K. Gregersen, None; T. R. Mikuls, None; J. R. O’Dell, None; R. M. Keating, None; V. M. Holers, None; J. M. Norris, None.

Figure 1. Health care utilization during the first decade of the twenty-first century by patients in a closed rheumatoid arthritis cohort and their matched referents from the general population. The y-axes show the mean number of visits per subject per calendar year.
Figure 2. Health care utilization during the first decade of the twenty-first century by patients in a closed rheumatoid arthritis cohort and their matched referents from the general population. The y-axes show the mean number of visits per subject per calendar year.

**Conclusion:** During the twenty-first century, coinciding with increasing use of earlier and more active RA treatment including biological treatment, the overall inpatient and outpatient health care utilization by a cohort of RA patients decreased relative to the general population.

**Disclosure:** S. Hagel, None; I. F. Petersson, None; A. B. I. Bremander, None; E. Lindqvist, None; C. Bergknut, None; M. Englund, None.

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Length of Stay for Rheumatoid Arthritis Related Orthopedic Surgery Has Improved Over the Past 3 Decades and Is Related to Disease Markers. Results From Two UK Multicentre Inception Cohorts (1986–2011) Compared with National Data. Elena Nikiphorou1, Stephen Morris2, David James3, Patrick D. Kiely4, David Walsh5 and Adam Young6. 1ERAS, St Albans City Hospital and University College London (UCL), St Albans, United Kingdom, 2Research Department of Epidemiology and Public Health, 1–19 Torrington Place, United Kingdom, 3Diana Princess of Wales Hospital, Grimsby, United Kingdom, 4St. Georges Hospital, London, United Kingdom, 5City Hospital, Nottingham, United Kingdom, 6St Albans City Hospital, St Albans, United Kingdom

**Background/Purpose:** Length of Stay (LoS) is one of the main drivers of costs for orthopedic surgery in RA. Better medical and surgical treatments in recent years should result in shorter LoS. Studies have reported LoS trends in RA-related orthopedic interventions, but less is known about clinical factors affecting it. In the current economic climate, with over-pressurized health services, identifying and targeting such factors could result in reduced LoS, and improved health care utilization planning.

**Methods:** LoS has been examined in two very similar multi centre inception cohorts, the Early RA Study (ERAS) (n=1465, 1986–1999) and the Early RA Network (ERAN) (n=1236, 2002–2010). Details of orthopedic interventions included date, type of procedure and LoS. The results were validated against the National Joint Registry and Hospital Episode Statistics, and follow up based on the National Death Register. Standard clinical, laboratory and x-ray measures recorded at baseline and annually were used to investigate factors affecting LoS with univariate and multivariate regression analysis.

**Results:** There were 770 (29%) out of 2701 patients in ERAS & ERAN who had a total of 1602 procedures: 40% major, of which 88% were total joint replacements (mainly knee followed by hip); 24% were intermediate (mainly hand/foot surgery) & 16% were minor (soft tissue surgery surgery/tendon transfers). A gradual reduction in the median LoS was noted over 25 years for major, intermediate and minor procedures: 10, 4 & 2 days respectively (IQRs 7–15, 3–7, 1–4) in ERAS & 7, 3 & 1 days (IQRs 5–8, 1–7, 1–2) in ERAN. Figure 1 shows the changing median LOS for the commonest types of surgery: Total Knee & Hip Replacements (TKRs & THRs) over 25 years. Figure 2 shows TKR median LoS compared with national data. Extrapolation of national data suggests that in the 1990s TKRs resulted in longer LoS than in the 2000s. The cost of a TKR based on 5 days LoS currently in the UK is £13495. The decline in LoS across various procedures has resulted in reduced costs. In multivariate analyses LoS varied significantly by type of procedure, DAS, hemoglobin (HB) levels and HAQ scores. Normal baseline HB significantly reduced LoS by 1.8 days (p<0.001), baseline HAQ<1 by 1.8 days (p=0.002) & low 1year DAS (<3.2) by 1.1 days (p=0.051).

**Conclusion:** LoS in RA-related orthopedic surgery has declined over the last 25 years, which could be a reflection of improved management of RA, and medical and surgical in patient treatments. Normal baseline HB, low baseline HAQ and low DAS at 1 year were found to be significant predictors for LoS.

**Disclosure:** E. Nikiphorou, None; S. Morris, None; D. James, None; P. D. Kiely, None; D. Walsh, None; A. Young, None.
Patient-Reported Outcomes Associated with Achieving and Maintaining Low Disease Activity in Rheumatoid Arthritis. Martin J. Bergman, James W. Shaw, Mary Cifaldi, Goubrad De, Tony He, Rajeev Ayyagari and James Signorovitch. Taylor Hospital, Ridley Park, PA, Abbott Laboratories, Abbott Park, IL, Analysis Group, Inc., New York, NY, Analysis Group, Inc., Boston, MA

Background/Purpose: Treat-to-target (T2T) guidelines for rheumatoid arthritis (RA) recognize low disease activity (LDA) as an acceptable therapeutic goal, particularly in patients with longstanding disease. The guidelines advocate that treatment targets be maintained throughout the course of the disease and study was conducted to assess associations of patient-reported outcomes (PROs) with achievement and maintenance of LDA.

Methods: Data were taken from four phase II/III randomized trials of adalimumab (ADA), alone or in combination with methotrexate (MTX), vs. MTX monotherapy for the treatment of RA in patients with early or late stage disease. Changes in scores for the Health Assessment Questionnaire Disability Index (HAQ-DI), the Functional Assessment of Chronic Illness Therapy Fatigue (FACIT-F) subscale, the four domains of the Work Productivity and Activity Impairment (WPAI) questionnaire, a visual analog scale measuring pain (VAS-P), and other PRO measures were compared between patient groups defined according to achievement of LDA after 12 weeks of treatment. Among those patients who achieved LDA, changes in PROs were compared between subgroups defined according to maintenance of LDA following an additional 12 or 14 weeks of treatment (based on the timing of study follow up). LDA was defined using a composite disease activity score based on 28 joints and C-reactive protein (DAS28- CRP-4) < 1.2 at a given assessment. The principle analyses were conducted using pooled data from the four trials with additional analyses being stratified by disease duration (i.e., early or late) or treatment received (i.e., ADA or MTX).

Results: A total of 2,533 patients with DAS28-CRP-4 assessments at baseline and after 12 weeks of treatment were included in the study. Compared with patients who did not achieve LDA after 12 weeks of treatment (N=1,820), those achieving LDA (N=713) had significantly greater improvements in scores for the HAQ-DI, FACIT-F, and VAS-P as well as the presenteeism, overall work impairment, and activity impairment domains of the WPAI. Among the 684 patients achieving LDA at week 12 with follow-up at week 24/26, those who maintained LDA (N=557) had significantly greater improvements in scores for the HAQ-DI, FACIT-F, VAS-P, and activity impairment domain of the WPAI than those who failed to sustain LDA (N=127). Similar results were obtained when performing analyses in disease duration and treatment subgroups.

Note: As the exception of the WPAI, which was administered in only one of the four trials, results are presented for the analysis of the pooled trial data. Wilcoxon tests were performed to facilitate group comparisons. The FACIT-F was scored so that higher values indicated less fatigue. All other outcomes were scored so that higher values indicated better functioning, work productivity, or pain.

Conclusion: RA patients achieving LDA after 12 weeks of treatment have significantly reduced disability, pain, work impairment, and fatigue compared to those who do not achieve LDA. A similar pattern of differences is observed between patients who maintain LDA and those who fail to do so after 24/26 weeks of treatment. The results of this investigation support the value of achieving and maintaining LDA, as recommended by the T2T guidelines.

Disclosure: M. J. Bergman, None; J. W. Shaw, Abbott Laboratories, 3; Abbott Laboratories, 1; M. Cifaldi, Abbott Laboratories, 1; Abbott Laboratories, 3; G. De, Abbott Laboratories, 5; T. He, Abbott Laboratories, 5; R. Ayyagari, Abbott Laboratories, 5; J. Signorovitch, Abbott Laboratories, 5.

The Difference in Performance of DAS28 and RADAI During Pregnancy Might Explain Discrepancies Between Older and More Recent Studies On the Impact of Pregnancy On Rheumatoid Arthritis. Jan Naterop, Johanna M.W. Haze and Radboud J.E.M. Dollhain. Erasmus Medical Center, University Medical Center Rotterdam, Rotterdam, The Netherlands, Rotterdam, Netherlands, Erasmus Medical Center, Rotterdam, Netherlands

Background/Purpose: Pregnancy is the only condition in which Rheumatoid Arthritis (RA) shows spontaneous remission. Both older and more recent studies showed improvement of disease activity, which was more pronounced and occurred earlier in pregnancy in the older studies. An explanation for the difference in improvement could be that the older studies measured RA disease activity retrospectively using self-assessed questionnaires, whereas the more recent studies measured disease activity prospectively using a joint score. The Disease Activity Score in 28 joints (DAS28) and the self-assessed Rheumatoid Arthritis Disease Activity Index (RADAI) are both valid tools to determine the disease activity in RA. However, the influence of pregnancy on the RADAI score has not been determined. Insight into this may contribute to a better understanding of the difference in outcome between older and more recent studies. Should the RADAI prove to be a valid instrument during pregnancy, it could be used for studies on RA and pregnancy. The aim of this study is to determine the validity of the RADAI during pregnancy in patients with RA by determining the correlation and agreement of the RADAI to the DAS28.

Methods: Pregnant RA patients were visited at their home-address (once before conception, during every trimester and three times post partum). During these visits the disease activity was measured by the RADAI and the DAS28. Correlation coefficients were determined for each time point. Furthermore, patients were stratified according to three disease states (high, intermediate, low and remission combined) based upon DAS28 and RADAI with cut off points for the RADAI that are thought to be equivalent to those used for the DAS28.

Results: Disease activity determined by RADAI as well as by DAS28 showed a decrease during pregnancy and a flare after delivery (p<0.01) (fig. 1). The correlations between DAS28 and RADAI were good (pre conception rho = 0.49, all other time points 0.61 < rho < 0.71 (p<0.01)). When patients were stratified according to disease states, it was shown that according to the RADAI more patients showed remission or low disease activity during first trimester. (1st trimest. RADAI 42.1%; DAS28 26.3%), whereas during the 3rd trimester these percentages were comparable (RADAI 43.3%; DAS 41.3%). After delivery, for both the RADAI and the DAS28, highest disease activity was observed at 12 weeks after delivery. Despite this the agreement on the disease activity states between RADAI and DAS28 was low (0.28 < kappa < 0.51).

Conclusion: The RADAI and DAS28 show moderate to good correlations. The RADAI might be a useful questionnaire to determine the disease activity for pregnant patients with RA. The study also shows that the RADAI...
Comorbid Conditions Do Not Explain Divergent Patient Assessments of Disease Activity and Global Health in Patients with Rheumatoid Arthritis. Dörte Huscher1, Katja Thiele2, Sascha Bischoff3, Ulrich von Hinnen4, Guido Hoese5, Kirsten Karberg6, Wolfgang Ochs7 and Angela Zink8. 1German Rheumatism Research Centre and Charite University Medicine, Berlin, Germany, 2German Rheumatism Research Centre, Berlin, Germany, 3Rheumatologist in Private Practice, Hildeshim, Germany, 4Rheumatologist in Private Practice, Stadthagen, Germany, 5Rheumatologist in Private Practice, Bayreuth, Germany.

Background/Purpose: In the discussion of the 2010 ACR/EULAR remission criteria the issue has been raised to what extent patients are able to distinguish rheumatoid arthritis (RA) related disease activity from global health assessment. It was proposed that co-morbidity is a major driver of poor self-assessed global health when exceeding disease activity.

Methods: We used cross-sectional data of 2,242 RA patients enrolled in the National Database of the German Collaborative Arthritis Centres between 2005 and 2010, for whom both self-assessed disease activity [VAS 0–100] and global health [NRS 0–10] were documented. Patients who were seen in 2005 and 2010, for whom both self-assessed disease activity [VAS 0–100] and global health were documented. Patients who were seen in more than one year were included only once. For comparison, the disease activity scale was transformed to NRS 0–10.

Results: 75% of the patients were female, their mean age was 62.3 years, the median disease duration 7.9 years. For 1,673 patients (75%) the ratings of disease activity and of global health were equal, 213 (10%) rated global health better and 356 (16%) worse. While mean global health scores in these three groups were rather similar, disease activity ratings revealed remarkable differences. Patients who rated their global health worse than their current disease activity were more frequently male, had low mean self-assessed disease activity, and a low DAS28 score. Their pain scores were, however, above their self-assessed disease activity. The proportions of patients with co-morbid conditions were comparable between the groups that rated “better” and “worse”, but higher for those patients who gave the same scores for global health and disease activity. For patients with comorbid conditions, the average number of comorbid conditions was higher in patients who rated their global health better than those who rated worse.

Table 1. Characteristics of patients with better, the same or worse global health rating when compared to self-assessed disease activity. Displayed are mean (± standard deviation) or median if not indicated otherwise.

<table>
<thead>
<tr>
<th>Patient's assessment: global health compared to disease activity</th>
<th>better</th>
<th>the same</th>
<th>worse</th>
</tr>
</thead>
<tbody>
<tr>
<td>N [% of all 2,242 patients]</td>
<td>213 [9.5%]</td>
<td>1,673 [74.5%]</td>
<td>356 [15.9%]</td>
</tr>
<tr>
<td>N [% of all 872 patients]</td>
<td>482 [55.7%]</td>
<td>350 [40.0%]</td>
<td>40 [4.8%]</td>
</tr>
<tr>
<td>Male</td>
<td>25%</td>
<td>24%</td>
<td>31%</td>
</tr>
<tr>
<td>Age, years</td>
<td>61.1</td>
<td>62.7</td>
<td>60.9</td>
</tr>
<tr>
<td>Disease duration, years</td>
<td>8.6 (5.6)</td>
<td>10.9 (8.8)</td>
<td>9.3 (6.0)</td>
</tr>
<tr>
<td>Patient ass. disease activity [VAS 0–100]</td>
<td>5.1 (5.0)</td>
<td>4.5 (5.0)</td>
<td>2.2 (2.0)</td>
</tr>
<tr>
<td>Patient ass. disease activity [NRS 0–10]</td>
<td>3.3 (3.0)</td>
<td>4.5 (5.0)</td>
<td>4.1 (3.5)</td>
</tr>
<tr>
<td>Pain [NRS 0–10]</td>
<td>4.1 (4.0)</td>
<td>4.5 (5.0)</td>
<td>3.6 (3.0)</td>
</tr>
<tr>
<td>Number of tender joints</td>
<td>2.0 (0.0)</td>
<td>1.7 (0.0)</td>
<td>1.0 (0.0)</td>
</tr>
<tr>
<td>Number of swollen joints</td>
<td>1.3 (0.0)</td>
<td>1.2 (0.0)</td>
<td>0.9 (0.0)</td>
</tr>
<tr>
<td>ESR</td>
<td>26.1 (18.0)</td>
<td>22.9 (17.0)</td>
<td>22.9 (16.0)</td>
</tr>
<tr>
<td>CRP</td>
<td>1.4 (0.6)</td>
<td>1.0 (0.4)</td>
<td>1.0 (0.4)</td>
</tr>
<tr>
<td>DAS28/ESR, global health</td>
<td>3.2 (3.0)</td>
<td>3.2 (3.0)</td>
<td>3.0 (2.8)</td>
</tr>
<tr>
<td>Physician ass. disease activity [NRS 0–10]</td>
<td>2.0 (1.0)</td>
<td>1.5 (1.0)</td>
<td>1.4 (1.0)</td>
</tr>
</tbody>
</table>

Conclusion: The majority of patients with RA gave concordant ratings for disease activity and global health. Differences in ratings were mainly driven by higher disease activity, while global health scores were similar between the groups with concordant and discordant ratings. Comorbidity played no recognizable role for differences between both scores.

Disclosure: J. Naterop, None; J. M. W. Hazes, None; R. J. E. M. Dolhain, None.

Factors Influencing On the Discordance Between 2011 ACR/EULAR Criteria and Physician’s Clinical Judgment for Remission in Rheumatoid Arthritis Patients. Yoon-Kyoung Sung, Bo Young Yoon, Soo-Kyung Cho, Chan-Bum Choi, Dae-Hyun Yoo, Jae-Bum Jun, Tae-Hwan Kim, Shin-Seok Lee, Tae-Jong Kim, Jisoo Lee, Jung-Yoon Choe, Sung-Hoon Park, Seung-Jae Hong, Yeon-Ah Lee, Jinseok Kim, Eun-Mi Koh, Hoon-Suk Cha, Jaejoon Lee, Won-Tae Chung, Sung Won Lee, Choong-Ki Lee, Hye-Soo Lee, Wan-Hee Yoo, Young Mo Kang and Sang-Cheol Bae. Hanyang University Hospital for Rheumatic Diseases, Seoul, South Korea, Inje University Ilsan Paik Hospital, Goyang, South Korea, Chonnam National University Medical School, Gwangju, South Korea, Ewha Womans University Mokdong Hospital, Seoul, South Korea, Catholic University of Daegu School of Medicine, Daegu, South Korea, Kyung Hee University, Seoul, South Korea, Jeju National University, Jeju, Korea, South Korea, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea, Dong-A University Hospital, Busan, South Korea, Yeungnam University Hospital, Daegu, South Korea, Hanyang University Guro Hospital, Guri, South Korea, Department of Internal Medicine, Chonbuk National University Medical School and Research Institute of Clinical Medicine, Jeonju, South Korea, Kyungpook National University School of Medicine, Daegu, South Korea, Hanyang University Hospital for Rheumatic Diseases, Clinical Research Center for Rheumatoid Arthritis (CRCRA), Seoul, South Korea.

Background/Purpose: Remission is a primary end point in the treatment of rheumatoid arthritis (RA). To ensure more uniform reporting of outcome measures, American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) recently developed new definitions of RA remission. The 2011 ACR/EULAR remission criteria provide the stringent definition of remission, but do not always concordant with the state of remission defined by physicians. The purpose of this study was to compare the concordance between new remission criteria and physician’s clinical judgment of remission and to identify influencing factors on discordance between them.

Methods: Total of 1,140 patients with RA were recruited from KORean Observational study Network for Arthritis (KORONA), a database generated by rheumatologist investigators across the South Korea. The frequency of remission was evaluated based on various definitions including the Boolean based ACR/EULAR criteria and physician’s clinical judgment. The agreement between them was estimated by Cohen’s kappa (κ). For the patients in remission according to Boolean based ACR/EULAR criteria and/or physician’s judgment (n=279), we divided them into three groups; Group 1 (remission according to both criteria and physician’s judgment), Group 2 (remission only by criteria), and Group 3 (remission only by physician’s judgment). On multinomial logistic regression analysis, we identified influencing factors for both discordant groups compared to concordance group in remission.

Results: Remission rates with the Boolean based ACR/EULAR remission criteria CDAI, and SDAI, were 10.5%, 16.4% and 17.2%, respectively. Remission rate according to physician’s clinical judgment was 18.4%, while Remission rates with the Boolean based ACR/EULAR remission criteria CDAI, and SDAI were 10.5%, 16.4% and 17.2%, respectively. The agreement between new remission criteria and physicians’ clinical judgment was low (κ = 0.202) and the concordant remission rate was only 4.1% (n=51, group 1), while the prevalence of remissions by only criteria and physician’s judgment were 6.1% (n=69, group 2) and 13.9% (n=159, group 3), respectively. Multinomial logistic regression analysis shows that the pain affected on both discordant groups and sleep disturbance and fatigue were associated with remission only by physician’s clinical judgment. These indicated that patient’s subjective symptoms such as pain, fatigue, and sleep disturbance may influence on the discordance between 2011 ACR/EULAR criteria and physicians’ clinical judgment for remission (Table).
Table. Multinomial logistic results for discordant remissions as compared to concordant remission between Boolean based ACR/EULAR remission criteria and physician’s clinical judgment (N=279)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease duration</td>
<td>-2.823</td>
<td>1.957</td>
<td>0.06</td>
</tr>
<tr>
<td>Age</td>
<td>0.18</td>
<td>0.13</td>
<td>0.17</td>
</tr>
<tr>
<td>Male</td>
<td>1.08</td>
<td>0.13</td>
<td>0.01</td>
</tr>
<tr>
<td>Normal ESR</td>
<td>-0.16</td>
<td>0.10</td>
<td>0.04</td>
</tr>
<tr>
<td>Normal CRP</td>
<td>0.08</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>HAQ</td>
<td>0.04</td>
<td>0.10</td>
<td>0.018</td>
</tr>
<tr>
<td>Fatigue</td>
<td>0.02</td>
<td>0.10</td>
<td>0.96</td>
</tr>
<tr>
<td>Pain</td>
<td>0.01</td>
<td>0.10</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Conclusion: Although the 2011 ACR/EULAR remission criteria are stringent than physician’s clinical judgment, their agreement was low and patients’ subjective symptoms such as pain, fatigue, and sleep disturbance were associated with discordance between them.

Disclosure: Y. K. Sung, None; B. Y. Yoon, None; S. K. Cho, None; D. H. Yoo, None; J. B. Jun, None; T. H. Kim, None; S. S. Lee, None; J. T. Kim, None; J. Lee, None; J. Y. Cho, None; S. H. Park, None; S. J. Hong, None; V. A. Lee, None; J. Kim, None; E. M. Koh, None; H. S. Cha, None; J. Lee, None; W. T. Chung, None; S. W. Lee, None; C. K. Lee, None; H. S. Lee, None; W. H. Yoo, None; Y. M. Kang, None; S. C. Bae, None.

Physician’s Global Assessment Is Affected by Physician’s Age and Gender, but Not by Patient Age and Gender in Rheumatoid Arthritis Patients Treated in Routine Care. Data From the Danish Nationwide Danbio Registry. Cecile Lindstrom Egholm1, Theodore Pincus2, Lene Dreyer3, Torkell Ellingsen4, Bente Glintborg5, Marcin Kowalski5, Tove Lorenzen5, Ole Rintek Madsen6, Henrik Nordin7, Claus Rasmussen7 and Dreyer3, Torkell Ellingsen4, Bente Glintborg5, Marcin Kowalski5, Tove Lorenzen5, Ole Rintek Madsen6, Henrik Nordin7, Claus Rasmussen7

Background/Purpose: Several studies have shown that significant discordance exists between patient (PATGL) and physician (DOCGL) global assessments of rheumatoid arthritis (RA) disease activity. These studies have focused on patient-related factors associated with discrepancy. However, relatively little is known about possible physician-related factors that might explain the DOCGL. The aim of the present study was to determine potential physician-related factors associated with the DOCGL score.

Methods: Physician data (e.g., age, sex, title and experience) were requested by questionnaire from physicians who use the Danish nationwide Danbio registry in their clinical work. DANBIO data based on first encounters between patients and physicians in the registry were analysed. Patient data included: sex, age, duration of disease, Health Assessment Questionnaire (HAQ) score, C-reactive protein (CRP), swollen (SJC28) and tender joint counts (TJC28), treatment (biologic/non-bio), and 100 mm visual analogue scales (VAS) for PATGL, pain and fatigue. Multivariate linear regression analysis was performed to determine physician- and patient-related factors that affected DOCGL.

Results: 90 physicians returned the questionnaire (34%). The physicians were matched with 8,970 patient encounters, for which physicians were 55% females, age 52 (47–56) years (median, Interquartile Range (IQR)), 78% were consultants in rheumatology, no. of patients seen per month per physician was 80 (50–120). Patients were 74% females, age 61 (51–70) years, disease duration 7 years (2–15), CRP 6 (3–12) mg/L, HAQ 0.7 (0.25–1.375), SJC 1 (0–3), TJC 2 (0–6), pain 32 (14–57) mm and fatigue 42 (19–67) mm. 34% of patients were rheumatologists. The mean discordance was 12 (5–27) mm and PATGL 39 (17–64) mm – a difference of 27 mm.

Table 1 shows patient and physician factors associated with the DOCGL. DOCGL was higher in male physicians, in the younger half of physicians and in physicians who were not consultants. Patient gender did not affect DOCGL, whereas SJC and TJC did. Patient age was statistically but not clinically significant for DOCGL. Thus, on average, the DOCGL in a male non-consultant less than 52 years old was 9.8 mm higher than that of a female consultant above 52 years of age.

Table 1. Results of multivariate linear regression analysis of physician and patients factors as predictors of DOCGL, only statistically significant variables included.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex female</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age &gt; 52 years</td>
<td>3.345</td>
<td>2.672–4.018</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age ≤ 52 years</td>
<td>3.461</td>
<td>2.754–4.168</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Consultant in rheumatology, yes</td>
<td>3.126</td>
<td>1.747–4.505</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: This study of 90 physicians matched with >8,000 RA patients treated in routine care showed clinically significant inter-physician variations in the physicians’ global score. Male physicians scored on average 3.1 mm higher than female physicians, that were < 52 years old scored 3.7 mm higher than their older counterparts, and consultants scored 3.1 mm lower than non-consultants. SJC and TJC, but not patient age and gender, also affected the physicians’ global score. The significant contribution of physician-associated factors may have implications for research involving measures of physicians’ global score and for clinical care.

Disclosure: C. L. Egholm, None; T. Pincus, None; L. Dreyer, None; T. Ellingsen, None; B. Glintborg, None; M. Kowalski, None; T. Lorenzen, Roche, Pfizer, 6; O. Rintek Madsen, None; H. Nordin, None; C. Rasmussen, Abbott, Wyeth, 2; M. L. Hetland, None.

Validation of Remission of Rheumatoid Arthritis by Traditional Disease Activity Score and Provisional Criteria by American College of Rheumatology and European League Against Rheumatism: Patient Reported Outcomes Analyzed From 3 Phase III Golimumab Trials. Chenglong Han1, E. Keystone, Roy Fleischmann2, Josef S. Smolen3, Paul Emery4, Mark C. Genovese5, Mitte K. Doyle6 and Elizabeth C. Hias7, 8, 9

Background/Purpose: Remission by Boolean-based definition (all scores on the tender joint and swollen joint count, CRP (mg/dL), and patient global assessment ≤1) and by Simplified Disease Activity Index-based definition (SDAI < 3.3) were proposed by ACR/EULAR. Using patient reported outcomes as anchors, this analysis validated these remission criteria against traditional Disease Activity Score (DAS28) using CRP remissions (<2.6) in 3 RA patient populations.

Methods: The efficacy of golimumab (GLM) was assessed in methotrexate (MTX)-naive patients (GO-BEFORE, N=637), RA patients with previously treated with biologic anti-TNFα agent(s) with baseline MTX use (GO-AFTER, N=305). Pooled data from patients who received placebo

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(PBO) + MTX, or GLM (50 or 100mg) + MTX, q4 weeks were used for this analysis. Patient reported outcomes were measured with the following: Health Assessment Questionnaire (HAQ), Physical and Mental Component Summary Scores of 36-item short-form health survey (SF36 PCS and MCS), Assessment of Chronic Illness Therapy-Fatigue (FACT-Fatigue), and a Visual Analog Scale (VAS, 0–10) of impact of RA on daily work productivity. Descriptive statistics were provided for patient reported outcomes among patients in remission as defined by the 3 remission definitions.

Results: Greater proportions of patients treated with GLM + MTX vs patients treated with PBO + MTX achieved remission in the 3 studies by each remission definition. In the pooled analysis, the remission rate at wk 24 was the highest (20.2%) by DAS28, compared to remission by SDAI (10.6%, p < 0.001) and remission by Boolean-based definition (8.6%, p < 0.001). Patients with remission by DAS28 achieved normal physical function (HAQ ≤ 0.3), normal SF-36 PCS, and MCS (≥ 50) by 67.8%, 38.4%, 62.2%, respectively; these parameters were numerically lower when compared to patients with remission by SDAI (81.3%, 62.8%, 72.1%, respectively) or by Boolean-based definition (82.0%, 63.5%, 74.3%, respectively). Patients in remission by DAS28 had higher HAQ scores (0.43 ± 0.49) compared to patients in remission by SDAI (0.26 ± 0.41) or Boolean-based criteria (0.28 ± 0.44). Similar results were observed in measures of FACT-fatigue and productivity VAS scores. Among MTX-naïve patients in the GO-BEFORE study who achieved remission by DAS28, 71.3% achieved normal physical function compared to 86.9% of those in remission by SDAI and 86.5% of patients in remission by Boolean-based definition. Among anti-TNFα experienced patients in the GO-AFTER study, 62.1% of those in remission by DAS28 achieved normal physical function compared to 65.0% of those in remission by SDAI, and 66.7% of patients in remission by Boolean-based definition.

Conclusion: While disease remission has been adapted as a target in the management of RA, more stringent remission criteria proposed by ACR/EULAR can provide optimal patient-reported outcomes.

Disclosure: C. Han, Johnson Johnson Pharmaceutical Services, LLC, 3; E. Keystone, Abbott Laboratories; Agen Inc.; AstraZeneca Pharmaceuticals LP; 2, Abbott Laboratories; AstraZeneca Pharma, Biotech, Bristol-Myers Squibb Company; Centocor, Inc.; P. Hoffmann-La Roche Inc; Genentech Inc; Merck, Nycomed, Pfizer Pharmaceuticals, UCB; 5, R. Fleischmann, Abbott, Pfizer, Merck, Roche, UCB, Celgene, Centocor-Janssen, Agen, AstraZeneca, BMS, Lilly, and Novartis, 2; Abbott, Pfizer, Merck, Roche, UCB, Celgene, Centocor-Janssen, Agen, AstraZeneca, BMS, Lilly, and Novartis, 5; J. S. Smolen, Janssen Research and Development, LLC, 9; P. Emery, Janssen Research and Development, LLC, 9; M. C. Genovese, Janssen Research and Development, LLC, 9; M. K. Doyle, Janssen Research and Development, LLC, 3; E. C. Hisa, Janssen Research and Development, LLC, 3.

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Transitions Among Disease Activity States: Estimates and Models of Covariate Associations

George W. Reed1, David H. Collier2, Andrew S. Koenig3,Katherine C. Saunders4, Joel M. Kremer5 and Sameer Kotak6.


Background/Purpose: Many RA patients have variable disease activity over time due to disease variability, reduction in efficacy of current medications, environmental factors and other co-morbid disease changes. Prior methodologies have been developed but in the absence of application with real data the models have not been validated. The model applied to patient clinical data may potentially provide insights into clinically relevant associations to disease state transitions and enhance treatment methods.

Methods: Disease activity states of low, moderate and severe were defined using CDAI (Low: CDAI<10; Moderate 10< CDAI≤22; and Severe 22< CDAI). A Markov Model for repeated measures allowing for covariate dependence was used to model transitions among three states (Figure 1a) - from a prior disease state to a current disease state. Population transition probabilities were estimated and a multinomial logistic regression model used to examine the impact of covariates on disease states and if the impact of covariates depended upon the prior disease state. Initiation of DMARDS, duration of RA, age and insurance were used as covariates of interest. Disease activity measurements at repeated visits of RA patients were used from the CORRONA RA registry (Oct, 2001 to Feb, 2012). There were 160,262 visits from 24,136 RA patients with CDAI measured at the visit and at the prior visit.

Results: Estimated transition probabilities in the population are in Figure 1b, showing that if the disease state at the prior visit was low then the probability of remaining low (PLL) is 0.833 and the probability of transitioning to moderate disease (PLM) at the next visit is 0.132, and to severe (PLe) is 0.035. Transition from any state to low disease was seen to improve from 2001-05 to 2009-12 with PLL going from 0.79 to 0.84 (p < 0.001). Logit models estimated the effect of covariates adjusted for time between visits. A patient in a prior state of moderate disease had a relative risk ratio of 7.6 (95%CI: 7.08–8.21) to be in moderate disease at the current visit (vs a patient in a prior state of low disease) if no DMARD was initiated on the prior visit. If a DMARD was initiated the risk was reduced to 4.08 (3.59–4.63). Longer duration of RA increased the risk of transition in a moderate or severe state. Age and insurance did not interact with prior disease states but showed an association with current disease state - with private insurance associated with lower levels of disease and age 50–64 with a larger risk for moderate and severe disease vs age <50.

Conclusion: Estimation of transition probabilities among disease states provides a snapshot of RA population risks dependent upon prior states and a methodology for examining factors associated with those risks. Current models estimate the impact of initiating DMARDS and the duration of RA and provide a proof of concept of the modeling framework that can be mined for examining further associations.


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Variability of the SF-6D Determinants Over Time in Early Arthritis: Results From the Espoir Cohort

Cécile Gaujoux-Viala1, Bruno Faure2, Kossar Hosseini3, Francis Guillémin3, René-Marc Filipo5 and Anne-Christine Rat5.

1Lorraine University, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy; Paris 6 - Pierre et Marie Curie University; Rheumatology, Pitié-Salpêtrière Hospital, Paris, France, 2Lorraine University, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy, France, 3Rheumatology Department, Lille University Hospital, Lille, France, 4Université de Lorraine, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy, France

Background/Purpose: There is growing emphasis on the cost-effectiveness of treating rheumatoid arthritis. The SF-6D, derived from the SF-36, is an indirect utility measure widely used to calculate quality-adjusted life-years in order to assess health benefits. Few trials directly record the health utility measures (or the SF-36), needed for economic analyses. Consequently linear regression methods have been used to transform Health Assessment Questionnaire (HAQ) scores into utility measures.

Objective: 1) To assess which variables are associated with the SF-6D in early arthritis over 3 years

2) To check if these associations are stable over 3 years
Methods: Patients: Between 2002 and 2005, the ESPOIR cohort enrolled 813 patients with recent arthritis in at least 2 joints with 6 weeks to 6 months disease duration.

Data available: SF-6D utility measures were longitudinally assessed in 813 patients with EA (at baseline, 6 months, 1, 2, and 3 years). Clinical and biological variables and X-rays were also recorded.

Analysis: The determinants of SF-6D-derived utility values at each time-point over 3 years were assessed by multivariate linear regressions to analyze which specific aspects of early arthritis were independently associated with the SF-6D.

Results: At baseline, higher HAQ, patient global evaluation, pain, fatigue, and lower mental status were significantly associated with lower SF-6D. HAQ and AIMS2-SF-mental scores explained 49 and 14% of the variance respectively. At 6 months, 1, 2 and 3 years, higher HAQ, patient global evaluation, fatigue, age and lower mental status were significantly associated with lower SF-6D. HAQ and AIMS2-SF-mental scores explained 7 to 13% and 55 to 57% of the variance respectively (figure).

Conclusion: The determinants of the SF-6D varied over 3 years in EA patients. At baseline, the SF-6D was essentially determined by function whereas after 6 months, the SF-6D was essentially determined by mental status. Cost-effectiveness models should not use utility values derived from HAQ.

Disclosure: C. Gaujoux-Viala, None; B. Fautrel, None; K. Hossein, None; F. Guillemin, None; R. M. Flipo, None; A. C. Rat, None.

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Substantial Functional Disability Is the Key Determinant of Discrepancies Between EQ-5D and SF-6D Utility Measures in Early Arthritis: Results From the Espoir Cohort. Cécile Gaujoux-Viala1, Bruno Fautrel1, Kossar Hossein1, Francis Guillemin1, René-Marc Flipo2 and Anne-Christine Rat1.

1 Université de Lorraine, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy, 2Paris 6 - Pierre et Marie Curie University; Rheumatology, Pitié-Salpêtrière Hospital, Paris, France, 3Paris VI University, Paris, France, 4Lorraine University, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy, France, 5Université de Lorraine, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy, France, 6Rheumatology Department, Lille University Hospital, Lille, France

Background/Purpose: The EQ-5D, a 5-dimensional multi-attribute questionnaire, and the SF-6D, derived from the SF36, are 2 indirect utility measures widely used to calculate quality-adjusted life-years in order to assess health benefits.

Objective: 1) To assess which variables at baseline are associated with EQ-5D and SF-6D in early arthritis 2) To assess which variables at baseline are associated with substantial utility differences between EQ-5D and SF-6D.

Methods: Patients: EQ-5D and SF-6D utility measures were assessed in 813 patients included in the French nationwide ESPOIR cohort, which enrolled early arthritis (EA) patients with ≥2 swollen joints for less than 6 months and suspicion of RA.

Analysis: Determinants of EQ-5D and SF-6D at baseline were assessed by multivariate linear regression. Multivariate linear regression was used to determine which aspects of EA were independently associated with the difference between the two utility measures in patients with substantial utility difference, i.e. 1 SF-6D − EQ-5D 1 > 0.074 (highest minimal important difference, MID). To assess the determinants of having substantial utility difference, patients were divided into 3 categories at baseline: SF-6D-EQ-5D 1 > 0.074 and SF-6D-EQ-5D 1 < 0.074 and SF-6D-EQ-5D 1 = 0.074 and EQ-5D SF-6D and the others corresponding to no substantial difference (reference category). Variables collected at baseline were analyzed by polynomial logistic regression, with the 3 categories as dependent variables.

Results: At baseline, mean values were 0.52 ± 0.31 (range -0.59 to 1) for EQ-5D and 0.58 ± 0.11 (range 0.30 to 0.92) for SF-6D. In the multivariate linear regression model, higher HAQ, pain and lower mental status (AIMS2-SF) were significant determinants of a lower EQ-5D. HAQ and AIMS2-SF-mental scores explained 41.4 and 7.9% of the variance respectively. Higher HAQ, patient global evaluation, pain, fatigue, and lower mental status were significantly associated with lower SF-6D. HAQ and AIMS2-SF-mental scores explained 49.3 and 14.5% of the variance respectively.

The majority of patients presented a substantial difference between the 2 utility values > 0.074 (66.5%) (mean difference 0.064 [range -0.421 to 0.941]). In these patients, higher disability, lower mental status and higher CRP were associated with substantial difference between EQ-5D and SF-6D. Lower disability was associated with the probability that EQ-5D was substantially superior rather than SF-6D in comparison with no substantial difference. Higher disability was associated with the probability that SF-6D was substantially superior to the EQ-5D.

Conclusion: Higher functional disability is the key element leading to substantial difference between the two utility measures in EA patients. EQ-5D and SF-6D are not interchangeable especially in patients with worse functional ability and the results of cost-effectiveness studies using different utility instruments must not be compared.

Disclosure: C. Gaujoux-Viala, None; B. Fautrel, None; K. Hossein, None; F. Guillemin, None; R. M. Flipo, None; A. C. Rat, None.

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Benefits of Treat-to-Target Guideline Compliance in Patients with Rheumatoid Arthritis: A Retrospective Claims Analysis. Martin J. Bergman1, James W. Shaw2, Mary A. Cifaldi3, Annie Guerin4, Pooja Chopra1 and James Signorovitch1.

1Taylor Hospital, Ridley Park, PA, 2Abbott Laboratories, Abbott Park, IL, 3Analysis Group, Inc., Montreal, QC, 4Analysis Group, Inc., Boston, MA

Background/Purpose: To achieve clinical remission/low disease activity in patients with rheumatoid arthritis (RA), the treat-to-target (T2T) guidelines recommend frequent disease monitoring through patient-rheumatologist interactions. The economic implications of treating to target have not been fully quantified. This study aimed to estimate the effects of compliance with T2T recommendations regarding patient follow-up on health care resource utilization (HRU) and medical service costs in RA patients newly initiated on a disease-modifying anti-rheumatic drug (DMARD).

Methods: Patients ≥ 18 years old with ≥ 2 RA diagnoses and ≥ 1 prescription fill for a DMARD that was preceded by a rheumatologist encounter (within 7 days) were identified from the MarketScan® Commercial Claims and Encounters database (1/2000 to 9/2011). A patient’s index date was randomly selected among all new DMARD initiation dates with ≥ 3 months of continuous enrollment before and ≥ 15 months after that date. Patients with a follow-up rheumatologist visit within 90 days of the index date were defined as compliant, while all others were classified as noncompliant.

HRU and costs (measured from a payer’s perspective in 2010 US dollars) were measured over a 1-year period starting 90 days after the index date. Adjusted all-cause HRU and medical service costs were compared between compliant and noncompliant patients using multivariable regression.

Results: A total of 15,103 RA patients were selected with 10,739 (71.1%) being designated as compliant. The average age was 49.9 years, and 23.2% were male. After adjusting for potential confounding, compliant patients exhibited significantly fewer inpatient admissions and inpatient days, fewer emergency room (ER) visits, and less use of other medical services but significantly more outpatient visits than noncompliant patients. Consequently, compliant patients had significantly lower adjusted inpatient costs but significantly higher adjusted outpatient costs than noncompliant patients. The inpatient cost reduction offset the increase in outpatient costs such that there was no significant difference between the two cohorts with respect to aggregate adjusted medical service costs.
86 Longitudinal Hypertension Diagnosis and Control Among a Primary Care Medically Homed Population with Rheumatoid Arthritis. Katy J. Voelker1 and Christie M. Bartels2. 1Univ of Wisconsin School of Medicine and Public Health, Madison, 2Univ of Wisconsin School of Medicine and Public Health, Madison, WI

Background/ Purpose: Hypertension is a key risk factor for cardiovascular disease (CVD) in patients with both and without rheumatoid arthritis (RA). In their review on hypertension in RA, Panoulas et al (2008) cited relative risks of hypertension for CVD events ranging from 1.5 to 4.3. Reports vary further regarding hypertension prevalence in RA largely due to varying case definitions and timing of observations. Herein we examined hypertension prevalence, diagnosis and control using standard Joint National Committee-7 (JNC-7) hypertension diagnostic criteria applied to a medically homed RA population.

Methods: Using a cohort design we studied all adult patients with rheumatoid arthritis who were medically homed receiving primary care and rheumatologic care within a large multispecialty practice. Patients were considered “medically homed” for each consecutive year (2005–2011) that they met definitions requiring ≥2 visits over a 24 month baseline (including at least 1 primary care visit and 1 rheumatology visit). RA was determined using algorithms requiring two ICD-9 claims of 714.0–714.4 in 24 months (modified Katz 1997, MacLean 2000). Hypertension diagnosis eligibility was defined by applying Joint National Committee-7 (JNC-7) hypertension diagnostic criteria: 3 or more blood pressures >140/90 or 2 or more pressures >160/100 on ≥2 separate visits. An algorithm was used to search for >1 ICD-9 hypertension code (Tu 2007) or any antihypertensive medication to indicate hypertension diagnosis. Total hypertension prevalence counted diagnosed and undiagnosed cases meeting JNC definitions. Control was also based on JNC-7 criteria requiring 3 normal blood pressures over 24 month baseline. Descriptive statistics were used to report hypertension prevalence, diagnosis and control during the baseline and subsequent medically homed period.

Results: In our population of 1,099 medically homed RA patients (mean age 56; 76% female) the prevalence of hypertension was 30% at baseline and 56% during follow up. Hypertension generally increased with age (Fig. 1). Compared to older patients, a higher proportion of younger patients remained undiagnosed. Although older patients were more often diagnosed, three quarters remained uncontrolled.

Conclusion: Our examination of medically homed RA patients receiving both primary care and rheumatology care highlights the importance of examining longitudinal data for assessing diagnosis and control of hypertension among patients with RA. These data illustrate that point prevalence

## Table: Comparison of all-cause HRU and medical costs between compliant and noncompliant RA patients

<table>
<thead>
<tr>
<th>HRU Category 1</th>
<th>Compliant [A]</th>
<th>Adjusted HRU ([B] CL [A]/[B]) Prevalence</th>
<th>Adjusted Mean Medical Cost [A]</th>
<th>[B]</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All medical services</td>
<td>13,662</td>
<td>11,596</td>
<td>321</td>
<td>0.624</td>
<td></td>
</tr>
<tr>
<td>INPT visits</td>
<td>3,620</td>
<td>3,715</td>
<td>(1.721, 2.390)</td>
<td>0.020</td>
<td></td>
</tr>
<tr>
<td>No. INPT admissions</td>
<td>0.17</td>
<td>0.17</td>
<td>(0.05, 0.97)</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>No. INPT days</td>
<td>0.97</td>
<td>1.04</td>
<td>(0.66, 1.44)</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Outpatient visits</td>
<td>20.55</td>
<td>17.75</td>
<td>(1.00, 0.98)</td>
<td>&lt;0.001</td>
<td>8,793</td>
</tr>
<tr>
<td>ER visits</td>
<td>0.36</td>
<td>0.36</td>
<td>(0.20, 0.50)</td>
<td>0.20</td>
<td>0.043</td>
</tr>
<tr>
<td>Other</td>
<td>3.93</td>
<td>3.25</td>
<td>(0.84, 0.98)</td>
<td>0.249</td>
<td></td>
</tr>
</tbody>
</table>

## Notes:
- Abbreviations: HRU, health resource utilization; RA, rheumatoid arthritis; IRR, Incidence Rate Ratio; CI, Confidence Interval; INPT, inpatient; ER, emergency room.
- The medical service category included laboratory, radiology, and other ancillary services.
- Given that the unadjusted incidence rates and means could have been biased due to confounding, comparative estimates were adjusted for age, region, insurance, comorbidities, index year, and HRU costs at baseline (chosen based on P < 0.05).
estimates may under report hypertension rates relative to standard JNC definitions using multiple observations. Overall, young hypertensive RA patients were proportionally less likely to be diagnosed and control remained poor across all age groups.

Disclosure: K. Voelker, None; C. M. Bartels, None.

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Prediction of Mortality in Rheumatoid Arthritis Using a Serum Cytokine Profile. Agustín Escalante1, Roy W. Haas1, Daniel F. Battafarano2 and Inmaculada Del Rincon1. 1University of Texas Health Science Center at San Antonio, San Antonio, TX, 2Brooke Army Medical Ctr, San Antonio, TX

Background/Purpose: Cytokines are important in the pathogenesis of RA. Their concentration in the serum rises immediately prior to RA onset, and may be associated with disease outcome. We are not aware of any studies of serum cytokines in relation to mortality in RA. In the present study we examined the accuracy of a profile of 38 cytokines in the prediction of mortality in an RA cohort.

Methods: We studied RA patient participants in a longitudinal study of RA outcomes who were recruited at a routine visit to a rheumatologist. After a baseline assessment that included a collection of a serum specimen, which was stored for future study, patients were tracked yearly for follow-up. We identified deaths thorough next of kin, physician or public database reports, confirmed by death certificate. We used stepwise logistic regression to examine the association between serum cytokine levels and mortality, adjusting for the confounding influence of age and sex. We used receiver operator characteristic (ROC) curves to measure accuracy of mortality prediction.

Results: We studied 1,328 RA patients. A serum sample for cytokine measurement was available in 1,217 patients, who accrued 5,965 person-years of observation, or an average of 4.9 years per patient (range 1 day to 15 years). During this time, 204 deaths occurred for a mortality rate of 3.4 per 100 patient-years, 95% CI 3.0 to 3.9. Using age- and sex-adjusted stepwise logistic regression to identify cytokines associated with mortality, we found that the serum concentrations of the following 8 cytokines were independently associated with increased mortality: IFN-g, 1.47 (1.03, 2.11); EGF, 1.27 (1.05, 1.54); TNF-a, 1.47 (1.12, 1.91); MCP-1, 1.60 (1.14, 2.24); IL-8, 1.75 (1.36, 2.23); IL-3, 1.67 (1.05, 2.67); IFN-g, 1.4 (1.08, 1.80); and GRO, 2.08 (1.40, 3.09). In the same model, the following 5 cytokines were independently associated with reduced mortality: MDC, 0.36 (0.26, 0.51); GCSF, 0.54 (0.39, 0.74); MIP-1a, 0.75 (0.62, 0.90); and IL-17, 0.71 (0.57, 0.89). Values shown are odds ratios (95% CI). The area under the mortality prediction ROC curve for a model including age and sex plus the above 13 cytokines was 0.776, P = 0.001 (see figure).

Conclusion: A serum cytokine profile is significantly associated with mortality in RA, and its accuracy in predicting mortality within 5 years is superior to that of age and sex alone. We are not aware of any previous reports of mortality prediction in RA using serum cytokine profiles.

Disclosure: A. Escalante, None; R. W. Haas, None; D. F. Battafarano, None; I. Del Rincon, None.

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The Effect of Weather On Patient Symptoms in Rheumatoid Arthritis: A Systematic Review of the Literature and Exploration of “weather sensitivity”. Annika Cutinha1, Frederick Wolfe2 and Kaleb Michaud3. 1University of Nebraska Medical Center, Omaha, NE, 2National Data Bank for Rheumatic Diseases, Wichita, KS, 3National Data Bank for Rheumatic Diseases & University of Nebraska Medical Center, Omaha, NE

Background/Purpose: Patients with rheumatoid arthritis (RA) often attribute an exacerbation of their symptoms to changes in the weather. There are several studies examining this relationship. We conducted a systematic review of the existing literature on the effect of weather on symptoms in RA, and a follow up study that characterized patients with RA that reported being “weather sensitive”.

Methods: A systematic review of Medline and Embase from inception until November 2011 looked for articles that report the effect of any aspect of weather on any symptom or outcome of patients with arthritis and 765 articles qualified. Then only included were non-duplicative articles in English with RA patients. We identified a subset of patients as “weather sensitive” (WS) based on patients reporting worse symptoms with increased weather. We observed that the percentage of WS patients in the studies reviewed, along with the difference in study methods, played a role in determining the final results. In order to identify WS patients and determine if they differ from other patients, we queried a cohort of 6901 US rheumatic disease patients (including 4655 RA, 1206 osteoarthritis (OA), and 374 fibromyalgia (FMS)) participating in an observational study and compared their demographic and clinical characteristics.

Results: Only 19 articles (N=3357 RA patients) qualified for our review. These studies did not find a consistent association between weather and RA symptoms. For example, 4 studies found a positive correlation between temperature and symptoms like pain and stiffness, 4 others found a negative correlation, and 4 more found no correlation. We had similar results for 11 articles studying humidity and RA outcomes: 6 positive, 1 negative, and 4 had no correlation. For atmospheric pressure, 3 were positive, 1 was negative, and 6 had no correlation. Of the 4655 RA patients we surveyed, 63% reported being WS (compared to 71% of OA and 78% of FMS), 20% were not, and the remaining 17% did not know. Columns 2–3 of Table 1 list their characteristics. Patients in the WS group were younger, less male, less educated, and had shorter RA duration. They also had worse RA symptoms as measured by HAQ, pain VAS, and SF36. The logistic multivariable regression for WS odds ratios are provided in column 4. We accounted for possible over reporting of symptoms by including a patient symptom count and polysymptomatic distress scale.

Table. Characteristics of RA patients by weather sensitivity and multivariable logistic regression.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Not weather sensitive (N=926) (SD)</th>
<th>Weather sensitive (N=2926)</th>
<th>Odds ratio (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>64.8 (12.0)</td>
<td>62.1 (12.3)</td>
<td>0.98 (0.97, 0.99)</td>
</tr>
<tr>
<td>Male (%)</td>
<td>25.6</td>
<td>15.0</td>
<td>0.71 (0.58, 0.88)</td>
</tr>
<tr>
<td>Education (0-17 years)</td>
<td>14.7 (2.2)</td>
<td>14.1 (2.3)</td>
<td>0.91 (0.88, 0.95)</td>
</tr>
<tr>
<td>RA duration (years)</td>
<td>19.7 (12.1)</td>
<td>18.6 (SD 12.3)</td>
<td>0.99 (0.99, 1.00)</td>
</tr>
<tr>
<td>HAQ (0-3)</td>
<td>0.61 (0.7)</td>
<td>1.10 (SD 0.7)</td>
<td>1.26 (1.02, 1.55)</td>
</tr>
<tr>
<td>Pain VAS (0-10)</td>
<td>2.16 (2.4)</td>
<td>3.97 (SD 2.7)</td>
<td>1.09 (1.04, 1.15)</td>
</tr>
<tr>
<td>SF36 Physical CS Score</td>
<td>44.3 (11.4)</td>
<td>36.0 (SD 10.8)</td>
<td>0.97 (0.96, 0.99)</td>
</tr>
<tr>
<td>Symptom count (0-37)</td>
<td>4.9 (4.6)</td>
<td>8.4 (6.9)</td>
<td>1.05 (1.03, 1.08)</td>
</tr>
<tr>
<td>Polysymptomatic distress scale</td>
<td>6.2 (6.5)</td>
<td>11.5 (7.9)</td>
<td>1.02 (1.00, 1.04)</td>
</tr>
</tbody>
</table>

Conclusion: Although widely believed, no consistent association in the literature between weather and RA symptoms was seen. Patients with worse function and pain are more likely to report being WS even after controlling for sociodemographic status and general symptoms. Future studies aimed at objectively measuring WS are needed to further evaluate whether subjective symptoms are more correlated with weather possibly through increased pain sensitization.

Disclosure: A. Cutinha, None; F. Wolfe, None; K. Michaud, None.
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Poor to Moderate Performance of Patient Self-Report in Indentifying Periodontitis in Patients with Rheumatoid Arthritis. Ted R. Mikuls1, Jeffrey Payne2, Harlan Sayles3, Shawnneen Gonzalez2, Jeffrey Mark2, Mark Beatty1, Grant W. Cannon2, David McGowan1, Gail S. Kerr1, Robert D. Ludman2, Andreas M. Reimold1,1 George E. Wahlen VA Medical Center, Omaha, NE, 2University of Nebraska Medical Center, Lincoln, NE, 3University of Nebraska Medical Center, Omaha, NE, 4Omaha VA Medical Center, Salt Lake City, UT, 5Washington DC VAMC, Georgetown and Howard University, Washington, DC, 6Washington DC VA, Georgetown and Howard University, Washington, DC, 7Dallas VA and University of Texas Southwestern, Dallas, TX

Background/Purpose: Periodontitis (PD) is a putative risk factor for rheumatoid arthritis (RA) risk and progression. PD is defined as inflammation of the supporting tissues of the teeth, progressive attachment and bone loss and is characterized by pocket formation and/or gingival recession. No single definition of PD has been well established and consistently applied in research. Although results from standardized periodontal examinations are considered the ‘gold-standard’ for PD classification, studies examining the relationship of PD with RA have also relied on patient self-report for case ascertainment. The goal of this study was to examine the performance of patient self-reporting in identifying PD based on results from a standardized periodontal exam in patients with established RA.

Methods: In a multicenter study, RA patients satisfying ACR classification criteria underwent a standardized, calibrated, periodontal evaluation. PD was defined as the presence of clinical attachment loss ≥ 6 mm for 2 or more teeth and one or more sites with a probing depth ≥ 5 mm (consistent with severe PD). Characteristics of patients with and without PD were compared using the Student’s t-test or Chi-square test. Patients responded to 6 questions previously used in research studies to assess for a history of PD, treatment, and/or related signs and symptoms (Table), the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the questions were calculated.

Results: Of the RA patients examined (n = 245), 82 (33.5%) had PD based on examination. Factors associated with an increased PD frequency based on results from a standardized periodontal exam in patients with established RA, affecting 1 in 3 patients. Although demonstrating moderate to good specificity in some cases, questions commonly used to assess for the presence of PD yield insufficient sensitivity (< 40%) in this population. Both PPV and NPV of these questions were consistently below 80% in this population, suggesting that misclassification and study bias are likely to occur in RA studies using patient self-report for PD case ascertainment.

Disclosure: T. R. Mikuls, None; J. Payne, None; H. Sayles, None; S. Gonzalez, None; J. Markt, None; M. Beatty, None; G. W. Cannon, None; D. McGowan, None; G. S. Kerr, None; R. Redman, None; A. M. Reimold, None; G. Griffiths, None.

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Physical Function, Pain and Fatigue Are Related to Sleep Disturbance in Females with Rheumatoid Arthritis. Cathrine Austad1, Tore K. Kviën2 and Till Uhlig3. 1Diakonhjemmet Hospital, Oslo, Norway, Oslo, Norway, 2Diakonhjemmet Hospital, Oslo, Norway

Background/Purpose: Sleep quality is an important aspect of health and well-being and the Outcome Measures in Rheumatology Clinical Trials group has identified sleep quality as a key concern for rheumatoid arthritis (RA) patients. Patient reported sleep-disturbance is included in the RAID (RA Impact of Disease) score, but not in many other core patient reported outcomes (PROs) and is rarely reported in clinical trials. The aim of this study was to assess self-reported sleep disturbance in a large sample of patients from a population based RA registry and identify factors associated with self-reported sleep disturbance.

Methods: In a population based RA registry in Oslo, Norway, 868 patients aged 20–79 years (mean (SD) age 59.9 (12.3) years, disease duration 13.0 (10.8) years, 77.1% females) responded to a mailed questionnaire in 2009 (response rate 60.6%). 844 patients answered the numeric rating scale (NRS) on sleep disturbance due to RA (part of the RAID questionnaire) within the last week, and reported use of benzodiazepines, hypnotics and other medications used in the treatment of RA. Other PROs included 100mm visual analogue scales (VAS) for pain, fatigue and patient global disease activity, HAQ (0–3, worst), SF-36 with physical (PCS) and mental (MCS) component scores (0–100, 0 = worst), RA Disease Activity Index (RADAI, 0–10, 10 worst) and RADAI score (0–10, 10 = extreme very poor). Multivariate linear regression analyses were used to identify factors independently associated with sleep disturbance (0–10 NRS, 10 = extreme sleep disturbance) and adjusted for age and disease duration.

Results:

Table 1. Clinical findings in females and males

<table>
<thead>
<tr>
<th>Significant gender differences</th>
<th>Female Mean (SD)</th>
<th>Male Mean (SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease duration (years)</td>
<td>13.5 (11.1)</td>
<td>11.5 (9.7)</td>
<td>0.02</td>
</tr>
<tr>
<td>VAS fatigue (0-100)</td>
<td>45.9 (28.8)</td>
<td>40.5 (28.7)</td>
<td>0.02</td>
</tr>
<tr>
<td>HAQ (0-3)</td>
<td>0.97 (0.73)</td>
<td>0.64 (0.62)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PCS (0-100)</td>
<td>36.0 (11.6)</td>
<td>37.9 (11.6)</td>
<td>0.05</td>
</tr>
<tr>
<td>RAID (0-10)</td>
<td>3.46 (2.14)</td>
<td>2.96 (2.14)</td>
<td>0.004</td>
</tr>
<tr>
<td>Sleep disturbance (0-10)</td>
<td>3.19 (2.79)</td>
<td>2.41 (2.71)</td>
<td>0.001</td>
</tr>
<tr>
<td>Use Z-hypnotics</td>
<td>20.8%</td>
<td>12.6%</td>
<td>0.004</td>
</tr>
</tbody>
</table>

No significant gender differences

| Age (years)                   | 59.9 (12.6)     | 59.7 (11.4)   | 0.83    |
| VAS pain (0-100)              | 34.9 (24.3)     | 31.6 (25.1)   | 0.11    |
| VAS patient global (0-100)    | 37.8 (24.9)     | 34.5 (24.6)   | 0.10    |
| MCS (0-100)                   | 46.8 (11.6)     | 47.3 (11.8)   | 0.61    |
| RADAI (0-10)                  | 3.25 (1.70)     | 3.00 (1.72)   | 0.07    |
| Use SDMARD                    | 60.5%           | 66.0%         | 0.99    |
| Use biologics                 | 20.3%           | 18.7%         | 0.61    |
| Use prednisolone              | 35.4%           | 35.9%         | 0.91    |

Multivariate linear regression analyses, adjusted for age and disease duration, with sleep disturbance assessed by NRS(0–10) as dependent variable, identified significant independent associations with female gender (B = 0.40, 95% CI 0.06, 0.74), HAQ (B = 0.40, 95% CI 0.13, 0.67), RADAI (B = 0.42, 95% CI 0.27, 0.57), VAS pain (B = 0.15, 95% CI 0.04, 0.27), VAS fatigue (B = 0.18, 95% CI 0.11, 0.25) and MCS (B = -0.52, 95% CI -0.65, -0.38), *per 10 unit change.

use of Z-hypnotics was significantly associated with MCS, PCS, HAQ, RADAI, RAD. NRS sleep disturbance, VAS pain/fatigue/pat/glob (all p < 0.001), and disease duration (p = 0.03).
Correlations of Single Item Health Literacy Screening Questions with Established Measures of Health Literacy in Subjects with Rheumatoid Arthritis. Izizar Quinzanos1, Joel M. Hirsh1 and Liron Caplan2. 1Denver Health Med Ctr, Denver, CO, 2Denver VAMC and Univ of Colorado School of Medicine, Aurora, CO

Background/Purpose: Preliminary research suggests that Health Literacy (HL) is associated with the functional status of rheumatoid arthritis (RA) patients. Single Item Health Literacy Screening (SILS) questionnaires are a convenient method of establishing the health literacy of patients. However, the wording of SILS, version 2 (SILS2, “How comfortable are you filling out medical forms by yourself?” Wallace LS, et al. J Gen Intern Med. 2006;21:874-7.) may be misinterpreted by RA patients as a query regarding their physical limitations.

Methods: English-speaking adult RA patients at Denver Health enrolled in a cross-sectional study. Subjects were asked to complete the SILS2, an older version of the SILS (SILS1, “How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?” Chew, et al. Fam Med 2004;36:588–594), as well as two longer HL measurement tools (Short Test of Functional Health Literacy in Adults [STOFHLA] and the Rapid Estimate of Adult Literacy in Medicine [REALM-]).

Results: 110 subjects participated in the study. There was a strong correlation between the two SILS versions (Table 1). The correlation of SILS2 and REALM or STOFHLA was less robust (Table 1), but still moderately well correlated, though the distribution of scores within each SILS2 category demonstrated substantial scatter (Figures 1 and 2).

Table 1. Correlations of various measures of health literacy in subjects with RA

<table>
<thead>
<tr>
<th>Measure</th>
<th>SILS1</th>
<th>SILS2</th>
<th>REALM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILS2</td>
<td>0.693</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>REALM</td>
<td>0.385</td>
<td>0.411</td>
<td>-</td>
</tr>
<tr>
<td>STOFHLA</td>
<td>0.416</td>
<td>0.439</td>
<td>0.554</td>
</tr>
</tbody>
</table>

Conclusion: The SILS2 has construct validity in the assessment of HL in patients with RA. The SILS instruments are moderately good reflections of HL for groups of RA patients, however the substantial scatter of scores within each SILS category likely limits the clinical utility of the SILS in determining the HL on any one subject.

Disclosure: I. Quinzanos, None; J. M. Hirsh, None; L. Caplan, None.

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Combined Response Index in Diffuse Systemic Sclerosis (CRISS)—Which External Anchors to Use When Developing the Index? Baseline Analysis. Dinesh Khanna1, Veronica Berrocal1, James R. Seibold2, Peter A. Merkel2, Maureen D. Mayes4, Kristine Phillips1, Robert W. Simms3, Shervin Assassi2, Philip J. Clements6 and Daniel E. Furst6. 1University of Michigan, Ann Arbor, MI, 2Scleroderma Research Consultants LLC, Avon, CT, 3University of Pennsylvania, Philadelphia, PA, 4University of Texas Health Science Center at Houston, Houston, TX, 5Boston University School of Medicine, Boston, MA, 6UCLA School of Medicine, Los Angeles, CA

Background/Purpose: As part of an NIH sponsored effort to develop a data-driven CRISS, we evaluated the face, content, and construct validity (convergent and discriminant) of patient (Pt) and physician (MD) assessments for use as the “external gold standards” or “anchors” to compare against individual core set items developed as part of a consensus meeting conducted by the Scleroderma Clinical Trial Consortium (Khanna D. Ann Rheum Dis 2008). This methodology has been used for developing other response criteria.

Methods: We recruited patients with early diffuse SSc (< 5 years) at four scleroderma centers in the United States. Pre-defined outcome measures were collected. These included demographics (e.g., age, disease duration), patient-reported outcomes (e.g., HAQ-DI, SF-36), physical examination (e.g., skin score, joint count), and physiological/radiological tests (e.g. echocardiogram, pulmonary function tests). We assessed the test characteristics of 8 potential Likert anchors (3 MD-derived: global assessment; activity of skin involvement; severity of skin involvement and 5 Pt. derived: patient global assessment; activity of skin involvement; limitations due to skin involvement; overall pain; transition question regarding overall health) against the above measures. The associations between anchors and outcome measures were assessed using Spearman correlation. The discrimination between the anchors (trichotomized) and outcome measures was assessed using parametric or non-parametric tests. Each anchor was ranked (1[weakest]-5[best]) based on the strength of the correlation (convergent validity) and significance of p value for trichotomized variables (discriminant validity) vs. each outcome measure. Due to skewness in the distributions, the median of the rankings for each anchor was used to identify anchors with the best convergent and discriminant validity.

Results: 200 patients completed the baseline visit. The mean (SD) age was 50 (11.9) yrs, disease duration was 2.4 (1.6) yrs, modified Rodnan skin score was 20.6 (10.1), and HAQ-DI was 0.96 (0.79). All 8 anchors have face validity. MD global, Pt. global, and Pt-activity skin have content validity as they assess overall SSc skin involvement [major feature of the SSc]. There were high correlations between the 3 MD anchors (r = 0.57–0.69) but wide variation for Pt anchors (r = 0.17–0.58). The pt. anchors complemented MD anchors (r = 0.18–0.47). Among the MD-administered anchors, global assess-
ment had the best convergent and discriminant validity (Table). Of the patient-administered anchors, patient global assessment and pain had the best convergent and discriminant validity (Table).

**Table 1.** Discriminant ability of health state utility value measures.

<table>
<thead>
<tr>
<th>Disease Severity Measure</th>
<th>SG</th>
<th>TTO</th>
<th>VAS</th>
<th>SF-6D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician’s Global Assessment</td>
<td>-2</td>
<td>90.16</td>
<td>85.22</td>
<td>75.15</td>
</tr>
<tr>
<td>(0-10)</td>
<td>2-6</td>
<td>82.25</td>
<td>74.30</td>
<td>63.20</td>
</tr>
<tr>
<td>Digital Tip Ulcers</td>
<td>&gt;6</td>
<td>80.24</td>
<td>67.31</td>
<td>63.20</td>
</tr>
<tr>
<td>Rodnan score</td>
<td>&gt;0</td>
<td>84.22</td>
<td>76.77</td>
<td>67.19</td>
</tr>
<tr>
<td></td>
<td>&gt;1</td>
<td>85.26</td>
<td>82.30</td>
<td>63.21</td>
</tr>
</tbody>
</table>

**Conclusion:** All anchors (except transition anchor) have high convergent and discriminant validity. These measures will serve as key anchors in the analysis of the CRiSS longitudinal database and the development of a composite index.

**Disclosure:** D. Khanna, Actelion Pharmaceuticals US, 2; Gilead, 2; Actelion Pharmaceuticals US, 5; Bayer Pharmaceuticals, 5; Gilead, 5; Sanofi-Aventis Pharmaceutical, 5; DIGNA, 5; Pfizer Inc, 5; Roche Pharmaceuticals, 5; NIH, 2; Actelion Pharmaceuticals US, 8; United Therapeutics, 8; V. Berrocal, None; R. J. Seibold, Actelion Pharmaceuticals US, 5, Genzyme Corporation, 5, P. A. Merkel, Actelion Pharmaceuticals US, 5, Genzyme Corporation, 5, Celgene, 2, Genentech and Biogen Idec Inc., 2; Bristol-Myers Squibb, 2; Human Genome Sciences, Inc., 2; Prodiscus, 2; M. D. Mayes, None; K. Phillips, None; R. W. Simms, None; S. Assassi, Savient Pharmaceuticals, 5; P. J. Clements, None; D. E. Forrest, Abbott, Actelion, Amgen, BMS, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 2; Abbott, Actelion, Amgen, BMS, Genentech, Centocor, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 5; Abbott, Actelion, UCB, 8.

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1. UCLA Medical School, Los Angeles, CA, 2Medimmune LLC, Gaithersburg, MD, 3OptumInsight, Eden Prairie, MN, 4Medimmune, LLC, Gaithersburg, MD.

**Background/Purpose:** Systemic sclerosis (SSc) is a chronic connective tissue disease affecting the skin and/or internal organs. Data on US economic burden of SSc is scant or old. The objective of this study was to estimate the medical costs and health care resource utilization of subjects with newly diagnosed and existing SSc in a large national US insurer.

**Methods:** Subjects at least 18 years of age and with claims-based evidence of SSc (ICD-9-CM 710.1x) were identified from a health plan database during 2003–2008. Subjects were divided into two cohorts; newly diagnosed and existing based on claims history of SSc. Subjects were matched using a ratio of 1:3 to unaffected controls, based on demographic and clinical characteristics. Healthcare costs and resource use were captured during a 12 month post-index period. A generalized linear model (GLM) was used to predict costs, controlling for demographic and clinical characteristics.

**Results:** 1,103 subjects with newly diagnosed SSc were matched to 3,309 controls, and 1,648 existing SSc subjects were matched to 4,944 controls. Mean overall annual healthcare costs were substantively higher among newly diagnosed subjects than matched controls ($18,934 vs. $5,508, p < 0.001) and among existing disease subjects than matched controls ($17,365 vs. $5,508, p < 0.001). Ambulatory costs were the largest driver of overall costs among both newly diagnosed and existing SSc subjects (mean annual ambulatory costs = $7,455 newly diagnosed; $6,713 existing). When adjusting for clinical and demographic characteristics (including comorbid conditions) with a GLM, the cost ratio of newly diagnosed SSc subjects to controls was 2.132 (95%CI: 1.84–2.47), and the cost ratio of subjects with existing SSc to controls was 1.988 (95%CI: 1.77–2.23). Predictors for higher costs after controlling for other variables were: evidence of lung disease, GI bleeding, renal disease, use of systemic corticosteroids, or drugs used to treat pulmonary hypertension (PAH)(all p < 0.001). Significantly higher proportions of newly diagnosed and existing SSc subjects had post-index ambulatory visits, primary care physician visits, specialist visits, emergency department visits, and inpatient hospital stays (all p < 0.001) than matched controls. Of the selected medications studied, a greater proportion of SSc subjects (both newly diagnosed and existing) than controls had claims for systemic corticosteroids, methotrexate, mycophenolate mofetil, cyclophosphamide, bosentan, and sildenafil (all p < 0.001).

**Conclusion:** Medical costs and resource use associated with treating either new or existing SSc are high (compared to unaffected controls), and subjects with serious disease complications experience the highest costs. These findings emphasize the need to develop more effective therapeutic management strategies for multi-system diseases like SSc.

**Disclosure:** D. E. Forst, Abbott, Actelion, Amgen, BMS, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 2; Abbott, Actelion, Amgen, BMS, BiogenIdec, Centocor, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 8; Abbott, UCB, 8; A. W. Fernandes, Medimmune LLC, 5; S. R. Iorga, Medimmune LLC, 9; W. Greth, Medimmune LLC, 3; T. Bancroft, Medimmune, LLC, 9.
Smoking Is Associated with Worse and More Widespread Pain, Worse Disease Activity, Function, Fatigue and Health Related Quality of Life in Patients with Axial Spondyloarthritis—Results From a Population Based Cohort.

Background/Purpose: In subjects with early axial Spondyloarthritis (SpA) smoking has recently been associated with earlier onset of disease, worse lesions of the sacroiliac joints and in later stages syndesmophyte progression. The aim was to study associations of smoking habits with self-reported information in a large population based cohort of patients with axial SpA.

Methods: A cross-sectional questionnaire survey performed in 2009 included all health care seeking subjects aged ≥18 years with a diagnosis of SpA according to ICD 10 codes identified by a regional health care register (n = 3711). Smoking habits were studied in patients with ankylosing spondylitis (AS, ICD M45) and in patients who fulfilled criteria for "non AS axial SpA" (without having one of AS). Criteria for non AS axial SpA were based on data from the questionnaire: pain for 3 months or more during the last 12 months together with 2 or more features out of 5 (inflammatory back pain, history of psoriasis, uveitis/tendinitis, inflammatory bowel disease or heredity). The questionnaire included data on smoking (never smokers vs. ever smokers), disease activity (BASDAI) physical function (BASFI), general health (BAS-G) all measured with numerical rating scales 0–10 (best to worst), health related quality of life (EQ-5D, 0–1 worst to best), pain, fatigue (numerical rating scales 0–10 best to worst) and number of painful regions noted on a pain mannequin (0–16 best to worst). Linear regression analysis was performed and all data were controlled for sex and age.

Results: Response rate was 76% whereof 2167 (58%) returned the questionnaire and 18% declined participation in the study. 598 subjects had an AS diagnosis and 572 fulfilled the criteria for non AS axial SpA. The AS group had a mean age of 54 (SD 14) years and 35% were women. Never smokers constituted 48% of the AS group. Ever smokers had worse scores in all studied variables compared with never smokers.

The linear regression analysis showed that ever smokers in the AS group had worse self-reported scores in BASDAI with age-sex adjusted parameter estimate (B) = 0.60 (95% CI 0.21; 1.00), BASFI B = 0.51 (95% CI 0.11; 0.91) and fatigue B = 0.51 (95% CI 0.06; 1.00). There was a tendency to worse scores for ever smokers also in EQ-5D B = −0.04 (95% CI −0.09; 0.001).

Mean age in the non AS axial SpA group was 55 (SD 14) years and 68% were women. Never smokers constituted 38% of this group. Also in the non AS axial SpA group the linear regression analysis showed that ever smokers had worse self-reported scores in BASDAI with age-sex adjusted parameter estimate (B) = 0.59 (95% CI 0.23; 0.94), BASFI B = −0.59 (95% CI 0.17; 1.00), pain B = 0.45 (95% CI 0.08; 0.82) and fatigue B = 0.43 (95% CI 0.03; 0.83), no of painful areas B = 0.73 (95% CI 0.06; 1.46) and also in EQ-5D B = −0.06 (95% CI −0.11; −0.002).

Conclusion: In a large population based axial SpA cohort, both patients with AS and non AS axial SpA who were ever smokers reported worse clinical features compared with never smokers. Further longitudinal studies are needed to better understand cause and effect. However, smoking cessation should be recommended not only due to general health perspectives but also due to disease specific issues.

Disclosure: A. B. L. Bremaender, None; I. F. Petersson, None; E. Haglund, None; S. Bergman, None; L. T. Jacobsson, None.

96 Quality of Care: Reference and Counter Reference From Family Physicians and Rheumatologists’ perspectives- A Pilot Study.

Background/Purpose: We delineated family physicians’ and rheumatologists’ point of view when primary care is facing cases of rheumatic diseases. We also tried to identify barriers in the reference and counter reference.

Methods: This is a pilot study, transversally designed, with family physicians and rheumatologists in a single city. The methodological steps were: (1) Development and preparation of three clinical scenarios that simulate and address different levels of clinical severity; (2) application of these scenarios in the population of family physicians and rheumatologists; (3) validation of the study scenarios. The final scenarios constructed were: (a) Scenario one: a patient with an autoimmune disease presenting fever and fatigue; (b) Scenario two: a patient with fibromyalgia and with poor adherence to the healthcare plan, requiring a medication to relief the symptoms; (c) Scenario three: patient with septic arthritis, prostration, and in poor clinical conditions. The scenarios were presented to two groups of physicians, which should choose regarding three decisions: (Decision 1) To apply a healthcare plan (investigation and/or treatment) and refer to a rheumatologist; (Decision 2) to prescribe medication and do not reference to rheumatologist; and (Decision 3) to refer to a rheumatologist with no primary care intervention. Finally, a multiple-choice questionnaire addressing potential factors that lead to barriers in the reference process of and counter reference was applied. Descriptive analysis was performed to map the results.

As this was a pilot study, we used bootstrap method for constructing hypothesis tests.

Results: Twenty-two family physicians and rheumatologists were involved. Family physician’s initiative to refer to specialized care was similar to the rheumatologist’s expectation (median: 1.5 [minimum 1.5 to maximum 1.7], for family physicians and 1.6 [1.3 to 2] for rheumatologists). For Scenario one, the majority of interviewee chose Decision 1 [1.27 (1–3), SD 0.59]. For the Scenario two, respondents chose the decision 2 [2 (1–3), SD 0.76]. For the Scenario three, Decision three was the preferred [1.47 (1–3), SD 0.83]). For the reference and counter-reference system evaluation, family physicians tend to refer any clinical case that could be a rheumatic disease. They consider that there is a poor communication between family physician and rheumatologist [4.2 (2–5), SD 1.01]).

Conclusion: There is a tendency for referral to rheumatologists and a poor perception of risk. This posture can contribute to the quality of care impairment. Proper communication seems to be a hurdle for the reference and counter reference system.

Disclosure: T. D. Baumangratz, None; R. Battisti, None; M. Cuziol, None; A. C. R. Janini, None; R. A. Levy, None; M. M. Abreu, None.


Background/Purpose: Prognostic and explanatory models are frequently utilized in clinical medicine to assist in judgments about diagnosis, prognosis, and treatment options. I surveyed predictive and explanatory models in rheumatology by conducting a systematic review using a PubMed (Medicine) search of a two year period, starting January 1, 2010, and ending December 31, 2011. This identified 564 articles using the key words: “Rheumatology,” and “prediction,” “models,” “stepwise,” “regression,” “multivariate,” “survival,” “prognosis,” “propensity scores,” “cost-effectiveness,” “decision analysis,” and “diagnosis.”

Methods: Out of the 564, I identified 76 articles, which I reviewed by abstract, and of these 42 articles were selected for review of their full text for adherence to methodologic standards.

Results: Studies addressed a variety of issues including diagnosis, prognosis, identification of risk factors, biomarker studies, and disease activity. Data sets included institutional, multi-institutional, and national registries. Prospectively acquired, retrospectively acquired, and cross-sectional data was used. Regression techniques included logistic, linear, generalized estimating equation (GEE) and generalized linear model (GLM). Two studies used classification and regression trees (CART) analysis, 2 used a Bayesian approach, and one used neural network. Only one study explicitly described a power calculation. Internal validation by bootstrapping, split sample, or similar techniques was used in 13 of 42 studies, but only 4 used an external validation step. Discrimination (ROC Curves) or clinical utility (sensitivity and specificity) was described in 12 studies, but only 3 were subjected to calibration.
Conclusion: A minority of published prognostic and explanatory models adhered to established methodologic standards. Very few studies contained a validation study and those that did were small and thus subject to over fitting. Several studies provided information on discrimination; however, few of these were calibrated using data from the validation study. A consensus scoring system of prognostic and explanatory models similar to that which has been utilized for systemic reviews needs to be constructed and adopted by the rheumatologic clinical epidemiology and clinical trial community.

Disclosure: D. A. Albert, None;

98 How to Assess Risks for Pulmonary Infection in Patients Receiving Immunosuppressive Treatment for Rheumatic Diseases? A Report From a Large-Scale Prospective Cohort Study

Background/Purpose: To identify risk factors for pulmonary infection in patients with rheumatic diseases in the literature. Prophylactic measures should be taken accordingly for better benefit-risk balance of treatment.

Disclosure: H. Yamazaki, None; R. Sakai, None; R. Koike, None; Y. Miyazaki, None; M. Tanaka, None; T. Nanki, None; K. Watanabe, None; S. Yasuda, None; T. Kurita, None; Y. Kaneko, None; Y. Tanaka, Bristol-Myers Squibb KK, 2, MSD KK, 2, Chugai Pharmaceutical, 2, Mitsubishi Tanabe Pharma, 2, Astellas Pharma, 2, Abbot Japan, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 5, Abbott Japan, 2, Pfizer, 2, Chugai Pharmaceutical, 2, Janssen Pharmaceutical KK, 2, Sanken Pharmaceutical, 2, Pfizer Japan, 2, Astellas Pharma, 2, Daiichi Sankyo, 2, Y. Nishiolho, Chugai Pharmaceutical, 2, Pfizer Japan, 2, Abbott Japan, 2, Biostet-Myers Squibb KK, 2, Y. Takasaki, None; K. Nagasaka, None; K. Amano, Chugai Pharmaceutical, 2, Abbott Japan, 2, Astellas Pharmaceutical KK, 2, S. Tohma, Pfizer Japan, 2, Esi, 2, Chugai Pharmaceutical, 2; M. Doi, None; T. Sugihara, None; H. Sugiyama, None; Y. Kawaguchi, None; N. Inose, None; S. Ochi, None; H. Hagiyama, None; N. Miyasaka, Abbott Japan, 2, Astellas Pharma, 2, Chugai Pharmaceutical, 2, Daiichi Sankyo, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 2, Taketa Pharmaceutical, 2, Tejin Pharma, 2, Bristol-Myers Squibb KK, 2; M. Harigai, Abbott Japan, 2, Astellas Pharma, 2, Bristol-Myers Squibb KK, 2, Chugai Pharmaceutical, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 2, Santen Pharmaceutical, 2, Takeda Pharmaceutical, 2, Pfizer Japan, 2.

99 Cancer Incidence and Type of Malignancy in Rheumatologic Diseases in Korea: Head-to-Head Comparison

Background/Purpose: Rheumatic diseases (RD) are associated with increased risk of developing cancer. However, it remains to be defined, if particular cancers are more frequent in certain rheumatic diseases. To address this, the incidence and site of cancer were analyzed in a large cohort of patients with rheumatoid arthritis (RA), dermatomyositis/polymyositis (DM/PM), systemic sclerosis (SSc), systemic lupus erythematosus (SLE) and ankylosing spondylitis (AS).

Methods: All patients with a confirmed diagnosis of a RA, AS, SLE, DM/PM, and SSc who underwent clinical care in our institution between January 2000 and April 2012 were enrolled in this retrospective study. Data on site, staging, treatment, and outcome of cancer were ascertained per chart review. The cancer incidence rates in RDs were compared with those of the National Cancer Registry and standardized incidence ratios (SIR) were calculated.

Results: A total of 4,726 patients with RD (female, 71.0 %) were analyzed. During the follow-up duration of 34,447 person-years (PY), 244 (female, 71.7 %) patients developed cancer with an overall incidence rate of 4.2 %. The SIR of cancer was significantly higher at 1.7 in patients with RD (95 % confidence interval (CI), 1.51–1.90) than the general population.

Conclusion: This is the first large-scale, prospective study identifying risk factors for pulmonary infection in patients receiving immunosuppressive treatment in rheumatic diseases. It will provide useful information for better benefit-risk balance of treatment.

Disclosure: N. Inase, None; S. Ochi, None; H. Hagiyama, None; N. Miyasaka, Abbott Japan, 2, Astellas Pharma, 2, Chugai Pharmaceutical, 2, Daiichi Sankyo, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 2, Taketa Pharmaceutical, 2, Tejin Pharma, 2, Bristol-Myers Squibb KK, 2; M. Harigai, Abbott Japan, 2, Astellas Pharma, 2, Bristol-Myers Squibb KK, 2, Chugai Pharmaceutical, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 2, Santen Pharmaceutical, 2, Takeda Pharmaceutical, 2, Pfizer Japan, 2.

Table 1. Multivariate analysis using COX hazard regression models in all patients with rheumatic diseases and in these patients excluding articular RA patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All patients (n = 766)</th>
<th>p value</th>
<th>Patients excluding articular RA patients (n = 621)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>4.86 (2.79–8.58)</td>
<td>&lt;0.01</td>
<td>4.80 (2.64–8.64)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Female</td>
<td>1.07 (0.55–2.09)</td>
<td>0.84</td>
<td>1.12 (0.56–2.23)</td>
<td>0.75</td>
</tr>
<tr>
<td>Charlson index</td>
<td>2.80 (1.35–5.04)</td>
<td>0.01</td>
<td>2.69 (1.34–5.22)</td>
<td>0.01</td>
</tr>
<tr>
<td>Scleroderma (SC)</td>
<td>1.63 (1.14–3.31)</td>
<td>0.01</td>
<td>1.23 (1.07–1.41)</td>
<td>0.01</td>
</tr>
<tr>
<td>Performance status (III or IV)</td>
<td>1.72 (0.55–5.74)</td>
<td>0.04</td>
<td>1.88 (0.57–6.53)</td>
<td>0.04</td>
</tr>
<tr>
<td>Maximum dose of PSL, 0–2W</td>
<td>3.57 (1.44–8.81)</td>
<td>0.01</td>
<td>2.12 (0.82–5.48)</td>
<td>0.12</td>
</tr>
<tr>
<td>Number of patients, 0–2W</td>
<td>0.97 (0.62–1.54)</td>
<td>0.91</td>
<td>0.99 (0.62–1.57)</td>
<td>0.96</td>
</tr>
<tr>
<td>Use of immunosuppressant, 0–2W</td>
<td>0.92 (0.63–1.35)</td>
<td>0.49</td>
<td>0.81 (0.44–1.46)</td>
<td>0.49</td>
</tr>
<tr>
<td>Use of biologics, 0–2W</td>
<td>1.40 (0.52–3.77)</td>
<td>0.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RA, rheumatoid arthritis; HR, hazard ratio; 95% CI, 95% confidence interval; C, control; PSL, prednisolone; sCr, serum creatinine.

Performance status was graded using the Eastern Cooperative Oncology Group scale. 0–2W, duration during first two weeks from the enrollment of the study.

Disclosure: H. Yamazaki, None; R. Sakai, None; R. Koike, None; Y. Miyazaki, None; M. Tanaka, None; T. Nanki, None; K. Watanabe, None; S. Yasuda, None; T. Kurita, None; Y. Kaneko, None; Y. Tanaka, Bristol-Myers Squibb KK, 2, MSD KK, 2, Chugai Pharmaceutical, 2, Mitsubishi Tanabe Pharma, 2, Astellas Pharma, 2, Abbot Japan, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 5, Abbott Japan, 2, Pfizer, 2, Chugai Pharmaceutical, 2, Janssen Pharmaceutical KK, 2, Sanken Pharmaceutical, 2, Pfizer Japan, 2, Astellas Pharma, 2, Daiichi Sankyo, 2, Y. Nishiolho, Chugai Pharmaceutical, 2, Pfizer Japan, 2, Abbott Japan, 2, Biostet-Myers Squibb KK, 2, Y. Takasaki, None; K. Nagasaka, None; K. Amano, Chugai Pharmaceutical, 2, Abbott Japan, 2, Astellas Pharmaceutical KK, 2; S. Tohma, Pfizer Japan, 2, Esi, 2, Chugai Pharmaceutical, 2; M. Doi, None; T. Sugihara, None; H. Sugiyama, None; Y. Kawaguchi, None; N. Inose, None; S. Ochi, None; H. Hagiyama, None; N. Miyasaka, Abbott Japan, 2, Astellas Pharma, 2, Chugai Pharmaceutical, 2, Daiichi Sankyo, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 2, Taketa Pharmaceutical, 2, Tejin Pharma, 2, Bristol-Myers Squibb KK, 2; M. Harigai, Abbott Japan, 2, Astellas Pharma, 2, Bristol-Myers Squibb KK, 2, Chugai Pharmaceutical, 2, Esi, 2, Janssen Pharmaceutical KK, 2, Mitsubishi Tanabe Pharma, 2, Santen Pharmaceutical, 2, Takeda Pharmaceutical, 2, Pfizer Japan, 2.
cervix, and 2 (7.1%) colon cancer. In SLE, thyroid cancer was most common with 12 (16.2%) cases, followed by 7 (9.5%) breast, 7 (9.5%) cervix, and 7 (9.5%) liver and intrahepatic bile duct cancers. In AS, liver cancer was common with 3 (17.9%) cases, followed by 2 (12.5%) lymphoid leukemia, and 2 (12.5%) thyroid cancer.

Table 1. Standardized incidence ratios (SIRs) and 95% confidence interval (CI) of cancer in rheumatic diseases.

<table>
<thead>
<tr>
<th>Rheumatologic disease</th>
<th>Person-year (P)</th>
<th>Observed cases</th>
<th>Expected cases</th>
<th>SIR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All rheumatic diseases</td>
<td>34,447</td>
<td>244</td>
<td>197</td>
<td>1.7</td>
<td>1.51-1.90</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>8,230</td>
<td>132</td>
<td>72</td>
<td>1.81</td>
<td>1.52-2.14</td>
</tr>
<tr>
<td>Dermatomyositis/Polyomysitis</td>
<td>1,988</td>
<td>39</td>
<td>12.5</td>
<td>3.11</td>
<td>2.21-4.16</td>
</tr>
<tr>
<td>Systemic Sclerosis</td>
<td>3,094</td>
<td>28</td>
<td>19.6</td>
<td>1.43</td>
<td>0.94-2.01</td>
</tr>
<tr>
<td>Systemic Erythematous Lupus</td>
<td>12,118</td>
<td>74</td>
<td>44.9</td>
<td>1.65</td>
<td>1.29-2.04</td>
</tr>
<tr>
<td>Ankylosing Spondylitis</td>
<td>7,709</td>
<td>16</td>
<td>17.8</td>
<td>1.11</td>
<td>0.51-1.39</td>
</tr>
</tbody>
</table>

Conclusion: To the best of our knowledge, this is the first study to show different malignancy risks among rheumatologic diseases in a head-to-head comparison. As particular cancer types are more frequent in certain rheumatic diseases, patients might benefit from cancer surveillance tailored to their RD.

Disclosure: S. H. Chang, None; J. K. Park, None; E. B. Lee, None.

100 Further Evidence On Biased Cancer Risk Estimation In Studies Comparing A Subpopulation To The General Population. Koray Tascilar1 and Hasan Yazici2.

Background/Purpose: We had previously proposed a selection bias in studies estimating cancer risk in patients with rheumatoid arthritis (RA) stemming from the comparison of a selected subpopulation to the general population (Arthritis Rheum. 2011;63:2543-4). Biased estimates would be the result of a) a death of a part of the subpopulation due to cancer before being selected, b) prevention of an autoimmune/inflammatory condition by cancer treatment and c) a lower probability of being selected/detected merely because of having cancer. These would cause the rate of accumulation of cancer cases in the selected subpopulation to be lower than that in the general population and hence a decrease in the comparative incidence if tracked over time. We had also demonstrated such a decrease in the comparative incidence over time in studies reporting cancer risk in RA patients (Ann Rheum Dis 2012;71(Suppl3):456). We conducted a systematic literature search to see whether such a bias exists in studies reporting the cancer risk in other autoimmune/inflammatory disorders.

Methods: We conducted multiple PubMed searches using the search terms “polymyositis”, “dermatomyositis”, “sarcoidosis”, “psoriasis”, “Crohn’s”, “ulcerative”, “lupus”, “SLE”, “Sjogren”, “ANA”, “polyarteritis”, “Wegener”, “polynephritis”, “vasculitis”, and “scleroderma” between June 2001 and February 2012. We combined these terms with “cancer” and “standardized” to capture studies that reported standardized incidence ratios or standardized morbidity ratios. We retrieved full-text manuscripts of studies that reported comparative incidence studies. Studies that reported multiple incidence ratios with respect to follow-up time were included.

Results: Our search identified 192 articles and we retrieved 36 articles of relevance in full-text. Among the 36 articles retrieved, 10 reported incidence comparison of overall cancer at multiple timepoints. There were 3 studies on inflammatory myopathies, 1 study each with scleroderma, Wegener’s granulomatosis, ulcerative colitis, Crohn’s disease, polymyositis, SLE and sarcoidosis. Number of timepoints ranged from 2 to 10, sampling period ranged from 10 to 48 years. The comparative incidence at the latest timepoint was lower in 9 of the 10 articles by 56 to 98% as compared to the earliest.

Conclusion: We provide further evidence that current methods of comparison of cancer incidence in a selected subpopulation to the general population results in biased estimates.

Disclosure: K. Tascilar, None; H. Yazici, None.

101 Kidney Function and the Risk of Incident Gout in A Population-Based Cohort of Adults: Atherosclerosis Risk in Communities Study. Mara McAdams DeMarco1, Anna Kogten2, Andrew Law3, Janet W. Maynard4, Josef Coren1 and Alan N. Bachtel. Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, 2University Hospital Freiburg, Freiburg, Germany, 3Johns Hopkins, Baltimore, MD, 4Johns Hopkins University School of Medicine, Division of Rheumatology, Baltimore, MD

Background/Purpose: The 1-year cumulative incidence of gout in patients with new onset end stage renal disease is 5% and rises to 15% by 5 years, far exceeding the risk in the general population. This higher prevalence of gout could be explained by hyperuricemia as a consequence of reduced renal function and subsequent development of gout due to common risk factors. Although the risk of developing gout is high among those with end stage renal disease, the risk of gout for those with moderate kidney dysfunction is unclear. We estimated the risk of developing gout over a range of estimated glomerular filtration rate (eGFR) values in participants enrolled in the Atherosclerosis Risk in Communities (ARIC) cohort study.

Methods: ARIC is a prospective population-based cohort recruited in 1987–1989 from 4 US communities, consisting of 4 visits over 9 years. Participants were included in this analysis if they answered the gout query and were free of gout at baseline. Incident gout was defined as self-reported onset after baseline. Serum creatinine was estimated using a modified kinetic Jaffe reaction. Glomerular filtration rate (eGFR) was estimated using the CKD-Epi equation and categorized as ≥90, 60–90, or <60 ml/min/1.73 m². Using a Cox Proportional Hazards model (age as time scale), we estimated the hazard ratio (HR) and 95% confidence intervals (CI) of incident gout by baseline eGFR, adjusted for confounders (sex, race, and center) and clinical factors (diuretic use, diabetes, hypertension, obesity, and alcohol intake). Additionally, we adjusted for visit 2 serum urate level (measured with the uricase method) to test for mediation.

Results: A total of 10,871 ARIC participants met the study criteria. The study population was 43% male, 21% African American and the mean age at cohort entry was 54 years (SD=5.7). The mean eGFR was 92 (SD=14.9) ml/min/1.73 m². At baseline, 217 (2%) participants were classified as having eGFR<60 ml/min/1.73 m²; 4,502 (41%) with an eGFR between 60 and 90 ml/min/1.73 m²; and 6,152 with an eGFR ≥90 ml/min/1.73 m² (57%). There were 274 incident gout cases. The results are presented in the table. After accounting for confounders and clinical factors, a 10 ml/min/1.73 m² decrease in eGFR was associated with increased risk of gout (HR=1.15, 95% CI: 1.10–1.25). Compared to those with an eGFR ≥90, the adjusted HR of incident gout was 1.13 (95% CI: 0.88–1.46) for those with an eGFR between 60 and 90 ml/min/1.73 m² and 2.57 (95% CI: 1.58–4.17) for those with an eGFR<60 ml/min/1.73 m². eGFR was not associated with incident gout after accounting for V2 serum urate level, suggesting full mediation. There was no evidence of effect measure modification by race (p=0.46) or sex (p=0.39).

Table. Risk of Gout by eGFR

<table>
<thead>
<tr>
<th>eGFR</th>
<th>HR of Gout (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60</td>
<td>1.11 (1.03, 1.22)</td>
<td>0.004</td>
</tr>
<tr>
<td>60–90</td>
<td>1.08 (0.84, 1.38)</td>
<td>0.57</td>
</tr>
<tr>
<td>&lt;90</td>
<td>2.80 (1.74, 4.50)</td>
<td>0.0001</td>
</tr>
<tr>
<td>&lt;60</td>
<td>1.18 (1.09, 1.27)</td>
<td></td>
</tr>
<tr>
<td>60–90</td>
<td>1.17 (0.91, 1.51)</td>
<td></td>
</tr>
<tr>
<td>&lt;60</td>
<td>2.93 (1.82, 4.73)</td>
<td></td>
</tr>
<tr>
<td>&lt;90</td>
<td>1.15 (1.10, 1.25)</td>
<td>0.0003</td>
</tr>
<tr>
<td>60–90</td>
<td>1.13 (0.88, 1.46)</td>
<td></td>
</tr>
<tr>
<td>&lt;60</td>
<td>2.57 (1.58, 4.17)</td>
<td></td>
</tr>
</tbody>
</table>

Model 1: Unadjusted
Model 2: Adjusted sex, race, and center
Model 3: Adjusted sex, race, center, diuretic use, hypertension, diabetes, obesity, continuous alcohol intake
Model 4: Adjusted sex, race, center, diuretic use, hypertension, diabetes, obesity, continuous alcohol intake, serum urate level at visit 2.

Disclosure: None.
**Conclusion:** Moderately reduced kidney function was associated with a 2.6-fold increased risk of joint independent of comorbid conditions. These findings suggest that kidney function may be a risk factor for gout that is partially mediated by increased serum urate levels.

**Disclosure:** M. McAdams DeMarco, Takeda Pharmaceuticals; 2. A. Kottgen, None; A. Law, None; J. W. Maynard, None; J. Coren, None; A. N. Baer, Takeda Pharmaceuticals, 2.

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**ACR Poster Session A**

**Imaging of Rheumatic Diseases:**

**Ultrasound, Nuclear Medicine and Fluorescence Imaging**

**Sunday, November 11, 2012, 9:00 AM–6:00 PM**

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**Sonographic Assessment of Normal Peripheral Joints: Evaluation According to Demographics Parameters.** Flavia S. Machado, Rita N.V. Furtado, Rogério D. Takahashi, Ana Leticia P. de Buosi and Jamil Natour. Universidade Federal de São Paulo, São Paulo, Brazil

**Background/Purpose:** To describe quantitative and semiquantitative joint sonography measurements in healthy people and compare them among different demographic parameters.

**Methods:** Bilateral ultrasound measurements of small, medium and large joints were performed in 130 healthy volunteers, stratified into five age groups (A: 18–29; B: 30–39; C: 40–49; D: 50–59; E: 60–80 years). Forty six joint recesses per patient were studied: radiocarpal, distal radioulnar, ulnocarpal, 2nd metacarpophalangeal (MCP) (dorsal, palmar, radial), 3rd MCP (dorsal, palmar), 2nd and 3rd proximal interphalangeal joint of the hand (dorsal, palmar), coronoid fossa; olecranon fossa, glenohumeral (GU) axillary recess, posterior GU recess, hip, knee, talocrural, talonavicular, subtalar, dorsal 1st metatarsophalangeal joint (MTP), dorsal 2nd MTP and 5th MTP (dorsal, lateral). Quantitative measurements of synovial recess (QSR) and semiquantitative measures of synovial hypertrophy (SSH), Power Doppler (SPD), bone erosion (SBE) (score 0–3) and articular cartilage (AC) (score 0–4) were performed by a blinded radiologist using a linear probe (6–18 MHz; Esaote, Genoa, Italy). Sonographic measurements were correlated with age group and other demographic parameters.

**Results:** Five thousand nine hundred and eighty joint recesses were studied in 130 healthy adults; mean age 44.84, 76.9% women, 62.3% white. The highest values of QSR were found in the hip (6.35mm), axillary GU (2.46mm) and posterior GU (2.45mm). The joint recess with greater frequency of supposed pathological scores were: 2nd MTP (78.8%) and 1st MTP (69.3%) for SSD; radiocarpal (77.7%) and 1st MTP (15.8%) for SPD; posterior GU recess (23.1%) and ulnocarpal (4.2%) for SBE. The highest QSR and the worst SSH measurement (p<0.02) were observed in age groups D and E and the worst SPD and SBE (p< 0.041) were observed in age group E. Minor AC changes (score 1) (p<0.001) were observed in age groups D and E. There were positive correlations among ultrasound measurements with height, age, weight and body mass index (BMI) in 26.1%, 34.8%, 43.5% and 43.5%, respectively, of all the articular recesses studied.

**Conclusion:** Articular sonographic measurements were performed in several types of joints in healthy adults at different age groups. Mainly synovial hypertrophy, but also Power Doppler, bone erosions and articular cartilage were associated with the worst measurements scores at oldest age groups.

**Disclosure:** F. S. Machado, None; R. N. V. Furtado, None; R. D. Takahashi, None; A. L. P. de Buosi, None; J. Natour, None.

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**A Pragmatic Musculoskeletal Ultrasound Screening Protocol Does Not Add to a Predictive Algorithm for Persistent Inflammatory Arthritis in a UK Early Arthritis Clinic.** Arthur G. Pratt1, Alice R. Lorenzi2, Gillian Wilson3, Philip N. Platt4 and John D. Isaacs3. 1Newcastle University, Newcastle Upon Tyne, United Kingdom, 2Freeman Hospital, Newcastle upon Tyne, United Kingdom, 3Musculoskeletal Research Group, Institute of Cellular Medicine, Newcastle University and Newcastle upon Tyne NHS Foundation Trust, Newcastle Upon Tyne, United Kingdom

**Background/Purpose:** Analyses of large clinical datasets from early arthritis cohorts permit the development of algorithms that may be used for outcome prediction in individual patients. The value added by routine use of musculoskeletal ultrasound (MSUS) in an early arthritis setting, as a component of such predictive algorithms, remains to be determined.

**Methods:** A retrospective analysis of a large, true-to-life, observational inception cohort of early arthritis patients in Newcastle, UK, which included patients with inflammatory arthralgia but no clinically swollen joints, was undertaken. All patients underwent a pragmatic, 10 minute MSUS assessment prior to their first visit. Logistic regression was used to develop two “risk metrics” that predicted the development of a persistent inflammatory arthritis (PIA), their derivation differing only according to whether or not MSUS parameters were allowed to be incorporated into the final prediction model.

**Results:** 379 included patients were assigned definitive outcome diagnoses after ≥12 months follow-up (median 28 months), of whom 162 (42%) developed a persistent inflammatory arthritis. A simple risk metric, derived purely from 12 readily obtainable baseline clinical and serological parameters, had an excellent discriminatory utility with respect to an outcome of PIA (area under ROC curve 0.91; 95% CI 0.88–0.94). A similar metric, derived from the same 12 parameters in addition to 5 MSUS parameters, had an almost identical, and not significantly superior, discriminatory utility (area under ROC curve 0.91; 95% CI 0.89–0.94).

**Conclusion:** MSUS use as a routine component of assessment in an early arthritis clinic does not add substantial discriminatory value to a risk metric for predicting PIA. More work is needed to refine a precise role of this imaging modality as a diagnostic tool in this clinical setting.

**Disclosure:** A. G. Pratt, None; A. R. Lorenzi, None; G. Wilson, None; P. N. Platt, None; J. D. Isaacs, None.

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**The Usefulness of A NEW Musculoskeletal ULTRASOUND Scoring System of the Hands and Wrist Joints (US10) for Evaluation of EARLY Rheumatoid Arthritis Patients.** Karine R. Luz, Rita N.V. Furtado, Marcelo M. Pinheiro, Giovanna S. Petterle and Jamil Natour. Universidade Federal de São Paulo, São Paulo, Brazil

**Background/Purpose:** Ultrasound (US) can be a useful tool for monitoring rheumatoid arthritis (RA). However, it can be time consuming when applied to too many joints as there is lack of uniformly standardised scoring system. Thus the aim of the present study was to propose a new US score of the hands and wrist joints (US10) and to evaluate its correlation with clinical, laboratory and functional status during a 48-weeks follow-up.

**Methods:** Forty-eight early RA patients with less-than-1 year symptom with no previous use of disease-modifying antirheumatic drugs (DMARD) were enrolled on the study. The patients underwent clinical, laboratory assessment and blinded US examination at baseline, 3, 6, 9 and 12 months. The US10 included the following joints: wrist, second and third metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints. This score was

**Conclusion:** US10 can be a useful tool for monitoring RA. However, it can be time consuming when applied to too many joints. A new US score of the hands and wrist joints (US10) was proposed and evaluated at baseline, 3, 6, 9 and 12 months. The US10 includes the following joints: wrist, second and third metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints. This score was

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leading to spondyloepiphysial dysplasia, and to focal bone destruction. If either condition was met the joint was classified as supporting the diagnosis of RA ("RA-supported"). The findings were categorized according to joint damage: a qualitative (0–1) and quantitative (0–3) scoring to bone erosions (ERQ10, range of 0–12; ERSQ10, range of 0–36) and to cartilage damage (CAQ10, range of 0–4; CASQ10, range of 0–12). The following were clinical and laboratory assessments: C-reactive protein level (CRP), 28-joint Disease Activity Score (DAS 28) and Health Assessment Questionnaire (HAQ). All patients were treated with the same protocol of treatment and by just one rheumatologist.

Results: The mean ± duration of the symptoms was 7.58 (± 3.59) months. All patients had high activity disease with mean ± DAS 28 of 6.50 (± 1.29). At baseline, there was significant correlation between all US parameters for inflammation (p<0.05) and the US parameters for joint damage (ERQ10, ERSQ10 and CASQ10) also had a good significant correlation (p<0.05) with synovial proliferation parameters. Besides, significant correlation (p<0.05) between all the US10 parameters for inflammation and CRP was observed. In addition, the PD and tenosynovitis scores showed a significant correlation (p<0.05) with DAS28. Longitudinal changes through out 12 months for the inflammation parameters (SPQ10, SPSQ10, GSTN and PD TN) and for bone erosions scores showed a highly significant correlation (p<0.05). There was a significant correlation between changes in the US parameters for synovial proliferation for tendovasosis and the DAS28 changes (SPQ10/DAS28: r=0.33, p<0.05; SPSQ10/DAS28: r=0.30, p<0.05; TNQ10/DAS28: r=0.48, p<0.05; TNQPD10: r=0.48, p<0.05) in a 12-month period. After one year, there was also a significant correlation between changes in the inflammation scores, in the CRP and in HAQ.

Conclusion: A new US scoring system of hand and wrist joints (US10) seemed to be a useful tool to monitor inflammation and joint damage in early RA patients with a significant correlation to longitudinal changes of disease activity criteria.

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Combined Synovial and Structural Ultrasound Score for the Diagnosis of RA. Gary A. Kunkel, Grant W. Cannon and Daniel O. Clegg. George E. Wahlen VA Medical Center, Salt Lake City, UT

Background/Purpose: Current ultrasonographic scoring systems used to assess the degree of finger joint synovitis in rheumatoid arthritis (RA) are not designed for distinguishing healthy or osteoarthritis (OA) patients from those with RA in clinical settings. In this pilot study we explore a novel scoring approach using structural as well as quantitative synovial ultrasonographic features to distinguish between healthy and OA finger joints and those with RA.

Methods: 22 patients with RA, 16 healthy controls, and 14 OA controls received a comprehensive ultrasound of one hand’s metacarpophalangeal and proximal interphalangeal joints, with scores assigned using a modification of a previously reported RA scoring system called the Semiquantitative Synovial Score (SSS), and using the novel approach called the Combined Structural/Synovial Score (CSSS). The SSS relied on the presence or absence of hypoechoic synovial tissue/fluid bulging over the lines between the joint-forming bones or extending to the diaphysis. If either condition was met the joint was classified as supporting the diagnosis of RA (“RA-supported”). The CSSS utilized structural features of osteophyte and erosion, as well as measured thickness of the synovial cavity over the bony diaphysis and Doppler signal. If >1+ Doppler signal, >2mm of synovial thickness, or an erosion >1mm in two orthogonal planes was imaged the joint was classified as “RA-supported.” The number of joints classified as “RA-supported” was tallied for each of the two scoring methods. Sensitivity and specificity for each method were calculated with respect to the clinical diagnosis of RA, and receiver operating characteristic (ROC) curves plotted across the range of possible scoring cutoffs.

Results: The SSS was highly sensitive (100%), but without specificity (0%) for the diagnosis of RA, when RA was defined as having more than 1 joint classified as “RA-supported.” The CSSS had high sensitivity (95%) and moderate specificity (77%) when RA was defined as having any joint classified as “RA-supported.” Moderate sensitivity (73%) and high specificity (97%) were found when having more than 1 joint classified as “RA-supported” was required to diagnose RA. Results of a sensitivity analysis of several different variations of the CSSS show some differences in the sensitivity and specificity of this system when different parameters are used such as volar or dorsal-only scans.

<table>
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<tr>
<th>Characteristics</th>
<th>Combined Structural/ Synovial Score</th>
<th>Combined Structural/ Synovial Score</th>
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<td>Sensitivity-RA: 1</td>
<td>Specificity-O: 0.95</td>
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<td></td>
<td>Specificity-H: 0.94</td>
<td>Specificity-All: 0.77</td>
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<tr>
<td></td>
<td>Specificity-H: 0.93</td>
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Conclusion: A novel combined structural and quantitative synovial hand joint scoring system was capable of distinguishing OA and healthy controls from RA patients in this pilot evaluation.

Disclosure: G. A. Kunkel, None; G. W. Cannon, None; D. O. Clegg, None.

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Development of a 6 Joint Simplified Ultrasonographic Score to Assess Disease Activity in Patients with Rheumatoid Arthritis. Tomas Cazenave1, Christian A. Waimann2, Gustavo Citera1 and Marcos G. Rosenfel1.

1Instituto de Rehabilitacion Psicosferica, Buenos Aires, Argentina, 2Instituto de Rehabilitacion Psicosferica, Buenos Aires, Argentina, 3Instituto de Rehabilitacion Psicosferica, Buenos Aires, Argentina

Background/Purpose: Ultrasound has become a routinely available bedside method for the evaluation of patients with Rheumatoid Arthritis (RA). However, it is time consuming, making it difficult to use in daily clinical practice. The aim of our study was to develop a new standardized ultrasonographic score including only 6 joints that could be applied to daily monitoring disease activity in patients with RA.

Methods: We included RA patients (American College of Rheumatology 1987 criteria). Each patient underwent clinical, radiological and ultrasonographic (US) evaluation. Clinical data included 28-joints count and disease activity index 28 (DAS28). Ultrasound evaluation was performed by two rheumatologists who were blind to clinical examination. Six joints were evaluated: bilateral wrist (dorsal view of radio and intracarpal joint), second metacarpophalangeal (2MCP; dorsal and palmar view), and fifth metatarso-phalangeal (5MTP; dorsal view). US synovitis was defined as a gray scale (GS) score ≥1. Synovial vascularity was assessed by power Doppler (PD) and graded from 0 to 3, according to OMERACT standards. The US score comes from the addition of the presence of synovitis (one point) and the degree PD, with a total score ranged from 0 to 4 (synovitis subscale = 0–10; PD subscale = 0–30). Final score was correlated with clinical variables (Spearman’s rho) and stratified according to patients’ disease activity (Kruskal Wallis and post-hoc tests).

Results: 124 patients were included. Mean age was 53 ± 13 years, 86% were female, and disease duration was 9.4 ± 8.5 years. Tender and swollen joints count were 3.3 ± 4 and 3.5 ± 4.5, respectively. DAS28 score was 3.8 ± 1.4. A total of 744 joints were evaluated. 548 (74%) exhibited...
ultrasoundographic changes (PD ≥1 = 35%; synovitis = 69%). 2MCP and 5MTP showed emissions in 70% and 83%, respectively. Mean ultrasonographic score was 11.4 ± 6.5 (Doppler subscale 4.8 ± 6.5; Synovitis subscale 6.6 ± 2.2). The score had a moderate correlation with swollen joint count and DAS28 (Spearman’s ρ 0.60 and 0.54, respectively; p < 0.001). The score was able to discriminate patients with high disease activity from those with moderate, low activity and remission (Remission = 8 ± 4, low activity = 9 ± 5, Moderate activity = 11 ± 5, High activity = 19 ± 8; p < 0.01). Excluding the 5MTP and synovitis subscale did not affect the results, showing an excellent correlation with primary score (Spearman’s ρ 0.98 and 0.96, respectively; p < 0.001). US examination was fast, taking 8 minutes per patient, including documentation.

Conclusion: A reduced US score of 6 joints showed to be fast and a valid tool to detect and monitor disease activity in patients with RA. Ultrasoundographic assessment of bilateral wrist, second MCP and fifth MTF could be enough for evaluating overall inflammatory activity, reducing the examination time, thereby making it possible to integrate the ultrasound to the daily rheumatologic practice.

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107 Sensitivity to Change of the Ultrasound synovitis SONAR Score in RA Patients: Results of the Scqm Cohort. Pascal Zufferey1, Almut Scherer2, Hans Rudolf Zsivale1, Giorgio Tambornini3, Laure Brulhart4 and Burkhard Moeller5. 1Lausanne University Hospital, Lausanne, Switzerland, 2SCQM Foundation, Zurich, Switzerland, 3Inselspital, University of Bern, Bern, Switzerland, 4University Hospital, Zurich, Switzerland, 5Geneva, Switzerland, 6Inselspital Bern, Bern, Switzerland

Background/Purpose: Since the end of 2009, an ultrasound scoring call SONAR has been implemented for RA patients as a routine tool in the SCQM registry (Swiss Clinical Quality Management registry for rheumatic diseases). A cross-sectional evaluation of patients with active disease and clinical remission according to the DAS28ESR and the novel ACR/EULAR remission criteria from 2010 clearly indicated a good correlational external validity of sonovial pathologies with clinical disease activity in RA (2012 EULAR meeting).

Objective: of this study was to evaluate the sensitivity to change of B-mode and Power-Doppler scores in a longitudinal perspective along with the changes in DAS28ESR in two consecutive visits among the patients included in the SCQM registry

Methods: All patients who had at least two SONAR scores and simultaneous DAS28ESR evaluations between December 2009 and June 2012 were included in this study. The data came from 20 different operators working mostly in hospitals but also in private practices, who had received a training in ultrasound rheumatologic practice. The data came from 20 different operators working mostly in hospitals but also in private practices, who had received a training in ultrasound rheumatologic practice.

Conclusion: This study confirms that the SONAR score is sensitive to change and provides a complementary method of assessing RA disease activity to the DAS that could be very useful in daily practice.

Disclosure: P. Zufferey, None; A. Scherer, None; H. R. Zsivale, None; G. Tambornini, None; L. Brulhart, None; B. Moeller, None.

108 Disparity Between Sonographic and Clinical Criteria of Remission in Psoriatic Arthritis. Christian Dejaco1, Rusmir Husic2, Judith Gretler2, Winfried B. Graninger3 and Josef Hermann4. 1Medical University Graz, Graz, Austria, 2Auenbruggerplatz 15, Graz, Austria

Background/Purpose: To compare ultrasound and clinical definitions of remission in psoriasis arthritis (PsA).

Methods: Prospective study of 70 consecutive PsA patients [mean age 51.1 (±SD 11.6) years, 30% female, median disease duration 7.0 (range 0.4–77) years]. Clinical and ultrasound examination was performed at 68 joints and 14 entheses (lateral epicondyle, triceps insertion, quadriceps insertion, proximal and distal insertion of patellar ligament, Achilles tendon, plantar fascia), and Disease Activity index for Psoriatic Arthritis (DAPSA), composite psoriatic disease activity index (CPDAI), HAQ and PASI were calculated. The following clinical definitions of remission were applied: DAPSA < 3, CPDAI (joint, entheses and dactylitis domains) = 0 or a Boolean definition with a score ≤ 1 in all of the following categories: tender joints (TJ), swollen joints (SJ), CRP, patient’s (PGA) and evaluator’s global assessment (EGA), enthesitis and dactylitis. Sonography was performed by two rheumatologists blinded to clinical data using an ESAOTE Twice ultrasound device. Power Doppler (PD) signals were graded 0 to 3. The presence of persynovitis and tenosynovitis was also recorded. Ultrasound remission was defined by a PD-score of 0 at joints, entheses and tendons.

Results: Fifteen (21.4%), 12 (17.1%) and 11 (15.7%) PsA patients were in remission according to the CPDAI, DAPSA and the Boolean definitions. A lower prevalence of PD signals in at least one joint or tendon was found in patients in remission according to DAPSA (58.3% vs. 84.5%, p = 0.039 and 8.3% vs. 38.6%, p = 0.043, respectively) and the Boolean definition (54.5% vs. 84.7%, p = 0.022 and 9.1% vs. 37.9%, p = 0.06, respectively) whereas the prevalence of active synovitis was similar in inactive and active disease groups according to CPDAI (66.7% vs. 83.6%, n.s.). Tenosynovitis tended to be more prevalent in cases with active disease according to CPDAI compared to patients in remission (38.9% vs. 13.3%, p = 0.06). Frequencies of active enthesitis and persynovitis were similar in groups with active and inactive disease according to CPDAI, DAPSA and the Boolean definitions.

Three (4.3%) patients had no PD-signal in joints, entheses and tendons. Comparing patients with PD-score = 0 [n = 14 (20%)] and PD-score ≥ 1 at joints we found a lower number of SJ [0 (0–4) vs. 1 (0–15), p = 0.007] and lower ESR [6.5 (1.0–17.0) vs. 10.0 (1.0–74.0), p = 0.049] among patients with inactive disease. CPDAI, DAPSA, TJ, CRP, PGA; EGA and HAQ were similar in both groups.

Patients without PD-signals at tendons [n = 46 (65.7%)] had lower DAPSA [9.9 (0.1–70.2) vs. 17.4 (0.2–60.8), p = 0.012], lower PGA [30 (0–80) vs. 40 (0–80), p = 0.024], lower CRP [2.0 (0.2–20.3) vs. 4.8 (0.6–49.5), p = 0.013] and lower ESR [6.0 (1.0–47.0) vs. 18.0 (5.0–74.0), p < 0.001] compared to patients with active tenosynovitis.

Patients without PD signals at entheses [n = 27 (38.6%)] did not differ from patients with active disease regarding clinical scores and laboratory measures.

Conclusion: Our data demonstrate a disparity between ultrasound and clinical definitions of remission in PsA. DAPSA and Boolean based definitions of remission are closer to ultrasound defined remission than a CPDAI based definition.

Disclosure: C. Dejaco, None; R. Husic, None; J. Gretler, None; W. B. Graninger, None; J. Hermann, None.

109 Does Joint Sonography Really Add Clinically Important Information Beyond Clinical Joint Examination? Miriam Gartner1, Helga Raderm2, Gabriela Supp3, Peter Mandl1, Daniel Aletaha1, Klaus P. Machold1 and Josef S. Smolen1. 1Medical University of Vienna, Vienna, Austria, 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: Sonographic assessment of joint activity in patients with rheumatoid arthritis (RA) is considered to be more sensitive than
the respective clinical assessment. However, this difference may be less dependent on the physical technique used (i.e. palpatory vs. ultrasound), but rather related to differences in arbitrary definitions of the presence or absence of “joint activity”. We aimed to evaluate the differences in numbers of clinically and sonographically active joints in RA, with special regard to the impact of sonographic definitions of activity.

**Methods:** We performed sonographic imaging of 22 joints of the hands of RA patients in clinical remission (n=60); defined as Clinical Disease Activity Index=CDAI ≤ 2.8). Each joint was assessed for grey scale synovial hyper trophy (GSSH) and power Doppler (PD) signal on a four point scale (0=no, 1=mild, 2=moderate and 3=marked). We investigated the sensitivity and specificity of clinically swollen joints for presence of sonographic activity, when using different cut points and combinations of sonographic definitions of activity. For the clinical assessment we used the strict conventional approach of not calling a joint swollen in case of any doubt. We then assessed changes of CDAI if the clinical swollen joint count (SJC) was replaced by sonographically active joints.

**Results:** Among the 1320 joints of patients in remission a total of 887 (67.2%) were GSSH positive and 269 (20.4%) were PD positive.

Clinical joint swelling was 100% specific for sonographic activity, even when stringent sonographic criteria (score=3) were applied. The maximum sensitivity was 25% using the most stringent sonographic criteria (GSSH=3 and PD=3).

Calculating CDAI by replacing the number of clinically swollen by the number of sonographically active joints (sCDAI) according to the various definitions above, resulted in high values using GSSH=1 or PD=1 (mean sCDAI=1.5) compared to the clinical CDAI of 1.4. However, sCDAI values approached the clinical CDAI with increasing stringency of the sonographic definition used, and were even numerically identical when accepting only grade 3 PD signals (Figure).

**Conclusion:** Sonography revealed residual signals of joint activity in patients in CDAI remission. Changing the stringency of the sonographic criteria toward higher signals for determination of joint activity led to similar results when considered in the context of overall disease activity, such as in the CDAI.

Disclosure: M. Gärtner, None; H. Radner, None; G. Supp, None; P. Mandl, None; D. Aletaia, None; K. P. Machold, None; J. S. Smolen, None.

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**Comparing Palmar and Dorsal Ultrasound Assessment of Small Joint Synovitis in Rheumatoid Arthritis: Dorsal Greyscale Mode Yields Significantly Better Concordance with Power Doppler.** Matthias Witt, Felix Mueller, Hendrik Schulze-Koops and Mathias Grunke. Division of Rheumatology, Medizinische Klinik und Poliklinik IV, University of Munich, Munich, Germany, Division of Rheumatology, Medizinische Klinik und Poliklinik IV, University of Munich, Munich, Germany

**Background/Purpose:** MCP andPIP joints are frequently involved in rheumatoid arthritis. Complete ultrasound assessment of these joints requires the palmar and the dorsal approach for both the grey scale (GSUS) and the power Doppler (PDUS) modality. However, depending on the approach used, the frequency of findings consistent with synovitis seems to differ considerably. As ultrasound assessment increasingly influences our understanding of disease progression, this study was undertaken to investigate the role of palmar versus dorsal GSUS and PDUS in therapy-naïve patients with rheumatoid arthritis.

**Methods:** Patients with newly diagnosed and therapy-naïve RA were included. Patients were assessed by clinical examination and ultrasound. Ultrasound was performed with grey scale (GSUS) and power Doppler (PDUS) of the metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints, using the dorsal and palmar approach. Synovitic findings in GSUS and PDUS were graded semiquantitatively from 0 to 3 as specified before. After the initial assessment, patients were treated with anti-rheumatic drugs according to national guidelines and were seen on a regular outpatient basis. Clinical and sonographic reevaluation together with assessment of EULAR responses was performed at month 6.

**Results:** Sofar, 40 patients with RA were included into this ongoing study. Palmar and dorsal GSUS identified 44.4% and 27.3% synovitic findings, respectively (p < 0.05). MCP joints with GSUS synovitis were tender and/or swollen in 53.4% and 62.6% in the palmar and volar approach, respectively (differences not significant). MCP joints with GSUS findings were PDUS positive in 17.8% using the volar approach compared to 71.7% using the dorsal approach (p < 0.001). Similar results were seen in the PIP joints with no significant differences concerning clinical concordance, while ultrasound concordance with PDUS was statistically significant between the palmar and dorsal approach.

**Conclusion:** In therapy naïve RA patients, marked discrepancies between palmar and dorsal GSUS can be observed. While palmar GSUS detects significantly more synovitic findings than dorsal GSUS, both the clinical and PDUS concordances are low. The dorsal approach, on the other hand, shows significantly better concordance between GSUS and PDUS. The reasons are manifold and include anatomical differences between the palmar and the dorsal aspect of the joints resulting in different sensitivities for GSUS and PDUS. In order to optimize ultrasonographic evaluation of small joints in RA, these findings require further clarification. Further analysis is underway to reassess GSUS and PDUS in these patients at month 6 of treatment.

Disclosure: M. Witt, None; F. Mueller, None; H. Schulze-Koops, None; M. Grunke, None.

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**Ultrasound Measurement of Metacarpal Cartilage Thickness Correlates with Joint Space Narrowing in the Metacarpophalangeal Joints of Patients with Rheumatoid Arthritis.** Peter Mandl, Helga Radner, Gabriela Supp, Peter V. Balint, Daniel Aletaia and Josef S. Smolen. 1Medical University of Vienna, Vienna, Austria, 2National Institute of Rheumatology and Physiotherapy, Budapest, Hungary, 3Medical University of Vienna and Hietzing Hospital, Vienna, Austria

**Background/Purpose:** To correlate cartilage thickness as measured by ultrasound (US) with joint space narrowing as measured by conventional radiography in the metacarpophalangeal (MCP) joints of patients with rheumatoid arthritis.

**Methods:** In this pilot study we examined 120 MCP joints of 15 patients with rheumatoid arthritis (RA). The cartilage layer of the metacarpal heads and proximal phalangeal bases of digits 2–5 were assessed bilaterally using a 15 Mhz linear transducer (GE Logic E9) from a dorsal longitudinal view in midline, with joints in 90° flexion. Cartilage thickness was measured in mm with an integrated caliper on static images. Joint space narrowing (JSN) was evaluated using the van der Heijde modified Sharp scoring method (vDHS) performed on conventional posterior-anterior radiographs of both hands. Cartilage thickness was correlated with x-ray findings using Spearman correlation, while differences of JSN within groups of different cartilage thickness (using tertiles) were evaluated by Kruskal-Wallis test.

**Results:** Mean disease duration was 9.3±6.2 years, mean CDAI 8.3±7.4; 63% of the patients were rheumatoid factor positive. US measurement of metacarpal cartilage thickness was 0.38+/−0.17 mm and correlated with total vDHS (r=0.54, p<0.001) as well as with the total vDHS (r=0.53, p<0.001). No correlation was found between phalangeal cartilage thickness and JSN. Metacarpal cartilage thickness correlated better with JSN than the sum score of metacarpal and phalangeal cartilage thickness (r=0.54 p<0.01 vs. 0.47 p<0.05). Moderate correlation was found between the left and right hand with regard to metacarpal cartilage thickness (r=0.56, p<0.05). Correlation was slightly higher between metacarpal cartilage thickness of the left hand and JSN (r=0.57 vs. 0.53, p<0.05). Significant differences of total vDHS, total JSN and JSN sum score for the MCP joints (JSN.mcp) were found between tertiles of cartilage thickness using Kruskal-Wallis Test (Figure 1). No correlation between cartilage thickness and disease activity, functional disability, or disease duration was seen.
Figure 1. Differences of JSN between groups of different cartilage thickness using tertiles. Tertile I: mean cartilage size 0.0189 (±0.003) mm; Tertile II: mean cartilage size: 0.035 (±0.005) mm; Tertile III: mean cartilage size: 0.058 (±0.009) mm.

Conclusion: JSN by radiography indeed represents cartilage thickness at least in MCP joints. When radiographic scoring is not available, US measurement of cartilage thickness of the metacarpal head might be a feasible alternative to depict cartilage damage in patients with rheumatoid arthritis. Phalangeal cartilage thickness has no added value beyond the measurement of metacarpal cartilage thickness.

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Time-Integrated Synovitis Activity Assessed by Power Doppler Ultrasound Significantly Correlates with Radiographic Progression in Rheumatoid Arthritis Patients Treated with Methotrexate Alone but Not in Those Treated with TNF Antagonists, Kei Ikeda, Daiki Nakagomi, Yoshide Sanayama, Mieko Yamagata, Ayako Okubo, Taro Iwamoto, Hiroshi Kawashima, Kentaro Takahashi and Hiroshi Nakajima. Chiba University Hospital, Chiba, Japan

Background/Purpose: Although a number of studies have shown a higher sensitivity of ultrasound than clinical joint examination in detecting synovitis in patients with rheumatoid arthritis (RA), only a few studies have actually demonstrated the superiority of ultrasound to conventional measures in evaluating synovitis that causes structural damage. In this study, we aimed to demonstrate that structural damage progression is associated with time-integrated power Doppler (PD) signals more significantly than with time-integrated DAS28 in RA patients receiving methotrexate or biological agents.

Methods: Patients with an established diagnosis of RA who required new or additional treatment with either methotrexate (MTX), TNF antagonists, or tocilizumab (TCZ) were consecutively enrolled in this study. Patients underwent clinical, laboratory, and ultrasonographic assessment at baseline and at 12 and 24 weeks of follow-up. Patients also underwent radiographic assessment at baseline and at 24 weeks. A systematic multiplanar ultrasound examination of 28 joint regions was performed and gray-scale (GS) synovitis and PD signals were recorded with semi-quantitative scores (0–3).

Results: Forty-eight RA patients were enrolled. All 17 patients in MTX group were treated with MTX alone, whereas 20 out of 23 patients in TNF group and all eight patients in TCZ group received combination therapy with MTX. Changes in DAS28 and CDAI significantly correlated with those in total GS and PD scores between baseline and 12 weeks. The absolute values of standardized response means (SRM) for total PD scores between baseline and 12 weeks tended to be larger (TNF antagonists, 1.43; TCZ, 1.93) than those for DAS28 (TNF antagonists, 1.39; TCZ, 1.71), CDAI (TNF antagonists, 1.07; TCZ, 1.03), or total GS scores (TNF antagonists, 1.40; TCZ, 0.86) in patients treated with biological agents. When time-integrated disease activity was calculated by summing scores at three visits, the correlation between time-integrated total PD scores and changes in total Sharp scores during 24 weeks was statistically significant, whereas the correlations between time-integrated DAS28 or total GS scores and changes in total Sharp scores were not statistically significant. In sub-group analyses for each treatment regimen, time-integrated total PD scores significantly correlated with changes in total Sharp scores in patients treated with MTX alone, but not in those treated with TNF antagonists (Figure).

Conclusion: PD ultrasound represents synovitis activity that causes joint damage progression more directly than DAS28 or GS synovitis does. The lack of correlation between time-integrated total PD scores and changes in total Sharp scores in patients treated with TNF antagonists may reflect the protective effect of TNF antagonists against joint damage that is independent of synovitis activity.

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Power Doppler Signal Is Frequently Positive Among Patients with Rheumatoid Arthritis in Clinical Remission and Normal Serum Matrix Metalloproteinase-3 Levels, Tadashi Okano, Tatsuya Koike, Masahiro Tada, Kenji Mamoto, Yuko Sugiioka, Atsuko Kamiyama and Hiroaki Nakamura. Osaka City University Medical School, Osaka, Japan

Background/Purpose: Serum matrix metalloproteinase-3 (MMP-3) is useful bio markers of synovitis associated with rheumatoid arthritis (RA). Ultrasonography (US) has recently become more popular as a method of evaluating joint synovitis. The purpose of this study is to determine the significance of grey scale ultrasonography (GSUS) and power Doppler ultrasonography (PDUS) scores by comparison with serum biomarkers and clinical disease activity assessment.

Methods: We selected 151 consecutive patients with RA at our hospital outpatient clinic. The patients underwent musculoskeletal ultrasonography at 26 synovial sites in the following joints: bilateral first to fifth MCP (dorsal recess), first IP and second to fifth PIP (dorsal recess) joints and the wrists (dorsal radial, dorsal median and dorsal ulnar). The GS and power PD signals were scored in each joint using a scale from 0 to 3. The GSUS and PDUS scores are the sums of the scores obtained for the 26 synovial sites. Correlations among serum CRP, ESR and MMP-3 values and disease activity evaluated using the DAS28-ESR, DAS28-CRP, SDAI, CDAI were analyzed along with the PDUS positive ratio in patients in remission and in patients with normal MMP-3 values.

Results: The clinical characteristics of the 151 patients (128 females and 23 males; mean age, 60.5 ± 13.1 years) with RA were as follows. They received only DMARDs (n = 80), and biological DMARDs (n = 71). The GSUS and PDUS scores were significantly and positively correlated with ESR, CRP, MMP-3, DAS28-ESR, DAS28-CRP, SDAI and CDAI. The PDUS score ≥1 was positive in 28 of 34 patients (82.3%) in remission with DAS28-CRP (< 2.6) and in 52 of 61 (85.2%) with normal serum MMP-3 levels. The PDUS score ≥2 was positive in 10 of 34 (29.4%) patients in remission with DAS28-CRP and in 30 of 61 (49.2%) with normal serum MMP-3 levels. The levels of PDUS score in the remission patients using biological DMARDs was less than the remission patients using only DMARDs.

Conclusion: Both GSUS and PDUS scores were closely correlated with clinical disease activity and serum biomarkers. These results indicate that US findings accurately reflect the pathogenesis of RA. However, patients in remission and normal serum MMP-3 levels also had a high rate of positive PD scores. We considered that US is more accurate for clinically evaluating patients with RA.

Disclosure: T. Okano, None; T. Koike, Chugai Pharmaceutical, 2, Eli Lilly Japan, 8, Novartis Pharmaceutical Corporation, 2, Teijin Pharma, 8, Bristol-Myers Squibb, 5, Ono Pharmaceutical, 8, Santen Pharmaceutical, 8, Eisai, 8, Abbott Japan, 8, Mitsubishi Tanabe Pharma Corporation, 2, Takeda Pharmaceutical, 8, Astellas Pharma Inc., 8, Pfizer Japan Inc., 8, Janssen Pharmaceutical, 2, Asahi Kasei Pharma Corporation, 8, Daiichi Sankyo Company, 2, M. Tada, None; K. Mamoto, None; Y. Sugiioka, None; A. Kamiyama, None; H. Nakamura, None.
Background/Purpose: very little is known about the differences in joint and periarticular structure involvement in rheumatoid or psoriatic arthritis (PsA). The main pathological features detected by US in rheumatoid arthritis (RA) are synovitis and bone erosion while, in spondyloarthropathies, enthesal inflammation is the common feature. Tendon involvement is particularly frequent and dactylitis is a typical PsA manifestation. Aim of the study was to find possible differences in ultrasound (US) involvement of wrist and hand in PsA and RA.

Methods: bilateral US examination of the wrist and hand was performed, by the same physician blinded to the diagnosis, in a consecutive, unselected, group of subjects affected by RA and PsA, using a Logiq 9 (General Electrics Medical Systems, Milwaukee, WI) with a linear probe (14 MHz). Radiocarpal, intercarpal, metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints and flexor and extensor tendons (in wrist and hand) were examined bilaterally. Bone erosion and tenosynovitis were diagnosed according to the OMERACT definitions [1], while synovitis was considered when a synovial hypertrophy (with or without power Doppler signal) was present. The patients were recruited on a time-criteria (the last who came for an outpatient visit). The RA and PsA diagnosis was given by other rheumatologists, according to the 1987 ACR and Caspar criteria, respectively.

Results: mean age and disease duration were comparable for both groups, while male/female ratio was different (as expected) (Table 1). US findings are reported in Table 1. The number of hand joints involved was higher in RA than in PsA (182 vs 150). Given the results, it is interesting that the total number of proliferative tenosynovitis was significantly greater in RA (49/68 vs 7/34 in PsA at the wrist level and 58/98 vs 13/63 in PsA at the hand level).

Conclusion: Wrist synovitis occurred significantly more frequently in RA patients than PsA subjects, while no significant differences were observed in hand synovitis between the groups. There was no difference in tendon involvement for frequency between RA and PsA groups considering the number of patients with tenosynovitis but it became significantly different when considering the total amount of tenosynovitis (as well as the number of proliferative tenosynovitis). The latter aspect could be determined by a more aggressive inflammation of the tendons in those patients that present tendon involvement and are affected by RA (only 10 RA patients had hand proliferative tenosynovitis, compared to 7 in the PsA group, indicating a lower frequency of synovial proliferation in the second group). There were no other significant differences in the results of the two groups.

References

Disclosure: A. Delle Sedie, None; E. Cioffi, None; L. Carli, None; E. Sardano, None; S. Bombardieri, None; L. Riente, None.

Table 1.

<table>
<thead>
<tr>
<th></th>
<th>RA (N=55)</th>
<th>PsA (N=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F/M</td>
<td>48/7</td>
<td>28/27</td>
</tr>
<tr>
<td>Mean age (yrs)</td>
<td>60.7±12.7</td>
<td>57.4±12.5</td>
</tr>
<tr>
<td>Disease duration (months)</td>
<td>113.3 ± 97.7</td>
<td>100.6 ± 95.6</td>
</tr>
<tr>
<td>Wrist synovitis (N of pts %)</td>
<td>38.69</td>
<td>24.44</td>
</tr>
<tr>
<td>Hand synovitis (N of pts %)</td>
<td>28.51</td>
<td>37.67</td>
</tr>
<tr>
<td>Wrist tenosynovitis (N of pts %)</td>
<td>23.43</td>
<td>16.29</td>
</tr>
<tr>
<td>Hand tenosynovitis (N of pts %)</td>
<td>22.40</td>
<td>25.45</td>
</tr>
<tr>
<td>Hand erosions</td>
<td>30.54</td>
<td>26.47</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>RA (N=55)</th>
<th>PsA (N=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean DAS28</td>
<td>2.5 (SD 1)</td>
<td>1.95 (SD 1)</td>
</tr>
<tr>
<td>Mean CDAI</td>
<td>6.15 (SD 1)</td>
<td>4.7 (SD 1)</td>
</tr>
<tr>
<td>Mean VAS</td>
<td>4.2 (SD 1)</td>
<td>3.8 (SD 1)</td>
</tr>
<tr>
<td>Mean CDAI</td>
<td>0 (SD 1)</td>
<td>0 (SD 1)</td>
</tr>
</tbody>
</table>

Conclusion: Most patients were classified as with mild disease activity by the US composite activity classification score in both diseases SpA and RA. In both diseases patients with higher US composite score had higher indices of disease activity although the differences were not always significant.

Disclosure: M. L. Acosta Felguer, None; C. Quiroz, None; S. Ruta, None; J. Rosa, None; M. Soltuk, None; L. Ferreyra Garrott, None; R. Garcia-Monaco, None; E. R. Soriano, Abbott Immunology Pharmaceuticals, 2; Janssen Pharmaceuticals Product, L.P., 8.

Table. Comparison of different variables related to disease activity in the different US composite activity score classification groups in patients with SpA and RA.

<table>
<thead>
<tr>
<th></th>
<th>SpA (N=55)</th>
<th>RA (N=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean DAS28</td>
<td>2.5 (SD 1)</td>
<td>1.95 (SD 1)</td>
</tr>
<tr>
<td>Mean CDAI</td>
<td>6.15 (SD 1)</td>
<td>4.7 (SD 1)</td>
</tr>
<tr>
<td>Mean VAS</td>
<td>4.2 (SD 1)</td>
<td>3.8 (SD 1)</td>
</tr>
<tr>
<td>Mean CDAI</td>
<td>0 (SD 1)</td>
<td>0 (SD 1)</td>
</tr>
</tbody>
</table>

Most patients were classified as with mild disease activity by the US composite activity classification score in both diseases SpA and RA. In both diseases patients with higher US composite score had higher indices of disease activity although the differences were not always significant.

Conclusion: An US composite activity classification score taking into account synovial, enthesis and tendons involvement proved to correctly discriminate patients with SpA and RA in different activity status according to classical activity indices.

Disclosure: M. L. Acosta Felguer, None; C. Quiroz, None; S. Ruta, None; J. Rosa, None; M. Soltuk, None; L. Ferreyra Garrott, None; R. Garcia-Monaco, None; E. R. Soriano, Abbott Immunology Pharmaceuticals, 2; Janssen Pharmaceuticals Product, L.P., 8.
Correlation Between Clinical and Ultrasonographic Examination of the Calcaneal Enthesis in Patients with Ankylosing Spondylitis: A Controlled Study, Suellen Narimatsu1, Rita N. V. Furtado1, Andre Rosenfeld1, Germana. B. Q. Estrela1, Jorge E. P. Pogthol2 and Jamil Natour1.1 Universidade Federal de Sao Paulo - UNIFESP, Sao Paulo, Brazil, 2 Universidade Federal de Sao Paulo - UNIFESP, Sao Paulo, Brazil, 3 Universidade Federal de Sao Paulo, Sao Paulo, Brazil. 

Background/Purpose: 1 – To compare US findings of calcaneal entheses between AS patients and healthy subjects; 2 – To assess the calcaneal entheses by US and correlate with clinical, functional and inflammatory aspects in patients with AS.

Methods: We conducted a cross sectional study of 50 patients with AS and 30 healthy volunteer subjects matched for age and sex. The clinical evaluation of patients included a global health scale, visual analogue scale (VAS) for pain and edema, calculation of BASDAI, BASFI, BASMI, HAQ-S, ASDAS-VHIS and enthesis index SPARRC (Spondyloarthritis Research Consortium of Canada Enthesitis Index). The US exam was performed at right and left entheses of samples by a radiologist expert in musculoskeletal “blind” to clinical findings. The analysis of the US was based on MASEI index (Madrid Sonographic Enthesitis Index) and the total analysis of its subitems. For evaluation was used the Esaote MyLab60 machine equipped with a linear transducer with a frequency of 6–18 MHz.

Results: Were evaluated by the US 160 calcaneal entheses in the whole sample. The patients had ages between 18–65 years (43.44 + 9.91) and healthy subjects 18–65 years (38.7 + 8.52). The mean disease duration was 11.11 (+ 6.77) years. The comparison of average Masei between patient and control groups (16.32 + 11.11 / 10.70 + 5.27) was not significantly different (p = 0.519). The comparison of each find in the US between groups showed statistical significance for the detection of erosion (17 patients / healthy 0) with p = 0.00 and power Doppler (PD) (6/0) with p = 0.053. There was no correlation between the presence of bursitis, calcification, erosion, thickening, structural change in the US evaluation of calcaneal tendon with clinical, functional, inflammatory activity in patients. However, the PD of the entheses was correlated with VAS pain (0.344, p = 0.00) and VAS edema (0.486, p = 0.00). The VAS pain and VAS for edema of the calcaneal entheses correlated statistically (0.653, p = 0.00).

Conclusion: The US of the calcaneal entheses of individuals with AS had more erosion and capture the PD when compared with control subjects. The PD on these entheses was the only parameter on US that correlates with more erosion and capture the PD when compared with control subjects. The VAS pain and VAS for edema of the calcaneal entheses correlated (0.344, p = 0.00). The VAS pain and VAS for edema of the calcaneal entheses correlated with VAS pain (0.344, p = 0.00). The VAS pain and VAS for edema of the calcaneal entheses correlated statistically (0.653, p = 0.00).

Disclosure: S. Narimatsu, None; R. N. V. Furtado, None; A. Rosenfeld, None; G. B. Q. Estrela, None; J. E. P. Pogthol, None; J. Natour, None.

Ultrasound for Diagnosis of Carpal Tunnel Syndrome – Comparison of Different Methods to Determine Median Nerve Volume and Value of Power Doppler Sonography. Christian Dejaco, Martin Stradner, Dorothea Zauner, Werner Seel, Nicole E. Simmet, Alexander Klammer, Kerstin Brickmann, Judith Gretler, Florentine Moazedi-Furst, Rene Thonhofer, Rusnir Husic, Josef Hermann and Stefan Quasthoff. Medical University Graz, Graz, Austria

Background/Purpose: Routine use of sonography for the diagnosis of carpal tunnel syndrome (CTS) is hampered by the lack of consensus regarding anatomical landmarks for the measurement of median nerve volume and difficulty of determining thresholds for abnormal median nerve swelling. This study was conducted to compare ultrasound measurement of median nerve cross-sectional area (CSA) at different anatomical landmarks and to analyze the value of Power Doppler (PD) signals within the median nerve.

Methods: We prospectively studied 135 consecutive patients with suspected CTS undergoing clinical and electrophysiological evaluation at two subsequent visits within three months. Final diagnosis of CTS was established by the evaluating neurologist based on findings from these conventional methods at both visits. Median nerve sonography was performed by two rheumatologists using a GE Logiq E9. CSA was measured at 5 different levels at forearm and wrist; and CSA wrist to forearm ratios or differences were calculated. Intra-neural PD-signals were semiquantitatively graded (scale 0–3). Diagnostic values of different ultrasound methods were compared by receiving operating characteristic (ROC) curves using SPSS (v19.0).

Results: CTS was diagnosed in 111 (45.5%) wrists; 84 (34.4%) had no CTS and 49 (20.1%) were possible CTS cases. Diagnostic values were comparable for all sonographic methods to determine median nerve swelling with AUCs ranging from 0.75 to 0.84. Thresholds of 9.8 and 13.8 mm² for the largest CSA of the median nerve yielded a sensitivity of 91% and a specificity of 92%, respectively. In cases of mild median nerve swelling the relative increase in CSA between the entrapment area and forearm provided additional diagnostic certainty (AUCs from 0.60 to 0.67). Increased vascularity as indicated by a PD-score ≥2 had a specificity of 90% for the diagnosis of CTS. Reliability of sonographic median nerve volumetry was good as indicated by an intra-class correlation coefficient of 0.90 (95% CI: 0.79–0.95).

Conclusion: Sonographic assessment of median nerve swelling and tissue vascularity at different anatomical landmarks allows for a reliable confirmation of the diagnosis in patients with clinically suspected CTS.

Disclosure: C. Dejaco, None; M. Stradner, None; D. Zauner, None; W. Seel, None; N. E. Simmet, None; A. Klammer, None; K. Brickmann, None; J. Gretler, None; F. Moazedi-Furst, None; R. Thonhofer, None; R. Husic, None; J. Hermann, None; S. Quasthoff, None.

Color Doppler Sonography of the Knee Joint: A Useful Tool to Discriminate Arthritis From Osteoarthritis? Wolfgang Hartung, Nelly Beiting1, Boris P. Ehrenstein, Christian Lühring, Joachim Gritka, Benno Schremer, Martina Müller and Martin Fleck. 1. Asklepios Klinikum Bad Abbach, Bad Abbach, Germany, 2 University Clinic Aachen, Aachen, Germany, 3 University of Regensburg, Bad Abbach, Germany, 4 University Clinic Regensburg, Regensburg.

Background/Purpose: To determine the diagnostic value of Colour Doppler ultrasound (CDUS) in patients with inflammatory arthritis (IA) versus osteoarthritis (OA) of the knee joint.

Methods: Standardized CDUS examinations have been performed in 111 knee joints of 106 patients (70 female, 36 male) presenting with severe OA (n=72) or confirmed IA (n=39) of one or both knee joints, to determine the degree of synovial inflammation in a semiquantitative fashion. To definitely distinguish inflammatory from non-inflammatory disease, synovial fluid has been obtained from every patient within 24 hours after sonography and analyzed synovial fluids containing up to 1000 white blood cells (wbc)/ul were considered non-inflammatory, whereas 5000 or more wbc/ul have been classified as inflammatory, respectively.

Results: The CDUS sum score of OA patients was determined at 3.3 (range 0–8). In contrast, IA patients exhibited significantly elevated synovitis scores at 5.3 (range 3–9) (p ≤ 0.001). However, high synovial CDUS activity could be observed in OA patients sporadically. Therefore, there is no definitive CDUS threshold that clearly separates OA from IA patients.

Table 1. Mean CDUS scores of the patients with osteoarthritis vs. arthritis of the knee.

<table>
<thead>
<tr>
<th></th>
<th>OA patients (n = 73)</th>
<th>IA patients (n = 39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>suprapatellar</td>
<td>0.14 (0-2)</td>
<td>0.64 (0-2)</td>
</tr>
<tr>
<td>infrapatellar</td>
<td>0.14 (0-2)</td>
<td>0.44 (0-2)</td>
</tr>
<tr>
<td>medial longitudinal</td>
<td>1.2 (0-3)</td>
<td>2.0 (1-3)</td>
</tr>
<tr>
<td>lateral longitudinal</td>
<td>2.0 (0-3)</td>
<td>2.3 (1-3)</td>
</tr>
<tr>
<td>Total score</td>
<td>3.3 (0-8)</td>
<td>5.3 (3-9)**</td>
</tr>
</tbody>
</table>

OA = Osteoarthritis, IA = inflammatory arthritis of the knee. ** (Chi square test: p value < 0.001).

Conclusion: CDUS is a valuable instrument to assist clinicians in distinguishing OA from IA of the knee, but nevertheless should always be interpreted within the clinical context.

Disclosure: W. Hartung, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5; N. Beiting, None; B. P. Ehrenstein, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5; C. Lühring, None; J. Gritka, None; B. Schremer, None; M. Müller, None; M. Fleck, Abbott Immunology Pharmaceuticals, 5, Roche Pharmaceuticals, 5, Pfizer Inc, 5.
Ultrasound (US) Findings in Patients with Knee Pain: Sensitivity and Specificity for the Diagnosis of Knee Osteoarthritis and Development of an US Prediction Score. Erika Catay, Santiago Ruta, Javier Rosa, David A. Navarta, Ricardo Garcia-Monaco and Enrique R. Soriano. 1Rheumatology Section, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 2Rheumatology Unit, Internal Medical Services, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 3Radiology and Imagenology Department, Hospital italiano de Buenos Aires, Buenos Aires, 4Rheumatology Unit, Internal Medical Services, Hospital Italiano de Buenos Aires, Instituto Universitario Hospital Italiano de Buenos Aires and Fundacion PM Catoggio, Buenos Aires, Argentina

Background/Purpose: The diagnosis of knee osteoarthritis (OA) is based mainly on clinical examination and radiological features. The objectives were to evaluate the sensitivity and specificity of different ultrasound (US) findings and to develop an US score for the diagnosis of knee OA.

Methods: Consecutive patients complaining of knee pain with and without previous diagnosis of knee OA (ACR criteria) and no other known rheumatologic condition were included. US examinations were performed by an experienced rheumatologist, blinded to clinical data, using a My Lab 70 machine (Esaote) provided with a multi-frequency linear transducer (4–13 MHz). The following US abnormal findings were investigated (presence/absence): joint effusion (increased hypoechoic or anechoic intraarticular material, within synovial recesses greater than 4 mm), osteophytes (cortical protrusions at the joint margin), menisci protrusion (a distance between the peripheral border of the meniscus and the outline of the tibial plateau greater than 2 mm), degenerative femoral hyaline cartilage involvement (loss of sharpness of the cartilage margins and/or loss of homogeneity of the cartilage layer and/or focal or extended cartilage thinning) and Baker’s cyst (abnormal hypo-anechoic, displaceable and compressible material within the gastrocnemius-semimembranosus, with a transverse diameter greater than 4 mm). We developed a US score using logistic regression analysis (OA as dependant variable) with US features included in the model. Weighting of each of these variables was obtained using the regression OR dependant variable) with US features included in the model. Weighting of each of these variables was obtained using the regression OR

Table 1: Diagnostic characteristics of different US abnormal findings for the diagnosis of knee OA.

<table>
<thead>
<tr>
<th>US Findings</th>
<th>Sensitivity % (95% CI)</th>
<th>Specificity % (95% CI)</th>
<th>PPV %</th>
<th>NPV %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint effusion</td>
<td>89.8 (83–94)</td>
<td>32 (22–44)</td>
<td>69</td>
<td>64.8</td>
</tr>
<tr>
<td>Osteophytes</td>
<td>85.8 (78–91)</td>
<td>73.1 (66–86)</td>
<td>86.5</td>
<td>76.3</td>
</tr>
<tr>
<td>Menisci protrusion</td>
<td>48 (39–57)</td>
<td>93.3 (85–98)</td>
<td>92.4</td>
<td>51.4</td>
</tr>
<tr>
<td>Degenerative femoral hyaline cartilage involvement</td>
<td>92.9 (87–97)</td>
<td>84 (74–91)</td>
<td>90.7</td>
<td>87.5</td>
</tr>
<tr>
<td>Baker’s cyst</td>
<td>16.5 (10–24)</td>
<td>82.7 (72–90)</td>
<td>61.7</td>
<td>36.9</td>
</tr>
</tbody>
</table>

Table 2: US score.

<table>
<thead>
<tr>
<th>Variables</th>
<th>OR</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint effusion</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Degenerative femoral hyaline cartilage involvement</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Osteophytes</td>
<td>1</td>
<td>5.8</td>
</tr>
<tr>
<td>Menisci protrusion</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Maximum Total score</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

Knees with OA had significantly higher scores than knees without OA (mean (SD): 8.1 (2.3) vs 2.1 (2.7); p<0.001, respectively. The area under the Receiver operative curve (ROC) was 0.83 (95% CI: 0.89–0.97). A value ≥ 5 had a sensitivity of 92 % and specificity of 81 % for the diagnosis of knee OA (LR + 4.9).

Conclusion: The identification of both osteophytes and degenerative femoral hyaline cartilage involvement by US showed the best diagnostic performance among all the US features investigated for the diagnosis of knee OA. A combined US score showed very good discriminative value for the diagnosis of knee OA in our population. A prospective cohort study would be needed to confirm these results.

Disclosure: E. Catay, None; S. Ruta, None; J. Rosa, None; D. A. Navarta, None; R. Garcia-Monaco, None; E. R. Soriano, Abbott Immunology Pharmaceuticals, 2, Jansen Pharmaceutica Product, L.P., 8.
Acuson Antares ultrasound system (high frequency transducer 7–14 MHz). CDUS was considered positive when the typical sign of halo (arterial wall swelling in transverse and longitudinal view) was observed in the temporal arteries. The patients were diagnosed with large vessels vasculitis (LVV) when intima-media complex thickness was homogenous and more than 1.5 mm in the carotid artery and more than 1 mm in the axillary artery. After the CDUS examination, unilateral biopsies of the temporal artery were carried out in the majority of the patients. The diagnostic value of CDUS, temporal artery biopsy and the American College of Rheumatology classification criteria for the GCA (ACR-GCA) were tested against the gold standard, for this study defined as final clinical GCA diagnosis established by an experienced rheumatologist.

Results: Seventy-eight patients (48 females, 30 males) were successively referred to our outpatient clinic. Thirty-six were diagnosed with GCA (27 females, 9 males) and all of them had a positive CDUS of the temporal artery. In addition, we found 4 patients with positive CDUS of the temporal artery but with other diagnoses (1 polycystic nodosa, 1 granulomatosis with polyangiitis and 2 with infections). Among the 36 patients with GCA, 32 fulfilled the ACR-GCA classification criteria. Temporal artery biopsy was positive in 20 of the 28 GCA patients who had a biopsy performed. Large vessel involvement was observed in 13 patients (36%). The mean time between the first presentation of symptoms and the diagnosis was 2.3 months (3.0 months in GCA patients with LVV and 1.7 months in classic GCA). In our series, sensitivity and specificity were 100% and 91% for CDUS, 64% and 95% for the temporal artery biopsy and 94% and 90% for the ACR-GCA classification criteria, respectively.

Conclusion: We conclude that CDUS has an excellent sensitivity and a high specificity to diagnose GCA in daily clinical care. CDUS do also have the advantage to identify large vessel involvement in GCA patients. We recommend the use of CDUS as a first line assessment tool in diagnosing GCA.

Disclosure: M. L. Hetland, None; G. Myklebust, None; G. Haugeberg, DiaGraphIT, 1; A. P. Diamantopoulos, None.

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Detection of Synovitis in Clinically Inactive Juvenile Idiopathic Arthritis Patients by Ultrasoundography with POWER Doppler. Paz Collado, Mari-Luz Gamir, Rosa Merino, Consuelo Modesto, Indalecio Montecagudo and Juan Carlos Lopez-Robledillo. 1Severo Ochoa University Hospital, Madrid, Spain, 2Ramon y Cajal University Hospital, Madrid, Spain, 3Hospital Universitario La Paz, Madrid, Spain, 4Hospital Valle de Hebron, Barcelona, Spain, 5Gregorio Marañón Hospital, Madrid, Spain, 6Hospital Niño Jesus, Madrid, Spain.

Background/Purpose: The advances in therapeutic effectiveness have created a need for looking for imaging tools that describe more precisely the clinical state of disease inactivity. The well-known advantages of ultrasoundography with power Doppler (PDUS) makes that this technique is ideal for evaluation of the pediatric population in the clinical setting and lets clinicians choose an appropriate treatment to induce remission. The purpose of this study was to determine the prevalence of abnormalities detected by ultrasoundography (US) in JIA patients presenting clinically inactive disease (ID) – medication and off medication – and to compare between two groups.

Methods: Study design: Cross-sectional, multicenter study. Patients: Inclusion criteria: 1) JIA patients, age from 4 to 16 years old, 2) remission according to clinical assessment by their consultant doctor for a minimum of 6 months prior to the screening, 3) taking stable disease modified anti-rheumatic drugs (DMARDs) therapy or have discontinued medications for JIA for a minimum of 6 months, 4) biologics naïve patients. Exclusion criteria: Intra-articular steroid injection in the last 6 months. Data collected: Clinical and PDUS assessments were performed blindly on 44 joints. Other clinical and laboratory markers of activity disease were collected. For the analysis the Outcome Measure in Rheumatology in Clinical Trials (OMERACT) definitions for rheumatoid arthritis of synovitis and tenosynovitis were applied in our patients. The presence of Doppler signal inside the intraarticular synovium or in the synovial sheath was considered as inflammatory activity.

Results: 34 patients, of whom 23 patients have attained clinical remission on medication (CR) with DMARD therapy and 11 patients have attained inactivity state off medication (CR) (3). The mean (SD) disease duration was 48.10 (35) months. Half of the study patients have attained one or more previous inactivity disease state, but there was no significant difference between the 2 groups. Thirteen (38.2%) patients had evidence of ≥1 US findings, although the number of US abnormalities detected in CRM patients was higher than CR group, there were no significant differences between the 2 groups in detecting GS synovitis (p = 0.86) and PD signal (p = 0.38). US examination showed 37 joints presented GS synovial hypertrophy and 18 (48%) of 37 joints with GS synovitis presented increased PD signal.

Conclusion: Our study shows that a proportion of patients presenting clinically inactive disease presented GS synovitis and some of them seem to present inflammatory activity detected by PDUS. The significance of these findings has importance in order to obtain an accurate definition of disease status in the growing skeleton of JIA patients.

References

Disclosure: P. Collado, Pfizer Inc, 2; M. Gamir, Pfizer Inc, 2; R. Merino, Pfizer Inc, 2; C. Modesto, Pfizer Inc, 2; I. Montecagudo, Pfizer Inc, 2; J. C. Lopez-Robledillo, Pfizer Inc, 2.

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Reliability of an Ultrasound Scoring Measure for Juvenile Localized Scleroderma (LS). Suzanne C. Li, Melissa S. Liebling, Andrea S. Doria, Molly Dempsey-Robertson, Carsten Hamer, Sven Optiz, Faridali Ramji, Stephanie Edgerton, Jose Jarrin, Tanicka Komyrat, Michael Malone, Arun Mohanta, Shuzhen Zhang and Knut M. Wittkowski. 1Joseph M Sanzari Children’s Hospital, Hackensack, 2Iowa Ortho Medical Center, Hackensack, NJ, 3Hackensack University Medical Center, Hackensack, NJ, 4Hospital for Sick Children, Toronto, ON, 5Texas Scottish Rite Hospital, Dallas, TX, 6Schon Klinik Hamburg Eilbek, Hamburg, Germany, 7University of OK Health Science Center, Okc, OK, 8Rockefeller University, New York, NY.

Background/Purpose: Although ultrasound (US) shows great potential for aiding assessment of LS disease activity, its use has been limited because both image acquisition and interpretation are operator dependent. Our multidisciplinary group (LOCUS, Localized scleroderma Clinical and Ultrasound...
Study group) has worked to develop an US scoring measure (U-DA) to help standardize sonographic interpretation of jLS patients (Pediatr Rheumatol 2010;8:14). The U-DA evaluates echogenicity and vascularity (color Doppler signal) differences in each tissue layer of the lesion compared with the corresponding normal tissue layer. A score of 0 represents no difference when the lesion compared with the normal site.

Objective: To assess the reliability of an ultrasound scoring measure (U-DA) for jLS.

Methods: LOCUS conducted a 3-day workshop meeting in 2009 on acquiring and interpreting US scans from jLS patients, which was attended by 12 radiologists and sonographers from 5 pediatric rheumatology centers. The group had developed a preliminary ultrasound scoring measure in 2007, and this preliminary measure was reviewed in conjunction with jLS US images showing the range of sonographic differences that had been observed up to the time of the meeting. This review led to modification of U-DA; definitions for scoring levels were then finalized. A tutorial on U-DA scoring was conducted, followed by individual scoring of two jLS US scans and collective review of scoring of these scans. Eleven attendees then scored a randomly-orderd set of 16 jLS scans, with 10 attendees resoring the same set in a different random order on a second day. Kendall coefficients of concordance were calculated to determine intra- and inter-rater reliability, and scoring of each U-DA was separately analyzed to evaluate for potential issues.

Results: Raters showed moderate to high intra-rater reliability for scoring total echogenicity (Kendall’s coefficient 0.77 to 0.92) and vascularity (Kendall’s coefficient 0.64–0.92), where total refers to sum of scores from each identifiable tissue layer (dermis, hypodermis, deep tissue). A moderate level of inter-rater reliability was found for scoring total echogenicity (Kendall’s coefficient 0.64, 0.56) and vascularity (0.58, 0.57). A high level of agreement was observed for dermis scoring (for example, majority of raters agreed on dermis vascularity score for 15/16 scans), with a much lower level of agreement observed for deep tissue scoring (majority agreement for 10/16 scans on deep tissue vascularity score).

Table 1. Intra- and Inter-rater reliability of U-DA Total Echogenicity, Total Vascularity

<table>
<thead>
<tr>
<th>U-DA Scoring Parameter</th>
<th>Kendall’s Coefficient</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Echo: Inter-rater, 1st reading</td>
<td>0.64</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Echo: Inter-rater, 2nd reading</td>
<td>0.56</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Vasc: Inter-rater, 1st reading</td>
<td>0.58</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Vasc: Inter-rater, 2nd reading</td>
<td>0.57</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Vasc: Intra-rater reliability range</td>
<td>0.64–0.92</td>
<td>0.1374 to &lt;0.0001</td>
</tr>
</tbody>
</table>

Conclusion: The U-DA was found to have a moderate level of intra- and inter-rater reliability for total echogenicity and vascularity. Among the different tissue layers, deep tissue layer showed the lowest concordance. More training in deep tissue layer evaluation may further improve the reliability of scoring the U-DA.

Conclusion: In SSc patients without overt cardiac dysfunction and no PH, borderline right ventricular primary involvement can be detected by trans-thoracic Doppler echocardiography. The clinical implications of these very early alterations are still to be determined.

Disclosure: L. Gargani, None; P. Gosciniak, None; C. Bruni, None; S. Guiducci, None; S. Bellando Randone, None; L. Pratelli, None; G. Agoston, None; A. Moggi Pignone, None; A. Varga, None; R. Sicari, None; E. Picano, None; M. Matucci Cerinic, None.

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Borderline Right Ventricular Involvement in Patients with Systemic Sclerosis without Pulmonary Hypertension. Luna Gargani1, Piotr Gosciniak2, Cosimo Bruni2, Serena Guiducci2, Silvia Bellando Randone2, Lorenzo Pratelli1, Gergely Agoston1, Alberto Moggi Pignone2, Albert Varga2, Rosa Sicari1, Eugenio Picanò1 and Marco Matucci Cerinic1, 1Institute of Clinical Physiology, National Research Council, Pisa, Italy, 2WSZ, Department of Cardiology, Szczecin, Poland, 3Department of Biomedicine, Division of Rheumatology AOUC, Excellence Centre for Research, Florence, Italy, 4University of Szeged, Faculty of Medicine, 2nd Dept of Internal Medicine & Cardiology Center, Szeged, Hungary, 5University of Florence, Department of Medicine, Division of Rheumatology, Florence, Italy

Background/Purpose: Cardiac dysfunction in systemic sclerosis (SSc) is associated with poor prognosis. Right ventricular involvement is typically associated to pulmonary hypertension (PH) in these patients. However, primary myocardial involvement, independently of pulmonary hypertension and without significant renal or pulmonary involvement, may also be present. The aim of the present study was to evaluate left and right ventricular function by transthoracic Doppler echocardiography in SSc patients without PH.

Methods: Sixty-five SSc patients without Doppler-derived signs of PH (49 women, mean age, 46±12 years) and 29 healthy age-matched controls (18 women, mean age 49±15 years, p=n) prospectively underwent a comprehensive transthoracic 2D and Doppler echocardiography, including tissue Doppler imaging analysis (TDI) of both right and left ventricle.

Results: SSc patients showed similar left ventricular systolic and diastolic function parameters compared to controls, but significantly worse values in systolic and diastolic right ventricular function (see table below), although still within normal limits.

<table>
<thead>
<tr>
<th>Echo variables</th>
<th>SSc 65 pts</th>
<th>Controls 29 pts</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF (%)</td>
<td>63.0 ± 5.1</td>
<td>65.6 ± 6.4</td>
<td>0.07</td>
</tr>
<tr>
<td>MAPSE (mm)</td>
<td>15.9 ± 2.5</td>
<td>15.8 ± 3.1</td>
<td>0.86</td>
</tr>
<tr>
<td>LV S’ TDI (cm/sec)</td>
<td>9.5 ± 1.9</td>
<td>9.0 ± 1.8</td>
<td>0.31</td>
</tr>
<tr>
<td>LA area (cm²)</td>
<td>16.6 ± 3.8</td>
<td>16.4 ± 4.6</td>
<td>0.93</td>
</tr>
<tr>
<td>E/E</td>
<td>7.8 ± 2.1</td>
<td>7.0 ± 2.1</td>
<td>0.12</td>
</tr>
<tr>
<td>TAPSE (mm)</td>
<td>22.5 ± 4.3</td>
<td>26.7 ± 4.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>RV S’ TDI (cm/sec)</td>
<td>13.5 ± 2.8</td>
<td>15.7 ± 2.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>RV E’ TDI (cm/sec)</td>
<td>12.7 ± 3.9</td>
<td>14.7 ± 3.7</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>PASP (mmHg)</td>
<td>24.7 ± 5.5</td>
<td>24.8 ± 5.5</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Conclusion: In SSc patients without overt cardiac dysfunction and no PH, borderline right ventricular primary involvement can be detected by transthoracic Doppler echocardiography. The clinical implications of these very early alterations are still to be determined.

Disclosure: L. Gargani, None; P. Gosciniak, None; C. Bruni, None; S. Guiducci, None; S. Bellando Randone, None; L. Pratelli, None; G. Agoston, None; A. Moggi Pignone, None; A. Varga, None; R. Sicari, None; E. Picano, None; M. Matucci Cerinic, None.

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Ultrasonography of Salivary Glands: Diagnostic and Prognostic Value in Primary Sjögren’s Syndrome. Nicoletta Luciano1, Chiara Baldini1, Rachele Pascale1, Francesco Ferro1, Alessandro Paolicchi1, Davide Caramella2, and Stefano Bombardieri1, 1Rheumatology Unit, University of Pisa, Pisa, Italy, 2Diagnostic and Interventional Radiology, University of Pisa, Pisa, Italy

Background/Purpose: To assess the accuracy of ultrasonography of the salivary glands (US) in the diagnosis of primary Sjögren’s syndrome (pSS) and to verify whether US abnormalities can be correlated to patients’ clinical features, to the histopathological score of minor salivary gland biopsies and to the patients’ unstimulated sialometry of whole saliva.

Methods: Consecutive patients with a diagnosis of pSS made according to the AECG criteria were enrolled in the cross sectional prospective study. The control group consisted of subjects with suspected SS who did not fulfill the AECG criteria for pSS. US examination of the parotid and submandibular salivary glands was performed by a real-time US (Esaote Technos MPX) equipped with a 7.5/10 MHz linear transducer. The size, parenchymal echogenicity and fibrosis of major salivary glands were evaluated by the same observer who was not aware of the patients’ clinical diagnosis. Parenchymal inhomogeneity was assessed scoring as 0 = completely normal, 1 = slight abnormalities/few hypoechoic areas, 2 = multiple hypoechoic areas or 3 = many or confluent hypoechoic lesions. US abnormalities were compared with patients’ clinico-serological data, sialometric findings and minor salivary gland focus score. For statistical comparisons, the t-test, the chi square test and logistic regression analysis were employed. P-values <0.05 were considered significant.

Results: Out of the 122 consecutive patients included in the study, 74/122 (45 F:3M, age 54.7±11.8 yrs) met the AECG criteria for pSS while the other 48/122 (45 F:3M, age 54.8±14.9 yrs) represented the control group. US abnormalities were found in 53/74 pSS patients vs 10/48 control group (p<0.0001); the grading values 2 and 3 resulted more frequent in the pSS group (36/74 vs 24/48; p<0.0001). Overall, the sensitivity of US was 71%, specificity 79% (96%, if we considered only parotid inhomogeneity), positive predictive value 84% and negative predictive value 64%. Parenchymal inhomogeneity of both parotid and submandibular glands correlated with antimicrobial antibodies (ANA), anti-Ro/SSA, hypergammaglobulinemia and Rheumatoid Factor positivities. Patients with score 3 had significantly higher ESSDAI score (grade 3 vs 1, p=0.004; grade 3 vs 2, p=0.037) and showed trends towards lower salivary flow in comparison to other subgroups (grade 3 vs 1, p = 0.01; grade 3 vs grade 2, p= ns). When pSS patients where...
stratified according to parenchymal inhomogeneity, no difference was found in the presence of focal salivary glands.

**Conclusion:** Major salivary glands US may be a specific tool in the diagnosis of pSS. US abnormalities should be investigated particularly in pSS patients with positive serological markers.

**Disclosure:** N. Luciano, None; C. Baldini, None; R. Pascale, None; F. Ferro, None; A. Paolicchi, None; D. Caramella, None; S. Bombardieri, None.

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**Ultrasonographic Evaluation of the Hands of Patients with Primary and Secondary Sjögren’s Syndrome.** Cristina Hernández-Díaz1, Luis M. Amezcua-Guerra1, Angélica Vargas2, Alberto Lopez-Reyes3 and Carlos Pineda1. 1Instituto Nacional de Rehabilitacion, Mexico City, Mexico; 2Instituto Nacional de Cardiologia Ignacio Chavez, Mexico City, Mexico; 3Instituto Nacional de Rehabilitacion, Mexico City, Mexico

**Background/Purpose:** Primary Sjögren’s syndrome (pSS) is an autoimmune disease characterized by lymphocyte infiltration of various exocrine glands, often associated with joint involvement traditionally described as non-erosive. On the other hand, patients with secondary Sjögren’s syndrome (sSS) to rheumatoid arthritis (RA) can show a pattern of arthritis indistinguishable from that observed in patients with RA without SS associated. The description of these different patterns of disease activity was described by plain X-ray films. The advent of new imaging techniques such as magnetic resonance imaging (MRI) and musculoskeletal ultrasound (MSUS) have changed paradigms of subclinical structural damage in various rheumatic diseases. Objective: To characterize by MSUS the morphologic and structural changes in the joints of the hands of patients with SS.

**Methods:** Patients with the diagnosis of pSS according to the European-American criteria for the classification of Sjögren’s syndrome and sSS patients with associated AR as a control group. A Siemens Acuson Antares® MSUS equipment was used, using a hockey stick type probe (7–12 MHz) images were obtained from the carpal recess, metacarpal and interphalangeal joints of both hands. The presence of synovitis (synovial hypertrophy or joint effusion), erosions and Doppler signal were intentionally sought. MSUS pathology definitions were used as described by the OMERACT group study.

**Results:** Seventeen patients with pSS and 18 sSS were evaluated, mean age of 60.2 ± 11.91 years. Time evolution of the disease in pSS group was 3 years and 9 years for sSS. Fourteen patients (82%) of the pSS group were positive (≤ 120 s: II: 121 – 240 s: III: 241 – 360 s). To dissect the effect of the overall perfusion of the hand from the perfusion due to active synovitis, a fluorescence ratio (FLRA) was calculated for each individual joint dividing the readout of the joint by the readout of the eponychium of the index finger. For comparison, absence or presence of synovitis in 5 joints of the clinical predominant hand (carpal joint, metacarpophalangeal and proximal interphalangeal joints of digits II & III) were analyzed using grayscale (GSUS) and power Doppler (PDUS) ultrasonography, or magnetic resonance imaging (MRI). The mean FLRO and FLRA were compared between joints with absent vs. present synovitis determined by GSUS, PDUS and MRI using student’s t-test.

**Results:** Ninety joints of 18 patients (86%) was (± SD) age 60.2 ± 11.91 years with RA were included. For adequate FOI interpretation, phases II & III appear to be most relevant. Utilizing the presented quantitative approach, significant differences of the mean FLRO and particularly of the FLRA could be demonstrated comparing synovitic to non-synovitic joints in patients with active RA. However, a definitive cut-off value for either analytic method could not be established.

**Disclosure:** V. S. Schäfer, None; W. Hartung, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5; P. Hoffstetter, None; J. Berger, mivenion GmbH, 3, Physikalisch-Technische Bundesanstalt, Braunschweig, 5, M. Müller, None; M. Fleck, Abbott Immunology Pharmaceuticals, 5, Roche Pharmaceuticals, 5, Pfizer Inc, 5; B. P. Ehrenstein, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5, Roche Pharmacueticals, 5.

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**Quantitative Assessment of Synovitis in Patients with Rheumatoid Arthritis Using Fluorescence Optical Imaging.** Valentin S. Schäfer1, Wolfgang Hartung1, Patrick Hoffstetter2, Jörn Berger1, Martina Müller1, Martin Fleck1 and Boris P. Ehrenstein1. 1Asklepion Klinikum Bad Abbach, Bad Abbach, Germany; mivenion GmbH, Berlin, Germany; 2University Clinic Regensburg, Regensburg

**Background/Purpose:** To prospectively evaluate quantitative assessment of involvement grade (ICG-enhanced fluorescence optical imaging (FOI)) for differentiation of synovitic from non-synovitic joints in patients suffering from rheumatoid arthritis (RA).

**Methods:** FOI of the hands was performed in patients with active RA as recommended by the manufacturer (Xiralite system, Mivenion GmbH, Berlin, Germany; ICG bolus of 0.1 mg/kg body weight, sequence of 360 images, one image per second, stratified fluorescence readout (FLRO) of 3 phases (I: 1 – 120 s; II: 121 – 240 s; III: 241 to 360 s)).

**Results:** Ninety joints of 18 patients (86%) was (± SD) age 60.2 ± 11.91 years with RA were included. The quantitative analysis for individual joints yielded values for the FLRO ranging from 4.4 to 49.0 × 107, and the FLRA ranging from 0.37 to 2.27. A comparison of mean (± SD) of FLRO and FLRA is depicted in table 1. Overall, the analyses based on the FLRA performed with a higher discrimination than the analyses related to the FLRO. The most significant differences were observed for mean values of phases II & III. A sensitivity of 26/39 (67%) and a specificity of 31/40 (77%) were calculated for the FLRA of phase III using a cut-off value of more than 1.2 to detect MRI-diagnosed synovitis with FOI.

**Table 1. Mean fluorescence readout and fluorescence ratios for joints with vs. without evidence of synovitis determined by established imaging techniques.**

<table>
<thead>
<tr>
<th>Synovitis</th>
<th>phase 1</th>
<th>phase II</th>
<th>phase III</th>
</tr>
</thead>
<tbody>
<tr>
<td>readout</td>
<td>1–120 s</td>
<td>121–240 s</td>
<td>241–360 s</td>
</tr>
<tr>
<td>GSUS yes</td>
<td>21.0 ± 11.4</td>
<td>23.5 ± 10.4</td>
<td>15.8 ± 7.9</td>
</tr>
<tr>
<td>GSUS no</td>
<td>16.6 ± 6.8</td>
<td>16.5 ± 6.8</td>
<td>10.5 ± 5.8</td>
</tr>
<tr>
<td>PDUS yes</td>
<td>24 ± 13.2</td>
<td>23.8 ± 9.3</td>
<td>15.0 ± 5.9</td>
</tr>
<tr>
<td>PDUS no</td>
<td>17.5 ± 7.7</td>
<td>18.2 ± 8.7</td>
<td>12.0 ± 7.0</td>
</tr>
<tr>
<td>MRI yes</td>
<td>20.9 ± 10.1</td>
<td>22.3 ± 9.5</td>
<td>14.8 ± 7.3</td>
</tr>
<tr>
<td>MRI no</td>
<td>17.8 ± 9.6</td>
<td>17.2 ± 9.2</td>
<td>10.9 ± 6.5</td>
</tr>
<tr>
<td>FOI ratio</td>
<td>0.47</td>
<td>0.34</td>
<td>0.50</td>
</tr>
<tr>
<td>FOI ratio</td>
<td>0.26</td>
<td>0.33</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Fluorescence readout results are displayed for better readability divided by 107. FOI = fluorescence optical imaging, GSUS = grey scale ultrasonography, PDUS=power Doppler ultrasonography, MRI= magnetic resonance imaging, FLRA ranging from 0.37 to 2.27. A comparison of mean (± SD) of FLRO and FLRA is depicted in table 1. Overall, the analyses based on the FLRA performed with a higher discrimination than the analyses related to the FLRO. The most significant differences were observed for mean values of phases II & III. A sensitivity of 26/39 (67%) and a specificity of 31/40 (77%) were calculated for the FLRA of phase III using a cut-off value of more than 1.2 to detect MRI-diagnosed synovitis with FOI.

**Conclusion:** ICG enhanced FOI has a potential for visualizing synovitis in subjects with RA. For adequate FOI interpretation, phases II & III appear to be most relevant. Utilizing the presented quantitative approach, significant differences of the mean FLRO and particularly of the FLRA could be demonstrated comparing synovitic to non-synovitic joints in patients with active RA. However, a definitive cut-off value for either analytic method could not be established.

**Disclosure:** V. S. Schäfer, None; W. Hartung, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5; P. Hoffstetter, None; J. Berger, mivenion GmbH, 3, Physikalisch-Technische Bundesanstalt, Braunschweig, 5, M. Müller, None; M. Fleck, Abbott Immunology Pharmaceuticals, 5, Roche Pharmaceuticals, 5, Pfizer Inc, 5; B. P. Ehrenstein, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5, Roche Pharmacueticals, 5.

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**Comparison of Automated, Computer-Based Assessment and Visually Assessed Disease Activity Scores in ICG-Enhanced Fluorescence Optical Imaging in Patients with Rheumatic Disorders: A Feasibility Study.** Stephanie G. Werner1, Michael Schirner2, Hans-Eckhard Langer3, Mathias Czumplik1, Jörn Berger4, Marina Backhaus5 and Malte Bahner2. 1RHIO, Rheumatology, Immunology, Osteology Duesseldorf, Dueseldorf, Germany; mivenion GmbH, Berlin, Germany; 3Roche Pharmaceuticals, Dueseldorf, Germany; 4Charite University Hospital, Berlin, Germany

**Background/Purpose:** Modern diagnostic imaging technologies including US and MRI become increasingly important in the management of rheumatic joint disorders. Semiquantitative scores, like the RAMRIS or the
US7 – score aim at measuring disease activity especially for clinical trials. Most recently, fluorescence optical imaging (FOI) became clinically available for diagnostic imaging. Most recently, it has been shown that automatic, computer-based image analysis of FOI using dedicated software is technically feasible and offers high reproducibility. Measurement of areas of high signal intensity expressed as DACT value may provide a reliable quantitative readout for inflammatory activity. In this feasibility study we compared the results of visual reading of FOI using the semiquantitative scoring system (FOIAS) (fluorescence optical imaging activity score) for visually assessment with this automatic, computer-based algorithm for quantitative analysis.

Methods: 45 patients (34 f, mean age 55y, mean DAS28 4.2) were selected. First 4 readers analyzed all 45 image data sets individually, and then 2 of the four readers performed a consensus reading. For articualar location of increased signal intensities (ISI) the FOIAS was used. For extraarticual location the signals were graded semiquantitatively on a scale of 0 to 2. These values were added to a single number representing the overall fluorescence signal intensity of the hands (cFOIAS, complete FOIAS). For DACT the intensity expressed as DACT value may provide a reliable quantitative readout for inflammatory activity. In this feasibility study we compared the diagnostic validities of the bone scintigraphy (BS) and BS assisted diagnosis in healthy individual equaled 1. Then cFOIAS and DACT value were compared.

Results: Correlation of the cFOIAS and the DACT value was high, while all 4 readers and the consensus readings showed good interreader reliability. Two sample scatter plots are shown in the figure.

Conclusion: Assessment of disease activity in FOI using automated, computer-based algorithms correlated well with visual assessment with a scoring system. While the semiquantitative assessment is time consuming and can be biased by the reader, the automatic calculation may be an objective and fast tool for assessment of disease activity. Following work should concern to prove this and the potential value of DACT for monitoring of treatment response in longitudinal, interventional studies.

Disclosure: S. G. Werner, None; M. Schirner, mivenion GmbH, 1, mivenion GmbH, 3; H. E. Langer, None; M. Cziumplik, mivenion GmbH, 3; J. Berger, mivenion GmbH, 3, Physikalisch Technische Bundesanstalt, 9, M. Bachhaus, None; M. Bahner, mivenion GmbH, 1, mivenion GmbH, 3.

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Is Bone Scintigraphy Still Useful to Diagnose Rheumatoid Arthritis After the Appearance of 2010 ACR/EULAR Classification Criteria? Ji Young Kim1, Soo-chong Cho2, Min-Kyung Han2, Yun Young Choi2, Ji Young Kim1

Background/Purpose: For many years, the importance of bone scintigraphy to measure inflammation in the joints of patients with RA has been emphasized. Moreover, increased blood pool activity of involved joints in bone scintigraphy corresponds to inflammatory synovitis which is characteristic feature in early RA. Therefore, bone scintigraphy especially with blood pool phase, might be useful in suggesting early joint involvement in RA. The aim of this study was to investigate the usefulness of bone scintigraphy in the diagnosis of rheumatoid arthritis (RA) with assisting the 2010 ACR/EULAR classification criteria.

Methods: A total of 156 patients who firstly visited the rheumatology department and had taken bone scintigraphy and blood pool image with screening laboratory and radiologic tests to confirm RA diagnosis were retrospectively enrolled. Gold standard RA patients were defined as the patients who started disease modifying anti-rheumatic drugs within 3 months of their first visit. After dividing patients into two groups according to the presence or absence of arthritis on their first presentation, we evaluated the diagnostic validity of bone scintigraphy as an independent diagnostic tool (BS only) and as an assistant tool for physicians’ application of 1987 and 2010 criteria (BS assisted diagnosis) to detect RA. In BS assisted diagnosis, the number, symmetry, and distribution of involved joints were evaluated with BS results instead of physician’s assessment.

Results: Seventy-five (48.1%) of the 156 patients had active arthritis on physical examination (Group I) and the others of 81 patients did not have arthritis at first visit (Group II). Among them, 56 (74.7%) in group I and 5 (6.2%) in group II were RA patients, respectively. For group I patients (n=75), who were eligible to 2010 criteria, the sensitivity of the bone scintigraphy alone was extremely low (42.9%) with elevated specificity (100%), though those of 2010 criteria assessed by only physician (82.1% and 94.7%, respectively). For this group, the sensitivity of BS assisted diagnosis (75.0%) was slightly lower than that of the diagnosis by physician. For group II patients (n=81) who are not eligible for 2010 criteria, only BS or BS assisted diagnosis identified 2 more RA patients among 5 gold standard RA patients who did not satisfy either 1987 or 2010 criteria (Table).

Table. Comparison of the diagnostic validities of the bone scintigraphy (BS) and BS assisted diagnosis

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
<th>PPV, %</th>
<th>NPV, %</th>
<th>AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I, Patients with Arthritis at presentation (who are eligible for 2010 criteria, n=75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS only</td>
<td>42.9</td>
<td>100</td>
<td>100</td>
<td>37.3</td>
<td></td>
</tr>
<tr>
<td>1987 criteria</td>
<td>Physician only</td>
<td>66.0</td>
<td>99.2</td>
<td>97.4</td>
<td>86.1</td>
</tr>
<tr>
<td>Physicm with BS</td>
<td>58.9</td>
<td>100</td>
<td>45.2</td>
<td>91.1</td>
<td>0.844 (0.77-0.977)</td>
</tr>
<tr>
<td>2010 criteria</td>
<td>Physician only</td>
<td>82.1</td>
<td>94.7</td>
<td>97.9</td>
<td>64.3</td>
</tr>
<tr>
<td>Physicm with BS</td>
<td>73.0</td>
<td>94.7</td>
<td>97.7</td>
<td>56.2</td>
<td>0.943 (0.883-1.0)</td>
</tr>
<tr>
<td>Group II, Patients without Arthritis at presentation (who are not eligible for 2010 criteria, n=81)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS only</td>
<td>40.0</td>
<td>98.7</td>
<td>66.7</td>
<td>96.2</td>
<td></td>
</tr>
<tr>
<td>1987 criteria</td>
<td>Physician only</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>93.8</td>
</tr>
<tr>
<td>Physicm with BS</td>
<td>20.0</td>
<td>100</td>
<td>95.0</td>
<td>0.696 (0.355-1.0)</td>
<td></td>
</tr>
<tr>
<td>2010 criteria</td>
<td>Physician only</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>93.8</td>
</tr>
<tr>
<td>Physicm with BS</td>
<td>40.0</td>
<td>100</td>
<td>96.2</td>
<td>0.862 (1.0)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: In usual practice, BS assisted diagnosis is not superior to physician’s assessment, especially after appearance of 2010 ACR/EULAR classification criteria. However, bone scintigraphy is still helpful to rule out non RA patients in patients with arthritis and to find out RA patients among patients without arthritis on physical examination.

Disclosure: J. Y. Kim, None; S. K. Cho, None; M. K. Han, None; Y. Y. Choi, None; Y. K. Sung, None.

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Subclinical Arthritis Visualised by Positron Emission Tomography and Macrophage Targeting Precedes Clinical Flare in Rheumatoid Arthritis Patients in DAS28 Remission. Y. Y. Gent, A. E. Voskayl, N. Ahmadni, N. Hoejties and C. J. van der Laken. VU University Medical Center, Amsterdam, Netherlands

Background/Purpose: Macrophages play an important role in the pathophysiology of Rheumatoid Arthritis (RA). Targeting of macrophages by (R)-[11C]PK11195 positron emission tomography (PET) has previously been successfully used for imaging of (sub)clinical synovitis in preclinical and established RA patients. It is known that a considerable number of RA patients with minimal disease activity or remission may have subclinical disease activity as well. Therefore, we have performed a prospective pilot study in which (R)-[11C]PK11195 PET was used to visualise subclinical inflammation in hand and/or wrist joints of RA patients that are in DAS28 clinical remission, in relation to magnetic resonance imaging (MRI) at baseline and clinical outcome within 3 years.

Methods: High spatial resolution (R)-[11C]PK11195 PET scans and contrast-enhanced MRI scans of both hands and wrists were performed in twenty-nine RA patients without any signs of arthritis according a 28-joint count and fulfilling DAS28 clinical remission. PET tracer uptake was scored semiquantitatively according a 0–3 scale and MRI scans were scored for presence of synovitis and bone marrow edema (BME) according to the OMERACT RAMRIS score. Cumulative scores were calculated by adding
up joint scores of all metacarpophalangeal, proximal interphalangeal and wrist joints (range PET 0–66; range MRI 0–222).

Results: (R)-[11C]PK11195 PET scans showed evidence of subclinical arthritis in at least one hand and/or wrist joint in 16/29 (55%) of patients. flare of clinical arthritis was found in 17/29 (59%) of patients within 3 years of clinical follow-up. Patients with cumulative PET scores >6 (n=3) and scores of 4-5 (n=2) developed arthritis in hands/wrists within respectively 26 weeks and 52 weeks. The SUVs of PET scores of >6 also depicted high cumulative MRI scores of >37. In patients without flare of clinical arthritis within 3 years (n=12), PET scores were always low or negative (≤1), but MRI scores varied between 0 and 27.

Conclusion: This prospective pilot study shows that macrophage targeting by (R)-[11C]PK11195 PET visualises subclinical synovitis in hand/wrist joints of RA patients in DAS28 remission. At patient level, high cumulative PET scores may predict a short-term flare of arthritis activity. (R)-[11C]PK11195 PET may be of additive value to MRI for detection of subclinical synovitis in DAS28 remission patients, in particular with regard to specificity, but this needs to be confirmed in larger patient cohorts.

Disclosure: Y. Y. J. Gent, None; A. E. Voskuyl, None; N. Ahmadl, None; N. Hoetjes, None; C. J. van der Laken, None.

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FDG-PET Evaluation of Axillary Lymph Nodes and Large Joints of Patients with Rheumatoid Arthritis Treated with Anti-TNF Drugs.

Koichi Okamura1, Yukio Yonemoto1, Tetsuya Kaneko1, Kimihiko Takeuchi2, Tatsuomi Kobayashi1 and Kenji Takagishi1, 1Gunma University Graduate School of Medicine, Maebashi, Gunma, Japan, 2Iseaki Fujishima Hospital, Iseaki, Gunma, Japan.

Background/ Purpose: F-18 fluoro-2-deoxy-D-glucose positron emission tomography (PET) can be used to image synovial inflammation in patients with rheumatoid arthritis (RA). The development of molecular imaging methods would be beneficial, especially in RA patients. In the present study, we evaluated whether the FDG uptake of the affected joints and the axillary lymph nodes (AxLN) represented by the standardized uptake value (SUV) correlated with the clinical assessment of patients with RA. In addition, we evaluated if there was a correlation between the differences in the SUV and the improvement of the therapy in inflammatory diseases. Positron-emission tomography/computed tomography (PET/CT) enables the acquisition of whole-body images and provides functional information about disease activity. The purpose of our study was to describe the PET/CT findings in patients with histologically-proven IgG4-RD and to evaluate their correlation with disease activity.

Materials/Methods: We searched the IgG4-RD Registry at Massachusetts General Hospital. Between March 2007 and May 2012, 20 patients (7 female and 13 male; median age 57 years, range 27–81), underwent whole body 18F-fluoro-2-deoxy-D-glucose positron-emission tomography/computed tomography (FDG PET/CT) imaging. All 20 patients had diagnoses of IgG4-RD based on the characteristic histology and immunostaining findings for this condition. We compared the sites of disease activity identified by PET/CT to the sites identified by their clinicians through symptoms, signs, laboratory findings, and other imaging studies.

Results: Patients presented with various symptoms including: flank/back pain (7 patients), face swelling (3), neck swelling (3), propotion (2), cough (2), weight loss (2), sinus congestion (2), and dry mouth/eyes (1). Thirteen of 20 patients (65%) had multi-organ disease at presentation, affecting some combination of the pancreas, bile ducts, liver, gallbladder, lung, salivary glands, orbitals, aorta, thyroid, kidney, retroperitoneum, and lymph nodes. The mean number of organs involved among patients with multi-organ disease was 4.1 (ranging 2–7 organs). Seven patients (35%) had localized disease at presentation (5 RPF, 1 lymphadenitis, 1 orbital pseudotumor).

The serum IgG4 was elevated in 8 patients at the time of PET-CT imaging (mean 635.6 mg/dL). FDG PET was positive in all 20 patients (mild to intense uptake in 19 and low in 1 subject). In 17/20 patients (85%), FDG uptake was concordant with clinical manifestations of active inflammation. In addition 7/20 (35%) had FDG uptake in organs not suspected of involvement on a clinical basis alone (RPF, lymph nodes, thoracic aorta, lung, lacrimal glands and nasopharynx).

Conclusion: In IgG4-RD, FDG PET-CT is a sensitive imaging tool for the detection of subclinical disease. This modality can demonstrate additional sites of disease not obvious by clinical presentation or on conventional CT imaging, therefore providing a more complete assessment of the extent of organ disease. It’s utility as a tool for monitoring treatment response and guiding therapy requires prospective studies.

Disclosure: A. Khosroshahi, None; L. Lee, None; M. Carruthers, None; R. Acu, None; P. Bonaffini, None; V. Deshpande, None; D. Sahani, None; J. H. Stone, Genentech, 5.
excluded the patients with pseudogout, hyperuricemia without gout, septic arthritis, traumatic arthritis, and RA initially misdiagnosed as having gout. Cumulative incidence of gout in RA adjusted for the competing risk of death was estimated. Cox models were used to assess risk factors for gout in RA.

Results: The study population included 813 patients, 537 (66%) were rheumatoid factor positive; 33% had rheumatoid nodules, and 53% had erosive joint disease. Among 9771 total person-years of follow-up (mean 12.0 years) we observed 582 patients developed gout by clinical criteria. The great toe was the most common site of gout (12 of 22 patients). The 25 year cumulative incidence of gout diagnosed by clinical criteria was 3.5%. Typical intracranial monosodium urate crystals were present in 9 of 22 patients with acute gout; all had developed gout after the RA incidence date. The 25 year cumulative incidence of gout diagnosed by clinical criteria including presence of urate crystals is 1.3%. The prevalence of gout in RA on Jan 1, 2008 was 1.9% (11 of 582 patients) as opposed to expected prevalence of 5.2% (or 30 patients) based on National Health and Nutrition Examination Survey (NHANES) data using age and sex specific prevalence rates.

Risk factors for gout in RA were: older age (hazard ratio [HR] 1.5 per 10 year increase; p < 0.04), male sex (HR 3.18; p = 0.03) and obesity (HR 3.5; p = 0.03). The presence of erosive RA joint disease reduced the risk of gout (HR 0.24; p = 0.03). Gout has become more common in patients diagnosed with RA in recent years (1995–2007) than in previous years (1980–1994; HR 5.6; p = 0.007).

Conclusion: Gout does occur in patients with RA though at a lower rate than in the general population, with a maximum/minimum cumulative incidence of 1.35–3.5%. Risk factors for gout in RA generally mirror those in the general population.

Disclosure: A. Jebakumar, None; C. S. Crowson, None; P. D. Udavakumaran, None; E. L. Matteson, Centocor, Inc.; Johnson and Johnson, 2; Genentech and Biogen IDEC Inc., 2; Hoffmann-La Roche, Inc., 2; Human Genome Sciences, Inc., 2; Pfizer Inc., 2; Novartis Pharmaceutical Corporation, 2; Roche Pharmaceuticals, 2; UCB Group, 2; Centocor, Inc., 5; Horizon Pharma, 5; Novartis Pharmaceutical Corporation, 5.

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A Pilot Study of the Efficacy of IL-1 Blockade by Anakinra in Acute Calcific Periarthritis of the Rotator Cuff. Pascal Zufferey, Melanie Faucherre, Pierre A. Varisco, Berengere Aubry Sr., Isabelle Fabreguet and Alexander K. So Sr.. CHUV, Lausanne, Switzerland

Background/Purpose: Calcific periarthritis of rotator cuff can induce acute and severe shoulder pain and is accompanied by signs of acute inflammation. The calcific deposits are composed of calcium phosphate crystals such as hydroxyapatite or basic calcium phosphate. These crystals stimulate the production and release of IL-1β from macrophages, in an analogous manner to MSU and CPPD crystals. As IL-1 blockade is effective in reducing signs and symptoms of inflammation in acute gout, we performed a pilot study to study if it is also effective in calcific periarthritis

Methods: 5 consecutive patients were included (mean age: 62, 3 females, 2 males) between March 2011 and March 2012. Symptoms of acute shoulder pain at rest had to be present for <7 days before inclusion, associated with limitation of shoulder mobility and the presence on calcification in the rotator cuff by conventional radiography. None of the patients had responded to at least 48 hours of high doses of NSAIDs. Exclusion criteria included no corticosteroid therapy in conventional radiography. None of the patients had responded to at least 48 hours of shoulder mobility and the presence on calcification in the rotator cuff by conventional radiography. None of the patients had responded to at least 48 hours of shoulder mobility and the presence on calcification in the rotator cuff by ultrasound examination showed shoulder mobility at days 0, 3, 15. ESR and CRP were measured at days 0, 3.

Results: Shoulder mobility also improved and the CRP normalized in 4 of 5 patients at day 15. The pain is still present even when the affected joint is not being moved/used.

Conclusion: Physicians’ and patients’ perceptions of the key features of gout have some similarities but many differences. The list of features with a

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A Delphi Exercise to Identify Characteristic Features of Gout—a Study of Opinions From Patients and Physicians to Inform New Classification Criteria. Rebecca Prowse, Nicola Dalbeth, H. R. Schumacher, Tuhina Neogi, Tim L. Jensen, Jaap Fransen and William Taylor. University of Otago, Wellington, New Zealand, 1University of Auckland, Auckland, New Zealand, 2University of Pennsylvania and VA Medical Center, Philadelphia, PA, 3Boston Univ School of Medicine, Boston, MA, 4St Radboud University Nijmegen Medical Centre, Netherlands, 5Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

Background/Purpose: Updated classification criteria for gout are required. The aim of this study was to identify a comprehensive list of features that might discriminate between gout and similar conditions, for use in a subsequent case-control study for developing and testing new classification criteria.

Methods: Two Delphi exercises were conducted using web-based questionnaires; one with physicians who have an interest in gout and one with patients who have gout. Physicians rated a list of potentially discriminating features that were identified via literature review and expert opinion and patients rated a list of features that they generated themselves. Agreement was defined by the RAND/UCLA disagreement index. Multiple iterations were conducted until consensus was reached or no changes in participant ratings were observed.

Results: Forty-four highly experienced physicians (62% response rate) and nine patients (11% response rate) responded to all iterations. For physicians, 71 items were identified by literature review and 15 more were suggested by physicians. The physician survey showed agreement for 26 discriminatory features and 15 that were not discriminatory. The patients identified 46 features of gout for which there was agreement on 25 items as being discriminatory and seven items being not discriminatory. The results of highly rated features for both physician and patient surveys are summarised in the Table (showing areas of agreement and disagreement). Patients and physicians agreed upon several key features of gout: suddenness of onset, redness, marked tenderness and swelling of the affected joint, elevated serum urate levels, presence of tophi, presence of urate crystals in synovial fluid and involvement of the first metatarsophalangeal joint. Physicians emphasized imaging and patterns of symptoms, whereas patients emphasized functional impact, dietary triggers and idiographic perception of symptoms.

Table. The overlap and differences between features highly rated (median 7 to 9) by physicians and patients. US: ultrasonography, CT: computed tomography, DECT: dual energy CT, MRI: magnetic resonance imaging

<table>
<thead>
<tr>
<th>Highly rated by physicians</th>
<th>Highly rated by physicians and patients</th>
<th>Highly rated by patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical X-ray erosion</td>
<td>Hyperuricemia</td>
<td>Difficulty walking</td>
</tr>
<tr>
<td>Snowstorm joint effusion appearance on US</td>
<td>MSU crystals in joint/tissue aspirate</td>
<td>Can’t use affected joint</td>
</tr>
<tr>
<td>Tophi on US, DECT, CT or MRI</td>
<td>Tophi</td>
<td>Interrupts sleep</td>
</tr>
<tr>
<td>Double-contour sign on US</td>
<td>Podagra ever</td>
<td>Medication helps</td>
</tr>
<tr>
<td>Monoarticular attacks in first few years, becoming oligo-, then polyarticular over time</td>
<td>Abrupt and severe pain</td>
<td>Thrashing/severe, sharp aching pain</td>
</tr>
<tr>
<td>Podagra at first attack</td>
<td>Redness around the affected joint joint</td>
<td>Gout attack occurs after eating seafood/shellfish/alcohol</td>
</tr>
<tr>
<td>Complete resolution of attacks</td>
<td>Normalized joint tenderness</td>
<td>The affected joint is hot or burning</td>
</tr>
<tr>
<td>Resolution of an attack within 7-14 days</td>
<td>Monoarticular joint involvement</td>
<td>The affected joint enlarged/swollen</td>
</tr>
<tr>
<td>Mid-foot joint involvement</td>
<td></td>
<td>If you injure an area that has been affected by gout, it takes longer to heal than one that has not been affected by gout</td>
</tr>
<tr>
<td>Uric acid nephrolithiasis</td>
<td></td>
<td>Only one foot is usually affected at a time</td>
</tr>
</tbody>
</table>

Conclusion: Physicians’ and patients’ perceptions of the key features of gout have some similarities but many differences. The list of features with a

SS9
median rating of 7 to 9, generated by both patients and physicians, will be examined in a case-control study to identify the most sensitive and specific combination for the classification of crystal-proven gout.

Disclosure: R. Prowse, None; N. Dalbeth, None; H. R. Schumacher, None; T. Neogi, None; T. L. Jansen, None; J. Fransen, None; W. Taylor, None.

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Monosodium Urate Crystals Inhibit Tenocyte Viability and Function: Implications for Periarticular Involvement in Chronic Gout. Ashika Chhana1, Karen E. Callon1, Bregina Pool1, Dorit Naot1, Gregory Gamble1, Brendan Coleman2, Fiona M. McQueen3, Jillian Cornish1 and Nicola Dalbeth1. 1Hospital of the University of Pennsylvania, Philadelphia, PA, 2University of Pennsylvania and Philadelphia Veterans Hospital, Philadelphia, PA, 3Hospital, Auckland, Auckland, New Zealand

Background/Purpose: Recent advanced imaging studies have demonstrated that monosodium urate monohydrate (MSU) crystals are likely to be in direct contact with tenocytes, the stromal cells of tendons. The aim of this study was to determine the effects of MSU crystals on tenocyte viability and function.

Methods: Cultures of primary rat tenocytes were prepared from Wistar rat tails. Primary human tenocytes were prepared from patients undergoing orthopedic surgery. MTT assays were used to assess tenocyte viability following culture with MSU crystals. Cells cultured with MSU crystals for various times were stained with Annexin V and propidium iodide, and flow cytometry was used to determine changes in the levels of apoptosis.

Results: MSU crystals reduced viability in a dose-dependent manner in both primary rat and human tenocytes (Figure). Differing MSU crystal lengths and increased serum levels in cultures did not alter this effect. The reduction in tenocyte viability was specific to MSU crystals, as soluble uric acid did not reduce cell viability. Flow cytometry showed that MSU crystals rapidly induced cell death, but apoptosis levels remained unchanged. Culture with MSU crystals reduced mRNA expression of collagen types 1 and 3; and tenocyte markers, including tenomodulin, scleraxis and tenasin-C. Collagen deposition was inhibited in tenocytes cultured with MSU crystals in a dose-dependent manner.

Conclusion: These data indicate that MSU crystals directly interact with tenocytes to reduce cell viability and function. These interactions may contribute to tendon damage in patients with chronic gout.

Disclosure: A. Chhana, None; K. E. Callon, None; B. Pool, None; D. Naot, None; G. Gamble, None; B. Coleman, None; F. M. McQueen, None; J. Cornish, None; N. Dalbeth, None.

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Evaluating Appropriate Use of Prophylactic Colchicine and Urate Lowering Therapy in Gout. Michael George1, Sally W. Pullman-Moosar2 and H. Ralph Schumacher3. 1Hospital of the University of Pennsylvania, Philadelphia, PA, 2University of Pennsylvania and Philadelphia Veterans Hospital, Philadelphia, PA, 3University of Pennsylvania and VA Medical Center, Philadelphia, PA

Background/Purpose: Colchicine is recommended to prevent gout flares in patients initiating and increasing uric acid lowering therapy until serum uric acid is ≤ 6 mg/dL. Many patients, however, are prescribed colchicine without adequate urate lowering therapy or remain on colchicine after uric acid targets have been met. The recent dramatic increase in colchicine cost in the United States has made it even more important to examine current prescribing practices, identify variables that influence these practices, and promote appropriate colchicine use.

Methods: Pharmacy identified 193 patients at a VA medical center with active outpatient colchicine prescriptions on 11/4/2011. Electronic medical record review revealed 126 patients prescribed colchicine for > 30 days for prophylaxis of gout flares. Colchicine prescribing was defined as inappropriate if 1) no concurrent urate lowering therapy was prescribed, 2) uric acid was not at goal and urate lowering therapy had not been initiated or increased in the past 3 months, or 3) uric acid goals were met for > 1 year and flares had resolved in the absence of tophi. Demographic and clinical variables in appropriate and inappropriate groups were compared.

Results: Of 126 patients prescribed prophylactic colchicine, 34 (27.0%) were prescribed no urate lowering therapy, 50 (39.7%) were not at uric acid goal and had not had urate lowering therapy increased in the prior 3 months, and 9 (7.1%) were at uric acid goal for more than one year with no flares or tophi. Colchicine use was considered appropriate in 33 patients (26.2%) – 20 (15.9%) with urate lowering therapy initiated or increased in the past 3 months, 12 (9.5%) at uric acid target for < 1 year, and 1 (0.8%) at uric acid target for > 1 year but with continued flares. Patients appropriately prescribed colchicine were younger, had shorter time on colchicine, and were more likely to have been seen by Rheumatology as opposed to being managed solely by primary care. Allopurinol dose and allergy, uric acid level, and renal function were similar in the two groups (see table).

Comparison of Patients Appropriately and Inappropriately Prescribed Prophylactic Colchicine

<table>
<thead>
<tr>
<th></th>
<th>Appropriate (N=33)</th>
<th>Inappropriate (N=93)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs</td>
<td>65 [33–49]</td>
<td>70 [37–49]</td>
<td>0.01</td>
</tr>
<tr>
<td>Male, no. (%)</td>
<td>33 (100.0)</td>
<td>92 (98.9)</td>
<td>1.0</td>
</tr>
<tr>
<td>Colchicine daily dose, mg</td>
<td>0.6 [0.3–1.2]</td>
<td>0.6 [0.3–1.2]</td>
<td>0.57</td>
</tr>
<tr>
<td>Time on colchicine, yrs</td>
<td>1.12 [0.07–17.4]</td>
<td>3.26 [0.85–14.1]</td>
<td>0.0002</td>
</tr>
<tr>
<td>Allopurinol dose, mg</td>
<td>200 [100–400]</td>
<td>200 [100–400]</td>
<td>0.34</td>
</tr>
<tr>
<td>Allopurinol allergy, no. (%)</td>
<td>1 (3.0)</td>
<td>7 (7.5)</td>
<td>0.36</td>
</tr>
<tr>
<td>Crystal confirmed, no. (%)</td>
<td>33 (91.8)</td>
<td>37 (39.8)</td>
<td>0.79</td>
</tr>
<tr>
<td>Uric acid level, mg/dL</td>
<td>6.7 [4.2–14.2]</td>
<td>7.4 [3.6–13.2]</td>
<td>0.36</td>
</tr>
<tr>
<td>Creatinine, mg/dL</td>
<td>1.29 [0.8–2.3]</td>
<td>1.24 [0.7–2.9]</td>
<td>0.93</td>
</tr>
<tr>
<td>GFR, mL/min/1.73m²</td>
<td>64 [37–126]</td>
<td>67 [27–144]</td>
<td>0.87</td>
</tr>
<tr>
<td>Rheumatology visit ≤ 1 yr, no. (%)</td>
<td>19 (57.6)</td>
<td>20 (21.5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Rheumatology visit ever, no. (%)</td>
<td>25 (75.8)</td>
<td>51 (54.8)</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Skewed data expressed as median [range]. Percentages may not add up to 100 because of rounding.

Conclusion: Our results demonstrate a high incidence of what we considered inappropriate prophylactic colchicine use, driven largely by failure to prescribe concurrent urate lowering therapy or adequately increase these medications. Rheumatology consultation was associated with improved colchicine prescribing. Increased education of primary care physicians about current standards of care is needed to avoid unnecessary colchicine exposure and excessive health care system costs.

Disclosure: M. George, None; S. W. Pullman-Moosar, None; H. R. Schumacher, Takeda, Wyeth, 2, Regeneneron, Novartis, Ardea, Pfizer, Savient, Metabolex, 5.

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Lack of Effect of Supplemental Vitamin C On Serum Urate in Patients with Gout. Lisa K. Stamp1, Christopher Frampton1, John L. O’Donnell1, Jill Drake1 and Peter T. Chapman1. 1University of Otago, Christchurch, Christchurch, New Zealand, 2Canterbury Health Laboratories, Christchurch, New Zealand, 3Christchurch Hospital, Christchurch, New Zealand

Background/Purpose: The key to effective long-term management of gout is sustained reduction of serum urate (SU) <0.6mmol/L. It has been suggested that supplemental vitamin C reduces SU in healthy controls via its uricosuric effect. However, it is unclear whether the reduction in SU is of a similar magnitude in patients with gout (who have reduced urate excretion) or whether co-administration of allopurinol lessens the magnitude of SU reduction from vitamin C. The aims of this study were to determine effects of modest dose supplemental vitamin C on SU in patients with gout both as monotherapy and in combination with allopurinol.

Methods: Patients with gout and a SU >0.36mmol/L were recruited. 20
patients already receiving allopurinol were randomised to either increase the dose of allopurinol or commence vitamin C 500mg/d. 20 patients not receiving urate lowering therapy were randomised to either start allopurinol or vitamin C 500mg/d. Plasma ascorbate, creatinine, SU, urine urate and creatinine were measured at days 0 and week 8.

**Results:** 18/20 patients who received Vitamin C were male with a mean age of 57.2 years (39–86). 18/20 patients who did not receive vitamin C were male with mean age of 55.0 years (27–78). There was no significant difference in baseline SU or eGFR between those who received vitamin C and those who did not (SU 0.50 ± 0.11mmol/l vs. 0.50 ± 0.09mmol/l; p=0.89; eGFR 65.5 ± 15.7 vs. 67.9 ± 20.7; p=0.67). 30% in the vitamin C group were receiving diuretics compared to 25% in the no vitamin C group (p=0.72).

In the 20 patients receiving supplemental vitamin C there was a significant increase between week 0 and week 8 in plasma ascorbate (34.2μmol/l; p<0.001). There was no significant change in plasma ascorbate in those who did not receive vitamin C. The reduction in SU was significantly less in those who did not receive vitamin C (p=0.72). In the 20 patients receiving supplemental vitamin C there was a significant increase between week 0 and week 8 in SU (0.014mmol/l vs. 0.118mmol/l; p<0.001) (Figure). Allowing for eGFR did not affect these results.

Since Vitamin C is uricosuric we assessed change in uric acid excretion using the Simkin index. In those patients already receiving allopurinol, addition of Vitamin C or an increase in allopurinol dose had no effect. In contrast, in those patients starting allopurinol there was a significant reduction in the Simkin index compared to those who did not receive vitamin C. The reduction in SU was significantly less in those 20 patients receiving vitamin C compared to those who started or increased the dose of allopurinol (0.014mmol/l vs. 0.118mmol/l; p<0.001) (Figure). Allowing for eGFR did not affect these results.

In the 20 patients receiving supplemental vitamin C there was a significant increase between week 0 and week 8 in plasma ascorbate (34.2μmol/l; p<0.001). There was no significant change in plasma ascorbate in those who did not receive vitamin C. The reduction in SU was significantly less in those who did not receive vitamin C (p=0.72). In the 20 patients receiving supplemental vitamin C there was a significant increase between week 0 and week 8 in SU (0.014mmol/l vs. 0.118mmol/l; p<0.001) (Figure). Allowing for eGFR did not affect these results.

**Conclusion:** In this study supplemental vitamin C at modest dose (500mg/d) for 8 weeks had no significant urate lowering effect in patients with gout despite increasing plasma ascorbate concentrations. These results differ from findings in hyperuricaemic healthy controls. The uricosuric effect of modest dose vitamin C appears less in patients with gout both as monotherapy and in combination with allopurinol. Whether larger doses will be effective remains to be determined.

**Disclosure:** L. K. Stamp, None; C. Frampton, None; J. L. O’Donnell, None; J. Drake, None; P. T. Chapman, None.

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**Effectiveness of Prophylaxis with Anti-Gout Medications On Risk of Gout Attacks.** Tuhina Neogi1, Clara Chen2, Jingbo Niu3, Christine E. Chaissour4, David J. Hunter5, Hyon K. Choi1 and Yuqing Zhang4. 1Boston University School of Medicine, Boston, MA, 2Boston University School of Public Health, Boston, MA, 3University of Sydney, Sydney, Australia, 4Boston University, Boston, MA

**Background/Purpose:** While a few studies have examined colchicine’s ability to prevent gout attacks, NSAIDs have not been formally studied in this regard, despite use of naproxen and its apparent efficacy in the febuxostat trials. Little data are available on effectiveness of prophylaxis with anti-gout medications on risk of gout attacks as used in the community. Further, dosing and choice of NSAID type for prophylactic purposes may vary widely in the community. We evaluated the association of colchicine and NSAID use with risk of recurrent gout attacks in an internet-based cohort of persons with gout.

**Methods:** We conducted an internet-based case-crossover study (each person acts as his/her own control, eliminating the effect of time-invariant confounders) to assess risk factors for gout attacks among persons with pre-existing gout. Subjects with gout who had ≥1 attack in the prior year were recruited online from across the US, with their gout diagnosis verified through medical records review. Participants logged onto the study website when they had a gout attack and provided exposure information (including medication use) over the 14-day period prior to the gout attack (case-period) using an online questionnaire. The same questionnaire was collected for a 14-day period during an intercritical period (control-period). Medication use between 3–14 days was not collected in an earlier study period (‘03–07) and was imputed assuming the data was missing at random. We examined the relation of colchicine and NSAID use, respectively, over specific time spans (prior 1–2 days, 1–7 days, and 1–14 days) to the risk of gout attacks using conditional logistic regression.

**Results:** Of the 724 participants (from 49 US states and D.C.) who experienced ≥1 gout attack during the study period, 78.5% were male, 89% were White, and 58% had a college education. 38.4% were on some form of ULT on study entry (majority on allopurinol 300mg/d). Colchicine was taken primarily as 0.6mg/d and the most common NSAID used was ibuprofen. Colchicine protected against gout attacks when taken consistently over a 14-day period, but not over shorter periods (Table). The increased risk of gout attacks when colchicine was used only in the prior 2 days (i.e., without having taken it in the prior 3–14 days) likely indicates its use in anticipation of an
impending gout attack (confounding by indication). However, very few only took colchicine in the prior 1 or 2 days only, limiting its interpretability. NSAID use did not appear to protect against gout attacks, regardless of consistent use (Table).

Table. Effect of consistent use of anti-gout prophylactic medication over a 2-week period

<table>
<thead>
<tr>
<th>Time-Period over which medication was taken*</th>
<th>Adjusted* ORs (95% CI)</th>
<th>Colchicine</th>
<th>NSAIDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taken daily in prior 14 days</td>
<td>0.46 (0.30–0.69)</td>
<td>1.05 (0.75–1.46)</td>
<td></td>
</tr>
<tr>
<td>Taken daily in prior 7 days only</td>
<td>0.62 (0.17–2.24)</td>
<td>1.17 (0.53–2.58)</td>
<td></td>
</tr>
<tr>
<td>Taken in prior 1 or 2 days only</td>
<td>2.16 (1.28–3.65)</td>
<td>1.11 (0.84–1.46)</td>
<td></td>
</tr>
<tr>
<td>Not taken at all in prior 14 days</td>
<td>1.0 (ref)</td>
<td>1.0 (ref)</td>
<td></td>
</tr>
</tbody>
</table>

*aadjusted for diuretic and aspirin use, purine, alcohol, water and caffeine intake, use of the other prophylactic medication (NSAIDs or colchicine, as appropriate) and urate-lowering medications; Results were similar when limited to those who met ACR criteria for gout.

** Note: the majority of persons who used these medications in the prior 1-2 days also used the medication daily in the prior 1-3 days.

Conclusion: Colchicine was effective in protecting against gout attacks when taken consistently; intermittent or short-term use did not confer protection. We cannot exclude the possibility that particular formulations and/or doses of NSAIDs are effective; nonetheless, as used in the community, NSAIDs were not associated with lower risk of gout attacks.

Disclosure: T. Neogi, None; C. Chen, None; J. Niu, None; C. E. Chaisson, None; D. J. Hunter, None; H. K. Choi, None; Y. Zhang, URL, 2.

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Background/Purpose: Canakinumab (CAN), a selective, fully human, anti-IL-1β monoclonal antibody, may be a potential therapeutic option for treating acute gout attacks and delaying new attacks in these patients (pts). Efficacy and safety of canakinumab was previously demonstrated in two 12-week, multicenter, double-blind, double dummy, active controlled trials (β-RELIEVED [N=228]; β-RELIEVED II [N=226]).1 Health-related quality of life was also measured in these studies, but not all patients completed each questionnaire. Therefore, a composite health outcomes response endpoint was developed to better interpret each patient’s overall response to treatment.

Methods: This analysis used pooled data from the β-RELIEVED program, which included pts meeting ACR 1997 preliminary criteria for acute GA and contraindicated, intolerant or unresponsive to NSAIDs and/or colchicine.1 A composite response endpoint representing overall change in gout-related health outcomes, from baseline to 12 weeks, included clinical markers (serum urate and flare activity); patient-reported data from the Gout Impact Scale (GIS) of the Gout Assessment Questionnaire2 2.0 (comprising markers (serum urate and flare activity); patient-reported data from the Gout Assessment Questionnaire2 2.0 (comprising)

Table 1. Responders (%) for Gouty Arthritis-Related Health Outcomes Measures at 12 weeks

<table>
<thead>
<tr>
<th>Outcome Domain</th>
<th>Variable</th>
<th>Responder Definition</th>
<th>CAN</th>
<th>TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urate</td>
<td>Serum uric acid</td>
<td>&gt;25% reduction1</td>
<td>199</td>
<td>6.5</td>
</tr>
<tr>
<td>Flare frequency</td>
<td>Flare past 4 weeks No</td>
<td>115</td>
<td>0.62***</td>
<td>133</td>
</tr>
<tr>
<td>New flares during the period</td>
<td>No</td>
<td>225</td>
<td>71.7*</td>
<td>229</td>
</tr>
<tr>
<td>Use of rescue medications</td>
<td>No</td>
<td>225</td>
<td>58.0***</td>
<td>256</td>
</tr>
<tr>
<td>Pain</td>
<td>Pain point severity past 4 weeks (GIS, 1-10 scale)</td>
<td>&gt;2 point reduction8</td>
<td>113</td>
<td>85*</td>
</tr>
<tr>
<td></td>
<td>Pain bad visual analog scale (0-100)</td>
<td>&gt;10 point reduction7</td>
<td>192</td>
<td>86.1</td>
</tr>
<tr>
<td>Patient global response</td>
<td>How well doing past 4 weeks (GIS, 1-10 scale)</td>
<td>&gt;2 point reduction4</td>
<td>113</td>
<td>69.0</td>
</tr>
<tr>
<td>Global treatment response</td>
<td>Acceptable, good or excellent</td>
<td>211</td>
<td>84.3**</td>
<td>213</td>
</tr>
<tr>
<td>Health-related quality of life (VAS specific) (GIS, very poor – excellent)</td>
<td>&gt;1 point improvement2</td>
<td>65</td>
<td>41.5**</td>
<td>85</td>
</tr>
<tr>
<td>Gout-related physical health</td>
<td>&gt;1 point improvement2</td>
<td>62</td>
<td>30.8**</td>
<td>77</td>
</tr>
<tr>
<td>Gout-related mental health</td>
<td>&gt;1 point improvement2</td>
<td>61</td>
<td>31.1</td>
<td>82</td>
</tr>
</tbody>
</table>

OVERALL Average percentage responder criteria met | - | 65.0*** | 49.0 |

Conclusion: These results demonstrate superior efficacy, across multiple health-outcomes variables comprising clinical markers and patient reported outcomes, of CAN versus TA over 12 weeks in patients contraindicated, intolerant or unresponsive to NSAIDs and/or colchicine.

References:
1. So A et al., ACR 2011, Chicago, Illinois [Abstract #23697].

Disclosure: A. Gnanasakthy, Novartis Pharmaceutical Corporation, 1; Novartis Pharmaceutical Corporation, 3; A. Sarkin, Novartis Pharmaceutical Corporation, 2; R. Lale, Novartis Pharmaceutical Corporation, 2; K. Choh, Novartis Pharmaceutical Corporation, 2; J. D. Hirsch, Novartis Pharmaceutical Corporation, 2.

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Proposed Gout Treatment Guidelines and Meeting Serum Urate and Flare Goals. Jasvinder A. Singh1, David Hagerty2, Chris Storgard2, Robert Mischler2 and Robert Morlock2. 1University of Alabama at Birmingham, Birmingham, AL; 2Ardea Bioscience, San Diego, CA.

Background/Purpose: Although gout is a relatively common condition, treatment is often not ideal with many patients continuing to experience multiple flares and some developing complications associated with the disease. To improve patient care the American College of Rheumatology (ACR) recently proposed a draft set of recommendations for treating patients with gout. The purpose of this study is to assess the percentage of patients that meet the recently proposed treatment guidelines and the impact of following guideline recommendations on reaching serum uric acid (sUA) and flare targets.

Methods: Data were assessed from a quantitative survey of US physicians about gout disease management. Laboratory and clinical data were confirmed through chart audits using a structured case report form. The sample was restricted to patients treated with allopurinol or febuxostat. Xanthine oxidase (XO) inhibitor and initial dose, use of prophylactic medication, sUA level, physician type (rheumatologist vs. primary care physician [PCP]), patient socio-demographics factors, and flare rates (treatment and non-treatment related) were recorded/abstracted. Descriptive statistics were used to describe key indicators consisting of the number of patients initiating XO inhibitor therapy with anti-inflammatory prophylaxis medication, titration of allopurinol and having multiple sUA assessments. A multivariate model was used to assess the impact of patient, clinician, and quality indicators on achieving sUA < 6 and < 1 flare over a 12-month period.

Results: The sample included 125 rheumatologists and 124 PCPs. Of the 1,245 patients with gout, 858 (69%) were treated with a XO inhibitor: 621 (73%) met ACR criteria for gout.

1 flare over a 12-month period. The majority of persons who used these medications in the prior 1-2 days also used the medication daily in the prior 1-3 days.

1 These results may reflect confounding by indication – those who are taking these medications only recently (i.e., without longer-term use) may be doing so because of concern regarding risk of impending gout attack, or because they only recently started ULT; very few took the medication only in the prior 1 or 2 days only.

Conclusion: Colchicine was effective in protecting against gout attacks when taken consistently; intermittent or short-term use did not confer protection. We cannot exclude the possibility that particular formulations and/or doses of NSAIDs are effective; nonetheless, as used in the community, NSAIDs were not associated with lower risk of gout attacks.
PCPs managed the care for 358 (41.7%) patients. Anti-inflammatory prophylaxis treatment was used in 67% of cases treated by rheumatologists and only 37% of cases treated by PCPs. Multiple sUA assessments over a 12-month period were done in 68% and 53% of patients managed by rheumatologists and PCPs, respectively. Allolpurinol dose was titrated above 300mg in 8% of patients treated by a PCP and 29% of patients treated by rheumatologists (p<0.01). Only 25% of patients obtained sUA < 6 and reported < 1 flare per year using multiple defining factors, a multivariate model for flares as indicators for the use of prophylaxis flare prevention at treatment initiation, multiple sUA assessments and physician type as predictive of achieving sUA and flare goals.

Conclusion: Only 25% of patients reach sUA < 6 and < 1 flare over a 12-month period. Adherence to draft ACR guidelines vary by physician type. Patients receiving guideline recommended care are more likely to achieve treatment goals, yet, significant opportunities exist to improve care for the majority patients regardless of physician specialty, including use of prophylactic treatment, dose titration of urate-lowering therapy and/or effective treatment strategies to bring patients to sUA goal and eliminating flares.

Disclosure: J. A. Singh, Research and travel grants from Takeda, Savient, Wyeth and Amgen, 2, Honoraria from Abbott, 9, Consultant fees from URL Pharma, Savient, Takeda, ArdeaBioscience, Allergan and Novartis, 5, D. Hagerty, Ardea Bioscience, 3, Ardea Bioscience, 1; C. Storgard, Ardea, 3, Ardea, 1; R. Mischler, Adea Bioscience, 3, Adea Bioscience, 1; R. Morlock, Adea Bioscience, 5.

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Long-Term Safety of Canakinumab in Patients with Gouty Arthritis, Aiyang Tao1 and Naomi Schlesinger8. 1CHUV, Univ of Lausanne, Lausanne, Switzerland; 8Northwestern University Feinberg School of Medicine, Chicago, Illinois, 5.

Background/Purpose: Gouty arthritis (GA) is a chronic inflammatory disease. Targeting the inflammatory pathway through IL-1β inhibition with canakinumab (CAN) may provide significant long-term benefits. CAN safety data, including open-label second extension (E2) studies. Herein we present full 18-month long-term CAN safety data, including open-label second extension (E2) studies.

Methods: GA pts completing β-REL E1 and β-REL-II E1 studies1 were enrolled in these 1-year, open-label, E2 studies. All pts entering E2, whether randomized to CAN or TA, received CAN 150 mg sc on demand upon new attack. Data are presented only for pts randomized to CAN, and are reported to CAN group died from pneumonia; one patient in the TA group died from CAN in the two core studies entered the two E2 studies, of which 68 and 64 pts, respectively completed the E2 studies. The 2 study populations had differing baseline comorbidity and geographic origin. Lab data (not time adjusted) for neutropenia appears worse after re-treatment in β-REL E2, and deterioration of creatinine clearance appears worse after re-treatment (Table 1). The time-adjusted incidence rates for AEs were 302.4/100 pyr and 360/100 pyr, and for SAEs were 27.9/100 pyr and 13.9/100 pyr in β-REL E2 and β-REL-II E2 respectively (Table 1). The time-adjusted incidence rates of any AEs, infection AEs, any SAEs, and selected SAEs before and after re-treatment are presented in Table 1. Incidence rates for AEs and SAEs declined after re-treatment, with the exception of SAEs in β-REL E2 which increased from 2.9/100 pyr to 10.9/100 pyr (no infection SAEs after re-treatment in β-REL-II E2, and other SAEs fit no special pattern). In the total safety population (N=454, core and all extensions), there were 4 deaths, 2 in the core studies previously reported1 and 2 during the β-REL E2 study (one patient in the CAN group died from pneumonia; one patient in the TA group who never received CAN died of necrotizing pneumococcal sep). None of the deaths was suspected by investigators to be study drug related. The mean rates of new attacks per year on CAN were 1.21 and 1.18 in β-REL E2 and in β-REL-II E2.

Table 1.

<table>
<thead>
<tr>
<th>Time-adjusted AE/ SAE</th>
<th>Total CAN (N=113)</th>
<th>CAN before</th>
<th>CAN after</th>
<th>Total CAN (N=112)</th>
<th>CAN before</th>
<th>CAN after</th>
</tr>
</thead>
<tbody>
<tr>
<td>All AEs</td>
<td>338 (302.4) 150 (401)</td>
<td>112 (224.3)</td>
<td>306 (360)</td>
<td>127 (170)</td>
<td>163 (135.4)</td>
<td></td>
</tr>
<tr>
<td>Infections</td>
<td>31 (27.9) 109 (29.4)</td>
<td>13 (26.6)</td>
<td>21 (45.7)</td>
<td>15 (13.9)</td>
<td>1 (5.9)</td>
<td></td>
</tr>
<tr>
<td>Individual system organ class with IR/100 pyr &gt;2 in any column</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac disorders</td>
<td>2 (1.8)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Eye disorders</td>
<td>2 (1.8)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Infections &amp; infections</td>
<td>3 (2.7)</td>
<td>2 (2.8)</td>
<td>3 (2.8)</td>
<td>2 (2.8)</td>
<td>3 (2.8)</td>
<td></td>
</tr>
<tr>
<td>Malignancy &amp; metastasis</td>
<td>2 (1.8)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal &amp; connective tissue disorders</td>
<td>2 (1.8)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td>2 (1.9)</td>
<td></td>
</tr>
</tbody>
</table>

*All CAN n (%): Necroptosis, malinger & unspecified (incl cysts & polyps) 1 (0.9) 0 1 (2.0) 1 (0.9) 0 1 (2.2)

Conclusion: The clinical safety profile of CAN upon re-treatment was maintained long-term with no new infection concerns.


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Prevalence of Non-Gout Arthritis in Patients with Gout: Not As Sparing As Previously Thought. Fernando Perez-Ruiz1 and Ana M. Herrero-Beites2.

1Hospital Universitario Cruces, Baracaldo, Spain, 2Hospital de Gorliz, Gorliz, Spain

Background/Purpose: the presence of other chronic inflammatory disease has been historically and academically thought to be “protective” conditions for the development of gout.

Objective: to evaluate the presence of concomitant chronic arthritis in patients with gout.

Methods: analysis of a dataset from a 20-year cohort of patients with gout prospectively included for follow-up. Diagnosis of associated rheumatic diseases at baseline or during follow-up were included if present. Classification criteria for such concomitant diseases varied depending on the classification criteria at the moment diagnosis was made.

Results: from 904 patients with 3,315 patient-year observation. Diagnosis of gout was based on crystal observation in 751 (80.8%). The majority patients regardless of physician specialty, including use of prophylactic treatment, dose titration of urate-lowering therapy and/or effective treatment strategies to bring patients to sUA goal and eliminating flares.

*All CAN n (%): Necroptosis, malinger & unspecified (incl cysts & polyps) 1 (0.9) 0 1 (2.0) 1 (0.9) 0 1 (2.2)

Conclusion: The clinical safety profile of CAN upon re-treatment was maintained long-term with no new infection concerns.


expected in the general population. All patients with a diagnosis of both disease had crystal-proven gout (MSU crystals) or crystal (CPP) X-ray proven PPA. Previous PPA was present in 3/46 patients, and both CPP and MSU crystals were observed in the same synovial fluid sample in 13/46, in the 23 left PPA appearing after properly controlled gout, no MSU crystals being observed in synovial fluid. Previous RA was present in 4/5 patients, previous PsA in 3/3, and previous SpA in 3/3. Only a patient developed RA 2-year after being satisfactorily treated for crystal proven gout, and showing high tips of RF and anti-CCP antibodies.

Patients with PPA and RA showed higher age and more frequent chronic kidney disease than patients with PsA or SpA. Diuretic use, a risk factor for gout, was frequent in all groups (Table 1).

Conclusion: the cumulative prevalence of other arthritis is as much in patients with gout as expected in the general population. Systematic analysis of synovial fluid samples, despite a previous and well established previous diagnosis allows to identify MSU and CPP crystals in patients suffering from other joint diseases but also to identify CPP crystals in patients with gout.


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The Treatment of Acute Gouty Arthritis in Complex Hospitalized Patients with Anakinra.

Mary Bach, Jane Park, Pradiptha Ghosh, Peter A. Simkin and Gregory C. Gardner. University of Washington, Seattle, WA

Background/Purpose: The management of acute crystal-induced arthritis in the hospital setting may be a difficult clinical problem due to co-morbidities that limit the use of traditional treatment options. Anakinra, an anti-IL1 receptor antagonist, has been successful in the treatment of acute/ chronic gout in 3 published series and 4 case reports totaling 27 patients and 2 case reports of calcium pyrophosphate dihydrate (CPPD) disease. We have previously reported our experience with 17 medically complex patients (16 gout, 1 CPPD) who had received 24 courses of anakinra which successfully treated their acute arthritis. The purpose of this study is to add additional case experience in the use of anakinra in this same population.

Methods: We reviewed our consult records over the past 5 years to identify inpatients with acute crystal-induced arthropathy treated with anakinra. Data extracted from the charts included age, gender, BMI, co-morbidities, uric acid level, joint(s) and soft-tissue sites involved, anakinra timing, time to initial improvement, time to complete resolution of signs and symptoms of inflammation, and any possible side effects (i.e. infection or leukopenia). 

Results: Twenty-six patients who had received 40 courses of anakinra were identified. Eighteen patients had failed colchicine and/or steroids, and an additional 8 patients were felt not to be candidates for traditional therapy due to co-morbid disease. None of the patients were candidates for NSAID therapy. In 29 of the 40 episodes, the arthritis was polyarticular. Foot and ankle joints were most commonly affected (44.5%) followed by hand and wrist (25%), knees (18.5%), shoulders, elbows and tendons (12%). Following first dose of anakinra, 67.5% of patients demonstrated significant pain improvement within 24 hours and 85% had significant relief by 48 hours. Complete resolution of signs and symptoms of gout occurred by day 5 in 72.5%. Seven patients received up to 3 courses with no apparent decrement in response. Anakinra was well-tolerated and no adverse outcomes were attributed to the drug. Only one patient appeared to be refractory to this form of IL-1 inhibition.

Conclusion: Anakinra is an effective and safe alternative treatment for acute gouty arthritis in medically complex patients who fail or cannot undergo more conventional therapy.

Disclosure: M. Bach, None; J. Park, None; P. Ghosh, None; P. A. Simkin, None; G. C. Gardner, None.

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Improvements in Long-Term Health-Related Quality of Life in Chronic Gout Patients Refractory to Conventional Therapies Treated with Pegloticase: Results From Responder Cohort.

Dinesh Khanna1, Puja Khanna1 and Faith D. Ottery.1 University of Michigan Medical School, Ann Arbor, MI, 2University of Michigan, Ann Arbor, MI, 3Savient Pharmaceuticals, Inc., East Brunswick, NJ

Background/Purpose: In replicate, 6-month, randomized, placebo-controlled Phase 3 clinical trials a subgroup of patients with treatment-refractory chronic gout (RCG) who received pegloticase infusions (8 mg) every 2 weeks (q2wk) demonstrated statistically significant improvements in multiple patient-reported outcome (PRO) measures derived from the HAQ and SF-36. Patients who showed sustained urate-lowering (defined as responders in the blinded trials) could continue treatment for up to an additional 2.5 years in an open-label extension (OLE) study, thus providing data on health-related quality of life (HRQoL) with long-term pegloticase administration in a responder cohort.

Methods: The OLE enrolled patients at 46 centers in the US, Mexico and Canada. Patients enrolled in the blinded trials were >18 years of age, with baseline uric acid (UA) >8 mg/dL and at least one of the following: 3 or more self-reported gout flares during the prior 18 months, 1 or more tophi, or gouty arthropathy (defined clinically or radiographically) and contraindication to allopurinol or failure to normalize UA during 3 or more months of treatment at the maximum medically appropriate dose. Pegloticase dosing regimen (8mg q2wks or q4wks) was determined at study entry and could be adjusted twice during the trial. All patients received prophylaxis for infusion reactions (IRs) and flares. A responder was defined as uric acid levels <6 mg/dL for at least 80% of the time during months 3 and 6. Data from the final visit of the blinded trials was used as the baseline value for the OLE study. Subjects completed the SF-36 and HAQ-DI at 3, 6, 12, 18, 24 and 30 months.

Results: 57 patients receiving q2wk pegloticase completed the blinded trials (36 responders, 29 non-responders). 35 of the 36 responders entered the OLE study; 21 continued with q2wk dosing and 14 elected once monthly dosing at study entry. The table presents mean change from baseline for multiple HRQoL measures.

<table>
<thead>
<tr>
<th>Study Visit</th>
<th>N</th>
<th>HAQ-DI change from baseline Mean</th>
<th>Physician’s GA change from baseline Mean</th>
<th>HAQ Pain change from baseline Mean</th>
<th>SF-36 PCS change from baseline Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT (months)</td>
<td>3</td>
<td>36</td>
<td>0.13*</td>
<td>36</td>
<td>7.45*</td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>0.21</td>
<td>33</td>
<td>19.94</td>
<td>36</td>
</tr>
<tr>
<td>OLE (months)</td>
<td>3</td>
<td>3</td>
<td>0.29</td>
<td>30</td>
<td>16.97</td>
</tr>
<tr>
<td>6</td>
<td>31</td>
<td>0.33</td>
<td>28</td>
<td>21.21</td>
<td>31</td>
</tr>
<tr>
<td>12</td>
<td>30</td>
<td>0.31</td>
<td>28</td>
<td>19.86</td>
<td>31</td>
</tr>
<tr>
<td>18</td>
<td>27</td>
<td>0.30</td>
<td>25</td>
<td>18.20</td>
<td>27</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
<td>0.44</td>
<td>1</td>
<td>46.00</td>
<td>2</td>
</tr>
<tr>
<td>Final</td>
<td>32</td>
<td>0.27</td>
<td>30</td>
<td>19.63</td>
<td>33</td>
</tr>
</tbody>
</table>

GA: global assessment, PCS: Physical Component Summary.

Conclusion: Pegloticase treatment during the OLE was associated with improvements in PROs for an additional 2.5 years among patients identified as urate responders during the first 6 months of blinded treatment.

Disclosure: D. Khanna, AREDA: Bioscience, Takeda Pharmaceuticals, 5, Savient Pharmaceuticals, 2, URL, 2; P. Khanna, Takeda, 8, Veteran Affairs, ARDEA, Savient, ACR-REF Bridge funding Award, 2; F. D. Ottery, Savient Pharmaceuticals, Inc., 3, Savient Pharmaceuticals, Inc., 1.

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Towards a Preliminary Definition of Remission From Gout.

William Taylor1, Nicola Dalbeth2, Jasvinder A. Singh3, Kenneth G. Saag4, and H. R. Schumacher5.1University of Otago, Wellington, New Zealand, 2University of Auckland, Auckland, New Zealand, 3University of Alabama at Birmingham, Birmingham, AL, 4University of Pennsylvania and VA Medical Center, Philadelphia, PA

Background/Purpose: In the arthritis community, remission is a term with a specific definition for remission in chronic gout.

Methods: Eighty unique paper patient profiles were generated by creating multiple patient-reported outcome (PRO) measures derived from the HAQ and SF-36. Patients who showed sustained urate-lowering (defined as responders in the blinded trials) could continue treatment for up to an additional 2.5 years in an open-label extension (OLE) study, thus providing data on health-related quality of life (HRQoL) with long-term pegloticase administration in a responder cohort.

Disclosures: D. Khanna, AREDA, Bioscience, Takeda Pharmaceuticals, 5, Savient Pharmaceuticals, 2, URL, 2; P. Khanna, Takeda, 8, Veteran Affairs, ARDEA, Savient, ACR-REF Bridge funding Award, 2; F. D. Ottery, Savient Pharmaceuticals, Inc., 3, Savient Pharmaceuticals, Inc., 1.
interested in gout were invited by email to evaluate each profile within an online survey and to decide whether the 12-month values indicated that the paper patient had attained a state of remission or not and the confidence in that decision (scale of 0 to 10). The exercise also asked respondents to consider whether the change in measures from baseline to 12-months represented a response to treatment or not, but those results have been reported separately. The distribution of the confidence ratings (~10 meaning high confidence of not in remission to +10 meaning high confidence of being in remission) for each patient profile were examined by a panel of 5 very experienced rheumatologists, who made a judgement that the distribution of confidence ratings indicated remission, not remission or uncertainty. An agreement of at least 80% was required amongst the 5 experts, to classify the remission status of the profile otherwise it was classified as ‘uncertain’. 

**Results:** There were 35 respondents. The median number of respondents per rated profile was 22.5 (range 22 to 33). This represents a median of 64% profiles that were rated by every respondent (range 63% to 94%). Two respondents did not rate any profiles and 63% (n=22) rated all 80 profiles. Of the 80 paper profiles, there was agreement by the panel of 5 experts that only 3 were in remission, 18 were uncertain and 59 were not in remission.

The mean, minimal value and maximal value for each measure, by remission status are shown in the Table. The p-value refers to ANOVA, comparing values across the 3 groups.

<table>
<thead>
<tr>
<th>Table. Mean (range) of core domain measures for different categories of remission status</th>
<th>Not remission (n=59)</th>
<th>Remission (n=3)</th>
<th>Uncertain (n=18)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUA (mmol/L)</td>
<td>0.45 (0.20 to 0.40)</td>
<td>0.31 (0.20 to 0.40)</td>
<td>0.31 (0.20 to 0.40)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Attack frequency (every 3 to 3 months)</td>
<td>5.5 (7.00)</td>
<td>0.00</td>
<td>0.00</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tophus size (mm²)</td>
<td>823.94 (1000)</td>
<td>0.00</td>
<td>0.00</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tophus number</td>
<td>2.75 (0 to 84)</td>
<td>0.00</td>
<td>1.50 (0 to 7)</td>
<td>0.004</td>
</tr>
<tr>
<td>Mental health component of SF-36</td>
<td>70.73 (50 to 86)</td>
<td>78.67 (72 to 88)</td>
<td>76.78 (66 to 93)</td>
<td>0.021</td>
</tr>
<tr>
<td>Physical health component of SF-36</td>
<td>74.46 (50 to 91)</td>
<td>84.67 (80 to 88)</td>
<td>80.44 (58 to 90)</td>
<td>0.025</td>
</tr>
<tr>
<td>Pain VAS (0 to 100)</td>
<td>27.17 (14 to 83)</td>
<td>20.00 (16 to 26)</td>
<td>21.89 (10 to 35)</td>
<td>0.027</td>
</tr>
<tr>
<td>HAQ-DI (0.00 to 2.10)</td>
<td>1.07 (0 to 2.20)</td>
<td>0.53 (0 to 2.10)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Patient Global VAS</td>
<td>53.02 (26 to 85)</td>
<td>33.00 (28 to 36)</td>
<td>41.22 (26 to 62)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Conclusion:** The domains that showed the greatest discrimination between remission and non-remission were SUA, tophi and flares. Pain between flares did not appear to discriminate between remission and non-remission status. The following definition of remission is proposed, based approximately on the maximal values observed in those who attained remission: SUA no more than 0.36 mmol/L AND no gout attacks in prior 3 months AND no tophi AND patient global assessment no more than 3 (0 to 10 scale).

**Disclosure:** W. Taylor; None; N. Dalbeth; None; J. A. Singh; research and travel grants to Takeda, Savient, Wyster and Aghen, 2 speaker honoraria from Abbott, Consultant fees from URL pharmaceuticals, Savient, Takeda, Ardea, Allergan and Novartis, 3 G. G. N. Becker; None; 2 Merck Pharmaceuticals, 2 Merck Pharmaceuticals, 2 Novartis Pharmaceutical Corporation, 2 Amgen, 5 Eli Lilly and Company, 5 Merck Pharmaceuticals, 5 Novartis Pharmaceutical Corporation, 5 H. R. Schumacher; None.

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Natural Language Processing in the Evaluation of Gout Quality Indicators: Gail S. Kerr,1 J. Steuart Richards,2 Carl A. Nunziato,2 Olga V. Patterson,2 Scott L. DuVall,2 David D. Maron3 and Richard L. Amdur4. 1Washington DC VAMC; 2Georgetown and Howard University, Washington, DC; 3Washington DC VA and Georgetown University, Washington, DC; 4VA Salt Lake City Health Care System and University of Utah School of Medicine, Salt Lake City, UT; 5Washington DC VA and Georgetown University, Washington, DC

**Background/Purpose:** Gout is a common inflammatory arthritis with significant impact on both patients and health care systems. Despite ACR/ EULAR management guidelines and gout quality indicators (QI) developed to improve outcomes, standard of care is often suboptimal and infrequently measured. We evaluated the standard of care of in a cohort of Veterans Affairs (VA) gout patients, using QI that include medication, laboratory and counseling criteria.

**Methods:** During a 4 year period, VA administrative data was used to identify gout outpatients (ICD 9 codes: 274.xx and at least 2 related visits). QIs assessed were Q1: patients with creatinine clearance < 60 ml/min, initial allopurinol dose to be < 300 mg/day; Q2: uric acid (UA) within 6 months of allopurinol start; Q3: if on colchicine CBC, CPK done within 6 months; Q4: counseling on gout specific diet, weight loss and alcohol consumption. For Q4, natural language processing (NLP), a technique that analyzes large amounts of text to identify key words and/or phrases, was used to analyze dietary, alcohol and weight loss counseling data from electronic medical records. Data collected were socio- demographics, comorbidities such as HTN, DM, obesity and hyperlipidemia, prescription counseling (QI), CPK (only 1 patient had CPK without CBC). For Q4, there was counseling for weight loss in 1008 (44.2%), diet in 390 (17.1%), alcohol in 137 (6.0%) and 51 (2.2%) had counseling on all 3 elements. Of those on new allopurinol prescriptions, target serum uric acid (< 6 mg/dL) was achieved in 64 (30.1%) patients within one year. Compared with non-compliant patients, patients compliant with Q2 had more rheumatology visits (3.5 vs. 2.6; p< 0.001), while those compliant with Q3 (CBC) were older (67.3 vs 64.9 years p<0.001) and had more CKD (p<0.001). DM (p<0.001) and CVD (p<0.001). Patients with DM, obesity, and hyperlipidemia were more often counseled on diet compared to those without comorbidities. Alcohol counseling was less frequent in gout patients with hyperlipidemia (p= 0.024) and DM (p =0.012) compared to patients without comorbidities.

**Conclusion:** In our study cohort, compliance with Q1 for uric acid and CPK monitoring were subpar. In gout patients, specific dietary counseling appeared to be directed by other comorbidities. NLP proved a valuable tool for evaluating dietary QI in patients with gout.

**Disclosure:** G. S. Kerr, Savient, Ardea; J. S. Richards, Ardea, 9 Savient, 9 C. A. Nunziato, None; O. V. Patterson; None; L. S. DuVall, Analox LLC, 2, Genentech Inc., 2, F. Hoffmann-La Roche Ltd, 2, Amgen Inc, 2, Shire PLC, 2, Mylan Specialty PLC, 2; D. R. L. Amdur; None; R. L. Amdur; None.

150

Uloceside (BCX4208) Long-Term Safety When Added to Allopurinol in the Chronic Management of Gout: A Phase 2 24-Week Blinded Safety Extension and Vaccine Challenge Study. Alan S. Hollister,1 Andreas Maetzell1, Michael A. Becker,2 Robert Terkeltaub,2 Valerie Smith4 and William P. Sheridan1. 1BioCryst Pharmaceuticals, Inc., Durham, NC, 2University of Chicago, Chicago, IL, 3VA Medical Ctr, San Diego, CA, 4East-West Medical Research Institute, Honolulu, HI, 5Pharpoint Research, Inc., Durham, NC

**Background/ Purpose:** A majority of gout patients treated with 300 mg/d allopurinol do not reach the therapeutic goal range serum uric acid concentration (sUA) of <6.0 mg/dL. Added to allopurinol, uloceside (BCX4208), a purine nucleoside phosphorylase inhibitor, synergistically reduces sUA and allows a greater proportion of gout patients to reach sUA <6.0 mg/dL. The objectives of this study were (1) to extend the safety assessment of a 12 week efficacy study through 24 weeks of drug administration, (2) to evaluate immune responses to vaccine challenge, and (3) to confirm continued efficacy of uloceside.

**Methods:** 278 gout patients (M:F=266:12) with sUA >6.0 mg/dL, despite allopurinol 300 mg received placebo or uloceside at 5, 10, 20, or 40 mg/d for 12 wks. 160 subjects entered the combination treatment extension to 24 wks on their blinded treatment assignment; 27 on placebo, and 39, 32, 33, and 29 on BCX4208 5, 10, 20, and 40 mg/d. All subjects received gout flare prophylaxis with colchicine or naproxen. At 16 or 20 wks, subjects were vaccinated with tetanus toxoid (TT) and/or multivalent pneumococcal polysaccharide vaccine (PPSV), and antibody levels were measured before and 4 wks after vaccination in 84 subjects.

**Results:** Subject mean (range) age was 49 y (19–69), BMI was 35.9 (22.8–42.2), 45% had mild or moderate renal impairment, and 14% had diabetes in a mostly white population (79%). Total adverse event (AE) rates for 24 wks were 45.3 per 100 patient-months (pmo) for placebo and 33.8, 41.0, 41.3, and 58.2 in the uloceside 5, 10, 20, and 40 mg/d treatment arms. Infection AEs rates were 8.3 for placebo and 6.3, 6.5, 7.3, and 5.1 per 100 pmo, for the respective uloceside arms. Infection severity, type, location,
and causative agent were similar among study arms. There were no opportunist infections. The ulodesine dose-related reduction of total lymphocyte count and lymphocyte subsets remained at a plateau reached between week 8 and 12. There were 4 and 11 protocol-specified withdrawals for CD4+ cell count <350 cells/mL in the ulodesine 20 and 40 mg/d arms by 24 weeks. The proportion of antibody responses to vaccination with TT (≥4-fold increase in antibody titers) and PPSV (≥2-fold increase in antibody titers to ≥4 of 6 antigens) was not different in ulodesine-than in placebo-treated subjects. The proportion of subjects with sUA levels <6.0 mg/dL among those completing week 24 was 25% (6 of 24) in the placebo group, and 40% (14 of 35), 50% (13 of 26), 46% (12 of 26), and 55% (12 of 22) in the 5, 10, 20, and 40 mg/d ulodesine arms.

Conclusion: Ulodesine was safe and generally well tolerated when added to allopurinol for up to 24 weeks. Patients generated a healthy immune response to vaccination. Adverse event frequency and severity was similar among all groups and no differences were seen in the rate or severity of infections. There were no protocol-driven study drug withdrawals due to low lymphocyte counts in the placebo, 5 mg/d, and 10 mg/d groups. The efficacy of ulodesine in reducing sUA at 12 weeks was sustained at 24 weeks.


Table 1. Management of acute gout attacks in 2003–2004 and 2005–2012

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NSAIDs</td>
<td></td>
</tr>
<tr>
<td>Colchicine</td>
<td>35%</td>
</tr>
<tr>
<td>Analgesics +/- other meds</td>
<td>23%</td>
</tr>
<tr>
<td>Analgesics alone</td>
<td>22%</td>
</tr>
<tr>
<td>Oral glucocorticoids</td>
<td>9%</td>
</tr>
<tr>
<td>Alternative remedies</td>
<td>2%</td>
</tr>
<tr>
<td>Any ULT acutely in absence of prior use</td>
<td>5%</td>
</tr>
<tr>
<td>Allopurinol acutely in absence of prior use</td>
<td>3.4%</td>
</tr>
<tr>
<td>Inappropriate management of acute gout attack</td>
<td>26%</td>
</tr>
<tr>
<td>Definitely inappropriate</td>
<td>5%</td>
</tr>
<tr>
<td>Potentially inappropriate</td>
<td>21%</td>
</tr>
<tr>
<td>Consulted a HCP for acute gout attack:</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>54%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>24%</td>
</tr>
<tr>
<td>Never</td>
<td>21%</td>
</tr>
</tbody>
</table>

Table 2. Factors related to use of any inappropriate therapy for acute gout attack management

<table>
<thead>
<tr>
<th></th>
<th>Adjusted* OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulted HCP for the attack</td>
<td>0.49(0.35–0.68)</td>
</tr>
<tr>
<td>Age (for every 10-year increase)</td>
<td>1.13(1.01–1.28)</td>
</tr>
<tr>
<td>Female sex</td>
<td>1.48(1.01–2.10)</td>
</tr>
<tr>
<td>Disease duration ≤1 year</td>
<td>1.36(1.00–1.88)</td>
</tr>
</tbody>
</table>

*Adjusted for age, sex, BMI, race, education, total # of attacks in one year, consulted HCP for the attack, comorbidities (HTN, renal disease, CHF, diabetes, gout disease), disease duration. HCP=healthcare professional.

Conclusion: In this large cohort of gout patients recruited from across the US, overall management of gout attacks appears to have improved over the past 8 years. Gout management education efforts still need to be focused on primary care, ER and particularly patients themselves as they are the most likely to manage gout attacks.

Disclosure: T. Neogi, None; C. Chen, None; C. E. Chaisson, None; D. J. Hunter, None; H. Choi, None; Y. Zhang, URL, 2.

152 Rilonacept for Gout Flare Reduction: Estimation of Number Needed to Treat to Benefit (NNTB). Robert R. Evans1, Steven P. Weinstein1, George D. Yancopoulos2 and Yuhwen Soo2. 1Regeneron Pharmaceuticals Inc, Tarrytown, NY; 2Regeneron Pharmaceuticals, Inc., Tarrytown, NY

Background/ Purpose: Two similarly designed phase 3 randomized clinical trials (PRESURGE-1 and PRESURGE-2) in gout patients initiating urate-lowering therapy (ULT) showed that subcutaneous treatment with the IL-1 antagonist rilonacept 80 or 160 mg weekly resulted in a significant reduction in the mean number of gout flares (GFs) per patient by 71%-80% relative to placebo over 16 weeks. Analyses were performed to estimate the number needed to treat to benefit (NNTB).

Methods: Using pooled data for the placebo and rilonacept treatment groups (n=160 per pooled group), NNTB was estimated using 1) classical calculations based on binary outcomes, 2) graphical analyses based on the distributions within each treatment group of the number of flares experienced by each patient, and 3) the estimated distributions of flares per patient in the placebo and rilonacept group using negative binomial and Poisson distributions, and the distribution of the difference between groups.

Results: Approximately half the placebo patients (48.4%) did not have a GF, but the other half averaged 2.2 GFs/patient. Approximately 30% more patients on rilonacept vs placebo had less than 1 GF, and approximately 25% more patients on rilonacept vs placebo had less than 2 GFs. NNTBs are ~4 based on either one of these individual binary outcomes. However, considering NNTB based on these binary outcomes individually does not account for the partial overlap of subgroups that benefit, nor for uncaptured flare reduction among patients with multiple GFs. Graphical analysis suggests that almost all of the patients destined to flare would likely have benefited from rilonacept treatment. A patient who would have had one GF would likely have none, and those destined to have multiple GFs would have fewer. With an estimated mean reduction in GFs of 74% with rilonacept, patients destined...
to flare would average about 1.6 fewer GFs. Combining these benefits shows that of 2 patients initiating ULT, 1 would not be expected to flare, even without prophylaxis, but the other patient would be expected to flare and would benefit from rilonacept, resulting in an NNTB of ~2. The difference in the negative binomial distributions and the difference in the Poisson distributions (Skellam distribution) independently confirm an NNTB of ~2; conditional on benefit with rilonacept, the mean benefit is about 1.65 fewer GFs. The most common category of adverse event (AE) infections, was balanced among treatment groups; the most frequent treatment-related AE, injection site reaction, was greatest with rilonacept 160 mg. The incidence of SAEs was low and similar across treatment groups.

Conclusion: This analysis shows that approximately 50% of patients with gout who are initiating ULT would benefit from treatment with rilonacept, resulting in an NNTB of ~2. Conditional on benefit with rilonacept, patients would experience about 1.6 fewer GFs with treatment.

Disclosure: R. R. Evans, Regeneron, 3, Regeneron, 1; S. P. Weinstein, Regeneron, 1, Regeneron, 3; G. D. Yanopoulos, Regeneron, 1, Regeneron, 3, 6; Y. Soo, Regeneron, 1, Regeneron, 3.

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Prevention of Recurrent Calcium Stones in Subjects with Hyperuricosuria: A Randomized Controlled Trial of Febuxostat vs Allopurinol.

David S. Goldfarb1, Patricia A. MacDonal', Lhanoo Gunawardhana', Solomon Chefo and Lachy McLean. 1 New York University Langone Medical Center, New York, NY, 2 Takeda Pharmaceuticals USA, Inc., Deerfield, IL, 3 Takeda Global Research & Development Center, Inc., Deerfield, IL.

Background/Purpose: About one-third of patients with recurrent calcium oxalate (CaOx) stones have hyperuricosuria as a urinary risk factor. Febuxostat (FEB), a newer xanthine oxidase inhibitor (XOI), may be superior to allopurinol (ALLO) in stone prevention. ALLO treatment has been shown to reduce the incidence of recurrent CaOx stones in hyperuricosuric stone formers (SF). We studied whether FEB would reduce 24h urinary uric acid (uUA) excretion and prevent stone formation and pre-existing stone growth.

Methods: In this 6-month, double-blind, multicenter, randomized, controlled trial, hyperuricosuric (>700 mg/d) adult subjects with a history of CaOx stones and ≥1 3-mm stone in its longest in-plane diameter as seen by multidetector computed tomography (MDCT) were randomized to receive daily FEB 80 mg, ALLO 200 or 300 mg (based on baseline CsCr), or PBO. Patients were excluded if they had a history of gout or secondary hyperuricosuria, if they had received ALLO within the past 2 years or ever received FEB. Primary end-point was percent change from baseline (CFB) to month 6 in 24h uUA; secondary end-points were percent CFB in size of index stone, CFB in number of stones and in 24h creatinine clearance (CrCl).

Results: Of 99 subjects enrolled, 86 completed the study. The key baseline characteristics were balanced. Most subjects were men (86%), had a mean lifetime history of 10.9 stone episodes, mean largest stone diameter of 9.9 mm and a mean number of stones 5.7 on MDCT. Normal renal function was present in 97% of patients (mean baseline Ccr was 147 mL/min/1.73m²). Mean baseline serum urate (sUA) was 6.3 mg/dL, 24h urine calcium excretion was 272.2 mg/d, and 24h uUA was 952.7 mg/d. FEB led to significantly greater reduction from baseline in 24h uUA than either PBO or ALLO. Reductions in stone size and number with FEB were not statistically greater than with ALLO or PBO. In all groups, there were no statistically significant changes in 24h Cr and serum creatinine did not change. Rates of adverse events (AE) were similar across the treatments groups. One patient in the placebo group experienced a serious AE of nephrolithiasis, but remained in the study.

<table>
<thead>
<tr>
<th></th>
<th>PBO (n=33)</th>
<th>FEB 80 mg (n=33)</th>
<th>ALLO 300 mg (n=33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline sUA (mg/d)</td>
<td>909.4 ± 166.4</td>
<td>1000.6 ± 224.0</td>
<td>948.1 ± 231.2</td>
</tr>
<tr>
<td>Treated 6-month sUA (mg/d)</td>
<td>783.5 ± 288.0</td>
<td>414.1 ± 288.4</td>
<td>580.0 ± 301.8</td>
</tr>
<tr>
<td>CFB in sUA (%)</td>
<td>-127.2 ± 28.8</td>
<td>-58.6 ± 28.6</td>
<td>-36.4 ± 37.0</td>
</tr>
<tr>
<td>Baseline uUA (mg/dL)</td>
<td>6.3 ± 1.24</td>
<td>6.2 ± 1.63</td>
<td>6.3 ± 1.49</td>
</tr>
<tr>
<td>Treated 6-month uUA (mg/dL)</td>
<td>6.2 ± 1.28</td>
<td>3.3 ± 1.11</td>
<td>4.6 ± 1.26</td>
</tr>
<tr>
<td>CFB in uUA (%)</td>
<td>-1.04 ± 13.5</td>
<td>-47.3 ± 16.7</td>
<td>-26.2 ± 12.6</td>
</tr>
<tr>
<td>CFB in stone size (%)</td>
<td>3.2 ± 23.7</td>
<td>-6.5 ± 28.6</td>
<td>0.6 ± 12.61</td>
</tr>
<tr>
<td>CFB in stone number</td>
<td>0.1 ± 0.18</td>
<td>0.1 ± 0.161</td>
<td>0.3 ± 1.95</td>
</tr>
</tbody>
</table>

mean±SD; *P<0.003 vs ALLO; bP<0.001 vs PBO and ALLO, respectively.

Conclusion: FEB 80 mg lowered 24h uUA significantly more than ALLO 300 mg in SF with hyperuricosuria. Neither XOI was associated with significantly reduced stone number or size compared with PBO after 6 months of treatment. Extended duration of FEB treatment leading to greater 24h uUA reductions may demonstrate improved prevention of CaOx stone recurrence.

Disclosure: D. S. Goldfarb, Takeda Pharmaceuticals USA, Inc.; P. A. MacDonald, Takeda Pharmaceuticals USA, Inc.; L. Gunawardhana, Takeda Global Research & Development Center, Inc.; S. Chefo, Takeda Global Research & Development Center, Inc.; L. McLean, Takeda Global Research & Development Center, Inc.

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Dual-Energy Computed Tomography As a Diagnostic Tool for Gout During Intercritical Periods.

Gabriel S. Breuer1, Naama Bogot2 and Gideon Neshet3. 1 Sharee Zedek Medical Center, Jerusalem, Israel, 2 Sharee Zedek Medical Center p o box 3235 Jerusalem, Israel, 3 Sharee Zedek Medical Center.

Background/Purpose: Dual-energy computed tomography (DECT) is a sensitive method for identifying uric acid deposits in joints and periarticular soft tissues in patients suspected of having gout. Diagnosis of gout cannot be confirmed by polarized microscopy during asymptomatic (intercritical) periods as joint aspiration is not feasible in most cases. We estimated the yield of dual-energy computed tomography (CT) in detection of uric acid tissue deposits during intercritical periods in patients suspected of having gout.

Methods: Patients aged at least 18 years with a history of recurrent, short-lived mono- or oligo-arthritis or arthritis, referred to the rheumatology clinic for diagnosis of their condition, were included. All had gouty acid levels >6 mg/dl and were completely asymptomatic at the time of clinical and radiological evaluations. Patients with a confirmed diagnosis of gout and patients on urate-lowering medications were excluded. DECT screened the specific joints and periarticular soft tissues that were previously involved in each case.

Results: 22 patients (18 men, 4 women) were included. Their mean age was 57±17 years. Articular or soft-tissue urate deposits were identified by DECT in 11 cases (50%). Uric acid level did not differ significantly between the groups with or without deposits (8.5±2 and 8.7±1.2 mg/dl, respectively). The table shows the yield of DECT in various anatomic locations:

<table>
<thead>
<tr>
<th>Area screened</th>
<th>feet</th>
<th>knees</th>
<th>elbows</th>
<th>hands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases</td>
<td>18</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Cases with urate deposits</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>% with urate deposits</td>
<td>39%</td>
<td>25%</td>
<td>0</td>
<td>75%</td>
</tr>
</tbody>
</table>

Conclusion: In asymptomatic hyperuricemic patients with a history of recurrent short-lived mono- or oligo-arthritis or arthritis, DECT identified urate crystals in 50%, confirming a diagnosis of gout. DECT is a valuable tool in diagnosing gout during intercritical periods.

Disclosure: G. S. Breuer, None; N. Bogot, None; G. Neshet, None.

155
Accuracy of International Classification of Disease Codes for Calcium Pyrophosphate Disease in the Veterans Administration Healthcare System.

Kerri A. Huber1, Lawrence M. Ryan2 and Ann K. Rosenthal. 1 MCW Froedtert Hospital, Milwaukee, WI, 2 Medical College of Wisconsin, Milwaukee, WI.

Background/Purpose: Calcium pyrophosphate disease (CPPD) commonly affects elderly patients, but few advances in our management of this disease have occurred in the 50 years since it was first described. Progress has been hampered by the absence of large population-based studies of CPPD. The National Veterans Administration (VA) system would be an ideal location to perform such studies. However, the accuracy of the diagnostic codes for CPPD in this database have not been confirmed. We set out to determine the accuracy of International Classification of Disease (ICD) codes for pseudogout/other disorders of calcium metabolism (275.49) and chondrocalcinosis (712.1–712.39) for the diagnosis of CPPD in a single VA hospital database and to describe the clinical picture of this disease in the VA population.

Methods: After approval by the IRB, 256 patients identified as having CPPD by ICD-9 codes for chondrocalcinosis (712.1–712.39) and pseudogout/other disorders of calcium metabolism (275.49) were identified at the Clement J. Zablocki VA Medical Center in Milwaukee, WI for the years 2009–2011. A chart review was performed by a second year rheumatology fellow for each patient and patients were categorized as having definite, probable, possible CPPD or no evidence of CPPD based on the diagnostic criteria proposed by...
McCarty and Ryan. Other data collected included patient demographics, the number and type of joints involved, whether the patients had been seen by the VA rheumatology service, and co-morbidities including renal disease and diabetes.

**Results:** Based on the medical records review, 227/256 (88.6%) patients met criteria for CPPD. Of these, 46 patients met definite criteria, 163 met probable criteria, and 18 met possible criteria for CPPD. Of these 227 patients, 107 (47.1%) patients had ICD-9 code 275. Seventy three (32.1%) had ICD-9 code 712, and 47 (20.7%) had both codes documented. The average age was 73.28 years (range 32–94 years), and, consistent with VA demographics in this age cohort, 98.2 % were men. Sixty-one (26.8%) had stage III or greater chronic kidney disease and 79 (34.8%) had diabetes. Many patients had both acute and chronic arthritis, as 166 (73.1%) had at least one documented episode of acute arthritis, while 208 (91.6%) had chronic articular symptoms. Knee involvement occurred in 86 patients, followed in frequency by involvement of the hand (68), wrist (64), foot (35), ankle (34), elbow (20), and olecranon bursa (10). The average number of joints involved for patients with chronic arthritis was 2.35 (range 1–6) and for acute was 2.012 (range 1–6). Rheumatology had evaluated 51.5% of these patients, including 53% with definite CPPD, 43.6% with probable CPPD, and 44.4% with possible CPPD.

**Conclusion:** We found a high correlation between evidence of CPPD documented in medical records and the ICD codes 275.49 and 712 in the medical records database at a single VA medical center. The demographics of this population and pattern of joint involvement confirm prior studies of the epidemiology of this disease and further support the accuracy of these codes. These findings suggest that the national VA healthcare database may be useful for future clinical studies of CPPD.

**Disclosure:** K. A. Huber, None; L. M. Ryan, None; A. K. Rosenthal, None.

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**Menopause and the Prevalence of Gout and Hyperuricemia: An Age-Matched Case Control Study.** Eswar Krishnan¹ and Mihoko Bennett². ¹Stanford University, Stanford, CA, ²Stanford University, Palo Alto, CA

**Background/Purpose:** Among women, the prevalence of gouty arthritis (gout) and hyperuricemia (serum urate >6.0 mg/dL) increases steeply after the age 60. This increase has been attributed to menopause, and its attendant hormones, medical conditions or surgical procedures. Unmatched and control analyses using data on women aged 20–60 years from the United States, 2009–10.

**Methods:** We performed multiple unmatched and age matched case-control analyses using data on women aged 20–60 years from the NHANES1999–2010 cycles. For the latter, each case of gout, defined as self-reported physician diagnosis, 3 age-matched controls were chosen at random. Menopause was defined as absence of menstrual bleeding in the preceding 12 months, excluding those caused by pregnancy, medications, hormones, medical conditions or surgical procedures. Unmatched and matched multivariable analyses were performed by Survey weighted logistic regressions that adjusted for age, body mass index, ethnicity, hypertension and serum creatinine. Models were repeated with hyperuricemia as the outcome variable.

**Results:** A) Gout: In unmatched analyses, the bivariate and multivariable odds ratio for menopause were 3.0(91.4,6.5) and 1.3(0.6,2.7) respectively. In the age-matched analyses, bivariate odds ratio was 0.9 (0.4,1.8) and multivariate odds ratio was not significant. B) Hyperuricemia: In unmatched analyses the odds ratio for menopause in bivariate and multivariable models were 2.3 (2.0–2.8) and 1.25(1.01–1.54) respectively. In age-matched logistic regression models, the bivariate and multivariable odds ratios were 1.3(1.1,1.4) and 0.98(0.86–1.11) respectively.

**Conclusion:** After offsetting the effect of age by matching, menopausal status was not associated with increased prevalence of gout or hyperuricemia.

**Disclosure:** E. Krishnan, savient, 1, URL, takeda, metbolex, ARDEA, 2, METABOLEX TAKEDA, 5; M. Bennett, None.

157

**Prevalence of Gout Among Adults with Chronic Kidney Disease in the United States, 2009–10.** Eswar Krishnan. Stanford University, Stanford, CA

**Background/Purpose:** The kidney is a major route of clearance of uric acid, a product of purine metabolism. The links between kidney disease, hyperuricemia, and gout in the general population are not well understood. Our objective was to estimate prevalence of gout and hyperuricemia among people with chronic kidney disease (CKD) in the US general population.

**Methods:** The study was designed as a cross-sectional analysis of the most recent National Health and Nutrition Examination Surveys (NHANES 2009–2010), a nationally representative sample of civilian men and women aged 20 years or older (n=5,589). Gout was defined per self-reported physician or health professional diagnosis. Hyperuricemia was defined as serum urate > 7.0 mg/dL for men and > 6 mg/dL for women. Estimated glomerular filtration rate (eGFR) calculated using the Chronic Kidney Disease-EPI equation was used to classify CKD as mild, moderate or severe.

**Results:** In 2009–2010, there were 5.2 million men and 2.3 million women with gout in the US. Of these, 1.25 million men and 0.78 million women had moderate or severe CKD. The prevalence of gout and hyperuricemia was 5-fold higher among those with moderate or severe CKD compared to those with no CKD. In multivariable logistic regression analyses that adjusted for age, gender, body mass index, hypertension, diabetes, hyperlipidemias including diuretics, blood lead levels, and hyperuricemia the odds ratios of gout and hyperuricemia were 5.8 (1.2, 26.5) and 19.5 (3.8, 99.2) among those with severe CKD compared to those with no CKD.

**Conclusion:** Gout is a major comorbidity of CKD with about 2 million Americans suffering from gout and moderate to severe CKD. The prevalence for gout and hyperuricemia increases as the severity of CKD worsens.

**Disclosure:** E. Krishnan, savient, 1, URL, takeda, metbolex, ARDEA, 2, METABOLEX TAKEDA, 5.

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**Focus Groups Reveal Knowledge Gaps in Patients with Gout-A Qualitative Study.** Puja Khanna¹, Veronica Berrocal¹, Tonya Hays², Daniel J. Clauw¹ and David A. Williams¹. ¹University of Michigan, Ann Arbor, MI, ²UCLA, Los Angeles, CA, ³Univ of MI Hlth System-Lobby M, Ann Arbor, MI

**Background/Purpose:** Gout is the most treatable arthritis in the Western World and there are effective medications available to treat both acute episodes and chronic gout. Prior studies have shown that treatment of chronic gout leads to improvement in patient-reported outcomes, and inadequate control has a substantial economic impact on the patient, employer, and society. Despite this, gout has the lowest adherence to medications (38%) across common chronic conditions such as hypertension, osteoporosis and diabetes mellitus. Currently, demographics, comorbidities, and poor adherence to chronic therapy are considered important attributes in developing poorly controlled gout. There is limited qualitative research assessing barriers to treatment and management among patients and health care providers. Therefore, we performed focus groups in patients with gout to identify conceptual gaps from patients’ perspective.

**Methods:** A trained moderator conducted formal in-depth focus groups in gout patients, who were enrolled using an online screening survey where they provided details of their gout management including medications. The script for the focus group included questions to test their knowledge about the natural history of gout, understanding about different aspects of treatment of gout (acute treatment vs. prophylaxis vs. chronic urate-lowering therapy), beliefs about how long the treatment should be taken, discussion on adherence
to their medications, perceptions about the association between diet and alcohol and gout flares, and coping with an acute attack of gout. Adherence to medications was measured using a validated eight-question adherence instrument, Morisky Medication Adherence Scale, which is scored as low, medium, and high adherence.

Results: Twenty-four patients participated in 4 focus groups that lasted 90 minutes each. Baseline demographics showed predominantly white males (75%), 18% Hispanic, mean age 47.8 (15.4) years, 33% had tophaceous gout as diagnosed by their physician, and 62% were on ULT. Majority were receiving care from their primary care physicians (PCP, n=13), 4 from a rheumatologist, and remaining from PCP/other subspecialties (n=5), or self-treated (n=2). The following themes emerged upon transcription of the scripts from these sessions: 1) Patients did not have a clear understanding of the natural history of gout; 2) patients did not realize that recurrent acute flares resulted in chronic joint damage; 3) there was lack of knowledge regarding treatment options and duration of therapy for acute and chronic gout; 4) patients felt that physicians did not spend enough time explaining the progression, i.e. natural history of the disease and its long-term effects; 5) patients did not grasp the need for chronic ULT to avoid complications and disability; and 6) patients were not aware of treatment goals for hyperuricemia, as evident by adherence to their gout medications. In these groups, 38% had low and 42% had medium adherence to their gout medications, respectively (per MMAS).

Conclusion: This qualitative study provides important insight into key modifiable variables that can be targeted to develop educational materials for patients.

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Clinical Efficacy Outcomes with up to 3 Years of Pegloticase Treatment for Refractory Chronic Gout. Michael A. Becker¹, Herbert S. B. Baraf², Robert A. Yood³, Aileen M. Dillon⁴, Janitzia Vazquez-Mellado⁵, Faith D. Ottery⁶, Dinesh Khanna⁷ and John S. Sundy⁸.¹University of Chicago, Medical Group, Worcester, MA, ²Kaiser Foundation Hospital, San Francisco, ³Reliant Medical Group, Worcester, MA, ⁴Kaiser Foundation Hospital, San Francisco, ⁵University of Michigan, Ann Arbor, MI, ⁶Savient Pharmaceuticals, Inc., East Brunswick, NJ, ⁷University of Michigan, Ann Arbor, MI, ⁸Duke University Medical Center, Durham, NC

Background/Purpose: Pegloticase, a recombinant modified mammalian uricase conjugated to mPEG, was approved for use in refractory chronic gout in the US in 2010. The Phase 3 clinical program comprised replicate, randomized, placebo-controlled trials (RCTs) followed by an open-label extension (OLE) study for a total treatment duration of up to 3 years. Here we focus on tophus resolution, flares, and tender/swollen joint counts with long-term pegloticase administration.

Methods: Patients entering the RCTs were >18 years of age, had baseline uric acid (UA) ≥8 mg/dL and at least one of the following: 3 or more self-reported gout flares during the prior 18 months, 1 or more tophi, or goyuty arthropathy and contraindication to allopurinol or failure to normalize UA during 3 or more months of treatment at the maximum medically appropriate dose. The OLE enrolled patients at 46 centers in the US, Mexico and Canada who completed a RCT. Pegloticase dosing regimen (8 mg q2wks or q4wks) was determined at entry to the OLE and could be adjusted twice during the trial. All patients received prophylaxis for infusion reactions and flares. A tophus complete response was defined as 100% reduction in the measured tophus complete response was defined as 100% reduction in the measured area of at least 1 tophus of baseline diameter ≥5 mm without growth of any other baseline tophus or appearance of any new tophus. 547 evaluable tophi were present in 113 patients at baseline. Serial physician’s global assessments (GA) were scored on a visual analogue scale from 0 (very good) to 100 (very bad) as a measure of patient well-being resulting from disease activity and assessed when tophi were of a size or location that would likely result in joint effusion or tenderness were also performed.

Results: Most subjects completing blinded treatment (151/157) entered the OLE study. Among the 149 patients treated with pegloticase in the OLE study (2 elected observation only), 110 had received pegloticase during randomized testing and 39 had received placebo. Mean UA was 10 mg/dL at the OLE baseline (see baseline definition below). After 1 year of OLE treatment (week 52 visit), 59% of patients remaining in the study (62/105) had UA levels below 6 mg/dL. Secondary endpoints over time are presented in the Table below at study baseline, Week 13 (first measurement), one year, and final visit.

<table>
<thead>
<tr>
<th>Efficacy variable</th>
<th>OLE Baseline*</th>
<th>Week 13</th>
<th>Week 52</th>
<th>Final Visit (LOCF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with SUA less than 6 mg/dL (%)</td>
<td>0.75% (1/147)</td>
<td>48% (59/122)</td>
<td>59% (62/105)</td>
<td>45% (63/141)</td>
</tr>
<tr>
<td>Patients with tophus CR</td>
<td>RCTs baseline used</td>
<td>45% (36/80)</td>
<td>74% (50/68)</td>
<td>60% (56/94)</td>
</tr>
<tr>
<td>Mean tender joint counts (0-54 joints)</td>
<td>12*</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Mean swollen joint counts (0-54 joints)</td>
<td>9*</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Physician GA score (0-100)</td>
<td>48*</td>
<td>20</td>
<td>13</td>
<td>17</td>
</tr>
</tbody>
</table>

Flare Data per 3 Month Period

<table>
<thead>
<tr>
<th>Months</th>
<th>1-3</th>
<th>4-6</th>
<th>10-12</th>
<th>12-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects with ≥1 flare</td>
<td>52%* (78/149)</td>
<td>38% (51/136)</td>
<td>26% (30/114)</td>
<td>17% (14/83)</td>
</tr>
</tbody>
</table>

*OLE baseline was defined as baseline data from the RCTs in patients treated with pegloticase and with a gap in therapy of <4 weeks between studies; for all other patients OLE baseline data was collected prior to the first OLE infusion. LOCF includes the data for all evaluable patients “carried forward” from the time of their final visit in the study.

Conclusion: Treatment with pegloticase for up to an additional 2.5 years beyond the 6 months of blinded trial participation was associated with continued benefits for patients. The OLE study provides a conservative estimate of benefit as data are pooled for responders and non-responders. Patients undergoing sustained treatment with pegloticase can be expected to show meaningful clinical improvements with up to 3 years of therapy.


Pegloticase Long-Term Safety: Data From the Open-Label Extension Trial. Michael A. Becker¹, Herbert S. B. Baraf², Robert A. Yood³, Aileen M. Dillon⁴, Janitzia Vazquez-Mellado⁵, Faith D. Ottery⁶, Dinesh Khanna⁷ and John S. Sundy⁸.¹University of Chicago, Chicago, IL, ²Arthritis & Rheumatism Associates, Wheaton, MD, ³Reliant Medical Group, Worcester, MA, ⁴Kaiser Foundation Hospital, San Francisco, CA, ⁵Hospital General de Mexico, Mexico city, Mexico, ⁶Savient Pharmaceuticals, Inc., East Brunswick, NJ, ⁷University of Michigan, Ann Arbor, MI, ⁸Duke University Medical Center, Durham, NC

Background/Purpose: Pegloticase is a recombinant modified mammalian uricase conjugated to mPEG and approved for treatment of refractory chronic gout. Pegloticase safety was evaluated during 2 replicate, 6-month randomized, placebo-controlled trials (RCTs). An open-label extension (OLE) of these trials for up to 2.5 additional years of therapy evaluated long-term safety.

Methods: Patients completing one of the RCTs (n=157) could enroll in the OLE study conducted at 46 sites in the US, Canada, and Mexico. Patients (n=149) received pegloticase 8 mg infusions Q2 weeks or Q4 weeks. Patients received prophylaxis for infusion-related reactions (IRs) and gout flares (flare prophylaxis could be discontinued after 3 months in the OLE). Safety was evaluated with special interest in gout flares and IRs (defined as any adverse event occurring during or within 2 hours after infusion and not reasonably attributable to another cause).

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Sunday, November 11

Results: Of 157 RCT completers, 151 (96%) entered the OLE study and
149 received pegloticase (2 patients chose observation only). Patients received a mean of 28 ⫾ 18 (SD) pegloticase infusions (range⫽ 1–59) and were
followed for a mean of 25 ⫾ 11 months in the OLE study. The most common
reasons for study withdrawal were AEs in 18% (27/149) of patients and loss
of urate-lowering response in 11% (16/149). Nearly all patients (98%) had at
least one AE during the OLE study. Gout ﬂares and IRs were the most
frequently reported adverse events (see table below); these were less common
in patients sustaining urate-lowering response to treatment and those receiving the q2wk dosing regimen. Most AEs were investigator-rated (worst
category per patient) as moderate (53%) in intensity. Overall, 54 patients
(36%) had AEs rated as severe; these were deemed treatment-related in 25
(17%) patients. The most common treatment-related severe AEs were IRs and
ﬂares in 11 (7.4%) and 10 (6.7%) subjects, respectively. No patients with
sustained urate-lowering response to treatment had a severe treatment-related
IR or a severe gout ﬂare.
Among the 13 serious AEs considered possibly related to pegloticase,
there were 11 IRs, 1 skin necrosis, and 1 nephrolithiasis. Among the 11
serious IRs, all but one (91%) occurred when serum UA exceeded 6 mg/dL.
A total of 4 deaths occurred during the OLE study; all were judged as unlikely
related to study drug by the investigator. Laboratory assessments (CBC, CMP
and U/A) identiﬁed no signiﬁcant treatment-related change from baseline
(except in UA).
Adverse Events in the OLE study
Subjects with any AE
Subjects with serious AEs
Subjects with serious AEs related to study drug
Discontinuations due to AE
Most common AEs (incidence ⬎10%)
Gout ﬂare
Infusion-related reaction
Arthralgia
Upper respiratory tract infection
Pain in extremity
Back pain
Diarrhea
Peripheral edema
Urinary tract infection
Nausea
Headache
Fatigue
Sinusitis
Nasopharyngitis

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Increased Serum Uric Acid: Consequence or Cause of Increased Cardiovascular Risk. Inger L. Meek1, Harald E. Vonkeman1 and Mart A.F.J.
van de Laar2. 1Rheumatology Center Twente, Medisch Spectrum Twente &
Twente University, Enschede, Netherlands, 2Medisch Spectrum Twente &
University of Twente, Enschede, Netherlands
Background/Purpose: Reports on cardiovascular (CV) disease in hyperuricemia and gout show conﬂicting results. Some studies show hyperuricemia
to be an independent risk factor for CV events and death, others ﬁnd no such
associations or only with gouty arthritis. Gout and hyperuricemia have also
been associated with individual CV risk factors such as increasing age, male
sex, overweight, hypertension, dyslipidemia, diabetes and inﬂammation.
Studies evaluating the complex associations between serum uric acid,
inﬂammation, gouty arthritis and CV risk are lacking. This study was done to
investigate the associations between serum uric acid and cardiometabolic risk
factors and estimated CV risk in patients with gouty arthritis, non-gouty
arthritis, and degenerative joint disease. To explore the effect of uric acid
lowering therapy (ULT) on CV risk.
Methods: Analysis of the relation between serum uric acid and estimated
10-year risk of CV death (SCORE risk calculation, low risk version corrected
for diabetes by increasing age with 15 years) and individual CV risk factors,
i.e. systolic blood pressure (SBP), TC/HDL ratio (TC/HDL), diabetes and
smoking in patients with osteoarthritis (OA, n⫽197), rheumatoid arthritis
(RA, n⫽675) and gouty arthritis (GA, n⫽201) in a cohort of consecutive
patients attending the Arthritis Center Twente in 2009. Subanalysis of the
effect of uric acid lowering therapy (ULT; allopurinol or benzbromarone,
target serum uric acid 0.36 mmol/L) on estimated 10-year CV risk in GA
patients. Differences between groups and associations between CV risk
variables and tertiles of serum uric acid were tested with ANOVA (for
continuous cardiovascular risk factors) or Chi squared statistics (for nominal
cardiovascular risk factors), adjusted for differences by age and sex.
Results: mean estimated 10-year CV risk was signiﬁcantly higher in GA
(GA 9.5% vs 5.7% in OA and RA, p⬍0.05). In RA and OA mean estimated
10-year cardiovascular risk as well as individual cardiometabolic parameters
(OA: mean SBP, mean TC/HDL; RA: mean SBP, mean TC/HDL, prevalence
diabetes. p⬍0.05) correlated with serum uric acid values. None of these
correlations were present in GA. In GA plasma uric acid was lower in patients
on ULT (0.32 mmol/l ULT vs 0.47 mmol/l non-ULT, p⬍0.05), age and
frequency of CV events did not differ from non-ULT users. ULT did not
affect mean estimated 10-year CV risk (9.7% ULT vs 8.9% non-ULT,
p⬍0.05).
Conclusion: Gouty arthritis is a red ﬂag for increased CV risk, as shown
by higher prevalence of previous CV events and increased metabolic
parameters of CV risk. Serum uric acid is associated with metabolic
parameters of CV risk and 10-year risk of CV death. Effective ULT does not
affect 10-year CV risk. Increased serum uric acid is therefore probably
secondary to a high cardiometabolic risk proﬁle.

All treated patients
(Nⴝ149) N (%)
146 (98)
51 (34)
13 (9)
11 (7)
106 (71)
65 (44)
29 (20)
27 (18)
26 (17)
25 (17)
22 (15)
21 (14)
20 (13)
17 (11)
16 (11)
15 (10)
15 (10)
15 (10)

Conclusion: The safety proﬁle of long-term pegloticase treatment was
consistent with that observed during the 6-month RCTs with no new safety
signals identiﬁed. As all but one of the 11 serious IRs reported during this
study occurred when the UA level was ⬎6 mg/dL, UA should be measured
prior to infusions and pegloticase should be discontinued when UA levels rise
⬎6 mg/dL after an initial response.

Disclosure: I. L. Meek, None; H. E. Vonkeman, None; M. A. F. J. van de Laar,
None.

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Metabolic Syndrome: The Genesis of Nephrolithiasis in Gout Patients?
Filipi M. Mello1, Rafael B. Tomita2, Ricardo Fuller2, Marco Antonio G. P.
Filho2, Thiago B. M. Barros2, Leandro L. do Prado2, Kristopherson L.
Augusto2 and Claudia Goldenstein-Schainberg2. 1Faculdade de Medicina da
Universidade de São Paulo, São Paulo, Brazil, 2Rheumatology Division University of São Paulo, São Paulo, Brazil

Disclosure: M. A. Becker, Takeda Pharmaceuticals Inc, 5, Savient Pharmaceuticals Inc, 5, BioCryst Pharmaceuticals Inc, 5, Ardea Biociences INC, 5,
Metabolex Pharmaceuticals Inc, 5, URL/Mutual Pharmaceuticals Inc, 5, Regeneron
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Inc., 2, Takeda Pharmaceuticals,; A. M. Dillon, Savient Pharmaceuticals, Inc, 2,
Savient Pharmaceuticals, Inc.,; J. Vazquez-Mellado, None; F. D. Ottery, Savient Pharmaceuticals, Inc., 3, Savient Pharmaceuticals, Inc., 1; D. Khanna, Savient
Pharmaceuticals, URL, 2, Ardea Biosciences, Takeda Pharmaceuticals, Savient
Pharmaceuticals, 5, Savient Pharmaceuticals, 8; J. S. Sundy, Ardea Biosciences, 2,
Ardea Biosciences, 5, Regeneron Pharmaceuticals, Inc., 2, Regeneron Pharmaceuticals, Inc., 5, Metabolex, Inc., 2, Metabolex, Inc., 5, Pharmos Corporation, 2,
Pharmos Corporation, 5, Savient Pharmaceuticals, Inc., 5, Savient Pharmaceuticals, Inc., 2, Celgene, 2, Academic Partners for Medical Education, LLC, 4,
Medanta Duke Research Institute, 6, Bristol-Myers Squibb, 2, Bristol-Myers
Squibb, 5.

Background/Purpose: Gout patients have a high frequency of metabolic
syndrome (MS), a disorder known to be associated with hyperinsulinemia.
The latter condition augments proximal tubular sodium reabsorption and
leads to reduced renal urate excretion and hyperuricemia. There are no data,
however, evaluating whether MS can inﬂuence gout-associated clinical
characteristics. Thus, we aimed to determine the prevalence of MS in our
population and to investigate if the presence of MS would characterize a
particular clinical and laboratorial gout proﬁle.
Methods: This was a cross-sectional study of 158 gout patients (ACR
criteria). MS was deﬁned in accordance to the National Cholesterol Education
Program ATP III (NCEP-ATP III) and the International Diabetes Federation
(IDF) criteria. Demographic, anthropometric (body mass index - BMI) and
clinical data were evaluated. Fasting serum levels of UA, glucose, triglycerides and cholesterol fractions were analyzed by routine laboratory tests.

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Nephrolithiasis was demonstrated by usual ultrasonography and urate underexcretion defined as UA clearance lower than 7.5 ml/min. Statistical comparisons were performed using Fisher’s exact, chi-square, student’s T and Spearman’s tests and P<0.05 was considered significant.

**Results:** The frequency of MS in gout patients was 73% and 71% according to NCEP ATPIII and IDF criteria respectively. Further comparison of 125 patients with MS and those 33 without this condition revealed similar mean ages (63.0 ± 11.9 vs 62.5 ± 12.9, p=0.05) and male predominance (94% and 96%, respectively). As expected, those with MS had higher BMI (30.2 ± 5.5 kg/m² vs 27.0 ± 5.8 kg/m²; p = 0.005) and higher prevalences of systemic arterial hypertension (93.3% vs 75% p= 0.012) and diabetes (25.8% vs 0%, p= 0.001), though comparable frequency of coronary artery disease (22.5% vs 16.7%; p = 0.460). With regard to gout clinical/laboratorial characteristic, patients with MS had more nephrolithiasis (37.1% vs 16.7%, p = 0.026), but they did not differ from patients without MS concerning the presence of tophi (52.8% vs. 55.6%; p = 0.780) or uric acid underexcretion (83.1% vs 94.4%; p = 0.148). Current alcohol consumption, mean estimated creatinine clearance and mean serum levels of uric acid, were alike in both groups (p>0.05).

**Conclusion:** The novel demonstration that MS in gout is associated to nephrolithiasis suggests that this condition may underlie the genesis of uric acid stones. Whether insulin resistance may account for a renal alteration that may ultimately impair buffering and amplification of acidic urine remains to be determined. Moreover, the elevated prevalence of MS in gout patients from our country (almost ¾) is higher than overall rates of 63% MS in gout worldwide, indicating possible influence of dietary, geographical and/or genetic background.

**Disclosure:** F. M. Mello, None; R. B. Tomita, None; R. Fuller, None; M. A. G. P. Filho, None; T. B. M. Barros, None; L. L. do Prado, None; K. L. Augusto, None; C. Goldenstein-Schainberg, None.

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**Evaluating Allopurinol Therapy and Serum Uric Acid Levels in Medicare Beneficiaries with Gout.** Melea Ward1, Anthony M. Louder2, Keith A. Szymanski3 and Leonardo Tamariz4. 1Competitive Health Analytics, Louisville, KY, 2Competitive Health Analytics, Inc., Louisville, KY, 3Takeda Pharmaceuticals America, Inc., Deerfield, IL, 4University of Miami, Miami, FL

**Background/Purpose:** Higher serum uric acid levels in gout patients have been associated with an increased frequency and risk of gout flares and greater subsequent healthcare costs. Despite the wide availability of allopurinol, achieving a therapeutic serum uric acid (sUA) level remains problematic for clinicians and patients. The objectives of this study included identifying predictors of an sUA response to allopurinol and investigating the associated healthcare costs.

**Methods:** A retrospective cohort study of a large health benefits company was conducted among Medicare Advantage Prescription Drug (MAPD) plan patients with gout newly initiated on allopurinol between 1/1/08 and 12/31/10. Patients were separated into two cohorts defined by their sUA response to allopurinol (sUA < 6 mg/dl or sUA > 6 mg/dl). Mean allopurinol adherence, as measured by proportion of days covered (PDC), was reported at 12 months follow-up. Multivariate logistic regression was used to determine factors associated with allopurinol response. A generalized linear model was developed to assess the association between allopurinol response and total healthcare costs.

**Results:** Of the 2,703 patients initiated on allopurinol, 57% had a baseline sUA and 33% had sUA > 6 mg/dl in the follow-up period. Higher adherence was associated with achieving an sUA < 6 mg/dl compared to > 6 mg/dl (PDC=0.74 and 0.59, respectively, p<0.0001). Predictors of sUA < 6 mg/dl included female sex, higher allopurinol PDC, and allopurinol dose >100 mg/day (OR:1.74, CI:1.41–2.13; OR:12.28, CI:8.25–18.28; OR:5.84, CI:4.73–7.20, respectively). Hispanic ethnicity, higher baseline sUA, renal impairment (Stage 3 vs. Stage 1), colchicine use, and NSAID use were associated with sUA > 6 mg/dl (OR:0.6, CI:0.56–0.66; OR:0.41, CI:0.30–0.55; OR:0.79, CI:0.65–0.97; OR:0.68, CI:0.55–0.85, respectively). There were no significant differences in total healthcare costs between the two cohorts.

**Conclusion:** A large percentage of patients initiated on allopurinol did not have adequate sUA monitoring, and did not achieve an sUA < 6 mg/dl. Drivers of a therapeutic response included increased adherence and dose escalation. This study demonstrates that ample opportunity exists for clinicians and patients to improve sUA monitoring and treatment adherence when initiating urate lowering therapy.

**Disclosure:** F. M. Mello, None; R. B. Tomita, None; R. Fuller, None; M. A. G. P. Filho, None; T. B. M. Barros, None; L. L. do Prado, None; K. L. Augusto, None; C. Goldenstein-Schainberg, None.

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**The Prevalence of Gout in a Large Tertiary Hospital and the Impact of In-Hospital Attacks of Acute Gout On Patient Outcomes and Health Resource Utilisation – a Nested Case-Control Study.** John HY Moi1, Mark Tacey2, Carol Roberts3, Caroline Brand1, Alexandra Gorelik4 and Sharon Van Doornum1. 1The Royal Melbourne Hospital, The University of Melbourne, Melbourne, Australia, 2The Royal Melbourne Hospital, Melbourne, Australia

**Background/Purpose:** Acute gout can develop in hospitalised patients either as a new event or as a recurrence of established disease. To date there have been no studies examining the effect of in-hospital acute gout on hospital length of stay (LOS) or health resource utilisation. This study was performed to investigate the burden of gout in a hospitalised population and to assess the impact of acute gout on patient outcomes and health resource utilisation.

**Methods:** The study utilised hospital administrative data from The Royal Melbourne Hospital, Victoria over a ten year period (1 January 2001 to 31 December 2010). Gout was defined according to The International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) codes and subdivided into three categories: ‘P-gout’ (gout was the primary reason for admission or was a pre-existing condition requiring treatment initiation/adjustment during admission), ‘C-gout’ (gout occurred as a complication during hospitalisation and was not a pre-existing condition), or ‘A-gout’ (gout was an associated diagnosis and did not require specific treatment during admission). The overall burden of gout was measured by determining the prevalence of gout diagnoses affecting all hospital admissions (excluding day case admissions) over the study period. The effect of acute gout on patient outcomes and health resource utilisation was measured in a nested case control study with matching of ‘C-gout’ patients to controls (ratio of 1:5) by age, gender, and principal diagnosis. Outcome measures included LOS, 28-day hospital readmission rates, and total number of hospital days in the 12 months post hospital discharge. For comparisons between ‘C-gout’ and matched control cases, the student T-test or Wilcoxon ranksum test for continuous data and Chi²test for categorical data were used. A p-value of <0.05 was considered significant.

**Results:** There were 278,491 multi-day hospital admission episodes during the 10 year study period. Of these, 1,400 (0.5%) had an ICD-10-AM code for gout (‘P-gout’=1,058, ‘C-gout’=307 and ‘A-gout’=35). A steady increase in the annual burden of gout of 0.22% over 10 years was noted. Patients who experienced an in-hospital attack of acute gout had a substantially longer LOS than the controls (median 13 days (IQR 7–25) vs. 5 days (IQR 2–11), p<0.001) and also had higher readmission rates in the first 28-days (p=0.002) and during the first 12 months (p<0.001) of hospital discharge.

**Conclusion:** Our study demonstrates a growing burden of in-hospital gout attacks and increased utilisation of health resources in patients who experience acute gout as a complication of their hospital stay. It was not possible from the design of our study to exclude other potential confounding factors which may have contributed to the observed increased hospital LOS.

**Disclosure:** J. H. Moi, None; M. Tacey, None; C. Roberts, None; C. Brand, None; A. Gorelik, None; S. Van Doornum, None.

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**Colchicine Is Associated with a Decreased Rate of Myocardial Infarction in Gout Patients: Interim Results From a Retrospective Cohort Study.** Dara B. Critteneder1, Cihan J. White1, Michael DeBerrardine1, Bruce Kim1, Binuta Shah2, resnica C. Kimmell1, Rima D. Patel1, Steven P. Sells2, Jeffrey D. Greenberg1, Craig T. Tenner1, Bruce N. Cronstein3 and Michael H. Pillinger4. 1NYU School of Medicine, Division of Rheumatology, New York, NY, 2NYU School of Medicine, Division of Cardiology, New York, NY, 3NYU School of Medicine, Department of Internal Medicine, New York, NY

**Background/Purpose:** Atherosclerosis is an inflammatory process, but to date no anti-inflammatory agent has definitively been shown to alter cardiovascular (CV) risk. Colchicine is an anti-inflammatory agent that
inhibits macrophages, endothelial cells, and neutrophils, all implicated in atherosclerosis. In a cross-sectional study, we found that colchicine use was associated with reduced prevalence of myocardial infarction (MI) in gout patients [1]. To further evaluate the relationship between colchicine and CV risk, we initiated a retrospective cohort study. Here we present an interim analysis.

**Methods:** We identified all active New York Harbor VA patients with an assigned ICD-9 code for gout or hyperuricemia between 2000-09. Charts were manually screened to confirm a diagnosis of gout utilizing ACR criteria, and pharmacy records were used to identify subjects on daily colchicine for ≥ 30 days (colchicine group). Subjects receiving no colchicine prescriptions formed the control group. Baseline characteristics including CV risk factors and medication use were ascertained. We excluded patients who did not meet our diagnostic criteria for gout, who received as-needed colchicine only, or with ≤ 3 months of follow-up time available for evaluation. We defined colchicine lapse as any period of non-colchicine use beginning 2 weeks after medication cessation (to account for the elimination time of the drug). The primary outcome was MI during the study period.

**Results:** 7819 subjects had requisite ICD-9 codes. Among 1031 charts reviewed to date, 214 patients met gout criteria and 183 were enrolled. Of these, 121 subjects (66%) used colchicine (totaling 363.8 patient-years of exposure) and 62 subjects (34%) used no colchicine (totaling 249.8 patient-years of follow-up). Colchicine and control groups had similar rates of hypertension (0.85 vs 0.92, p=0.2), diabetes (0.37 vs 0.3, p=0.4), hyperlipidemia (0.66 vs 0.56, p=0.3), coronary artery disease (0.29 vs 0.37, p=0.3), and allopurinol use (0.22 vs 0.21, p=1.0), as well as similar BMI (30.6 vs 29.8, p=0.3), serum urate (8.4 vs 8.2 mg/dL, p=0.6), and creatinine (1.3 vs 1.4 mg/dL, p=0.7). Colchicine users experienced no MIs while on their medication. In contrast, control patients had 4 MIs (0 vs 6.4%; p=0.01), and 3 MIs occurred during colchicine lapses (3%; lapse vs colchicine p=0.09; lapse vs control p=0.43; mean time from last colchicine use to MI 5.9 months). We also compared rates of MI per patient-year between colchicine exposure (0.0), control follow-up (0.016), and colchicine lapse follow-up (0.018) periods, and observed significant differences between colchicine vs control (p=0.036) and colchicine vs lapse (p=0.035), but not between control vs lapse group MI rates (p=0.26).

**Conclusion:** In this interim analysis, gout patients taking colchicine had a significantly reduced rate of MI vs non-users, and vs themselves during periods when not taking colchicine. These data suggest that colchicine is protective against MI, though probably only during active use. Evaluation of the remaining 6,788 patients is ongoing.


**Disclosure:** D. B. Crittenden, None; C. J. White, None; M. DeBerardine, None; G. Kim, None; B. Shah, None; J. C. Kimmel, None; R. D. Patel, None; S. P. Sedlis, None; J. D. Greenberg, None; C. T. Tenner, None; B. N. Cronstein, Canfilet BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Roche, Genentech, 5, Arthritis Foundation, SLE Foundation, 6. Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.; M. H. Pillinger, Takeda Inc, 2.

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**Low-Dose Allopurinol Promotes Greater Serum Urate Lowering in Gout Patients with Chronic Kidney Disease Vs Normal Renal Function.** Michael DeBerardine¹, Mark C. Fisher², Robert T. Keenan³, Michael H. Pillinger¹ and Daria B. Crittenden¹. ¹NYU School of Medicine, Division of Rheumatology, New York, NY, ²Massachusetts General Hospital, Boston, MA, ³Duke University, Durham, NC.

**Background/Purpose:** Patients with chronic kidney disease (CKD) may be at increased risk for allopurinol (ALLO) hypersensitivity, possibly because impaired renal excretion causes accumulation of the active ALLO metabolite oxyipurinol (OXY). For this reason, lower doses of ALLO are recommended when initiating urate lowering in CKD patients. OXY accumulation suggests that ALLO should also be more efficacious in CKD patients, a hypothesis not previously tested. We therefore assessed whether ALLO is more effective at lowering serum urate (sUA) in patients with CKD vs those with normal renal function.

**Methods:** Using the electronic medical record of the NY Harbor VA Health Care System, we identified all gout patients taking 100 mg or 300 mg of ALLO daily between August 2007 and August 2008 for whom both pre- and post-treatment sUAs were available. ALLO use was identified using pharmacy records and confirmed by individual chart review. Baseline characteristics were obtained. Patients in each ALLO dose group were categorized by National Kidney Foundation stages, and mean change in sUA for each ALLO dose according to CKD stage was determined.

**Results:** Among 1288 charts reviewed, 199 patients met entry criteria and had sufficient data to permit evaluation. 95 patients were taking 100 mg and 104 were taking 300 mg ALLO daily. 100 mg vs 300 mg groups were similar in age (71.4±1.2 vs 68.7±1.1 years) and BMI (29.1±0.6 vs 30.9±0.6). Overall, patients taking 300 mg experienced a trend toward greater sUA decrease vs those taking 100 mg (2.9±0.2 vs 2.5±0.2 mg/dL, p=0.13), resulting in a lower post-treatment mean sUA in the 300 mg group (7.0±0.2 mg/dL for 100 mg dose, 6.1±0.2 mg/dL for 300 mg dose, p=0.001). Across increasing degrees of renal insufficiency, mean decreases of sUA in patients taking 300 mg did not change significantly. In contrast, in patients taking 100 mg, decreases in sUA (in mg/dL) increased progressively from stage I to V CKD: stage I (n=10) sUA decrease = 1.7±0.6, stage II (n=25) = 2.4±0.4, stage III (n=46) = 2.7±0.4, stage IV (n=8) = 2.5±0.9, stage V (n=6) = 3.1±0.6. Whereas patients with normal renal function (stage I) experienced greater sUA lowering with 300 mg vs 100 mg (3.4±0.7 vs 1.7±0.6 mg/dL, p=0.04), 100 mg ALLO was as efficacious as the 300 mg dose in patients with stage V CKD (sUA decrease 3.1±0.6 vs 3.2±0.2 mg/dL, p=0.5).

**Conclusion:** In patients with gout, low-dose ALLO is progressively more effective for sUA lowering in proportion to increasing degrees of renal insufficiency, presumably owing to OXY accumulation. No such effect was seen at the 300 mg dose, suggesting that sUA-lowering effects may reach a ceiling in CKD patients. These data support the strategy of starting gout patients with CKD on low-dose ALLO and titrating upwards only as needed, not only to minimize toxicity, but also because lower doses may be more effective in CKD patients, and higher doses may confer little or no additional benefit.

**Disclosure:** M. DeBerardine, None; M. C. Fisher, None; R. T. Keenan, None; M. H. Pillinger, Takeda Inc, 2. B. N. Cronstein, None; D. B. Crittenden, None.
Serum Uric Acid Control and Risk of Flare According to Different Cut-Offs in Patients with Gout: Longitudinal Analysis From the King Study of the Italian Society for Rheumatology, Marianna Manara1, Carlo Alberto Sciriha2, Marco A. Cimmino3, Marcello Govoni3, Fausto Salaffi4, Greta Carrara4, Carlomaurozio Montecucco5, Marco Matucci-Cerinic6, Giovann Minisola7 and Kick-off of the Italia Network for Gout (KING) Study Group8, 1Epidemiology Unit - Italian Society for Rheumatology, Milano, Italy, 2Epidemiology Unit - Politecnico University of the Marche, Jesi, Italy, 3Division of Rheumatology - University of Ferrara, Ferrara, Italy, 4Rheumatology Unit - Polytechnic University of the Marche, Jesi, Italy, 5Division of Rheumatology - University of Pavia School of Medicine, IRCCS Policlinico San Matteo Foundation, Pavia, Italy, 6Department of Biomedicine & Division of Rheumatology AOUC - University of Florence, Florence, Italy, 7Rheumatology Unit - San Camillo Forlanini Hospital, Rome, Italy, 8SIR, Italy

Background/Purpose: The therapeutic goal of the management of gout is to promote crystal dissolution and prevent crystal formation. For this reason national and international guidelines recommend to maintain the serum uric acid (sUA) below the saturation point for monosodium urate (from 5 to 6.38 mg/dl). In this analysis we evaluated the influence of different sUA levels on the risk of acute attack in an observational setting.

Methods: This is a longitudinal analysis of an ongoing multicentre cohort study including 450 patients with prevalent clinically diagnosed gout from 30 rheumatology centers across Italy (Kick-off of the Italian Network for Gout, KING, promoted by the Italian Society for Rheumatology - SIR; NCT01549210) recruited from June 2011 and January 2012. Participants were centrally selected from clinical registers by random sampling. All patients underwent full clinical evaluation at baseline, including general and disease-specific characteristics. During the first 6 months of follow-up the number of flares, sUA and concurrent treatment were collected.

The relationship between sUA and risk of flare was analyzed using logistic models on complete data, and estimation of the risk of flare is presented as odds ratios (OR) and 95% confidence intervals (CI). The optimal cut-off of sUA was explored by identifying the minimum cut-off associated with a significant increase of risk of flare.

Results: A total of 178 patients were included in the analyses: 92.7% were male with a mean (SD) age of 64.5 (10.9) years, 22.9% had tophaceous disease-specific characteristics. During the first 6 months of follow-up the number of flares, sUA and concurrent treatment were collected.

The relationship between sUA and risk of flare was analyzed using logistic models on complete data, and estimation of the risk of flare is presented as odds ratios (OR) and 95% confidence intervals (CI). The optimal cut-off of sUA was explored by identifying the minimum cut-off associated with a significant increase of risk of flare.

Results: A total of 178 patients were included in the analyses: 92.7% were male with a mean (SD) age of 64.5 (10.9) years, 22.9% had tophaceous and 18.7% polyarticular disease. Mean (SD) sUA was 6.1 (1.6) mg/dl, of which 26.9% <5mg/dl, 26.4% from 5–6mg/dl, 16.8% from 6–7mg/dl and 29.8 above 7mg/dl. During the follow-up of 6 months 60 patients (33.7%) presented at least one flare with a total of 140 flares.

SUA levels were linearly associated with an increased risk of flare: OR[95%CI] of 1.39 [1.13,1.71] per each mg/dl increase. The adjusted analyses confirmed a similar increase of risk of flare regardless of changes in urate-lowering therapy or prophylactic treatment: OR 1.38 [1.12,1.71]. The minimum cut-off associated with a significant increase of risk of flare was 5.9 mg/dl with an OR of 1.90 [1.01,3.59]. Consistently, using sUA<5mg/dl as reference category, 5–6mg/dl was not associated with a significant increase of risk of flare (OR 1.54 [0.60, 4.15]) while 6–7mg/dl and >7mg/dl were associated with significant ORs: 2.90 [1.03,8.16] and 3.52 [1.43,8.62], respectively.

Conclusion: The optimal management of gouty patients requires strict control of serum uric acid levels. A virtual absence of risk of flare is associated with levels of uric acid levels below 4mg/dl, but the operative cut-off of 6mg/dl is a robust limit to discriminate patients with increased risk of relapse.

Disclosures: M. Manara, None; C. A. Sciriha, None; M. A. Cimmino, None; M. Govoni, None; F. Salaffi, None; G. Carrara, None; C. Montecucco, None; M. Matucci-Cerinic, None; G. Minisola, None;

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Allopurinol Use Is Associated with a Decreased Risk of Myocardial Infarction. Lamia Grimaldi-Bensouda1, Annick Alperovitch2, Eloide Aubrun1, Nicolas Danchin3, Michel Rossignol4, Lucien Abenhaim5, Pascal Richette6 and PGRX Mi Group7, 1LA-SER, Paris, France, 2Inserm U708-Neuroepidemiology, La Pitié-Salpêtrière Hospital, Paris, France, 3Coronary disease unit, Georges Pompidou European Hospital, Assistance Publique-Hôpitaux de Paris and Paris-Descartes University, Paris, France, 4LA-SER, Centre for Risk Research, Montreal, 5LA-SER Europe Ltd, London, United Kingdom, 6Lariboisière Hospital, Paris, France, 7Paris, France

Background/Purpose: Xanthine oxidase inhibitors (XOI) reduce both urate levels and the oxidative stress in the vasculature, which are known cardiovascular risk factors. However, the effects of XOI on major cardiac events such as myocardial infarction (MI) are unknown. The objective was to investigate whether XOI use is associated with a modified risk of myocardial infarction.

Methods: We used a matched case-control study comparing patients with first ever MI with controls. Cases were retrieved from a myocardial infarction registry consisting of 63 cardiology centers, whereas controls were selected from general practice settings. The association between XOI or colchicine use and MI was assessed by adjusted OR from conditional logistic regression.

Results: Data are from 2277 MI patients matched to 4849 controls. Allopurinol was by far the most frequent XOI taken by participants of this study. The adjusted OR (95% CI) for MI in allopurinol users was 0.75 (0.56–1.01), and it was 0.66 (0.49–0.89) using the whole pool of referents (n=8444). The effect of allopurinol persisted across subgroups by sex, presence of hypertension, and in ST-segment elevation MI patients. In contrast, colchicine use was not associated with a modified risk of MI: nOR= 1.17 (0.70–1.93).

Conclusion: Allopurinol, but not colchicine use, is associated with around a 30% reduction in the risk of myocardial infarction. Besides its urate lowering property, allopurinol might have a cardio protective effect.

Disclosure: L. Grimaldi-Bensouda, None; A. Alperovitch, None; E. Aubrun, None; N. Danchin, None; M. Rossignol, None; L. Abenhaim, None; P. Richette, None;

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Background/Purpose: Pegloticase is a recombinant modified mamblian uricase conjugated to mPEG which was approved in the US in 2010 for treating hyperuricemia in patients with refractory chronic gout. The pegloticase development program comprised 2 randomized, placebo-controlled trials (6 months; N=212) followed by an open-label extension study for a total treatment duration of up to 3 years. Trial entry was preceded by a 1 week washout period for urate-lowering therapies. Patients were considered “responders” if they met the primary efficacy endpoint of uric acid (UA) <6 mg/dL for 80% of time during months 5 and 6. 42% of patients met this definition (vs. 0% with placebo; p<0.001) in the randomized trials1. Post-hoc analyses revealed a significant relationship between a loss of urate-lowering response to therapy and the presence of high titer anti-pegloticase antibodies. Loss of response was also associated with increased risk of infusion reactions (IRs). Further analyses confirmed that the great majority of IRs occurred in patients who had already lost their urate-lowering response to therapy (20/22 or 91% for patients receiving pegloticase 8 mg q2wks and 24/34 or 71% for patients treated q4wks). These two findings led to clear guidance that patients treated with pegloticase should discontinue treatment if UA levels rose above 6 mg/dL (particularly with 2 consecutive levels >6 mg/dL). New information provided by post-marketing pharmaco-
vigilance suggests a relationship between serum UA levels <6 mg/dL, IRs and concomitant use of xanthine oxidase inhibitors (XOIs).

Methods: Post-marketing AE data were collected as standard, unsolicited reporting and summarized from September 14, 2010 to November 30, 2011 to evaluate concomitant XOIs use.

Results: During approximately one year of commercial pegloticase use in the US, IRs were reported in 20 patients and anaphylaxis in 8 patients. Among the reports of IRs, 6 patients had UA >6, 7 had UA <6 and UA was unknown at the time of the IR in 5. Among the reports of anaphylaxis, 4 patients had UA levels >6, 2 had UA levels <6 and 2 had unknown UA. Importantly, AE reporting revealed that 40% of patients (8/20 IRs and 3/8 cases recorded as anaphylaxis) were receiving one or both XOIs in addition to pegloticase. Details of these 11 patients are provided in the table.

<table>
<thead>
<tr>
<th>Patients with infusion reactions receiving concomitant XOIs</th>
<th></th>
<th>Demographic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>SUA on XOI</td>
<td>Infusion #</td>
</tr>
<tr>
<td>Patient A</td>
<td>3rd</td>
<td>5-6 mg/dL</td>
</tr>
<tr>
<td>Patient B</td>
<td>2nd</td>
<td>4.1 mg/dL</td>
</tr>
<tr>
<td>Patient C</td>
<td>3rd</td>
<td>4.5 mg/dL prior to 2nd infusion</td>
</tr>
<tr>
<td>Patient D</td>
<td>3rd</td>
<td>Very low (unspecified)</td>
</tr>
<tr>
<td>Patient E</td>
<td>4th</td>
<td>5.2 mg/dL prior to 3rd infusion</td>
</tr>
<tr>
<td>Patient F</td>
<td>2nd</td>
<td>1.3 prior to 2nd infusion</td>
</tr>
<tr>
<td>Patient G</td>
<td>3rd or 4th</td>
<td>5.3 mg/dL</td>
</tr>
<tr>
<td>Patient H</td>
<td>3rd</td>
<td>4.6 mg/dL prior to 2nd infusion</td>
</tr>
</tbody>
</table>

Patients with anaphylaxis receiving concomitant XOIs

| ID | SUA on XOI | Infusion # | Previous SUA |
|----------------|----------------|-------------|
| Patient I | 3rd | 7.6 mg/dL | 58 yo white male |
| Patient J | 2nd | 4.3 mg/dL | 60 yo white male |
| Patient K | 3rd | 0.9 prior to 22nd infusion | 47 yo white male |

Conclusion: Post-marketing adverse event reporting provided valuable information regarding pegloticase administration in the real world setting. Importantly, the use of concomitant urate-lowering therapies has the potential to mask the rise of UA levels in patients treated with pegloticase and confound the use of UA as a biomarker of response. XOIs should be discontinued prior to initiation of pegloticase and not restarted while on treatment. Further, UA monitoring and discontinuation of pegloticase upon loss of efficacy are critical to safe and effective care.

References
3. KRYS TExXXA prescribing information.


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Relative Risk of Infusion Reactions with KRYS TExXXA® (pegloticase) From Post-Approval Safety Data: Results From Sept 2010 to June 2012

Methods: During randomized clinical trials (RCTs) with pegloticase, the incidence of infusion-related reactions (IRs) was 26% including 5 cases of anaphylaxis (determined post-hoc using published criteria). Post-hoc analyses revealed a relationship between loss of urate-lowering response and IRs. This relationship could not have been detected during the trials as investigators were blinded to pre-infusion uric acid (UA) values. These analyses led to guidance on measuring UA levels as a biomarker of response and IR risk, and included the recommendation that patients discontinue pegloticase if serum uric acid (UA) was >6 mg/dL, particularly at 2 consecutive q2wk infusions. In order to determine whether this guidance was effective in reducing the incidence of IRs, the company reviewed IRs from post-approval safety data.

Methods: We estimated the incidence of IRs by comparing usage information from the RCTs and the post-approval period (Sept 14, 2010 to June 1, 2012). An estimate of the total number of infusions given in the post-approval period was derived from the number of vials sold during that period compared to the number administered to a defined number of patients in the 6-month RCTs.

Results: 852 individual vials for infusion were administered to the 85 patients receiving the approved dose of pegloticase during the RCTs (8 mg every 2 weeks) and there were 22 reports of IRs (see Table). During the post-approval period, 5727 vials were sold and the company received 58 reports of IRs and anaphylaxis (43 reports of IRs, 15 reports of anaphylaxis). The above information was used to estimate the relative risk reduction for IRs during the post-approval period compared with the RCTs period. When determined this way, there was a 61% reduction (95% CI: 36.3 to 75.9) in the risk of IR during the post-approval period vs. the RCTs.

While providing evidence for relatively low rates of IRs, these estimates have substantial limitations. The actual number of patients receiving infusions is difficult to estimate from vials sold. In addition, the number of IRs depends on voluntary reporting and some adverse events are reported to the FDA and not to the company. Finally, these estimates are valid only for the time period of collection as practice patterns may change with accrued clinical experience.

3. KRYS TExXXA prescribing information.


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Disease Modifying Agents Combined with Isoniazid for Latent Tuberculosis in Patients with Rheumatic Diseases

Background/Purpose: Reactivation of latent tuberculosis (LTB) has been described with the use of anti-TNF for the treatment of rheumatic diseases. Combined treatment with isoniazid (INH) and DMARDs such as methotrexate (MTX) and sulfasalazine (SSZ) can potentially increase the risk of liver toxicity. The goal of this study was to investigate the risk of liver toxicity in rheumatic patients taking isoniazid (INH) and disease modifying agents (DMARDs) or biologics.

Methods: We reviewed the Institut de Rhumatologie de Montréal database (RhuMaData®) for rheumatic patients with positive tuberculin skin test who took INH and at least one concomitant DMARD or biologic between August 2001 and April 2011. Liver function tests (LFT) were tested at baseline and during therapy.

Results: Of 922 patients screened with tuberculin skin test, 87 patients tested positive and received INH. During INH treatment, 75.9% were taking concomitant DMARDs (71.3% MTX, 19.5% hydroxychloroquine (HCQ), 5.7% SSZ, 3.4% leflunomide), 82.0% were taking concomitant biologics, and 46.0% were using NSAIDs on a regular basis. Twenty-four percent had
abnormal liver enzymes during INH therapy. Most of them were mild or transient, but 8% (7 patients) had significant abnormalities leading to INH discontinuation. Among these patients, mean (min, max) was 241 (52, 617) for AST and 262 (92, 669) for ALT. Concomitant medications taken by patients who stopped INH were: biologics (4 patients), MTX (1), biologic and MTX (1), biologic, leflunomide and HCO (1).

**Conclusion:** The use of INH for LTBI was generally well tolerated in patients with rheumatic diseases on a background regimen of DMARDs or biologics. However, the rate of significant abnormalities in our study is higher than the reported rates for INH hepatitis in the literature. There is no evident signal to change the current guidelines. Therefore, it is prudent to follow LFT closely on patients taking combination therapy.

_Disclosure:_ J. Bourré-Tessier, None; M. A. Rino i Torregrosa, None; D. Choquette, None.

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A Systematic Review and Meta-Analysis of Antibiotic Treatment for Reactive Arthritis. Claire E. Barber1, Joseph Kim2, R. D. Inman3, John Esdaile4 and Matthew T. James5. 1University of Calgary, Calgary, AB, 2University of British Columbia, Vancouver, BC, 3University of Calgary, Calgary, 4Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON, 5University of British Columbia, Vancouver, BC, 6University of Calgary, Calgary

**Background/Purpose:** Although bacterial infections are a common precipitant, it is unclear whether antibiotic treatment is effective for reactive arthritis. The purpose of this study was to conduct a systematic review and meta-analysis of randomized controlled trials to examine the efficacy and safety of antibiotic treatments for reactive arthritis.

**Methods:** Medline, Embase, Pubmed, Cochrane CENTRAL Register of Controlled trials were searched up to November 2011 using MeSH terms and keywords pertaining to two major themes: reactive arthritis and antibiotic therapy. Randomized controlled trials of antibiotic use for reactive arthritis reporting on: remission, joint counts, pain or patient global scores were included. Two reviewers independently extracted information on the definition of reactive arthritis, features of study quality, type of treatment and outcomes. Pooled relative risks for binary outcomes (failure to achieve remission and adverse events) and pooled mean differences for continuous variables (joint counts, pain and patient global scores) were computed. Potential sources of heterogeneity were investigated using stratified analyses and meta-regression.

**Results:** Twelve trials were eligible for inclusion and 10 provided adequate data for meta-analysis. The pooled relative risk of failure to achieve remission from a random-effects model showed no significant benefit of antibiotic treatment (seven trials: 375 participants RR 0.74, 95% CI 0.49–1.10); however, substantial heterogeneity was observed (I² = 76.3%, p<0.0001). The treatment effect did not significantly differ by the type of organism triggering the reactive arthritis (Chlamydia versus other), use of combination versus mono-therapy, or risk of bias. However, when only biphenyl sulfones were pooled, the treatment effect was attenuated and heterogeneity decreased significantly (RR 0.87, 95% CI 0.70–1.10, I² = 32.8%, p=0.19). No significant effects of antibiotic treatment were observed on swollen joint counts (six trials, 375 participants weighted mean difference 0.21, 95% CI 1.16, 0.75, I² = 82.9%, p<0.0001) tender joint counts (five trials, 326 participants, standardized mean difference 0.10, 95% CI -0.58, 0.78, I² = 86.9%, p<0.0001), pain (three trials, 220 participants, standardized mean difference 0.16, 95% CI -0.15, 0.46, I² = 12.6%, p=0.381), or patient global scores (four trials, 284 participants, standardized mean difference 0.15, 95% CI -0.08, 0.39, I² = 0.0%, p=0.499); however, antibiotics were associated with a 97% increase in gastrointestinal adverse events.

**Conclusion:** Trials of antibiotic treatment for reactive arthritis have produced heterogeneous results which may be related to differences in study quality. The current evidence base does not support the use of antibiotics in routine clinical practice for the management of reactive arthritis.

_Disclosure:_ C. E. Barber, None; J. Kim, None; R. D. Inman, None; J. Esdaile, None; M. T. James, None.

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**Background/Purpose:** Background: Current recommendations for latent tuberculosis infection (LTB) screening and treatment in patients eligible for anti-TNF agents are not well established in endemic regions. Thus, the aim of this study is to evaluate the long-term efficacy of LTB screening and treatment in RA patients under TNF blockers tight control therapeutic strategy

**Methods:** Two hundred and two RA patients (1987 criteria) eligible for anti-TNF agents were initially screened for LTB by PPD test, chest X-ray and contact history. Two hundred and nine patients receiving traditional DMARDs comprised the control group. Patients and controls were regularly followed up at 1–3 months interval, from January 2007 to December 2011. During the study period, PPD was repeated in patients with TB clinical suspicion or due to extended (>12 months) interruption/re-start of biologic treatment.

**Results:** 202 patients were treated with anti-TNF blockers, 85(42%) with one agent and 117(58%) with two or more; 181 received infliximab, 93 adalimumab and 75 etanercept. LTB screening (PPD and/or history of contact and/or X-ray) was positive in 69(34%) patients. In 65%(45 patients) PPD was positive, 36%(n=25) had history of contact and 21%(n=15) with X-ray alterations. Of note, in the 24 LTBI patients with negative PPD, contact history accounted for 75% and X-ray for 37% of the positive screened cases. LTB treatment with isoniazid during 6 months was administered to all positive screened patients and none developed TB during follow-up. Regarding the 133 remaining screening negative patients none had TB during the first twelve months of anti-TNF therapy. PPD test was repeated in only 53 patients (26%) due to interruption/re-start of biologic treatment (5cases) or clinical TB suspicion (2cases). PPD turned out to be positive in five patients: three that received LTBI treatment and the two patients with clinical TB suspicion, both diagnosed as active TB (after 14 and 36 months of anti-TNF treatment) and properly treated with standard TB treatment. In those RA patients under traditional DMARDs, three cases (1.5%) of active TB were observed. Thus, the frequency of TB in RA patients during five years of observation was similar in patients under biological and traditional DMARDs (1% vs. 1.5%, p=0.68), although higher than the expected for the area (60/100,000/ per year).

**Conclusion:** The present study provided evidence that the recommended screening and treatment protocol for LTBI in patients under anti-TNF treatment was also efficient in endemic areas, with a special attention to contact history in those with negative PPD. Active TB diagnosis during anti-TNF treatment seems not to be related to screening failure, reinforcing the importance of constant clinical surveillance.

_Disclosure:_ I. Laurindo, None; A. C. M. Ribeiro, None; J. C. B. Moraes, None; C. G. S. Saad, Grants; 2; K. R. Bonfiglioli, None; F. H. C. Souza, None; A. L. G. Calich, None; M. G. Waissberg, None; J. K. N. Guedes, None; E. Bonfa, Grants, 2.
infected, and 17/32 (53%) of the HIV-mono-infected patients. The MD-HAQ results in the 178 HCV-infected patients demonstrated a mean pain score of 5.9/10, mean physical function score 2.5/10, mean global assessment of function 4.2/10, and mean RAPIPD12 12.7. No differences were observed between subjects with and without joint pain with regards to age (p=0.62), sex (p=0.53), race (p=0.32), and clinical site (p=0.32). Differences in clinical characteristics among those with and without joint pain among patients with chronic HCV infection are displayed in the table below.

### Analysis of Potential Risk Factors Among Patients with Chronic HCV

<table>
<thead>
<tr>
<th></th>
<th>Current HCV treatment</th>
<th>No HCV (N=178)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIV</td>
<td>89 (48)</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Genotype 1</td>
<td>135 (76)</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Genotype 2</td>
<td>6 (12)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Genotype 3</td>
<td>6 (12)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Smoking</td>
<td>65 (37)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Alcohol</td>
<td>5 (3)</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance</td>
<td>85 (48)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Dry eyes</td>
<td>25 (14)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Dry mouth</td>
<td>55 (31)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Peripheral neuropathy</td>
<td>37 (21)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Myalgia</td>
<td>36 (20)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>70 (39)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td>79 (44)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>AST†, Mean (SD)</td>
<td>63.8 (59.5)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>ALT†, Mean (SD)</td>
<td>59.8 (5.0)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>HCV viral load, Mean</td>
<td>3.1 million (6.8)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Note: NS: p-value H11005, *NS: p-value NS/H1121, †AST= alanine amino transferase and ALT= alanine amino transferase.

**Conclusion:** Joint pain was common (62%) among patients with chronic HCV and was associated with diminished functional status and emotional well-being. HCV/HIV co-infected and HIV mono-infected have significantly lower rates of joint pain compared with HCV mono-infected patients, possibly due to T-cell moderation by HIV resulting in decreased effects of the hepatitis C virus or the intensive outpatient follow-up many HIV patients receive.

**Disclosure:** S. Bhangle, None; V. Lo Re, None; W. G. Pang, None; K. M. Chang, None; V. Amorosa, None; J. Kostman, None; H. R. Schumacher, Takeda, Wyeth, 2, Regeneron, Novartis, Andea, Pfizer, Savient, Metaboles, 5; A. Ogdie, None.

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### The Impact of Hepatitis Screening On Diagnosis and Treatment in Rheumatoid Arthritis

**Background/Purpose:** Hepatitis testing is an important pre-requisite to the diagnosis and treatment of patients with rheumatoid arthritis. Joint symptoms may be a manifestation of acute or chronic hepatitis B or C. Immunosuppressive treatment may increase viral load in patients with undiagnosed viral hepatitis. The prevalence of hepatitis varies amongst populations, but even in areas with low endemic levels, it is imperative to identify those in whom current or past infection may influence clinical outcome. The CDC recommends testing for 4 components: hepatitis B surface antigen, hepatitis B surface antibody, hepatitis B core antibody and hepatitis C antibody. Although ACR recommendations do not specifically recommend hepatitis screening, they do advocate vaccination against hepatitis B in all patients. This study was conducted in order to identify new cases of hepatitis in a cohort of patients with RA attending a large university teaching hospital and to evaluate the extent of the hepatitis screen undertaken.

**Methods:** One hundred consecutive patients, with a diagnosis of RA, were retrospectively assessed for completeness of hepatitis screening by reviewing their hospital records. A dedicated teaching session for all members of the rheumatology team was then conducted, highlighting the results of the survey and explaining the rationale for complete hepatitis screening in all patients with RA. Paper reminders were placed on all desks to alert staff to screen patients at clinic review. A prospective study of hepatitis screening of a separate cohort 100 consecutive out-patients with RA was then performed.

**Results:** In the initial 100 patients, 21% were male, mean age was 65 years. 85% were taking methotrexate and 22% were on biologic treatments (18% anti-TNF agent, 4% Rituximab). Liver profile was abnormal in 20%. A complete hepatitis screen was present in only 8%, while 12% had a hepatitis B core antibody checked and 53% had a test for hepatitis C.

In the 100 patients assessed after staff education, 26% were male, mean age was 63 years. 86% were taking methotrexate and 27% were on biologic treatments (23% anti-TNF agent, 4% Rituximab). Liver profile was abnormal in 30%. A full hepatitis screen was available in 63%, while 65% had a hepatitis B core antibody checked and 81% had a test for hepatitis C.

In the total 200 patients, we identified 3 cases of positive hep B core antibody, 11 cases of positive hep B surface antibody and 1 case of positive hep C antibody. On retrospective analysis, 2 had identifiable risk factors for blood-borne infections (both healthcare workers).

**Conclusion:** Even in populations where hepatitis B or C is not endemic, laboratory screening will reveal new cases of hepatitis that should be identified prior to immunosuppressive treatment. Educational initiatives are helpful in teaching staff working in busy clinical environments to screen patients, but ongoing reminders are likely to be essential.

**Disclosure:** R. Conway, Roche Pharmaceuticals, 2, UCB Pharma, 2, Merck Pharmaceuticals, 7; M. Doran, None; F. D. O’Shea, None; G. Cunnane, None.

### Prevalence and Associations of Hepatitis C Arthritis in Chronic Hepatitis C Virus Infection

**Background:** Chronic infection with hepatitis C virus (HCV) has been reported to cause inflammatory arthritis and/or fibromyalgia. Case series of patients with HCV-associated arthritis have been described, but population-based studies of individuals with chronic HCV including systematic interview and evaluation by a rheumatologist have been limited.

**Methods:** Study participants were recruited from a population-based cohort with chronic HCV. Any individual in the cohort who had not been treated with anti-viral therapy was invited to participate. The study visit included an interview for joint symptoms and fatigue, including the London Point Count; and a blood draw. Sera were tested for the following autoantibodies: cyclic citrullinated peptide (CCP), rheumatoid factor (RF) by nephelometry, RF isotypes (IgG, IgM, and IgA) by ELISA, and ANA by immunofluorescence. After the study visit and medical record review, participants were categorized as follows: 1) HCV-associated arthritis; 2) RA; and 3) no inflammatory arthritis.

**Results:** To date, 71 study participants have been recruited, of whom 6 (8.5%) were classified as HCV-associated arthritis, 4 (5.6%) as RA, and 61 (85.9%) as no inflammatory arthritis. CCP and RF were more common in those with RA, when compared to HCV arthritis and no inflammatory arthritis groups (CCP 67%, 0%, and 2%, respectively; p = 0.006; RF 100%, 20%, and 40%, p = 0.03). Of the RF isotypes, only RF IgG prevalence differed by group (75%, 0%, and 27%, p = 0.04). ANA prevalence did not differ by group (50%, 80%, and 35%, p = 0.09). The mean HAQ-DI was similar across groups (0.41, 0.52, and 0.29, p = 0.29), and the prevalence of fatigue interfering with activities was also similar (50%, 83%, 48%, p = 0.29).

There was a difference between groups in screening positive for fibromyalgia on the questionnaire (26%, 35%, and 15%, p = 0.01), but no difference in mean number of tender points on examination (10.5, 8.2, 4.6, p = 0.06) or in the proportion with 11 or more tender points present (50%, 33%, and 16%, p = 0.09).

**Conclusions:**
Conclusion: In chronic HCV infection, CCP, RF, and RF IgG differ in the groups with HCV arthritis, RA, and no inflammatory arthritis. Positive fibromyalgia screen by questionnaire is more common among those with HCV arthritis, but disability, fatigue, and the number of tender points on exam are similar. Future studies are ongoing with a goal to expand our ability to characterize HCV associated arthritis.

Disclosure: E. D. Ferucci, None; H. S. Ryan, None; T. L. Choromanski, None; L. J. Livingstone, None; E. L. Livingston, None; B. J. McMahon, None; M. H. Wener, BioRad Laboratories, 2, Inova Diagnostics, Inc.,

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Antibodies to Citrullinated Peptides in Tuberculosis. Isabella Lima1, Rodrigo Oliveira2, Ajax Atta1, Samyra Marchi1, Lúcio Barbosa3, Eliana Reis2, Mittermayr G. Reis3 and Mittermayr Santiago1. 1Escola Bahiana de Medicina e Saúde Pública, Salvador, Brazil, 2Universidade Federal da Bahia, Salvador, Brazil, 3Fundação Oswaldo Cruz, Salvador, Brazil

Background/Purpose: Rheumatoid arthritis (RA) is an autoimmune disease characterized by symmetric polyarthritis, rheumatoid factor positivity (RF) in the majority of patients, and bone erosions shown in radiographs. More recently, research has been conducted into anti-citrullinated peptides antibodies (ACPs) to which greater sensitivity and specificity have been attributed than RF for diagnosis of RA. However, these antibodies have also been described in infectious diseases, particularly tuberculosis, placing the high specificity of the test in doubt. The aim of the present research was to study the presence of ACPs in patients with tuberculosis (TB).

Methods: Patients with bacteriologically confirmed pulmonary tuberculosis, RA according to the American College of Rheumatology criteria, in addition to healthy controls (C) were included in the study. ACPs were researched by two methods: anti-CCP (INOVA) and anti-MCV (Orgentec), in addition to RF by ELISA, in accordance with the protocol recommended by the manufacturers.

Results: The study was conducted in 50 patients with TB, 50 with RA and 20 healthy controls. Anti-CCP antibodies were found in 39 (78%) of the patients with RA, median titer: 128 U (interquartile interval: 24 to 233) whereas anti-MCV antibodies were found in (50%) of the patients with RA, median titer of 21U (interquartile interval: 10 – 218). Of the patients with TB two (4%) had positivity for anti-CCP and anti-MCV and no patient in the control group tested positive for these antibodies. Sensitivity of anti-CCCP for diagnosis of RA was 78% (CI: 63 to 88%) and specificity of 97% (CI: 89 to 99%) while the sensitivity of anti-MCV was 50% (CI: 35 – 64%) and specificity of 97% (CI: 89 to 99%). RF was positive in 40 (80%) of the patients with RA, median titer: 128 U (interquartile interval: 24 to 233).

Conclusion: Our findings showed high sensitivity of anti-CCP and high specificity of both anti-CCP and anti-MCV antibodies for diagnosis of RA, even in a population with high incidence of tuberculosis. The higher frequency of positivity of ACPA in TB observed in previous studies may be attributed to methodological factors.

Disclosure: I. Lima, None; R. Oliveira, None; A. Atta, None; S. Marchi, None; L. Barbosa, None; E. Reis, None; M. G. Reis, None; M. Santiago, None.

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Intravenous Immunoglobulin in Parvovirus B19 Mediated Pure Red Cell Aplasia: A Retrospective Study in 10 Patients and a Review of 123 Cases. Yoann Crabol Hôpital Cochin, Assistance Publique-Hôpitaux de Paris (AP-HP), Paris, France

Background/Purpose: The efficacy of intravenous immunoglobulin (IVIg) therapy in patients with pure red cell aplasia (PRCA) related to human parvovirus B19 (HPV-B19) infection is mainly supported by cases reports and few small retrospective studies.

Methods: We conducted a retrospective study and reviewed all cases of HPV-B19 PRCA treated with IVIg in the Assistance Publique-Hôpitaux de Paris hospitals between January 2000 and December 2005. In addition all published HPV-B19 PRCA cases treated with IVIg were reviewed from 1980 to 2012.

Results: Among the 36 cases collected, PRCA was confirmed in 22, and among these 22, only 10 had proven HPV-B19 infection. 9 patients were immunocompromised including 4 who had undergone transplantation. All patients had severe anemia (hemoglobin 5.0±1.9 g/dL (mean±standard deviation (SD)). Three presented severe clinical symptoms related to anemia, and six had symptoms consistent with HPV-B19 infection. HPV-B19 PCR was positive at diagnosis on bone marrow aspiration in 7/7 patients. Patients received 2.7±2.1 IVIg courses at a dose of 1.3±0.54 kg/course. Hemoglobin correction was achieved in 9/10 cases within 80±54 days. The only non responsive patient had underlying myelodysplasia. Negativation of blood HPV-B19 PCR was achieved in 35 to 159 days. Side effects of IVIg were noted in 4 patients: acute reversible renal failure and pulmonary edema, 2 cases each.

Including our series, we reviewed in literature 133 patients with HPV-B19 PRCA treated with IVIg. All except 2 of them were immunocompromised, including 39 HIV infected patients and 63 solid organ transplanted. After first IVIg course, hemoglobin correction was observed in 124 cases but 42 patients relapsed, in a mean time of 4.3 months. Among the 96 patients in whom the 12 months response to IVIg treatment was available, hemoglobin correction was achieved in 45 patients while persistent anemia was noticed in 51. In univariate analysis, HIV infection and absence of anti HPV-B19 IgM at diagnosis were associated with 12 months anemia persistence. Mean first IVIg dose (2.2g/Kg) didn’t differ significantly between responders and non responders. Overall survival was significantly better in responders patients. Side effects were noticed in 18 cases, including 9 cases of acute renal failure.

Conclusion: IVIg therapy is efficient and relatively safe to immunocompromised patients with HPV-B19 PRCA. Deepness of immunosuppression seems to be an important determinant of persistence response to treatment.

Disclosure: Y. Crabol, None;

ACR Poster Session A
Miscellaneous Rheumatic and Inflammatory Diseases: Periodic Fever Syndromes
Sunday, November 11, 2012, 9:00 AM–6:00 PM
Conclusion: Our findings indicate that in some patients, anakinra therapy is superior to etanercept therapy for TRAPS. Of the seven patients, all of them experienced clinically significant decreases in inflammatory markers including CRP and ESR as well as clinical improvement in symptoms related to TRAPS upon the initiation of anakinra.

Disclosure: A. K. Ombrello, None; P. M. Hoffmann, None; A. Jones, None; K. S. Barron, None; D. L. Kastner, None.

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Safety of Canakinumab in a Large Cohort of Patients with Cryopyrin-Associated Periodic Syndrome: Results From the β-Confident Registry. H. Hoffman1, J. B. Kuenemier-Deschner2, P. Hawkins3, T. van der Poll4, Ulrich A. Walker5, B. Rauer6, J. M. Nebesky7 and H. Tilson8, 1University of California at San Diego, San Diego, CA, 2University Hospital Tuebingen, Tuebingen, Germany, 3University College London Medical School, London, United Kingdom, 4Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands, 5Universitäts-Poliklinik, Felix-Platter Spital, Basel, Switzerland, 3Novartis Pharma AG, Basel, Switzerland, 7The University of North Carolina Gillings School of Global Public Health, Chapel Hill, North Carolina

Background/Purpose: Cryopyrin-associated periodic syndrome (CAPS) is an extremely rare autoinflammatory disorder associated with overproduction of interleukin-1β (IL-1β). Canakinumab, a fully human, selective, anti-IL-1β monoclonal antibody, is approved for the treatment of CAPS (including familial cold autoinflammatory syndrome [FCAS] and Muckle-Wells syndrome [MWS]). In order to enhance long term data, the β-Confident Registry, a global, prospective, observational study, is monitoring safety and disease progression in patients treated with canakinumab over a 5-year period.

Methods: CAPS patients receiving canakinumab as part of their routine medical care are included in the registry. Data are collected during routine clinical assessments (no mandatory visits), and the registry is updated every 6 months. Assessments include adverse events (AEs); physician’s global assessment of autoinflammatory disease activity; and C-reactive protein (CRP) and serum amyloid A (SAA) levels. Data reported here are adverse events through 18 months of follow-up (cut-off date, March 2012). Additional safety data will be updated with the presentation, as available.

Results: Since December 2009, 229 patients with CAPS and other autoinflammatory diseases have enrolled. Selected baseline characteristics are shown in the Table. Overall, 59 AEs (25.8%) were reported in 29 patients (12.7%). Infections were the most common AE, with 12 AEs (5.2%) reported in 8 patients (3.5%), and upper respiratory type infections accounted for most. CNS disorders were the second most common AE, with 7 AEs (3.1%) in 8 patients (3.5%), and upper respiratory type infections accounted for most. 11 Serious AEs (4.0%) were reported in 8 patients (3.5%), including 1 malignancy (rectal cancer), 2 infections (pneumonia in a 40 year old female CAPS patient with later hospital discharge; aseptic meningitis in a 25 year old female CINCA patient with recovery). There was only 1 permanent canakinumab discontinuation, due to patient preference.

Table. Baseline characteristics of enrolled patients

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Overall (n=229)</th>
<th>FCAS (n=55)</th>
<th>MWS (n=135)</th>
<th>NOMID (n=10)</th>
<th>Others (n=23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 1 y</td>
<td>159</td>
<td>35</td>
<td>102</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Male</td>
<td>107</td>
<td>28</td>
<td>68</td>
<td>10</td>
<td>15</td>
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<tr>
<td>Female</td>
<td>122</td>
<td>23</td>
<td>67</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>NLRP3 mutation, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>183</td>
<td>35</td>
<td>126</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>No</td>
<td>46</td>
<td>20</td>
<td>31</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Mean disease duration, months</td>
<td>312</td>
<td>403</td>
<td>316</td>
<td>228</td>
<td></td>
</tr>
<tr>
<td>History of rash/arthralgia/headache/conjunctivitis, %</td>
<td>79.81±55.38</td>
<td>100/94/54/43</td>
<td>81.80/90/67</td>
<td>89/94/89/87</td>
<td>76/90/38/28</td>
</tr>
<tr>
<td>Prior canakinumab treatment, %</td>
<td>191</td>
<td>28</td>
<td>117</td>
<td>17</td>
<td>29</td>
</tr>
<tr>
<td>Prior treatment duration, months (ranges, wk)</td>
<td>87.3 (9-139.4)</td>
<td>85.1 (8-126.3)</td>
<td>87.3 (9-139.4)</td>
<td>82.9 (43-122.0)</td>
<td>65.4 (23-139.4)</td>
</tr>
<tr>
<td>Prior number of infections/patches, mean (SD)</td>
<td>6.4±4.4</td>
<td>4.5±2.7</td>
<td>6.8±3.9</td>
<td>8.6±5.2</td>
<td>6.1±1.2</td>
</tr>
</tbody>
</table>

FCAS, familial cold autoinflammatory syndrome; MWS, Muckle-Wells syndrome; NOMID, neonatal-onset multisystem inflammatory disease.

Conclusion: Consistent with the earlier 12-month assessment, the safety of canakinumab treatment at 18 months was maintained and no unexpected safety signals were reported.


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Thiopurine S-Methyltransferase Levels in Patients with Behcet’s Disease. Hakan Emmungül1, Melike Kalfa2, Raika Durusoy4, Figen Yargucu Zilni1, Gokhan Keser3 and Kenan Akso1. 1Dept. of Internal Medicine, Division of Rheumatology, Ege University, Izmir, Turkey, 2Department of Public Health, Ege University, Izmir, Turkey

Background/Purpose: Azathioprine (AZA) is an immunosuppressive agent which is widely used not only for the treatment of Behcet’s disease (BD), but also for the treatment of many systemic inflammatory diseases including systemic lupus erythematosus (SLE) and various systemic vasculitides. Thiopurine S-methyltransferase (TPMT) is a genetically moderated key enzyme involved in the metabolism of AZA. Low TPMT levels may cause a tendency for AZA-related adverse effects. In the present study, TPMT levels in patients with BD were compared with healthy controls, as well as with patients with SLE or with systemic vasculitis, as disease control groups. We investigated the relationship between TPMT levels and AZA-related adverse effects, and also whether TPMT levels were affected by AZA treatment.

Methods: In the present cross-sectional study, 101 patients with BD (M/F: 61/40; mean age 42.15±10.33 years), 74 patients with SLE (M/F: 11/63; mean age: 39.86±11.69 years), 44 patients with systemic vasculitis (M/F: 21/23; mean age 47.09±13.36 years) and 101 healthy controls, age and sex matched with BD were included. Detailed past medical data were available for all patients. The TPMT activity in red blood cells was measured using ELISA. AZA was stopped three days before measurements in patients already receiving this drug. Data were presented as mean ± SD. Mean TPMT levels (mU/ml) were compared with Student’s t, Mann Whitney U and Kruskal Wallis tests, and Receiver Operating Characteristic (ROC) analysis was used to determine whether TPMT could be used to predict toxicity.

Results: Mean TPMT levels in BD (22.80±13.81) were comparable with healthy controls (22.71±13.49), but significantly lower than in patients with SLE (29.37±11.39) (p=0.001). There were 130 patients, 77 with BD, 35 with SLE, and 18 with systemic vasculitis who had used or have been currently using AZA treatment. TPMT levels were not significantly different between patients with and without AZA treatment. AZA-related adverse effects involving gastrointestinal tract, liver and bone marrow were identified in 8 out of 130 patients (5 with BD and 3 with SLE). Although the mean TPMT levels were significantly lower in patients suffering from AZA-related adverse effects (14.08±9.49) than in patients without adverse effects (25.62±12.68) (p=0.013), a cut-off value for predicting AZA-related adverse effects could not be determined with ROC analysis (Area under the curve: 0.249).

Conclusion: This was the first study evaluating TPMT activity in Turkish adult population. Despite more frequent AZA-related adverse effects in the presence of low TPMT levels, absence of a certain cut-off value for TPMT levels implicate that variation in the level of this enzyme may not be the only factor determining AZA-related adverse events. Clinical relevance of TPMT testing should further be determined with larger prospective studies.

Disclosure: A. K. Ombrello, None; P. M. Hoffmann, None; A. Jones, None; K. S. Barron, None; D. L. Kastner, None.

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Comprehensive Analysis of Protein Expression in Peripheral Blood Mononuclear Cells From Patients with Behcet’s Disease. Takuya Yoshikawa1, Manae Kurokawa1, Yukiko Takakura1, Hirotsuya Nakano2, Seido Ooka3, Nobuko Izuka4, Toshiyuki Sato5, Mitsumi Arito6, Kouhei Naga7, Kazuki Okamoto8, Naoya Suzuki4, Noboru Suzuki8, Shoichi Ozaki9 and Tomohiro Kato1. 1St. Marianna Univ School Med, Kawasaki, Japan, 2St. Marianna University School of Medicine, Kawasaki, Japan, 3Kinki Univ., Kinokawa, Japan

Background/Purpose: To elucidate the pathophysiology of Behcet’s disease (BD) and to establish biomarkers for the disease, we comprehensively analyzed protein expression of peripheral blood mononuclear cells (PBMCs).

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Methods: PBMCs were obtained from 16 patients with BD, 16 patients with rheumatoid arthritis (RA), and 16 healthy control (HC) subjects. Proteins, extracted from the PBMCs, were separated by 2-dimensional differential gel electrophoresis. Proteins were identified by mass spectrometry.

Results: As a result, a total of 563 protein spots were detected. Compared to HC, 14 spots showed significantly higher intensity with more than 1.2 folds, and 9 spots showed significantly lower intensity with less than 1/1.2 folds in BD. The spots with higher intensity included proteins involved in T cell activation, metabolism of pre-mRNAs, and protein trafficking. The spots with lower intensity included cytoskeletal proteins. Similarly, compared to RA, 98 spots showed significantly higher intensity with more than 1.2 folds, and 17 spots showed significantly lower intensity with less than 1/1.2 folds in BD. The spots with higher intensity in BD than in RA included proteins associated with bacteriolysis, oxidation/reduction, activation of transcription, regulation of kinases, and modulation of glycosylation. We completely discriminated the BD patients from the HC subjects and from the RA patients by multivariate analyses of 23 and 35 protein spots, respectively. The analyses using only 1–3 protein spots provided areas under the receiver operating characteristic curves of 0.797–0.898 in the discrimination of the BD patients from the HC subjects, from the RA patients, and from the both HC subjects and RA patients.

Conclusion: Taken together, the protein spots which contributed to the discrimination could be biomarker candidates for BD. In addition PBMC-derived proteins, expression of which was significantly altered in BD, may be involved in the pathophysiology of BD.

Disclosure: T. Yoshioka, None; M. Kurokawa, None; Y. Takakawa, None; H. Nakano, None; S. Oka, None; N. Izuka, None; T. Sato, None; M. Arito, None; K. Nagai, None; K. Okamoto, None; N. Suematsu, None; N. Suzuki, None; S. Ozaki, None; T. Kato, None.

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A Strong Association Between HLA-A*26 and Behcet’s Syndrome in Japanese Patients: From Two-Center Cohort Study of Behcet’s Syndrome, Tatsu Kobyashi1, Mitsumasa Kimishimo2, Kazuki Yoshida3, Yuri Ohara4, Hiroto Nakano5, Masahiro Minoda6, Hideto Oshikawa6 and Kazuo Matsui6. 1Kameda Medical Center, Kamogawa City, Chiba, Japan, 2St. Ohara2, Hiroto Nakano1, Masahiro Minoda1, Hideto Oshikawa1 and Kazuo Matsui1. 1Kameda Medical Center, Kamogawa City, Chiba, Japan, 2St. Luke’s International Hospital, Chuo-ku, Tokyo, Japan

Background/Purpose: An association between Behcet’s Syndrome (BS) and HLA-B*51 is widely reported among many different ethnic groups. Recently, a few reports from Taiwan, Greece and Japan were published that indicated HLA-A*26 is also associated with BS independently from HLA-B*51, but these studies may have some limitations. These limitations include small numbers, which were not written in English, only analyzed BS with ocular lesions, or were mainly led by ophthalmologists. Therefore, the association between HLA-A*26 and BS still remains unclear. For this report we studied phenotype frequencies (PF) of HLA-A and HLA-B in Japanese BS patients seen by not only ophthalmologists but also experts in different specialties, mainly rheumatologists.

Methods: All BS patients seen at tertiary care centers of Kameda Medical Center and St. Luke’s International Hospital in Japan between 2003–2012 were included in the analysis. Patients were mainly seen by rheumatologists, followed by neurologists, dermatologists, ophthalmologists, and gastroenterologists. The diagnosis of BS was made on clinical manifestation and expert opinions. Charts were reviewed for DNA typing of HLA alleles and disease manifestations. To compare PF, we adopted data from the central bone marrow data center registry of Japanese Red Cross Society (n=263016) as a control for the general population in Japan. The significance of the distribution of phenotypes was analyzed by one-sample proportions test and the primary P-values were corrected by using the Bonferroni correction (Pc). We analyzed manifestations by Fisher’s exact probability test or t-test.

Results: As for HLA-A and HLA-B, 80 and 81 patients were tested respectively (88 patients were eligible for HLA-B*51 analysis) and 6 HLA-A and 19 HLA-B alleles were detected. Of all, PF of HLA-A*26 was significantly higher than the general Japanese population (42.5% vs. 22.6%, Pc=8.0 × 10⁻⁴). The same is true for HLA-B*51 (44.3% vs. 17.1%, Pc=7.1×10⁻⁴). No significant differences were seen in other HLA alleles. Secondly, we analyzed the difference in manifestations of BS patients stratified by HLA-A*26 or HLA-B*51. No significant difference was seen except for the age of onset, which was younger in patients with HLA-A*26 than without it (mean±SD (years): 34.1±13.6 vs. 41.3±17.9, P=0.041). There is also a tendency that gastrointestinal (GI) lesions are less likely for patients with HLA-B*51 (28.2% vs. 46.9%, P=0.082). We detected no significant difference of manifestations between HLA-A*26 positive patients and negative patients.

<table>
<thead>
<tr>
<th></th>
<th>PF of BS patients (%)</th>
<th>PF of the general Japanese (%)</th>
<th>P-value</th>
<th>Pc-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLA-A*02</td>
<td>46.3</td>
<td>42.9</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>-A*24</td>
<td>58.8</td>
<td>60.1</td>
<td>0.83</td>
<td></td>
</tr>
<tr>
<td>-A*26</td>
<td>42.5</td>
<td>22.6</td>
<td>3.6×10⁻⁵</td>
<td></td>
</tr>
<tr>
<td>-A*33</td>
<td>58.8</td>
<td>60.1</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>HLA-B*51</td>
<td>44.3</td>
<td>17.1</td>
<td>3.2×10⁻¹⁰</td>
<td></td>
</tr>
<tr>
<td>-B*52</td>
<td>16.1</td>
<td>21.0</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>-B*54</td>
<td>16.1</td>
<td>14.6</td>
<td>0.83</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: HLA-A*26 is found to be allelic for BS susceptibility among BS patients not only with ocular lesions but also various manifestations in Japan. Moreover, our study also showed that patients with HLA-B*51 have younger onset and a lower tendency of GI lesions.

Disclosure: T. Kobyashi, None; M. Kimishimo, None; K. Yoshida, None; Y. Ohara, None; H. Nakano, None; M. Minoda, None; H. Oshikawa, None; K. Matsui, None.

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The Retrospective Review of 39 Intestinal Behcet’s Disease Focusing On The Requirement for the Immunosuppressive Drugs Other Than Corticosteroid. Yoshitaka Kimura1, Kurumi Asako1, Hirotoshi Kikuchi2, Akiteru Takeuchi3 and Hajime Kono4. 1Department of Internal Medicine, Teikyo University school of medecine, Tokyo, Japan, 2Teikyo University, Tokyo, Japan, 36-7-8 Arakawa, Tokyo, Japan, 4Teikyo University School of Medicine, Tokyo, Japan

Background/Purpose: To examine the demography, clinical characteristics, features of intestinal lesions, treatment, and prognosis in patients with the intestinal Behcet’s disease currently followed at a university hospital in Tokyo especially focusing on the factors that correlated with additional immunosuppressive therapies to corticosteroid.

Methods: The records of 39 patients with intestinal Behcet’s disease were retrospectively reviewed who were treated at the Teikyo University Hospital between August 1st, 2011 and March 31th, 2012. We compared the well-controlled patients treated only with steroid or 5-ASA/SASP, with the poorly-controlled patients who required additional immunosuppressive drugs or anti-TNFa antibodies.

Results: The patients were consisted of 26 male and 13 female with the average age of 56.8 ± 13.1 years old. The mean age at onset of Behcet’s disease was 35.5 ± 11.2 years. They developed the intestinal lesions at mean age 41.3 ± 13.0 years. HLA-B51 or HLA-A26 were positive in 35.4% or 32.3%, respectively. Seventeen cases were complete Behcet’s and 22 were incomplete type. Almost all patients had oral ulcerations and skin lesions. Twenty five cases had arthritis, 7 had epididymitis. Vascular and central nervous system involvements were seen in 8 and 2 patients, respectively. The most frequent initial symptom for intestinal Behcet’s was abdominal pain (22 cases). Other initial symptoms were melena/bloody stool (16 cases), dysphagia (2 cases). The intestinal lesions existed in various lesions of the gastrointestinal tract including esophagus (3 cases) and small intestine (4 cases), ileo-cecal area (31 cases), ascending colon (7 cases), transverse colon (3 cases), descending colon (3 cases), sigmoid colon (2 cases), rectum (5 cases). They (28 cases) were treated with predonisolone of the average 32.5mg daily as the initial dosage. Thirty two patients were treated 5-ASA or SASP. Fourteen cases were added with methotrexate, and 3 cases with cyclosporine. Infliximab was administrated in 6 cases. In the patients who needed immunosuppressive drugs or anti-TNFa antibodies other than steroids, we found the significantly higher HLA-B51 positivity (42%) and higher CRP at the beginning of treatment (10.5±8.5 mg/DL). In addition, the poorly responded patients with corticosteroid and sulfasalazopyridine showed more frequent atypical intestinal lesions.

Conclusion: The retrospective review revealed that the requirement for the additional immunosuppressive therapies could have a linkage to the HLA-B51 in patients with intestinal Behcet’s disease.

Disclosure: Y. Kimura, None; K. Asako, None; H. Kikuchi, None; A. Takeuchi, None; H. Kono, None.
Long-Term Efficacy and Safety of Tumour Necrosis Factor Antagonists for Patients with Behçet’s Disease with Uveitis As Main Involvement. M. Victoria Hernández, Marina Mesquida, Gerard Espanola, Victor Llorens, Laura Pelegrín, Juan D. Cañete, Ricardo Cervera, Alfredo M. Adan and Raimon Sammarti. Hospital Clinic of Barcelona, Barcelona, Spain

Background/Purpose: To assess the long-term efficacy and safety of tumour necrosis factor (TNF) antagonists (infliximab [IFX], adalimumab [ADA] and golimumab) for the treatment of patients with Behçet’s disease (BD) with uveitis who failed to respond or did not tolerate conventional treatment.

Methods: Retrospective study of patients with BD and uveitis treated with anti-TNF therapy in a tertiary reference hospital. Data analyzed were: demographic characteristics; disease duration and type of uveitis; visual acuity; previous treatments; dosage, type and duration of biological agent used; outcome (remission, loss of efficacy, adverse events). The characteristics of uveitis, including the degree of inflammation and disease course, were analyzed according to the definitions of the Standardization of Uveitis Nomenclature (SUN) criteria.

Results: We included 15 patients (8 male, mean age 36.9 ± 8.3 years) with BD and severe intraocular inflammation. Mean disease duration was 9.6 ± 5.7 years; 66.6% had panuveitis and 26.6% posterior uveitis. All patients had previously received oral glucocorticoids (GC) and 60% had received > 2 immunosuppressive (IMS) drugs. Thirteen patients were treated with ADA and 2 with IFX as initial anti-TNF therapy. Six of 13 patients treated with IFX were switched to another anti-TNF agent due to adverse events or loss of efficacy: 5/13 were switched to ADA and 1/13 was switched to golimumab. Globally, 7/15 patients were treated with ADA. IFX was infused at a dose of 5 mg/kg for a mean of 10.4 months (range: 2-24). ADA 40 mg was administered subcutaneously every 2 weeks for a mean of 29 months (range: 9-44). The mean follow-up was 37 months (range: 10-72). Twelve (80%) patients achieved remission. Three patients were able to discontinue all systemic IMS and GC drugs. Best corrected visual acuity remained stable or improved in 27/29 eyes. Three serious adverse events requiring IFX withdrawal were reported: 1 severe infusion reaction, 1 disseminated tuberculosis, and 1 prostatitis.

Conclusion: In the treatment of BD, IFX therapy was not associated with an increased risk of hospitalizations for serious infections. In addition, 2-year continuation rate of IFX was considerably higher than that previously reported in RA patients.

Disclosure: S. Ueda, None; H. Tsukamoto, None; Y. Inoue, None; M. Ayano, None; H. Ueda, None; N. Ueki, None; A. Tanaka, None; S. I. Ohta, None; Y. Arinobu, None; H. Niiro, None; T. Horiuchi, None; K. Akashi, None.

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Effect of Colchicine On Cholesterol Levels in Patients with Familial Mediterranean Fever and Behçet’s Syndrome. Serda L Ugurlu1, Emire Seyahi2, Idil Hanci2, Huri Ozdogan1, Seval Masatlou-Pehliwan1 and Hasan Yazici1. 1MD, Istanbul, Turkey, 2Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey, 3MD, Division of Rheumatology, Department of Medicine, Cerrahpasa Medical Faculty, University of Istanbul, Istanbul, Turkey, 4MD, Rheumatology, Istanbul University, Turkey, 5Istanbul University, Cerrahpasa Medical School, Rheumatology, Istanbul, Turkey.

Background/Purpose: We and others have previously shown that patients with Familial Mediterranean Fever (FMF) had low cholesterol levels when compared to healthy controls (1–2). The causes of this abnormality are not understood. It could be due to an inherent effect of FMF or due to a lipid lowering effect of colchicine. We conducted a 12 week study to determine whether colchicine would decrease serum lipid levels in patients with FMF and Behçet syndrome (BS).

Methods: Blood cholesterol and triglycerides levels were measured in 24 patients with FMF (11 M, 13 F) and 16 (8 M, 8 F) patients with BS who were registered at the outpatient clinic of Cerrahpasa Medical Faculty. All patients were naïve to colchicine or immunosuppressive treatment or any other lipid lowering drugs at study entry. Blood cholesterol and triglycerides levels were measured again after 12 weeks of colchicine 1.5 mg daily.

Results: There were 19 (8 M, 11 F) patients with FMF and 15 (7 M, 8 F) patients with BS who completed 12 weeks period. Patients with FMF were (mean age: 33.8 ± 14.1 years) significantly younger than BS patients (mean age: 36.5 ± 9.5) (P = 0.001). Colchicine did not change significantly cholesterol and triglycerides levels in patients with FMF (Table). This was also true for patients with BS (Table). Mild diarrhea was observed in 2 patients with FMF and in 1 with BS.

Table. Lipid levels before and after colchicine treatment

<table>
<thead>
<tr>
<th>Lipid Level</th>
<th>Before colchicine (n = 19)</th>
<th>After colchicine (n = 19)</th>
<th>P</th>
<th>Before colchicine (n = 15)</th>
<th>After colchicine (n = 15)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. cholesterol</td>
<td>168.95 ± 77.1</td>
<td>181.26 ± 48.3</td>
<td>0.58</td>
<td>181.43 ± 50.9</td>
<td>172.3 ± 44.4</td>
<td>0.53</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>122.2 ± 82.6</td>
<td>128.21 ± 69.5</td>
<td>0.75</td>
<td>111.7 ± 62.9</td>
<td>106.5 ± 52.1</td>
<td>0.18</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>120.37 ± 44.3</td>
<td>112.16 ± 39.9</td>
<td>0.35</td>
<td>115.14 ± 38.43</td>
<td>106.1 ± 39.7</td>
<td>0.85</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>42.11 ± 13.4</td>
<td>47.11 ± 10.9</td>
<td>0.61</td>
<td>47.93 ± 9.205</td>
<td>48.3 ± 9.9</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Conclusion: This study provided no evidence that colchicine changes lipid levels in patients with FMF and BS.

References
2) Akdogan A, et al. Are familial Mediterranean fever (FMF) patients at increased risk for atherosclerosis? Impaired endothelial function and increased intima media thickness are found in FMF. J Am Coll Cardiol. 2006 Dec 5;48(11):2351-3.

Disclosure: S. Ugruš, None; E. Seyahi, None; I. Hanci, None; H. Ozdogan, None; S. Masatlıoğlu-Pehlivan, None; H. Yazıcı, None.

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Etiology of Uveitis: A Hospital-Based Study in a Referral Centre. Claudia Ferrari1, Rosaria Talarico1, Michele Figus2, Chiara Stagnaro1, Anna d’Ascanio1 and Stefano Bombardieri1, 1Rheumatology Unit, University of Pisa, Pisa, Italy, 2Ophthalmology Unit, University of Pisa, Pisa, Italy

Background/Purpose: Defined as an intraocular inflammation, uveitis may be associated to a systemic disease or represent an isolated entity. It affects people from all parts of the world, and it is a significant cause of severe visual impairment, accounting for 10% of blindness in the Western world. Screening for associated extra-ocular manifestations is mandatory in uveitis patients. The aim of the study was to analyse the etiology and the pattern of uveitis in a cohort of patients followed in the context of a uveitis clinic of a rheumatologic referral centre.

Methods: The study included 120 patients (M/F: 86/34; mean age at disease onset 35 years) with uveitis examined from January 2009 to May 2012. All patients had a comprehensive rheumatologic and ophtalmological evaluation, including: clinical history, Snellen visual acuity, slit-lamp examination, applanation tonometry, dilated fundus examination and/or visual field evaluation, including: clinical history, Snellen visual acuity, slit-lamp examination, dilated fundus examination and/or visual field evaluation. Moreover, all patients underwent the standard protocol of serological examinations for uveitis, including routine examination, acute phase reactants, HLA typing, serum fluorescent treponemal antibody absorption detection, mnn viral and bacterial screening, serum angiotensin-converting enzyme, serum lysozyme, tuberculin reaction tests, non-organ specific auto antibodies profile and, when required, chest X-Ray.

Results: Seventy percent of patients referred by ophthalmologists, 27% patients directly attending our department and 3% referred by general practitioners. Posterior uveitis was the most common feature (46%), followed by anterior uveitis (28%), panuveitis (16%), and intermediate uveitis (10%). For 57 of 120 (47%) patients with uveitis, a specific aetiological diagnosis was established, while 53% of patients were found to have idiopathic uveitis. In the posterior uveitis group (n=55), a specific diagnosis was made for 21 patients (38%); the most frequent forms were represented by toxoplasmosis (48%) and Behçet’s disease (25%). In the anterior uveitis group (n=34), a specific diagnosis was made in 19 patients (56%). The most common diagnoses included herpetic infection (53%), Fuchs’ heterochromic iridocyclitis (22%), HLA-B27-positive anterior uveitis ± associated to a spondylarthropathy (15%). Among patients with panuveitis (n=19), 15 (79%) had a specific aetiological diagnosis, in the majority of cases linked to Behçet’s disease (88%). In the intermediate uveitis group (n=12) only two etiologies were identified: sarcoidosis and multiple sclerosis.

Conclusion: In this hospital-based study, the most common cause of uveitis is idiopathic. However, a multi-disciplinary approach may surely improve the diagnosis of uveitis secondary to autoimmune diseases.

Disclosure: C. Ferrari, None; R. Talarico, None; M. Figus, None; C. Stagnaro, None; A. d’Ascanio, None; S. Bombardieri, None.

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Pedal Swelling As a Characteristic Phenotype of the New Category of Autoinflammatory Disease Associated with NOD2 Gene Mutations. Qingping Yao. Cleveland Clinic, Cleveland, OH

Background/Purpose: Autoinflammatory diseases are characterized by seemingly unprovoked episodes of inflammation, without high titer autoantibodies or antigen specific T cells, and derive from genetic variants of the innate immune system. We previously reported a case series of a new autoinflammatory disease associated with nucleotide oligomerization domain (NOD2) gene mutations. Herein, I report a characteristic phenotype as an addition to further define this disease entity.

Methods: Six patients with pedal swelling and other autoinflammatory phenotypes were enrolled between January 2009 and April 2012. These patients were tested for NOD2 gene mutations.

Results: All 6 patients were non-Jewish Caucasians, with 5 female, 1 male. The mean age at disease diagnosis was 49 years (range 29–63) and disease duration was 3.9 years (range 0.4–10) (Table 1). These patients usually presented with weight loss, self limiting fever, dermatitis, and inflammatory polyarthritis/polyarthralgia. Apart from previously reported characteristic spongiotic dermatitis, all patients presented clinical feature: ankle/foot swelling/pain (Figure 1) which was primarily unilateral. There was no convincing evidence of inflammatory bowel disease, sarcoidosis, or Blau’s syndrome. All patients carried the NOD2 gene mutations, with R702W/IVS8+3T in 4 and 2 having rare variants R703C and T189w/wild type.

Conclusion: The current cohort has affirmed and extended that dermatitis, pedal swelling and positive NOD2 mutations may characterize this entity.

Disclosure: Q. Yao, None.
Analysis of Genes Involved in Autoinflammatory Diseases in Adult Onset Still’s Disease. Emma García-Melchor1, Dolores Grados1, Eva Gonzalez-Roca2, Elena Riera3, Manel Juan4, Jordi Yagüe4, Juan Ignacio Aróstegui4, Javier Narváez3 and Alejandro Olivé5. Hospital Clinic Barcelona, Hospital Universitari Germans Trias i Pujol, Badalona, Spain, 2Hospital Mutua de Terrassa, Terrassa, Spain, 3Hospital Universitari de Bellvitge, L’Hospitalet de Llobregat, Spain

Background/Purpose: Adult Onset Still’s Disease (AOSD) is a systemic inflammatory disease characterized by fever, skin rash, articular involvement, lymphadenopathy, hepatosplenomegaly and serositis. Due to the absence of autoantibodies and autoantigen-specific T cells and the efficacy of treatment with IL-1β blocking agents, AOSD has been considered an autoinflammatory disease. Some entities of this group are inherited diseases caused by mutations in genes related to the processing of IL-1β. The cryopyrinopathies are caused by heterozygous gain-of-function mutations in NLRP3 gene (Nucleotide-binding domain Leucine Rich repeat family Pyrin domain containing 3) and share some clinical features with AOSD like fever, cutaneous and musculoskeletal involvement and serositis. Heterozygous gain-of-function NOD2 (Nucleotide Oligomerization Domain 2) mutations are associated with Blau syndrome, which is characterized by uveitis and, like AOSD, fever and chronic arthritis. The aim of this study is to analyze the potential involvement of mutations in the NALP3 and NOD2 genes in AOSD patients.

Methods: Eighteen patients with AOSD from two hospitals in Spain were enrolled. All the patients fulfilled the Yamaguchi criteria and informed consent was obtained from each participant. The study protocol was approved by the ethics committee from the Hospital Universitari Germans Trias i Pujol. Genomic DNA was extracted from whole blood using the Roche MagNApure Compact (Roche Diagnostics, Indianapolis, IN). Exon 4 of NOD2 gene (GeneBank NM 022162.1) and exon 3 of NLRP3 gene (GeneBank NM 00124313.1) were amplified by polymerase chain reaction. Bidirectional fluorescence sequencing was performed using an ABI BigDye Terminator version 3.1 Cycle Sequencing kit and run on a 3730XL DNA Analyzer. As control population, the European Germans Trias i Pujol. Genomic DNA was extracted from whole blood informed consent was obtained from each participant. The study protocol were enrolled. All the patients fulfilled the Yamaguchi criteria and controls were examined using the Chi-squared method, Fisher’s exact test and logistic regression with Statistical Analysis Software (SAS).

Results: Most AOSD patients showed no pathogenic variants in NALP3 or NOD2 gene. Of interest, two patients were carriers of a NOD2 polymorphism associated with Crohn disease (p.R702W, rs206684) without having any symptom suggestive of inflammatory bowel disease, and another one was carrier of a rare NOD2 variant of uncertain significance that was previously reported in a patient with spondyloarthritis (p.R791Q, rs104895464). In the NALP3 analysis, one patient was carrier of the variant of uncertain significance p.V198M (rs121908147).

Conclusion: AOSD has some similarities with inherited autoinflammatory syndromes like the clinical presentation and the efficacy of treatment with IL-1β blocking agents. Although in our series none of the AOSD patients carried a true disease-associated mutation, the possibility of an inherited autoinflammatory disease should be considered in the differential diagnosis and ruled out by means of genetic analysis.

Disclosure: E. García-Melchor, None; D. Grados, None; E. Gonzalez-Roca, None; E. Riera, None; M. Juan, None; J. Yagüe, None; J. I. Aróstegui, None; J. Narváez, None; A. Olivé, None.

Clinical and Laboratory Findings in A Cohort of Italian Patients with Adult Onset Still’s Disease: The Role of IL-18 As A Disease Biomarker. Roberta Priori1, Serena Colafrancesco1, Carlo Perricone1, Antonina Minniti1, Cristiano Alessandrì2, Giancarlo Iaiani and Guido Valesini. Rheumatology Unit, Sapienza University of Rome, Rome, Italy, 2Department of Infectious Diseases and Tropical Medicine, Sapienza University of Rome, Rome, Italy

Background/Purpose: Adult Onset Still’s Disease (AOSD) is a systemic inflammatory syndrome driven by interleukin (IL)-18. Since differential diagnosis between AOSD, sepsis and other inflammatory conditions can be difficult, we aimed to investigate IL-18 serum levels in AOSD and to assess whether this cytokine could be used as disease biomarker.

Methods: Patients with AOSD (Yamaguchi criteria) were evaluated. Disease activity was assessed with Pouchot’s and Rau’s criteria and patients were defined active if they had ≥4 criteria. Serum IL-18 levels were detected by ELISA (Immmuno-Pharmacology Research, Italy) in patients with AOSD and sepsis (according to ACCP/SCCM Consensus Conference). Furthermore, patients with Rheumatoid Arthritis (RA), Sjögren Syndrome (SS), Systemic Lupus Erythematosus (SLE) and healthy subjects (NHS) served as controls. Area under the receiver operating curve (ROC-AUC) analysis was used to evaluate the diagnostic utility of the IL-18.

Results: Clinical and laboratory features of 50 AOSD patients are described in table.

Two patients experienced DIC, one with fatal outcome. Considering Pouchot’s and Rau’s criteria, active patients were 18/50 (36%) and 21/50 (42%), respectively. Mean ferritin was higher in active than non active patients (p = 0.0127). Mean IL-18 was significantly higher in AOSD than in sepsis [1298.7 pg/ml (range 0–6015) vs 113.5 pg/ml (range 52–328), p = 0.008]. The ROC-AUC analysis for IL-18 serum levels between AOSD patients and sepsis was 0.712 (cut-off 179 pg/ml, specificity (sp)=87.5%, sensitivity (se)=87.5%, likelihood (LR)=2.89). IL-18 serum levels were significantly higher in active than non active patients and sepsis (p = 0.0039 and p = 0.007, respectively). The ROC-AUC analysis for IL-18 between active AOSD and sepsis was 0.845 (cut-off=223 pg/ml, sp=87.5%, se=80.9%, LR=6.48). The ROC-AUC analyses for IL-18 between AOSD patients and other groups (NHS, RA, SS, SLE) were respectively 0.853 / 0.720 / 0.750 / 0.791 (NHS: cut-off=293.7 pg/ml, sp=85.19%, se=85.71%, LR=5.79; RA: cut-off=335.5 pg/ml, sp=81.48%, se=52.38%, LR=2.83; SS: cut-off=424.3 pg/ml, sp=74.07%, se=66.67%, LR=2.57; SLE: cut-off =268.2 pg/ml, sp=85.19%, se=60%, LR=4.05).

Conclusion: The clinical and laboratory findings of our cohort overlap with the literature. Ferritin parallels disease activity, suggesting that the Rau’s criteria could be more accurate. AOSD prognosis is usually favourable but severe complications may occur. Finally, a significant difference in IL-18 serum levels between patients with AOSD and sepsis was observed, and IL-18 can represent a useful biomarker in the differential diagnosis between AOSD and other inflammatory conditions. Moreover, IL-18 serum levels reflects disease activity.

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Tocilizumab in Adult Still’s Disease: The Israeli Experience. Ori Elkayam1, Nizar Jeries2, Zvi Dranitzki2, Shaye Kivity3, Merav Lidar4, Ofer Levy5, Mahmoud Abu-Shakra6, Hagit Sarvagil-Maman7, Hagit Padova7, Dan Caspi8 and Izhak Rosner9. 1Tel Aviv Sourasky Medical Center and the Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel, 2Bnai Zion Medical Center, Israel, 3Hadassah hebrew university, Jerusalem, Israel, 4Center for Autoimmune Diseases, Sheba Medical Center, Tel-hashomer, Israel, Tel-Hemashomer, Israel, 4Sheba Medical Center, Ramat Gan, Israel, 5Asaf Harofe Medical Center, 6Soroka Medical Centre and Ben Gurion University, Beer-Sheva, Israel, 7Tel Aviv, Israel, 8Bnai Zion Medical Center, Technion Faculty of Medicine, Haifa, Israel

Background/Purpose: The objective of this study was to review the clinical and laboratory characteristics of patients with adult’s Still’s disease treated with tocilizumab (TCZ) in Israel.

Methods: Israeli rheumatologists who have ever treated a patient suffering from adult Still’s disease with TCZ were asked to review their files with special emphasis on the symptoms of the disease (arthralgias/arthritis, fever, sore throat, pleura-pericarditis, hepatitis), number of tender and swollen joints, ESR, CRP and dosage of prednisone at the initiation of TCZ, after 6 months and at the end of follow-up.

Results:: 11 cases were ascertainment. All the patients fulfilled the Yamagushi classification criteria for adult Still’s disease: 7 men, aged 33±12, mean duration of disease of 7 years (range 1–25 years). Until treatment with TCZ, the mean number of disease modifying drugs, including TNFα blockers was 1.1. Ten patients reported joint pain; the mean tender and swollen joints count was 12 and 8, respectively. After the initiation of TCZ, the mean ESR and CRP were 65 and 13, respectively. After 6 months of treatment and at the end of follow-up, the number of swollen and tender joints, the ESR and CRP and the dosage of prednisone decreased significantly (Table 1). At the end of follow-up, only 2 patients still complained of mild arthralgias and none reported systemic symptoms.

Start of TCZ After 6 months End of follow-up

| Swollen joints count | 8 ± 6 | 1.25 ± 1.7* | 0.7 ± 1.2* |
| Tendon joints count | 11.9 ± 7.7 | 2.25 ± 2* | 1.2 ± 0.7* |
| ESR | 65 ± 32 | 3.4 ± 1.5* | 4.3 ± 2.26* |
| CRP (mg/dl) | 13 ± 17 | 0.47 ± 0.17* | 0.46 ± 0.6* |
| Prednisone dosage (mg/d) | 31 ± 28 | 4.8 ± 3.5* | 3.5 ± 5* |

* Mean ± SD; p<0.05
Mean: SD

Conclusion: TCZ is extremely efficacious in adult Still’s disease. Although randomized controlled studies are needed to confirm this observation, TCZ should be strongly considered in the treatment of patient with adult Still’s disease.

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Long-term Efficacy of Tocilizumab in A Patient with Amyloidosis and Interstitial Pneumonia Secondary to Multicentric Castleman’s Disease (MCD). Michihito Katayama1, Soichiro Tsuji1, Satoshi Teshigawara2, Eriko Kudo-Tanaka3, Maiko Yoshishima1, Akane Watanabe1, Akiko Yura1, Yoshinori Harada4, Yoshinori Katada4, Jun Hashimoto4, Masato Matsuhashi4, Yukihiko Saeji4 and Shiro Ohshima1. 1Osaka-Minami Medical Center, Kawachinagano City, Japan, 2Kawachinagano City, Japan, 3Osaka Minami Medical Center, Osaka, Japan

Background/Purpose: Castleman’s disease is a benign lymphoproliferative disorder characterized histologically by follicular hyperplasia and capillary proliferation with endothelial hyperplasia. In addition, overproduction of interleukin-6 (IL-6) was shown in the germinal centers of hyperplastic lymph nodes. IL-6 is also identified in patients with multicentric Castleman’s disease (MCD). We evaluated long-term efficacy of IL-6 blockade therapy in a patient with both amyloidosis and interstitial pneumonia secondary to MCD.

Methods: A 61-year-old male had abnormal shadows on his chest radiography pointed out by medical checkup in June 1999. Based on the results of a lymph node biopsy in April 2004, he was diagnosed with plasma cell-type MCD. Abnormal shadow on chest radiography indicating interstitial pneumonia, marked anemia, hypoalbuminemia, hypergammaglobulinemia and proteinuria were observed, and got worse gradually. In November 2007, the patient was admitted to our hospital. He showed marked lymphadenopathy at multiple sites, general malaise, low grade fever, loose stool, edema, coughing and dispnea on exercise were observed. The administration of Tocilizumab (TCZ) (8 mg/kg, every 2 weeks) was initiated in December 2007. As his disease activity was extremely high, it is necessary to use concomitant administration of low dose prednisolone to maintain the inflammation low. We monitored clinical findings, laboratory findings, functional test, imaging, and quality of life (QOL) evaluated by SF36 in the patient for four years after initiation of the IL-6 blockade therapy. Moreover, we examined the efficacy of TCZ for the treatment of amyloidosis by intestinal biopsies both at the baseline and one year after first administration of TCZ.

Results:: At the baseline, abnormal laboratory findings were as follows; severe anemia, hypoalbuminemia, hypergammaglobulinemia, an elevated CRP level, an elevated serum amyloid A protein (SAA) level, an elevated IL-6 level and proteinuria (2.39 g/day). The results of the respiratory function test indicated obstructive dysfunction of the lung, and blood gases on room air showed hypoxia. Chest CT scan revealed interstitial pneumonia with multiple cysts distributed throughout the lung fields and generalized lymph node enlargement. Endoscopic biopsy of the stomach and duodenum revealed heavy deposition of AA amyloid at the baseline indicating amyloidosis secondary to MCD. TCZ reduced the levels of both CRP and SAA, and improved anemia and hypoalbuminemia. Disappearance of urinary protein was achieved within a year. Lymph nodes throughout the body decreased in size. The results of the images and functional test demonstrated improvement in the patient’s interstitial pneumonia. One year after initiation of treatment with TCZ, endoscopic biopsy of former sampling site of the stomach and duodenum revealed disappearance of AA amyloid. The result of SF36 indicated the improvement both in physical and mental QOL. No severe side effect were observed during the treatment period.

Conclusion: This case report indicates the long-term efficacy of TCZ for the treatment of MCD. Moreover, TCZ is effective for the treatment of amyloidosis, interstitial pneumonia secondary to MCD.

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Inflammatory Arthritis in Patients with Myelodysplastic Syndrome: French Multicenter Retrospective Study. Arsene Mekinian1, Olivier Decaux2, Geraldine Falgarone3, Thorsten Braun Sr.4, Eric Toussirot5, Loic Raffay6, Bruno Gombert7, Bruno de Wazieres8, Anne Laure Buchdaul9, H. Saeki10, Pierre Fenaux11 and Olivier Fain11. 1Jean Verdier Hospital, Bondy, France, 2Hôpital Sud, Rennes, France, 3Hôpital avicenne, Paris, France, 4Avicenne hospital, Bobigny, France, 5CIC Biotherapy 506 and Rheumatology and EA SFMNI, 6The CRI (Club Rhumatismes Inflammation) and Groupe Francais d’étude des syndromes myelodysplasiques.

Background/Purpose: To describe the characteristics and the outcome of inflammatory arthritis in patients with myelodysplastic syndrome (MDS).

Methods: French multicenter retrospective study which included patients with MDS and inflammatory arthritis. Patient’s clinical, biological and radiological data at the diagnosis, during the follow-up were recorded, as well as treatment regimen. Patients with isolated arthritis were compared to MDS-associated vasculitis (n=22).

Results:: Twenty-two patients with myelodysplastic syndrome (77.5 years [69–81]: 10 women) were included. IPSS score of the myelodysplastic syndrome (MDS) patients was achieved within a year. Lymph nodes throughout the body decreased in size. The results of the images and functional test demonstrated improvement in the patient’s interstitial pneumonia. One year after initiation of treatment with TCZ, endoscopic biopsy of former sampling site of the stomach and duodenum revealed disappearance of AA amyloid. The result of SF36 indicated the improvement both in physical and mental QOL. No severe side effect were observed during the treatment period.

Conclusion: This case report indicates the long-term efficacy of TCZ for the treatment of MCD. Moreover, TCZ is effective for the treatment of amyloidosis, interstitial pneumonia secondary to MCD.

Disclosure: M. Katayama, None; S. Tsuji, None; S. Teshigawara, None; E. Kudo-Tanaka, None; M. Yoshishima, None; A. Watanabe, None; A. Yura, None; Y. Harada, None; Y. Katada, None; J. Hashimoto, None; M. Matsuhashi, None; Y. Saeji, None; S. Ohshima, None.
At the diagnosis of the arthritis, median DAS28-CRP was 4.5 [2–6.5], with the presence of anti-CCP antibodies in 2 cases (9%) and radiological erosions in 1 case. The median time between the diagnosis arthritis and MDS was of 9 [2–30] months, with median arthritic symptoms duration of 3 months [2–8]. The appearance of these 2 diseases was concomitant in 6 (27%) cases; arthritis preceded MDS in 12 (55%) and occurred after MDS in 4 (18%) cases. Characteristics of arthritis and of MDS, as well as treatments at the different points in time are shown in Table 1. Whereas the number of swollen and tender joints significantly diminished during follow-up, as was the median DAS28-CRP from 4.3 [3.8–4.6] at baseline to 2.9 [1.7–3.3]; p<0.005, C-reactive protein remained elevated (CRP>20 mg/l) in 14 (64%) at baseline versus 8 (42%). Nevertheless, no patients show any radiographic progression and new anti-CCP positivity during the follow-up of 29 [9–76] months. No correlation was found in concern the evolution of DAS and inflammatory arthritis. In concern the treatments, whereas almost all patients have corticosteroids, the associated treatment was present in only 4 cases (hydroxychloroquine in 2 cases, salazopyrine and etanercept, n=1; each). Eleven patients died during the follow-up from complications of MDS treatment or acutisation. In patients with MDS-associated vasculitis (n=22), death occurred in 17 cases (77%), but survival was not different from patients with only inflammatory arthritis.

### Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>P value compared with ACCESS Study</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex: Male/Female</td>
<td>46 (38.3%) / 74 (61.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race: White/Black</td>
<td>(110 / 98.5%) / (227 / 27%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age</td>
<td>50 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thoracoscopic biopsy:</td>
<td>67 (55.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biopsy</td>
<td>108 (90%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical (Lofgren’s)</td>
<td>12 (10%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of inflammatory involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sarcoidosis</td>
<td>26 (31.7%)</td>
<td></td>
<td></td>
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<tr>
<td>Skin biopsy:</td>
<td>19 (23.7%)</td>
<td></td>
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<tr>
<td>Bone marrow biopsy:</td>
<td>8 (25.8%)</td>
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</tbody>
</table>

### Table 2.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>P value compared with ACCESS Study</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease activity</td>
<td></td>
<td>P &gt; 0.0001</td>
<td>Type of immunosuppressive medication</td>
</tr>
<tr>
<td>Leofgren’s syndrome</td>
<td></td>
<td>P &gt; 0.001</td>
<td>Methotrexate: N = 14</td>
</tr>
<tr>
<td>Sex: Male/Female</td>
<td>54 (43.9%) / 76 (66.1%)</td>
<td></td>
<td></td>
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<tr>
<td>Female</td>
<td>38 (31.2%) / 76 (66.1%)</td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>10 (8.3%) / 8 (6.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of diagnosis</td>
<td></td>
<td>P &gt; 0.001</td>
<td>Methotrexate: N = 14</td>
</tr>
<tr>
<td>Biopsy</td>
<td>67 (64.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical</td>
<td>18 (16.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of organ involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>80 (75%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>78 (74.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin</td>
<td>62 (59.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye</td>
<td>61 (58.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neurology</td>
<td>6 (5.8%)</td>
<td></td>
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<tr>
<td>Cardiovascular</td>
<td>5 (4.8%)</td>
<td></td>
<td></td>
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<tr>
<td>Kidney</td>
<td>4 (3.7%)</td>
<td></td>
<td></td>
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<tr>
<td>Treatment (IX)</td>
<td></td>
<td>P &gt; 0.05</td>
<td>Type of immunosuppressive medication</td>
</tr>
<tr>
<td>No TIX/steroid alone (Non IMS group): 91 (75.7%)</td>
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</table>

### Conclusion

This study describes the characteristics of associated inflammatory arthritis in MDS. At the difference of other recommendatory arthritis, the use of other than steroids immunosuppressors is very poor, probably in relation with the underlying hemopathy. The use of biologics in this condition could be preferred to methotrexate, but need prospective studies.

### Disclosure

A. Mekinian, None; O. Decaux, None; G. Falgarone, None; T. Braun Sr., None; E. Toussirot, None; L. Raffray, None; B. Combert, None; B. de Waziers, None; A. L. Buchdaul, None; J. M. Ziza, None; D. Launay, None; G. Denis, None; S. Madaule, None; P. Fenaux, None; O. Fain, None.

### 196

Sarcoidosis in Northern New England. Clinical Characteristics and Predictive Factors for More Aggressive Therapy. Alireza Meymati1, Kevin F. Spratt2 and Christopher M. Burns3. Dartmouth Hitchcock Medical Center, Lebanon, NH, 1Geisel School of Medicine at Dartmouth, Lebanon, NH, 2Dartmouth Medical School, Lebanon, NH.

### Background/Purpose

Sarcoidosis is characterized by a variable clinical presentation. DMDARs and biologics have been used for resistant and/or organ-threatening disease. We analyzed the cases of sarcoidosis in a tertiary medical center in northern New England.

### Methods

This was a retrospective review of the medical charts of patients who presented to Dartmouth-Hitchcock Medical Center from 2005–2010. Data were extracted from the electronic medical records using ICD-9 code. Patients with biopsy-proven non-caseating granuloma or Lofgren’s syndrome were included. Patients were divided into those requiring either no treatment or steroids alone (non-immunosuppression (Non-IMS) group) and those requiring immunosuppressive medication beyond steroid (IMS group).

### Results

402 charts were reviewed and 120 patients met the inclusion criteria. Comparison was made with data from the ACCESS study (736 patients, Baughman et al., 2001). See table 1. In addition, Comparison was made between IMS and Non-IMS group in the study. Of 29 patients in the IMS group, 82.7% had 2 or more organs involved (P<0.0005). 68.9% were followed by Rheumatology service in IMS group (P<0.0001). Eye (P<0.003), Musculoskeletal (P<0.0004) and nervous system (P<0.030) involvement often required IMS. The average ACE level (Unit/L) was 66.8 in IMS and 48.3 in Non IMS group (P<0.0339). See Table 2.

| Table 2. |
|-----------|--------|-----------------------------------|---------|
| Parameter | Result | P value compared with ACCESS Study | Details |
| Disease activity | | P > 0.001 | Type of immunosuppressive medication |
| Leofgren’s syndrome | | P > 0.05 | Methotrexate: N = 14 |
| Sex: Male/Female | 54 (43.9%) / 76 (66.1%) | | |
| Female | 38 (31.2%) / 76 (66.1%) | | |
| Male | 10 (8.3%) / 8 (6.8%) | | |
| Mode of diagnosis | | P > 0.001 | Methotrexate: N = 14 |
| Biopsy | 67 (64.8%) | | |
| Clinical | 18 (16.8%) | | |
| Number of organ involvement | | | |
| Lung | 80 (75%) | | |
| Musculoskeletal | 78 (74.3%) | | |
| Skin | 62 (59.1%) | | |
| Eye | 61 (58.3%) | | |
| Neurology | 6 (5.8%) | | |
| Cardiovascular | 5 (4.8%) | | |
| Kidney | 4 (3.7%) | | |
| Treatment (IX) | | P > 0.05 | Type of immunosuppressive medication |
| No TIX/steroid alone (Non IMS group): 91 (75.7%) | | | |

### Conclusion

This study describes the characteristics of associated inflammatory arthritis in MDS. At the difference of other recommendatory arthritis, the use of other than steroids immunosuppressors is very poor, probably in relation with the underlying hemopathy. The use of biologics in this condition could be preferred to methotrexate, but need prospective studies.
**Conclusion:** We have characterized a unique sarcoidosis population in rural northern New England, mainly Caucasian with more musculoskeletal, skin and kidney involvement and less lung involvement compared to existing data. 24% of our patients required treatment beyond steroid (IMS group). The use of IMS was associated with the number of organs involved (≥2), and the specific organ involvement (eye, musculoskeletal, nervous system) at the time of diagnosis. We also observed a trend toward higher ACE levels in patients requiring the use of IMS. Rheumatologists followed most patients on IMS treatment, perhaps due to familiarity with these agents and/or seeing more complicated cases in their clinic.

**Disclosure:** A. Meyers, None; K. F. Spratt, None; C. M. Burns, None.

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**Collapsing Glomerulopathy in Collagen Vascular-Like Disease.** Rawad Nasr¹, Christine Johns² and Elie Gertner¹. ¹University of Minnesota, Minneapolis, MN; ²Regions Hospital, St Paul, MN; ³Regions Hospital and University of Minnesota Medical School, St. Paul, MN

**Background/Purpose:** Collapsing Glomerulopathy (CG) is an uncommon podocytopathy with distinct clinical and pathological characteristics. It is usually associated with HIV disease or parvovirus B19 infection. There are a few case reports of CG in association with well-defined connective tissue diseases mainly SLE. The rheumatological literature does not describe patients with CG and marked serological abnormalities who do not have sufficient clinical findings to diagnose definite collagen vascular disease.

**Objective:** Our objective is to expand the spectrum of rheumatological disease that may accompany CG to include patients with marked serological abnormalities, but minimal clinical findings that do not meet criteria for definite collagen vascular disease. These patients all appear to have a very similar mode of presentation and course. Rheumatologists should be aware of this condition and its association with marked serological abnormalities.

**Methods:** A review of all kidney biopsies performed at Regions Hospital from 2004 till 2012 revealed four cases of CG not associated with other diseases. We conducted a chart review of these patients. These four cases were then compared with the sixteen cases of collagen vascular-like disease in the renal literature to construct a profile of patients with collagen vascular-like disease and CG.

**Results:** Four patients (all non-Caucasian) were identified. Ages ranged from 29 to 51 years. All patients presented with massive proteinuria (approximately 20 grams / 24 hours) and renal insufficiency. None of the renal biopsies showed evidence of lupus nephritis, immune complex deposition or vasculitis. All had evidence of CG. All testing for HIV, parvovirus B19, and other known causes of CG were negative.

**Conclusion:** Older patients with hypertension presenting to a cancer center with abdominal, retroperitoneal, or in particular supravacuclar LAD are at risk for the diagnosis of hematologic malignancy. We recommend that they be followed for at least 1 year for a definitive diagnosis. A larger prospective study should be conducted to analyze other factors such as localized vs. generalized LAD or ACE levels (or other laboratory values) and their correlation with a cancer diagnosis.

**Disclosure:** H. Lu, None; X. Pundole, None; K. Vu, None.

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**Diagnostic Predictors and Clinical Outcomes in Patients Presenting Solely with Lymphadenopathy.** Hufang Lu, Xerxes Pundole and Khanh Vu. UT MD Anderson Cancer Center, Houston, TX

**Background/Purpose:** Patients presenting solely with radiologic evidence of lymphadenopathy (LAD) to tertiary cancer centers are often diagnosed with malignancy or autoimmune diseases such as sarcoidosis. However, the baseline characteristics predictive of a cancer or sarcoidosis diagnosis, clinical outcomes and follow-up time are unknown.

**Methods:** Retrospective chart review of adult patients (age > 18 years) presenting with LAD and without an apparent mass at other sites, such as the breast or prostate; seen at Mary Ann Weiser Suspcion of Cancer Clinic and rheumatology clinics at The University of Texas MD Anderson Cancer Center, new consultation from January 1, 2003, to June 30, 2007, and followed to December 31, 2011. Data collected and analyzed included age, sex, follow-up time, comorbidities, B symptoms, laboratory test results, imaging studies, histopathology analyses, and final diagnosis. Multiple logistic regression was used to assess baseline characteristics predictive of a cancer diagnosis.

**Results:** Of the 66 patients studied, 36 (55%) were diagnosed with cancer; the most common type was lymphoma. Sarcoidosis (17%) and reactive hyperplasia (23%) were the most commonly seen benign causes of LAD. Malignancy was diagnosed in 94%, 79%, and 70% of patients with supravacular, retroperitoneal, and abdominal LAD, respectively, suggesting an association between these locations and a cancer diagnosis. A benign diagnosis was more common with localized LAD than with generalized LAD (63% vs 37%). The final multiple logistic regression models showed age (used as a continuous variable) (p = 0.0342) and hypertension (p = 0.0399) to be associated with a cancer diagnosis. Another model using age as a dichotomized variable (<50, ≥50) (p=0.0447) and hypertension (p=0.0245) showed both to be associated with a cancer diagnosis, suggesting hypertension and age as independent factors in predicting a cancer diagnosis. Other comorbidities like history of smoking, history of alcohol, history of prior cancer and rheumatologic disease did not have a significant association with a cancer diagnosis. Mean serum levels of angiotensin-converting enzyme (ACE) checked in 24 of the 66 patients, were higher in patients without cancer than in patients with cancer. No significant statistical correlation was observed between B symptoms and a cancer diagnosis. On histopathology varying proportions of cell types were found in the lymph node specimens and a conclusive relationship with a particular diagnosis was not evident overall. The average follow-up time was 7 months, although in 1 of the patients a conclusive diagnosis was arrived at after 1 year. None of the patient’s with sarcoidosis progressed to a cancer diagnosis.

**Conclusion:** Older patients with hypertension presenting to a cancer center with abdominal, retroperitoneal, or in particular supravacuclar LAD are at risk for the diagnosis of hematologic malignancy. We recommend that they be followed for at least 1 year for a definitive diagnosis. A larger prospective study should be conducted to analyze other factors such as localized vs. generalized LAD or ACE levels (or other laboratory values) and their correlation with a cancer diagnosis.

**Disclosure:** H. Lu, None; X. Pundole, None; K. Vu, None.

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**Joint, Hand and Feet Swelling As a Presenting Symptom of Hereditary Angioedema.** Maria J. Gutierrez¹ and Timothy J. Craig². ¹Penn State College of Medicine Milton S. Hershey Medical Center, Hershey, PA; ²Penn State College of Medicine Milton S. Hershey Medical Center, Hershey, PA

**Background/Purpose:** Hereditary Angioedema (HAE) is a rare disorder caused by deficiency or impaired function of C1 esterase inhibitor. Early and accurate diagnosis of HAE is important to initiate appropriate therapy and avoid potentially fatal outcomes. However, HAE symptoms can mimic other conditions potentially leading to incorrect diagnosis and delay in treatment. Our purpose was to investigate the proportion of hand, feet and joint swelling as presenting signs of hereditary angioedema across different countries.

**Methods:** A web-based survey was conducted among physicians who treated HAE patients over 500 countries in the Americas, Europe, Asia and Africa. Physicians voluntarily accessed and completed the internet-based survey between November 2010 and February 2011.
Results: A total of 201 international physicians who treated HAE patients completed the survey. Most patients treated by surveyed physicians were under 35 years old (67%) and symptoms had first presented during childhood or adolescence in 77% of all cases. Among respondents there was widespread consensus about delay between the first HAE attack and diagnosis. Overall, only 14% of treated patients had been diagnosed within the first year and in 48% of cases there was a reported delay of 4 or more years. The patient’s most common complaint was facial swelling. Nonetheless, hand, feet or joint swelling were listed as one of the two most common symptoms at onset by 40% of physicians. Interestingly, hand, foot and joint swelling were also ranked among the three most problematic symptoms during attacks by 35% of physicians surveyed.

Conclusion: HAE is a rare condition that usually presents during the first two decades of life and may present with hand, foot and joint swelling as main symptom. In addition, an important proportion of surveyed physicians thought that this is one of the most problematic symptoms of patients with HAE. Accordingly, HAE should be included in the differential diagnosis of certain types of joint and extremity edema, and thus, increased awareness of the pediatric rheumatology community could lead to a decrease in the morbidity and mortality of this condition.

Disclosure: M. J. Gutierrez, None; T. J. Craig, Dyax, Shire, Viroypharma, Pharring, CSL Behring, 2; CSL Behring, 5; Dyax, Shire, Viroypharma, CSL Behring, 8.


Background/Purpose: Autoimmune hepatitis (AIH) is a progressive fibrosing inflammatory disease of the liver of unknown etiology, leading to cirrhosis. Its course is usually fluctuating and its clinical manifestations are problematic symptoms during attacks by 35% of physicians surveyed.

Conclusion: HAE is a rare condition that usually presents during the first two decades of life and may present with hand, foot and joint swelling as main symptom. In addition, an important proportion of surveyed physicians thought that this is one of the most problematic symptoms of patients with HAE. Accordingly, HAE should be included in the differential diagnosis of certain types of joint and extremity edema, and thus, increased awareness of the pediatric rheumatology community could lead to a decrease in the morbidity and mortality of this condition.

Disclosure: F. Zazzetti, None; N. C. Fernandez, None; J. Benavidez, None; L. A. Colombato, None; G. R. Rodriguez, None; G. Nardi, None; C. Bru Morin, None; O. L. Rillo, Pfizer Inc.; Z. A. Quadrini, None; S. M. Garay, None; M. Fabi, None; T. Gonzalez, None; J. C. Barreira, None.

201 High Rate of Autoimmune Manifestations During Idiopathic CD4 Lymphtocytopenia. Alexis Régent, Brigitte Autran, Guislae Carcelain, Benjamin Terrier, Alain Krivitzky, Eric Oksenhendler, NathalieCoste-d'Chalumeau, Pascale Hubert, Olivier Lortholary, Nicolas Dupin, Patrice Debire, Loïc Guilleuin and Luc Mouthon. 1Hospital Cochin, Paris, France, 2Laboratoire d’Immunologie Cellulaire Et Tissulaire, Paris, France, 3Hôpital Cochin, Paris, France, 4Department of Internal Medicine, Referral Center for Rare Autoimmune and Systemic Diseases, Hôpital Cochin, AP-HP, Université Paris Descartes, Paris, France, Paris, France

Background/Purpose: When first described by the Center for Disease Control, idiopathic CD4 lymphocytopenia (ICL) was characterized by opportunistic infections in patients with a CD4 count<300/mm³ or ≤20% lymphocytes. It is now well established that auto-immune manifestations occur during primary or secondary immunodeficiencies.

Methods: We prospectively included 36 patients (21 females) with ICL between January 1991 and June 2011. T lymphocyte phenotyping and lymphocyte proliferation assay were realized at diagnosis. Infectious, autoimmune manifestations and malignancies during a mean follow-up of 7.6±6.7 years were recorded and correlated with data at inclusion.

Results: Twenty four patients showed infections (11 with human papillomavirus infection), 11 autoimmune symptoms, 5 malignancies and 7 mild or no symptoms. Autoimmune and/or inflammatory manifestations include immune thrombocytopenic purpura (n=5), autoimmune hemolytic anemia (n=3), central nervous system vasculitis (n=1), Goodpasture syndrome (n=1), grade II duodenal villous atrophy (n=1), Crohn disease (n=1), antiphospholipid syndrome (n=1) and Hashimoto’s thyroiditis (n=1). At the time of diagnosis, mean CD4⁺, CD8⁺, CD19⁺ and natural killer (NK) cell counts were 126/mm³ (range 4–294), 238/mm³ (1–1293), 107/mm³ (3–547) and 115/mm³ (5–416), respectively. Most patients exhibited deficiency in CD8⁺, CD19⁺, and/or NK cells. Patients with infections had a significantly lower NK cell count (p=0.03) and those with autoimmune manifestations higher CD45Ro⁺CD8⁺ count (p=0.02). T-cell proliferation induced by mitogens and antigens revealed great discrepancies. Six patients died (16.6%) during follow-up. CD4⁺ T-cell count <150/mm³ and NK cell count <100/mm³ were predictors of death.

Conclusion: 30.5% patients with ICL show auto-immune manifestations during clinical course. These patients had higher CD45Ro⁺CD8⁺ count at diagnosis. In addition to CD4 lymphocytopenia, patients often have CD8, CD19 and NK cell deficits. Mortality is related to an initial CD4⁺ count <150/mm³ and NK cells<100/mm³.

Disclosure: A. Régent, None; B. Autran, None; G. Carcelain, None; B. Terrier, None; A. Krivitzky, None; E. Oksenhendler, None; N. Coste-d’Chalumeau, None; P. Hubert, None; O. Lortholary, None; N. Dupin, None; P. Debire, None; L. Guilleuin, None; L. Mouthon, None.

202 Diseases Associated with Markedly Elevated Ferritin Levels. Reshima Mann, Payal J. Patel, Amita Thakkar, Rochella A. Ostrowski, Eric McBride and Rodney Tehranl. Loyola Univ Medical Ctr, Maywood, IL

Background/Purpose: Adult onset Still’s disease (AOSD) is a rare form of inflammatory arthritis with inflammatory systemic disease of unknown
etiology. It is a diagnosis of exclusion and can be a diagnostic challenge. A patient with suspected AOSD at our institution prompted a retrospective chart review of all patients with markedly elevated ferritin levels.

The patient, a 59 year old male with fever of at least one month who underwent an extensive negative evaluation for infection, malignancy, and other autoimmune etiologies was treated with high dose corticosteroids. A ferritin level at admission was 2200 ng/mL and rapidly rose to almost 50,000 ng/mL. Treatment for AOSD with IL-1 and IL-6 inhibition was unsuccessful and he died within one month from multi-organ failure. A bladder wall biopsy obtained just prior to death revealed an anaplastic large cell lymphoma.

**Methods:** In order to determine the association of autoimmune disease, including AOSD, with markedly elevated ferritin levels, in comparison to non-autoimmune diagnoses, we conducted a retrospective chart review of patients with elevated ferritins (> 10,000 ng/mL) seen at our institution from January 2000 to July 2011. Cases were divided into two subgroups, those with values between 10,000–15,000 and >15,000 ng/mL for analysis. The highest ferritin value was used when an individual subject had multiple values. There were 108 charts identified and reviewed for diagnoses at the time of the elevated ferritin level. Patients with either autoimmune disease, malignancies, liver disease, and/or infection were included in the analysis. Patients with hemoglobinopathies were excluded to avoid confounding of the ferritin levels by frequent blood transfusions. The remaining 88 cases were included for analysis.

**Results:** Twenty six patients with ferritin levels between 10,000–15,000 ng/mL were identified. The mean age of patients in this subgroup was 46.6 years. Of these patients, 10/26 (38%) had elevated ferritin levels secondary to liver disease, 7/26 (27%) malignancy/infection, 6/26 (23%) malignancy alone, 1/26 (4%) autoimmune disease, and 1/26 (4%) infection and liver disease/infection respectively. There were 62 patients with ferritins greater than 15,000 with a mean age of 44.3 years. Of these patients, 29/62 (47%) had liver disease, 9/62 (14%) malignancy, 7/62 (11%) autoimmune disease/infection, 4/62 (6%) liver disease/infection, 4/62 (6%) malignancy/infection and 2/62 (3%) autoimmune/infection.

**Conclusion:** The observation that both ferritin groups include higher percentages of patients with liver disease and malignancy compared to autoimmune disease. Although not a part of the diagnostic criteria for AOSD, the presence of hyperferritinemia is commonly used to assist with diagnosis. These findings suggest that other diagnoses such as malignancies or liver disease should be considered in the differential diagnoses of markedly elevated ferritin levels. The diagnosis of AOSD is a diagnosis of exclusion and other underlying causes need to be ruled out.

**Disclosures:** R. Marri, None; E. McBride, None; R. Tehrani, None.

204 Characterization of Joint Disease in Mucopolysaccharidosis Type I Mice and the Effects of Enzyme Replacement Therapy. Patricia Oliveira¹, Guilherme Baldo², Fabiana Mayer², Barbara Martinelli³, Luise Meurer², Roberto Giugliani², Ursula Matte² and Ricardo M. Xavier¹. ¹Hospital de Clinicas de Porto Alegre, Porto Alegre, Brazil, ²Hospital de Clinicas de Porto Alegre, ³Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

**Background/Purpose:** Mucopolysaccharidosis type I (MPS I) is a lysosomal disorder caused by deficiency of alpha-L-iduronidase, which leads to storage of glycosaminoglycans. Patients with MPS I present destructive changes in their joints in a process not well understood. The MPS I animal model is a useful tool to study the disease pathogenesis; however the changes in the MPS I joints were never investigated. This work aimed to describe the joint histomorphometry of MPS I, the response to enzyme replacement model of MPS I, and the effect of treatment with enzyme replacement therapy (ERT).

**Methods:** Normal (wild type) and untreated MPS I mice were sacrificed at different time points (from 2 to 12 months). In addition, some MPS I mice were treated with ERT and sacrificed at 6 months. The knee joints were collected and hematoxilin and cosin staining was used to evaluate the articular architecture. Safranin-O and Sirius-Red staining was used to analyze proteoglycans (PGs) and collagen content. In addition we analyzed the expression of matrix-degrading metalloproteinases (MMPs), MMP-2 and -9, by immunohistochemistry.

**Results:** We observed progressive joint alterations from 6 months, including presence of synovial inflammatory infiltrate, destruction and thinning of the cartilage extracellular matrix and PGs and collagen depletion. Also, we observed an increase in the expression of MMP-2 and -9, which could explain the degenerative changes. We also investigated the effect of ERT when started at 2 months, which showed no benefits, suggesting that the poorly vascularized cartilage is difficult to reach, and an ancillary therapy might be needed for patients.

**Conclusion:** Our results suggest that the degenerative joint and bone disease in MPS I animals presents some similarities to osteoarthritis. More important, our results evidence the need for an ancillary therapy for MPS I patients.

**Disclosures:** P. Oliveira, None; G. Baldo, None; F. Mayer, None; B. Martinelli, None; L. Meurer, None; R. Giugliani, None; U. Matte, None; R. M. Xavier, None.
Idiopathic Inflammatory Myositis Is Associated with an Increased Incidence of Systemic Sclerosis. Shreyas H. Chaudhary1, Susanna Proudman2 and Vidya S. Limaye3. 1Medical Student University of Adelaide, Adelaide, Australia, 2Royal Adelaide Hospital, Adelaide, Australia

Background/Purpose: Systemic sclerosis (SSc) and idiopathic inflammatory myositis (IIM) are two systemic autoimmune connective tissue diseases with predominant effects on skin and muscle respectively. Although they generally occur as distinct disease entities, some features of SSc and IIM may be seen together in “overlap syndromes” or in mixed connective tissue disease (MCTD). The aim of this study was to determine the occurrence of SSc in IIM, and vice versa, in patients without features of MCTD or overlap syndromes. We also sought to compare the incidence of SSc in IIM, with that of rheumatoid arthritis (RA), systemic lupus erythematosus (SLE) and primary Sjogrens syndrome (pSS).

Methods: The South Australian (SA) Myositis Database has registered all patients with biopsy-proven IIM in SA since 1980. All adult muscle biopsies performed in SA are reported in a central diagnostic laboratory and are subjected to peer review. The criteria used to diagnose IIM are those based on current published literature. Myositis-associated antibodies (MAA) and myositis-specific antibodies (MSA) have been measured on 138 patients with myositis. The South Australian Scleroderma Register similarly registers all patients in SA diagnosed with limited or diffuse SSc. Fisher’s exact T-test was used for statistical comparisons.

Results: The incidence of SSc in IIM was 18/426 (4.2%). A greater proportion of IIM patients had SSc (18/426) than RA (2/426, p = 0.003) or MCTD (4/426, p = 0.004). There was a trend towards a greater proportion of IIM patients having SSc than SLE or pSS (each 8/426, p = 0.07). There was no difference in the proportion of females amongst patients with IIM alone (231/426) compared with IIM and SSc (13/18, Fishers exact T test p = 0.15). Of the 18 patients with SSc and IIM, 14 had polymyositis, 3 dermatomyositis, 2 inclusion body myositis and one had necrotizing myopathy. Four patients had antibodies to PM-Scl (3 of these had polymyositis, one had dermatomyositis). Antibodies to other MSA or MAA were detected as follows: Ku (n = 2), Mi-2 (n = 1), PL12 (n = 1), Jo-1 (n = 1) and Ro52 (n = 2). Of the 177 patients on the SA Scleroderma Register, 22 had suspected SSc (incidence of SSc in IIM, 18/426, p = 0.003). There was no difference in the proportion of females amongst patients with SSc alone (216/426) compared with SSc and IIM (13/18, Fishers exact T test p = 0.15).

Conclusion: Although the population incidence of RA, SLE and pSS is greater than SSc, in IIM, there is a greater incidence of SSc and SSc is the commonest autoimmune connective tissue disease in IIM. The co-occurrence of these two conditions raises the possibility of shared disease susceptibility.

Disclosure: S. H. Chaudhary, None; S. Proudman, None; V. S. Limaye, None.

Idiopathic Inflammatory Myositis Is Associated with an Increased Incidence of Systemic Sclerosis.
collected at weeks 0 and 16, multiplexed sandwich immunooassays (Meso Scale Discovery) quantified IFN-regulated chemokines and other pro-inflammatory cytokines. An IFN chemokine score combining IFN-inducible T-cell chemokintant (I-TAC), IFN-inducible 10-kd protein (IP-10), and monocyte chemotactic protein 1 (MCP-1) was computed. Data collected at each visit included: muscle enzymes, physician global, muscle and extramuscular visual analog scale (VAS) scores (0–10 cm) and Myositis Disease Activity Assessment Tool variables (i.e., VAS score for organ involvement). Pulmonary involvement was defined as VAS > 1 cm and included active interstitial lung disease (ILD) and respiratory muscle weakness (i.e., dysphonia and dyspnea). Changes in IFN chemokine and VAS scores were calculated as week 16–week 0, and correlations were assessed using Spearman methods.

Results: In 181 patients (87 Early, 94 Late) with available serum samples, changes in IFN chemokine score correlated with changes in physician global (r = 0.19 p = 0.017), muscle (r = 0.19 p = 0.019) and extramuscular VAS (r = 0.24 p = 0.002). These associations persisted after adjusting for muscle enzymes (global r = 0.15 p = 0.056; muscle r = 0.16 p = 0.046 and extramuscular r = 0.25 p = 0.002), suggesting that the IFN chemokine score is complementary to muscle enzymes. The IFN chemokine score at week 0 correlated with change in extramuscular VAS (r = -0.18 p = 0.027), but not with change in global or muscle VAS (r = 0.1).

In patients with pulmonary involvement (n = 70), IFN chemokine score at week 0 was more strongly correlated with changes in disease activity (global r = 0.37 p = 0.004; muscle r = 0.36 p = 0.005; extramuscular r = 0.44 p = 0.001) in patients with pulmonary involvement (n = 111; r = 0 to 0.14). The change in IFN chemokine score was also more strongly correlated with the change in disease activity by VAS among patients with pulmonary involvement (global r = 0.27 p = 0.04; muscle r = 0.45 p = 0.001; extramuscular r = 0.41 p = 0.001) compared to patients without pulmonary involvement (r = 0.06 to 0.15). Results for patients with active ILD (n = 32) were similar to those for non-parenchymal pulmonary involvement.

Conclusion: Changes in IFN chemokine score correlated with changes in disease activity, particularly among myositis patients with pulmonary involvement (with or without active ILD). The IFN chemokine score may be a useful clinical biomarker for patients with myositis, especially in patients with lung involvement. In addition, these chemokines may provide useful insights into the pathogenesis of myositis or specific manifestations.

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Outcome of Muscle Function and Disease Activity in Patients Recently Diagnosed with Polymyositis and Dermatomyositis—Preliminary Results of a 1-Year Follow-up Registry Study. Helene Alexanderson1, Jenny Benggård2, Christina Ottosson3, Maryam Dastmalchi4 and Ingrid E. Lundberg1. 1Karolinska Institutet, Stockholm, Sweden, 2Karolinska University Hospital, Solna, Stockholm, Sweden, 3Karolinska University Hospital, Stockholm, Sweden, 4Rheumatology Unit, Karolinska University Hospital in Solna, Karolinska Institutet, Stockholm, Sweden.

Background/Purpose: Most patients with polymyositis (PM) and dermatomyositis (DM) develop sustained muscle impairment. The aim of this study was to evaluate the muscle endurance (Functional Index 2, FI-2), muscle strength (selected 6-item core set measures) at 6 and 12 months after PM/DM diagnosis onset (baseline).

Methods: 72 patients, 40 with PM and 32 with DM, diagnosed 2003–2010 who performed the FI-2 and the MMT at baseline were included. They had median age 66 (Q1-Q3) 55 (41–70) years and month duration 0 (0–1) months and 28 were women. 15 (20%) were inpatients with no pulmonary involvement, 34 patients had MD 50 (30–80) months of prednisone/day, 38 were without medication. Mixed Linear Model with time as fixed variable was used with the Bonferroni after test to compare genders and diagnosis at different time points. Individually patients were identified as responders improving > 20% or worsening > 20% in the FI-2/MMT at follow-ups compared to baseline. Significance level was set to 0.05.

Results: The group had med 27 (8–60) % of FI-2 maximal score and med 94 (83–99) % of MMT maximal score at baseline (p<0.000) with no significant change at 6 or 12 months compared to baseline. Men had higher FI-2 scores med 50% (22–84) of maximal score at baseline, 54% (17–88) at 6 months, 61% (27–90) than women med 13% (5–42) at baseline, 19% (6–47) at 6 months and 18% (0–61) at 12 months (p<0.000) and men improved more over time in FI-2 than women (p<0.000). 44% of patients were responders and 22% worsened in FI-2 score at 6 months and 49% of 45 patients were responders and 29% worsened at 12 months. 19 % of 37 patients were responders in MMT score at 6 months and 15% of 33 patients were responders at 12 months, no patient worsened. PM and DM patients improved in VAS physician global disease activity at 6 and 12 months compared to baseline (p<0.034, p<0.002) but patients with PM had significantly higher scores 10 (5–30) mm at 12 months compared to DM md 6 (4–15) mm (p<0.043). The men had significantly reduced global extra-muscular VAS scores at 6 and 12 months compared to baseline (p<0.011, 0.021) and women remained unchanged. Patients with DM had more in global extra-muscular VAS scores at 6 and 12 months (p=0.022, p=0.021) while there was no change in PM.

Conclusion: Male patients seem to improve more over time than women in muscle endurance and improve in extra-muscular disease activity while women do not. Patients with DM seem to have lower disease activity compared to PM and DM patients improve in extra-muscular disease activity while patients with PM do not. 20% in the FI-2/MMT at follow-ups were responders and none worsened in muscle endurance while 15–19% were responders and none worsened in muscle strength.

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Clinical Study of Determination of Myositis-Associated Autoantibodies in Japanese Patients with Connective Tissue Diseases except Autoimmune Myositis. Toshio Kawamoto1, Masakazu Matsuhashi1, Ken Yamajim2, Naoto Tamura3 and Yoshinari Takasaki1. 1Juntendo University School of Medicine, Tokyo, Japan, 2Division of Rheumatology, Department of Internal Medicine, Juntendo University, Tokyo, Japan.

Background/Purpose: Anti-Jo-1 antibody is detected in the sera of patients with polymyositis/dermatomyositis (PM/DM). The antigen to which this antibody is directed is histidyl-tRNA synthase, an aminoacyl-tRNA synthase (ARS) which occurs in the cytoplasm of eukaryotes, and various anti-ARSs have been identified depending on differences of corresponding amino acids. In addition, other autoantibodies detected in patients with myositis include anti-Ku antibody, anti-Mi-2 antibody, anti-SRP antibody, and anti-PM-Scl antibody. This study was performed to evaluate the clinical characteristics and usefulness of determining the serum levels of these antibodies in patients with connective tissue diseases (CTD) other than PM/DM.

Methods: The study included 337 patients with CTD who had been followed up at the outpatient service of this hospital. Of them, 63 had PM/DM, 86 had systemic lupus erythematosus (SLE), 86 had rheumatoid arthritis (RA), 29 had Sjögren’s syndrome (SjS), 11 had mixed connective tissue disease (MCTD), 14 had progressive systemic sclerosis (SSc), 12 had ANCA-associated vasculitis, 5 had Behçet’s disease, 6 had aortitis syndrome, 7 had adult-onset Still’s disease, and 18 had other diseases. Serum levels of antibodies were determined using Myositis Profile 3 Euroline Blot Test Kit commercially available from EURO-IMMUN (Lubeck, Germany). Clinical features were assessed for cases found to be positive for these autoantibodies.

Results: The analysis revealed that 12 patients were positive for anti-PL7 antibody, among other anti-ARS antibodies, and 6 of these patients had CTD other than PM/DM. Similarly, anti-PL12 antibody was detected in 4 patients including those with SLE, RA or MCTD. Anti-EJ antibody and anti-Jo-1 antibody were also detected frequently in RA and other non-myositis CTD. As for other myositis-associated autoantibodies, anti-PM-Scl75 antibody was detected in 7 patients with SLE and 2 patients with RA, while anti-Ku antibody was demonstrated in 3 patients with PM/DM, 4 patients with SLE and 3 patients with MCTD.

Regarding the relationship between the autoantibodies detected and clinical manifestations, concurrent interstitial pneumonia (IP) was high in incidence irrespective of underlying disorders among anti-ARS antibody-positive patients with CTD other than PM/DM. Anti-Ku antibody, anti-SRP antibody and anti-Mi-2 antibody, on the other hand, were detected also in non-myositis connective tissue diseases; however, there was no definite correlation between these antibodies and clinical manifestations including IP. The data obtained were reviewed also with respect to arthritis and Raynaud’s phenomenon.

Conclusion: Serum levels of antibodies associated with myositis were determined in 337 patients, and anti-ARS antibodies were detected in a number of patients with CTD other than PM/DM. These autoantibodies detected were strongly correlated with IP, which tended to be intractable. The present results indicate that it is clinically useful to determine the serum levels of anti-ARS antibodies and other myositis-associated autoantibodies in patients with CTD complicated by IP even when their underlying diseases are not myositis.

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Efficacy and Safety of Disease Modifying Drugs, Biologic Therapies and Immunoglobulin in Patients with Polymyositis and Dermatomyositis: A Systematic Literature Review. JA Martinez-Lopez Sr. 1, J. Gran˜a Sr. 2, T. B. M. Barros 3, S. M. Shinjo, F. H. C. Souza 4, None; T. B. M. Barros, None; S. K. Shinjo, Federico Foundation, 2.

Background/Purpose: The aim of this study was to systematically review the efficacy and safety of available drugs in patients with polymyositis (PM) or dermatomyositis (DM).

Methods: We systematically searched MEDLINE, EMBASE and the Cochrane Central Register of Controlled Trials up to October 2011 using a comprehensive search strategy for disease modifying drugs (DMARD), biologic therapies, intravenous immunoglobulins (IVIG), primary PMS and DPM, efficacy and safety (mesh terms and text words). Selection criteria were predefined by protocol. We selected meta-analysis, systematic literature reviews, clinical trials (CT), that included > 18 year-old patients primary PMS and DM on the selected drugs, English, Spanish and French languages. Studies including patients with secondary PMS or DM, and basic science studies were excluded. Title and abstract selection and subsequent detailed review of selected articles were independently performed by two reviewers. A hand search of the selected articles was performed. The included studies quality was graded using the Oxford Levels of Evidence Scale, and results expressed as level of evidence (LE), recommendation grade (RG).

Results: The search strategy identified 2,442 potentially relevant articles, of which 114 were selected for full paper review. Twenty articles were eventually included in the analysis. The selection included 7 randomized CT, 13 open trials, which analyzed 334 patients. Main characteristics and results are shown in the table below.

Table 1. Main results of the systematic literature review

<table>
<thead>
<tr>
<th>Study</th>
<th>Efficacy</th>
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<tr>
<td>Amano (2011)</td>
<td>BCT (n=16 DM), 52 w, Oxford 1c ETA vs PCB</td>
</tr>
<tr>
<td>Bouch (1975)</td>
<td>BCT (n=14 PM), 12 w, Oxford 2b AZA vs PCB</td>
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<tr>
<td>Bouch (1980)</td>
<td>BCT (n=16 PM), 12 w, Oxford 2b AZA vs PCB</td>
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<tr>
<td>Dalakas (1993)</td>
<td>BCT (n=15 DM), 24 w, Oxford 1c IVIG (0.1 infusion) vs PCB</td>
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<tr>
<td>Fini (1997)</td>
<td>BCT (n=4 PM), 16 w, Oxford 2b CYC vs PCD</td>
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<tr>
<td>Miyazaki (2011)</td>
<td>BCT (n=26 PM/DM), 26 w, Oxford 1b IVIG vs PCB</td>
</tr>
<tr>
<td>Chemnitz (2008)</td>
<td>OF (n=13 PM), 5 yr, Oxford 2b IVIG</td>
</tr>
<tr>
<td>Chang (2007)</td>
<td>OF (n=8 DM), 24 w, Oxford 2b RTX</td>
</tr>
<tr>
<td>Garcia Horenstein (2010)</td>
<td>OF (n=14 PM/DM), 16 w, Oxford 2b IFX</td>
</tr>
<tr>
<td>Kamoila (2008)</td>
<td>OF (n=10 DM + intestinal pneumonia), Oxford 2b Prednisolone + CYC + CyA</td>
</tr>
<tr>
<td>Levine (2008)</td>
<td>OF (n=7 DM), 52 w, Oxford 2b RTX</td>
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<tr>
<td>Mattaglia (1990)</td>
<td>OF (n=7 PM/DM), Oxford 2b IVIG</td>
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<td>Meik (2007)</td>
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<td>Saito (2008)</td>
<td>OF (n=15 PM/DM), 12 w, Oxford 2b IVIG</td>
</tr>
<tr>
<td>Tokuno (2002)</td>
<td>OF (n=11 PM/DM), 24 w, Oxford 2b IFX</td>
</tr>
</tbody>
</table>

Table 1. Main results of the systematic literature review

BCT: Biologic Therapy combination; DM: dermatomyositis; IFX: Infliximab; IVIG: Intravenous immunoglobulin; PM: polymyositis; PMS: Primary Myositis; PM/DM: Polymyositis/dermatomyositis; RTX: Rituximab; S90 - See Table 1, column 2.
Conclusion: Rituximab is effective to achieve remission in patients with PM/DM refractory to standard therapy (high dose prednisone and DMARD), (LE 2b; GR B-C). There is no current evidence on the efficacy of infliximab in patients with PM/DM (LE 2b; GR B-C). The addition of etanercept to steroids does not increase response rate or decreased adverse events (LE 1c, GR B), but could be useful as steroids sparing in DM patients (LE 1c, GR B). The addition of azathioprine to steroids does not increase response rate or decreased adverse events in DM patients (LE 2b; GR B-C). IVIG is effective to achieve remission in patients with PM/DM refractory to DMARD (LE 2b, GR B-C).

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Distinctive Characteristics of Anti-Mi-2 and \textit{p}155/140 Autoantibody Production in Two Cohorts of Mexican Patients with Dermatomyositis.

Mónica Vazquez-Del Mercado1, Marcelo Petri2, Luis J. Jara-Quezada3, Miguel A. Saavedra-Salinas4, Claudia Cruz-Reyes5, Olga-Lidia Vera-Lastra6, Lilia Andrade7, Mario Salazar-Paramo8, Laura Gonzalez-Lopez9, Jorge Gamez-Nava10, Rosa E. Prieto-Parra11, Teresa Martín Marquez12, Jason Y.F. Chan13, Edward K.L. Chan13 and Minoru Satoh14.

1Universidad de Guadalajara, Guadalajara, Mexico, 2Universidad de Guadalajara, Guadalajara, Jalisco, Mexico, 3Hospital de Especialidades Centro Médico La Raza, IMSS, Mexico City, Mexico, 4Centro Médico Nacional, Mexico, 5Centro Médico La Raza Instituto Mexicano del Seguro Social Mexico D.F., Mexico, 6F. Mexico, 7Inst Mexicano Seguro Social, Mexico City, Mexico, 8CMN 20 Noviembre ISS STE, Mexico, Mexico, 9Instituto Mexicano Del SS, Guadalajara, Mexico, 10Hospital Regional de Zona 110, Instituto Mexicano del Seguro Social (IMSS), Guadalajara, Jalisco, Mexico, 11CMNO Guadalajara, Jalisco, Mexico, 12Centro Medico de Occidente, Guadalajara Jal, Mexico, 13University of Florida, Gainesville, FL.

Background/Purpose: Various autoantibodies associated with a unique subset of polymyositis/dermatomyositis (PM/DM), including antibodies to Jo-1 and other synthetic antibodies, MR, MI-2, PM-Scl and others, have been described. Specificities of autoantibodies and associated clinical manifestations in PM/DM are known to be affected by both genetic and environmental factors. In particular high prevalence of DM and anti-Mi-2 in Central America is thought to be associated with high UV index of the area. Prevalence of autoantibodies and clinical manifestation in PM/DM patients were evaluated comparing two cohorts in Mexico

Methods: Ninety-five Mexican patients with PM/DM (66 DM, 29 PM; 67 Mexico City, 28 Guadalajara) were studied. Autoantibodies recognized by sera were characterized based on protein analysis by immunoprecipitation using \textsuperscript{35}S-methionine labeled K562 cell extract and RNA analysis in immunoprecipitates by urea-PAGE and silver staining. Clinical information was from database and chart review.

Results: DM was 69% in Mexican PM/DM and anti-Mi-2 was the most common autoantibody specificity (35%), followed by anti-p155/140 (11%); however, anti-Jo-1 that is the most common in PM/DM studies was only 4%. DM was more common and comparable in both Mexico City and Guadalajara (69% and 71%, respectively). However, autoantibody profile in DM of Mexico City vs Guadalajara showed striking difference; anti-Mi-2 was 59% vs 15% (P = 0.001) whereas anti-p155/140 was 9% vs 30% (P = 0.001), respectively. Thus, despite comparable DM dominance and similar UV index of the two areas (higher percentage of Amerindian derived genes in Mexico City vs Guadalajara, respectively). Thus, despite comparable DM dominance and similar UV index, prevalence of DM and anti-Mi-2 was very high (59%) in Mexico City but not in Guadalajara (15%), suggesting a role of factors other than UV. Reported differences in genetic background of Mexican-Mestizo in these two areas (higher percentage of Amerindian derived genes in Mexico City vs European derived gene dominance in Guadalajara area) may be related to the difference in prevalence of autoantibodies. Clinical feature of anti-Mi-2(+) DM (n = 30) vs anti-Mi-2(-) DM (n = 36) was compared. Male was more common in anti-Mi-2(+) vs (-) (37% vs 22%, P=0.27).shawl sign (80% vs 62% respectively) and worse (59% vs 45%, P=0.30) were more common in anti-Mi-2(+) vs anti-Mi-2(-) DM. High CPK (> 2000) (88% vs 35%, P = 0.0001) was more common in anti-Mi-2(+) and levels of muscle enzymes were higher in anti-Mi-2(+) group than anti-Mi-2(-) group (CPK p = 0.0001, LDH p = 0.0001).

Conclusion: Anti-Mi-2 is at high prevalence in Mexican DM and associated with male, shawl sign, and high CPK. Prevalence of anti-Mi-2 and anti-p155/140 was significantly different in Mexico City vs Guadalajara, suggesting roles of factors other than UV in DM autoantibody production. Significant difference in clinical features of DM within a same country need to be carefully evaluated and the role of environmental and genetic factors will need further studies.

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NSAIDs Suppress the Inflammatory Reaction Related to Muscle Soreness but May Delay Recovery. Matthias Roether1, Egbert J. Seidel2, Alexander Fischer3 and Ilka Rother1.

1LMR Partner GmbH, Graefelfing, Germany, 2Sophien- and Hufeland Clinic, Weimar, Germany.

Background/Purpose: Eccentric muscle contraction causes an inflammatory reaction with pain peaking 24 to 48 hours after exercise–delayed onset of muscle soreness (DOMS). NSAIDs are used frequently for treatment or in prevention of DOMS. But evidence for treatment effects of NSAIDs is controversial. Timing of intervention and pharmacological properties of the specific NSAID tested might explain the contrasting results. In two previous studies using a daily active model of DOMS induced by walking down stairs we found for 200 mg celecoxib when given about 16 h after exercise a modest, insignificant reduction in pain [Phys Med Rehab Kuror 2012; 22: 57–63]. Ketoprofen (100 mg bid), a higher potent anti-inflammatory drug, caused a delay in recovery from DOMS when given immediately after exercise [Phys Med Rehab Kuror 2012; accepted for publication]. This study investigated the effects of a Cox-2 inhibitor (90 mg qd etoricoxib) on markers of inflammation, pain and muscle force after eccentric exercise.

Methods: Randomized, double-blind, placebo-controlled, cross over study in 50 healthy subjects exposed to exercise based, eccentric exercise on the lower limb (“extratfi Beinstrecker”, extrat INVESTMENT GmbH, Germany). Subjects with pain during muscle contraction of at least 5 on a 0–10 point categorical scale at 16±2 h after exercise were eligible for randomization. Pain at rest and during contraction, muscle force, pain threshold at tender point and markers of inflammation (high sensitive C-reactive Protein (hsCrP), sedimentation rate, leucocyte number) were evaluated at various time points during the treatment period of 7 days.

Results: There is a non significant trend for reduction of pain at rest with etoricoxib treatment for the first 24 h of treatment (etiocoxib: 10.4±9.7, placebo: 11.5±9.9). For peak torque and pain threshold at the tender point, there is a trend of delayed recovery with etoricoxib treatment. HsCrP is increased due to DOMS and showed significant cross-over effects (p = 0.0089). The carry-over effect might be due to anti-inflammatory effects of etoricoxib in period I (p = 0.0341) carried over into period II. This is in line with the overall result indicating a significant long term anti-inflammatory effect evident through a reduction in hsCrP as compared to placebo (p=0.0203). Overall, also a trend of reduction in model induced increase of leucocytes (p = 0.0981) was shown. Sedimentation rate was insensitive to the model and treatment effects.

Conclusion: Equipment based eccentric exercise of the lower limbs appears to be a robust model of muscle pain. This approach allows the design of cross-over studies since the exercise load can be individualized and adapted to differences in muscle force of the dominant vs. non-dominant limb. Treatment related effects are in line with previous studies indicating a modest analgesic effect but evidence for delayed recovery. This supports the concept that the inflammatory reaction is an essential part of the recovery process.
Anti-inflammatory treatment might cause a delay in recovery. Caution should be used when using NSAIDs for the treatment of exercise induced muscle pain.

Disclosure: M. Rother, MSD Sharp & Dohme GmbH, 2; E. J. Seidel, IMR Partner GmbH, 5; A. Fischer, IMR Partner GmbH, 5; L. Rother, IMR Partner GmbH, 3.

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Inflammatory Muscle Disease Associated Pulmonary Hypertension - Clinical Features and Survival at a National Referral Centre. Matthew Webber1, D. Dobarro1, C. Handler1, Christopher P. Denton2, Benjamin E. Schreiber3 and John G. Coghlan1. 1Royal Free Hospital, London, United Kingdom, 2Royal Free Hospital, London, United Kingdom, 3UCL, London, United Kingdom.

Background/Purpose: The association between connective tissue disease (CTD) and pulmonary hypertension (PH) is well known, especially in the scleroderma population. However, the association between inflammatory muscle disease (IMD) and PH has not been described in detail.

Methods: We searched our prospectively collected database of patients undergoing diagnostic right heart catheterization (RHC) from January 2000 to December 2011 for patients with a diagnosis of IMD who had been investigated at the Pulmonary Hypertension Unit, Royal Free Hospital, London (a national tertiary centre). Patient data was sourced from written notes and electronic medical records.

Results: Of the twenty patients with IMD who underwent RHC at the unit, 17 were diagnosed with PH. Mean age was 61 years and 76% were female with 11 patients diagnosed as dermatomyositis (DM) and 6 as polymyositis (PM). Mean pulmonary artery pressure (mPAP) was 41.2 mmHg with a pulmonary vascular resistance (PVR) of 730.7 dynes.cm.s⁻¹. Mean 6 minute walk test (6MWT) result was 215 meters and mean NTproBNP values were 176.5 pmol/L. On HRCT scan 70% of patients had evidence of extensive interstitial lung disease (ILD), 24% had limited fibrosis and 1 patient showed no prior evidence of ILD.

Eleven patients went on to receive vasodilator therapies. Of these, 9 underwent repeat RHC at 3–6 months. There was a trend towards improvement: mPAP fell from 40 to 34.2 mmHg (p = 0.10) and PVR fell from 704 to 375 dynes.s.cm⁻⁵ (p = 0.10).

In the 6MWT there was a mean increase of 65.9 meters from baseline to 3–6 months post therapy start date and this improvement was maintained with 3–6 months post treatment.

Amongst all 17 patients diagnosed with PH the overall median survival was 41.6 months. In the 12 patients with extensive ILD associated DM/PM the 1, 3 and 5 year survival rates were 75%, 42% and 28% respectively compared to 100%, 75% and 37% for the 5 patients with limited/no ILD (p = 0.09 for difference).

Conclusion: This analysis is the largest of its kind to assess hemodynamic characteristics and functional response to treatment in this rare group of patients. Patients with IMD who develop PH have shown an improvement in mPAP, PVR, 6MWT and NTproBNP although statistical significance was not reached.

There was no significant difference between outcomes in patients with or without extensive ILD and the survival rates in patients with extensive ILD were higher when compared to a similar group of patients in a regional scleroderma population. Given the young age of some of these patients and the poor prognosis it may be beneficial to consider them for lung transplantation at an early stage in their diagnosis. Despite the poor prognosis however, this observed response to treatment may buy time for pulmonary rehabilitation and the use of combination therapies in patients who are either not eligible or waiting for transplant.

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Abnormal Videofluoroscopy Swallow Study Finding in Inflammatory Myopathy Patient with Dysphagia As Predictor of Prognosis. Hye Won Kim, Hwang Kim, Sung Jae Chang, Hye Jin Oh, Myeong Jae Yoon, Bong Seung Ku, Byeong Mo Oh and Eun Young Lee. Seoul National University College of Medicine, Seoul, South Korea.

Background/Purpose: Previous reports of dysphagia in patients with inflammatory myopathy (IM) have been focused on detection, intervention and rehabilitation. However, whether dysphagia with abnormal videofluoroscopy swallow study (VFSS) findings is in relation to clinical manifestations and treatment response is not known. We hypothesized that clinical entities in IM patients with dysphagia would be distinct from non-dysphagia patients and abnormal VFSS finding could be a predictor of prognosis.

Methods: Total 236 patients with IM were reviewed in this study. Of them, the patients with dysphagia were evaluated with clinical functional scale, VFS scale, new VFSS scale, and American Speech-Language-Hearing Association National Outcome Measurement System swallowing scale. VFSS score was categorized into oral, pharyngeal and esophageal phase based on modified Logemann’s methods. Association between VFSS scale and serum creatinine kinase (CK), clinical findings, or treatment response were analyzed.

Results: Among 236 IM patients, 28 patients had IM related dysphagia (26 with dermatomyositis, 1 polymyositis and 1 inclusion body myositis). Ten male and 18 female with mean age of 42.7 were included. Dysphagia was a presenting symptom in 5 patients (17.9%) and rest of patients developed dysphagia in average 221 days later. The VFSS results showed more prevalent abnormalities in pharyngeal phase than oral phase (n = 26 vs n = 9).

Baseline CK level was higher in delayed laryngeal elevation and epiglottic closure (LEE) patients than in normal LEE patients (473.8 ± 415.6 mg/dl vs 3931.7 ± 5532.3 mg/dl, p = 0.008) (Figure). There was no correlation in total VFSS score with baseline CK level. Intravenous immunoglobulin were significantly more prescribed in delayed LEE patients than in normal LEE patients (OR = 10.7, p = 0.047). Frequency of pulmonary involvement and malignancy were significantly different between patients with dysphagia and patients without dysphagia (7.1% vs 40.4%, p = 0.001, 35.7% vs 9.6%, p = 0.001, respectively) (Table 1).

Table 1. Comparison of clinical characteristics between IM patients with dysphagia versus without dysphagia

<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>Dysphagia (n=28)</th>
<th>Nondysphagia (n=208)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/female (n, %)</td>
<td>10/18 (35.7/64.3)</td>
<td>47/161 (22.6/77.4)</td>
<td>0.157</td>
</tr>
<tr>
<td>Age (mean ± SD)</td>
<td>42.7 ± 21.6</td>
<td>46.3 ± 14.5</td>
<td>0.244</td>
</tr>
<tr>
<td>DM/PM/IIBM (n, %)</td>
<td>26/1/3 (92.9/3/3.6)</td>
<td>156/51/3 (75.0/45.0)</td>
<td>0.013</td>
</tr>
<tr>
<td>Creatinine kinase</td>
<td>3869.8 ± 5916.3</td>
<td>1546.3 ± 3529.9</td>
<td>0.004</td>
</tr>
<tr>
<td>Interstitial lung disease (n, %)</td>
<td>2 (7.1)</td>
<td>84 (40.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Malignancy (n, %)</td>
<td>10 (35.7)</td>
<td>20 (9.6)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Conclusion: Abnormal VFSS findings in IM Patients with dysphagia were more prominent in pharyngeal phases than oral phases. Delayed LEE was associated with higher baseline CK level and use of intravenous immunoglobulin. IM patients with dysphagia showed lower pulmonary involvement and higher malignancy. These results indicate that dysphagia in IM is not only a localized symptom or disabling condition, but also a predictor of prognosis.

Disclosure: H. W. Kim, None; H. Kim, None; S. H. Chang, None; H. J. Oh, None; M. J. Yoon, None; B. S. Ku, None; B. M. Oh, None; E. Y. Lee, None.

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Clinical and Serological Associations of Malignancy in Adult Patients with Polymyositis and Dermatomyositis. Yuji Hosono, Ran Nakashima, Yoshitaka Imura, Naoichiro Yukawa, Hajime Yoshifuji, Motomu Hashimoto, Koichiro Ohnura, Takao Fuji and Tsuyoshi Mimori. Graduate School of Medicine, Kyoto University, Kyoto, Japan.

Background/Purpose: Polymyositis (PM) and dermatomyositis (DM) are systemic connective tissue disorders, which are often associated with internal malignancy. Several studies have reported the association between
autoantibodies (Abs) and clinical manifestations of the disease. In adult PM/DM, the association of malignancy with anti-p155/140 Ab is reported. However, background of association of malignancy in whole IIM patients is currently unclear. Here, we intended to analyze the clinical and serological associations of malignancy in adult IIM patients.

Methods: Clinical data and serum samples were collected from 207 adult Japanese patients with PM/DM (119 with DM and 88 with PM). Myositis-specific Abs were measured using the RNA immunoprecipitation assay (anti-ARS and anti-SRP) and immunoprecipitation with [35S] methionine-labelled HeLa cells (anti-p155/140 and anti-CADM-140).

Results: 30 patients (14.5%, 15 females and 15 males) had history of malignancies. 20 patients (66.7%) were DM and 10 patients were PM (33.3%). No certain common cancer types were recognized. In comparison with malignancy-negative patients, the average age at IIM onset was higher in malignancy-positive IIM patients (52.3 ± 59.6 years). Among malignancy-positive IIM patients, anti-p155/140 (N = 10, 33.3%) and anti-ARS (N = 13, 43.3%) predominated. 2 (6.7%) were anti-SRP-positive; 1 (3.3%) was anti-CADM140-positive, and other 3 (10%) patients were positive for unknown Ab that immunoprecipitated a 120kDa protein. Anti-p155/140 Abs were predominantly found among PM/DM patients associated with malignancy. Malignancies in PM/DM patients with anti-p155/140 Abs were higher than that of patients with other Abs (65.7% vs 56.6%).

Conclusion: Anti-p155/140 Abs and anti-ARS Abs were predominantly found among PM/DM patients associated with malignancy. Malignancies in PM/DM patients with anti-p155/140 were all diagnosed at the onset of DM, whereas the onset of malignancies in patients with anti-ARS did not coincide with myositis. These results suggest that different mechanisms may be present in the association of malignancy and myositis between the two autoantibody-positive patient groups. Screening of autoantibodies and work up of malignancy are recommended in advanced age patients with a new diagnosis of DM.

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Myositis-Associated Usual Interstitial Pneumonia Has Better Survival Than Idiopathic Pulmonary Fibrosis

Christine McBurney¹, Rohit Aggarwal¹, Kevin Gibson², Kathleen Lindell², Carl Fuhrman³, Diane Koontz⁴, Frank Schneider⁵, Naftali Kaminski⁶ and Chester V. Oddis³. ¹University of Pittsburgh, Pittsburgh, PA, ²University of Pittsburgh Medical Center, Pittsburgh, PA, ³University of Pittsburgh School of Medicine, Pittsburgh, PA, ⁴Pittsburgh, PA

Background/Purpose: Usual interstitial pneumonia associated with idiopathic pulmonary fibrosis (IPF-UIP) has a poor prognosis with a median survival of 3 years. It is unknown whether myositis-associated UAP (MA-UAP) has an improved survival compared to IPF-UIP patients (pts). Our objective was to compare the cumulative and pulmonary event-free survival between MA-UAP and IPF-UIP.

Methods: Adult MA-UAP and IPF-UIP pts were identified using prospective registries. Pts with myositis (PM/DM/overlap) or the antisynthetase syndrome and radiographic UIP on HRCT scan (verified by a thoracic radiologist) or a lung biopsy revealing UIP histology were included. IPF-UIP pts met ATS criteria and had UIP pathology. Death status and date were ascertained using the Social Security Death Index. Kaplan-Meier survival curves and the log rank test compared cumulative and pulmonary event free survival (event = transplant or death) between a) all MA-UAP and IPF-UIP pts, b) MA-UAP pts with biopsy proven UIP (n = 25) vs. IPF-UIP pts matched for age, gender and baseline FVC (±10%). Cox proportional hazards ratios compared overall and event free survival controlling for co-variates.

Results: IPF-UIP pts (n=81) had a mean age of 63 (±8.4), 73% male, 98% Caucasian, baseline FVC% 65 (±15.3) and DLCO% 47 (±17.3). The MA-UAP pts (n=43) had a mean age of 46 (±11.0), 35% male, 83% Caucasian, baseline FVC% 60 (±19.6) and DLCO% 47 (±18.3). Median cumulative and event free survival time from diagnosis in IPF vs. MA-UAP was 5.2/1.8 years vs. 16.1/10.8 years, respectively. The 5 and 10 year % unadjusted event-free (graph 1) and cumulative survival was significantly worse in IPF-UIP vs. MA-UAP (25/0 vs. 80/50 and 59/32 vs. 80/65) (p < 0.001). The hazard ratio (HR) of IPF-UIP vs. MA-UAP pts was 2.86 (95% CI 1.45–5.61) for cumulative and 5.0 (95% CI 2.8–8.7) (p < 0.001) for event-free survival. IPF-UIP event-free survival (but NOT cumulative survival) remained significantly worse than MA-UAP with a HR of 6.4 (95% CI 3.0–13.8) after controlling for age at ILD diagnosis, gender and baseline FVC%.

Conclusion: MA-UAP pts demonstrated a significant survival advantage over a matched IPF cohort, suggesting that despite similar histologic and radiographic findings at presentation, the prognosis of MA-UAP is superior to that of IPF-UIP. Thus, in pts with a radiographic or pathologic UIP picture, it is critical to distinguish those with an underlying autoimmune etiology as to their course and response to therapies may differ from pts with true IPF.

Disclosure: C. McBurney, None; R. Aggarwal, None; K. Gibson, Consultant: Boehringer-Ingelheim biomarker program, 5; K. Lindell, None; C. Fuhrman, None; D. Koontz, None; F. Schneider, None; N. Kaminski, None; C. V. Oddis, Genetech Advisory Board, 6.

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Proteomics Study of a Phase 1b Trial with an Anti-IFN-α Monoclonal Antibody Indicates Association of Soluble Interleukin 2 Receptor with Type 1 Interferon Activity in Patients with Dermatomyositis or Polymyositis

Xiang Guo, Brandon W. Higgins, Wei Zhu, Yihong Yao and Wendy White. MedImmune, LLC, Gaithersburg, MD

Background/Purpose: To evaluate downstream effects of an anti-IFN-α monoclonal antibody (mAb) in adult dermatomyositis (DM) and polymyositis (PM) patients using serum proteomics and gene expression profiling from patient blood and muscle samples.

Methods: A phase 1b randomized, double-blinded, placebo-controlled, multicenter clinical trial was conducted in adult patients with DM or PM. Whole blood, serum, and muscle specimens were procured both pre and 98 days post administration with an anti-IFN-α mAb, sifalimumab. Affymetrix whole genome arrays were used to measure transcript expression in whole blood and muscle, while a multiplex luminex immunoassay was used to measure serum levels of more than 130 proteins. Target modulation of type 1 IFN activity was measured using a 13 gene type 1 IFN gene signature in patients following administration with either sifalimumab or placebo.

Results: Serum levels of soluble interleukin-2 receptor (sIL-2R) were significantly higher at baseline in 19 DM and 18 PM patients showing an elevated blood type 1 IFN signature than in 6 DM and 5 PM patients without an elevated signature and 20 normal controls. Among patients with high baseline type 1 IFN gene signature, those expressing high levels of sIL-2R had significantly lower manual muscle testing (MMT8) scores at baseline, compared to patients with only a elevated baseline type 1 IFN gene signature. Following administration with sifalimumab, whole genome transcript profiling identified...
the IL2 signaling pathway as among the top ten most suppressed pathway, along with several T cell-related signaling pathways. This result was not identified in placebo-dosed patients. Sifalimumab also down-regulated sIL-2R levels by more than 30% in 3 DM and 4 PM patients, with no significant change in 11 placebo dosed patients. Further, patients showing strong sIL-2R down-regulation post dosing of sifalimumab, also exhibited suppression of the type I IFN gene signature (target suppression > 80% in the blood).

Conclusion: Our results demonstrate that sIL-2R levels in the serum of myositis patients, in combination with a blood type I IFN gene signature, may correlate with disease activity in a patient subset better than a type I IFN gene signature alone. Sifalimumab down-regulated serum sIL-2R levels in a subset of myositis patients that also showed strong suppression of the type I IFN gene signature in blood. These results suggest the possibility to combine sIL-2R and type I IFN gene signature as a prognostic marker for myositis patients.

Disclosure: X. Guo, AstraZeneca, 1, MedImmune, 3; B. W. Higgs, AstraZeneca, 1, MedImmune, 3; W. Zhu, AstraZeneca, 1, MedImmune, 3; Y. Yao, AstraZeneca, 1, MedImmune, 3; W. White, AstraZeneca, 1, MedImmune, 3.

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Significant Functional Improvement Using Aggressive Immunomodulatory Therapy in Patients with Inflammatory Myopathy and Interstitial Lung Disease. Ramona Mihu1, Roger D. Rossen2, Jovan Popovich2 and Sandra L. Sessions2. 1Baylor College of Medicine, Houston, TX, 2The Methodist Hospital, Houston, TX

Background/Purpose: Pulmonary disease in patients with idiopathic inflammatory myopathies, polymyositis (PM), dermatomyositis (DM), and clinically amyopathic dermatomyositis (CADM) is a major cause of morbidity. Approximately 35–40% of patients with PM/DM/CADM develop interstitial lung disease (ILD) during the course of their illness. Mortality ranges from 45–71% in those with ILD. Treatment of ILD in patients with inflammatory myopathies remains a challenge. In the absence of evidence-based data from randomized control trials, corticosteroids are regarded as the mainstay of therapy, although their effect is variable.

Methods: We retrospectively evaluated 62 patients with idiopathic inflammatory myopathies treated during the past ten years.

Results: Of the 62 patients reviewed, 22 developed ILD with varying degrees of functional impairment; 11 of the 22 had PM, 8 had DM and 3 had CADM. Three eventually died of causes unrelated to their lung disease. Pulmonary disease severity was judged by measuring blood oxygen saturation, dyspnea and tachypnea at rest, and following exercise, radiographic evidence of pulmonary infiltration and signs of pulmonary restriction and impaired diffusion capacity by pulmonary function testing. Patients were followed for at least 24 months, with an average length of follow up of 121 months. All ILD patients received combination therapy with an average number of 3 immune modulating agents plus corticosteroids. Four out of the 7 patients with severe ILD received concomitant combination therapy with IVIG, cyclophosphamide and cyclosporine for up to 6 months; 7 other moderate to severely affected patients received IVIG plus cyclosporine in addition to corticosteroids. Patients’ functional capacity before and after treatment was evaluated according to the NYHA criteria developed for the assessment of patients with heart failure. The table (below) demonstrates that immunomodulatory therapy resulted in a statistically significant improvement, (Chi Square = 10.3, DF = 3 p < 0.02). One patient developed Candida pneumonia and 3 who were treated with cyclosporine and other agents had reversible declines in renal function during therapy. Four patients developed Herpes Zoster during the follow up period, but long after the aggressive immunomodulatory therapy was finished. Treatment was otherwise well tolerated.

Conclusion: Our results support the early use of aggressive immunomodulatory therapy with a combination of agents designed to interfere with T cell recruitment, activation and replication in patients with idiopathic inflammatory myopathies and ILD.

Disclosure: R. Mihu, None; R. D. Rossen, None; J. Popovich, None; S. L. Sessions, None.

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Efficacy of Rituximab for the Treatment of Refractory Inflammatory Myopathies Associated with Anti-Histidyl-tRNA Synthetase Antibodies (the FORCE Jo1 Study). Yves Allenbach1, Aude Rigolet1, Marguerite Guesdon2, Isabelle Marie3, Eric Hauw4, Dominique Farge5, Kubrakka Mariampillai6, Serge Jacquot7, Fabienne Jouen8, Olivier Boyer9, Lucile Musset10, Serge Herson11 and Olivier Benveniste1. 1Pitié-Salpêtrière Hospital, Paris, France, 2Paris, France, 3Service de médecine interne, CHU de Rouen, Rouen, France, 4Department of Internal Medicine, Claude Huriez Hospital, University of Lille, Lille CEDEX, France, 5EBMT, Paris, France, 6INSERM U905, Université de Rouen, Rouen, France, 7Rouen University Hospital, Rouen Cedex, France, 8INSERM U905, Université de Rouen, Rouen, France

Background/Purpose: anti-histidyl-tRNA synthetase (anti-Jo1) antibodies are found in approximately 25–30% of patients with idiopathic inflammatory myopathies, frequently in the frame of an anti-synthetase syndrome characterized (in addition to the myositis) by the association of interstitial lung disease (ILD, one of the main prognostic factors), arthritis, Raynaud’s phenomenon and mechanic’s hand syndrome. These manifestations have high dose corticosteroids in association with an immunosuppressant. Nevertheless, some patients remain refractory. We tested the efficacy of rituximab in this situation.

Methods: we conducted a prospective, multicenter, open, phase II study (ClinicalTrials.gov: NCT00774462) of rituximab (1g at day 0 (D0), 15 and month 6). Inclusion criteria were myositis as defined by the 119th ENMC workshop (Hoogendijk JE, et al. Neuromuscul Disord 2004;14:337–45) with anti-Jo1 antibodies, refractory to conventional treatments (i.e. failure, lack of efficacy or major side effects of prednisone and at least two immunosuppressants, leading the physician to a DMARD decision). Endpoints were evaluated at month 12 (M12).

Results: 12 patients were enrolled (8 men, median (IQR) age 50 (32 to 59)). The delay between diagnosis/first treatment and inclusion was 23 months (12 to 45). Patients already received in average 3 lines of treatments (2 to 4). Associated treatments with rituximab were prednisone (n=12), methotrexate (n=1), azathioprine (n=6), intravenous immunoglobulins (n=4), mycophenolate mofetil (n=2) and cyclophosphamide (n=1). Eleven patients completed the study and one was lost of follow-up after 3 weeks. No particular side effects due to rituximab were observed.

Muscle weakness evaluated by the manual testing (Kendall’s test on 10 muscles) was 94.5 (range 75 to 100) at D0. Only 1 patient had normal strength (100) at D0, and 6 patients at M12. Median creatine kinase (CK) was 1331 UI (range 32 to 11718) at D0. Only 1 patient had normal CK level (< 190 U/l) at D0, and 9 patients at M12. Effort dyspnea was noticed in 7/12 patients at D0 and 4/11 at M12. At DO, pulmonary tests showed, median FVC: 72% (46 to 117), FEV1: 69% (46 to 104) and DLCO/VA ratio: 73 (43 to 127). At M12, on the 6 patients who completed functional respiratory tests, 3 presented an increase by more than 10% of their FVC, FEV1 or DLCO/VA. Abnormalities were observed in 9/12 patients at D0 vs. 4/11 at M12. Anti-Jo1 antibody titers remained stable over time, with no seronegatization. Finally, at M12 on 11 patients, the burden of associated treatments was unchanged (n=1) or even increased (n=4) in 5 patients but was slimmed-down for 6 patients.

Conclusion: in the difficult situation of long past history of refractory anti-synthetase syndrome with anti-Jo1 antibodies, rituximab seems effective in 50% of the cases permitting an important reduction of immunosuppressants. This effect is observed on muscle strength, ILD and arthritis. Rituximab should now be evaluated in a phase III trials in this homogenous group of patients.

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Expanding the Clinical and Serological Spectrum of MDA5-Associated Dermatomyositis. John C. Hall1, Livia Casciola Rosen1, Sonye K. Danoff2, Lesly-Anne Samedy1 and Lisa Christopher-Stine1. 1Johns Hopkins University, Baltimore, MD, 2Johns Hopkins School of Medicine, Baltimore, MD

Background/Purpose: Dermatomyositis (DM) is a heterogeneous systemic disease with specific autoantibodies (Abs) which correlate with unique clinical phenotypes.Melanoma differentiation-associated gene 5 (MDA5) Abs have been described in several Japanese DM patient cohorts and one US DM cohort) in conjunction with amyopathic DM and rapidly progressive interstitial lung disease (ILD). Given the widening spectrum of associated clinical findings, we sought to determine prevalence of Abs to MDA5, associated clinical findings and whether Ab titers correlated with clinical course in a longitudinal cohort of myositis patients.

Methods: This is a retrospective case series review of clinical and serologic features of eleven DM patients with MDA5 Abs who were evaluated at the JHU Myositis Center. In addition, six MDA5+ patients with longitudinal data and banked serologic samples were evaluated for clinical correlations (MRC scale strength, cutaneous features, arthritis, ILD) with Ab titers.

Results: All patients were evaluated as part of routine clinical care between 2006 and 2012. Informed consent was obtained, and 165 consecutive DM patients (for whom banked serum samples were available) were tested for the presence of MDA5 Abs. Patient sera were screened for autoantibodies by immunoprecipitation (IP) of in vitro transcribed/translated (IVTT), radiolabeled MDA5. When multiple serum samples were available from the same patient, IPs were performed simultaneously and run on the same gel for comparison. Patient sera were further screened for antibodies against Jo-1 and Ro52 by ELISA, and Mi-2 and NXP2 by IP of IVTT generated protein.

Results: MDA5 was targeted in 11/165 (6.7%) patients with DM. In our cohort of 11 MDA5+ patients, 82% (9/11) presented with a symmetric polyarthropathy; 5% (5/11) demonstrated overt clinical myopathy; and only 64% (7/11) had ILD. The majority of ILD stabilized with immunosuppression. Only two patients had progressive ILD, and both were anti-Ro52 positive. All MDA5+ positive patients remained Ab positive over the entire course of follow-up. Longitudinal MDA5 antibody titers were assessed in 6 patients; with the exception of one patient, titers did not vary significantly over time, nor did they track with clinical course. Jo-1 was negative in all MDA5+ patients, while anti-Ro52, frequently found in Jo-1 positive patients, was present in 7 of 11.

Conclusion: This report adds to our growing understanding of the expanding phenotype of MDA5+ DM. The MDA 5 phenotype can overlap with the antisynthetase syndrome (e.g. mechanics hands, myositis, fever and ILD); however autoantibodies to Jo-1 were not found concomitantly. Many patients presented initially with an inflammatory arthritis that looked clinically similar to RA, and many patients had an overt myopathy. While MDA5 autoantibodies remained positive throughout disease course and relative titer did not correlate with clinical course, even patients with a relatively fulminant clinical course of disease with regard to ILD, myositis, cutaneous disease, and arthritis were often able to attain sustained clinical remission, in some cases even after discontinuation of immunosuppression.

Disclosure: J. C. Hall, None; L. Casciola Rosen, None; S. K. Danoff, None; L. A. Samedy, None; L. Christopher-Stine, None.

Lung Nodules in Patients with Idiopathic Inflammatory Myopathies. Laura C. Cappelli1, Andrew L. Mammen,2, Sonye K. Danoff,1 Grant H. Louie1, Thomas E. Lloyd,2 and Lisa Christopher-Stine1. 1Johns Hopkins University, Baltimore, MD, 2Johns Hopkins School of Medicine, Baltimore, MD

Background/Purpose: The idiopathic inflammatory myopathies are associated with an increased incidence of malignancy, and interstitial lung disease (ILD) has been reported in as many as 20–78% of patients with polymyositis and dermatomyositis when followed from diagnosis. As a result of these associations, patients often receive CT scans of the chest where lung nodules are incidentally discovered. The radiographic nature of these lung nodules and whether they tend to increase in size, regress, or remain stable in size has not been described. The aim of this study was to define the prevalence of lung nodules in patients with inflammatory myopathies in a large clinical cohort evaluated at a Myositis Center, the clinical features associated with the presence of lung nodules, and whether the nodules changed in size over time.

Methods: Data was obtained from the cohort of 976 patients referred to the Myositis Center at Johns Hopkins. Only patients with confirmed inflammatory myopathies and at least one chest CT scan performed at our Center for clinical purposes were included in the study. For patients with more than one CT, all CTs were reviewed. The presence of interstitial lung disease was defined by decreased total lung capacity (TLC) or diffusing capacity (DLCO) on pulmonary function testing and/or presence of ground glass opacities on chest CT.

Results: 298 of the 976 patients had at least one chest CT performed at our Center. The prevalence of lung nodules in these patients was 25.5% (76/298). Only 5 patients had a nodule > 10 mm, and in those patients with follow up CTs, none of these nodules increased in size. Interstitial lung disease was present in 34.9% of the total cohort. The prevalence of nodules was not significantly different in those who had interstitial lung disease and those who did not (26.9% and 24.7% respectively, p = 0.68). Of the 76 patients with lung nodules, 39.4% (30/76) had a follow-up chest CT. The interval for follow-up was variable and ranged from 3 to 19 months. On subsequent CTs, none of the nodules had progressed in size by more than 2 cm and 51.6% (16/31) had regressed entirely.

Conclusion: Lung nodules are frequently observed in patients with inflammatory myopathies, but not greatly increased in prevalence over healthy adults where they are reported in 18% of patients. Lung nodules were no more common in patients with ILD than those patients without ILD. The lung nodules do not likely represent malignancy as they do not progress when followed over time. In fact, about half of patients had regression of the nodules,

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High Prevalence and Clustering Over Time of Anti-PL-7 Autoantibody-Positive Idiopathic Inflammatory Myopathies. Yoshioki Yamasaki1, Michorui Satoh2, Hidehiro Yamada1, Machiko Mizushima1, Takahiro Okazaki3, Hiroko Nagafuchi1, Seido Ooka1, Tomohiko Shibata1, Hirotsuka Nakano1, Hitoshi Ogawa1, Kohei Azuma1, Akihiko Maeda1, Hirofumi Mitomi1, Tomofumi Kiyokawa1, Kosei Tsuchida1, Hidenori Mikage1, Jason Y.F. Chan1 and Shoichi Ozaki4. 1St. Marianna University School of Medicine, Kawasaki, Japan, 2University of Florida, Gainesville, FL

Background/Purpose: Unusually high prevalence of autoantibodies to threonyl tRNA synthetase (PL-7) [17% in polymyositis/dermatomyositis (PM/DM) associated with lower levels of serum creatine kinase (CK) and milder muscle weakness (vs. anti-Jo-1 positive patients)] was found in our study 8 years ago. We extended and analyzed a larger population of patients with PM/DM to further clarify the clinical characteristics of patients with anti-PL-7 antibodies.

Methods: The diagnosis of PM/DM and clinically amyopathic DM (cADM) was based on the Bohan and Peter criteria and modified Sontheimer’s criteria, respectively. Autoantibodies in sera from 97 Japanese patients with PM/DM (36PM/57DM/4cADM) were characterized by immunoprecipitation of K562 cell extract. Antibodies to Jo-1, melanoma differentiation-associated gene (MDA) 5, and Mi-2 were also tested by ELISA. Clinical and laboratory data were retrospectively collected.

Results: The prevalence of autoantibodies to aminoacyl tRNA synthetases (ARS) such as histidyl (Jo-1) (22%), glycyl (EJ) (4%), iso/eucyl (OJ) (1%), and alanyl tRNA synthetase (PL-12) (1%), and autoantibodies to Ku (7%), p155/140 (5%), SRP (4%), and Mi-2 (3%) was similar to other studies. However, prevalence of anti-PL-7 was unusually high (12%, 12/97) in contrast to other studies showing a prevalence of up to 4% (p <0.05 by Fisher exact test) consistent with our previous report. Notably, disease onset of patients with anti-PL-7 was either before 1993 or after 2002 and none between 1994–2001 whereas onset years of patients with anti-Jo-1 was distributed throughout (Table 1).

Table 1. Prevalence of autoantibodies to PL-7 and Jo-1 according to year of onset.

<table>
<thead>
<tr>
<th>Year</th>
<th>90–93</th>
<th>94–97</th>
<th>98–01</th>
<th>02–05</th>
<th>06–09</th>
<th>10–12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-PL-7 (%)</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Anti-Jo-1 (%)</td>
<td>17</td>
<td>60</td>
<td>23</td>
<td>11</td>
<td>23</td>
<td>20</td>
</tr>
</tbody>
</table>

Intersitial lung disease (ILD) was common in all anti-ARS-positive patients. Manual muscle testing (MMT) (total score of 90) <80 was only in
10% of anti-PL-7 group vs. 35% in anti-Jo-1 group, CK >3000 IU/L was 17% in anti-PL-7 vs. 57% in anti-Jo-1 (p = 0.05 by Fisher exact test) (Table 2).

Table 2. Frequency of ILD and severity of muscle involvement in patients with anti-ARS antibodies (vs. patients with no anti-ARS antibodies).

<table>
<thead>
<tr>
<th>Autoantibodies</th>
<th>ILD (%)</th>
<th>PL-7 (%)</th>
<th>EM (%)</th>
<th>Jo-1 (%)</th>
<th>ARS (%) (a)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBD (max 90)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>35</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td></td>
</tr>
<tr>
<td>MMT (SD)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td></td>
</tr>
<tr>
<td>特长 (max 90)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td></td>
</tr>
<tr>
<td>Serum CK IU/l</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td>85 (%)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Persistently high prevalence of anti-PL-7 antibodies was observed in this cohort, however, there was a 10 year period when anti-PL-7 was not observed, suggesting roles of environmental factors. Muscle involve-ment was milder in patients with anti-PL-7 and EM vs. anti-Jo-1.

Disclosure: Y. Yamasaki, None; T. Kiyokawa, None; H. Ogawa, None; K. Tsuchida, None; M. Satoh, None; T. Shibata, None; H. Nakano, None; H. Ogawa, None; K. Azuma, None; A. Maeda, None; H. Mitomi, None; T. Kiyokawa, None; K. Tsuchida, None; H. Mikage, None; J. Y. F. Chan, None; S. Ozaki, None.

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Standardized Incidence Ratios and Predictors of Malignancies in 215 Southern Chinese Patients with Inflammatory Myopathies. Chi Chiou Southern Chinese Patients with Inflammatory Myopathies. Standardized Incidence Ratios and Predictors of Malignancies in 215

Background/ Purpose: To examine the standardized incidence ratios (SIRs) and predictive factors for malignancy in a cohort of southern Chinese patients with inflammatory myopathies (IM).

Methods: Patients with polymyositis (PM), dermatomyositis (DM) or amyotrophic dermatomyositis (ADM) diagnosed between 2000 and 2010 in the three regional hospitals were studied. Diagnosis was made according to the Peter and Bohan criteria. Demographic data, clinical presentation, time of diagnosis of malignancies since diagnosis and the nature of malignancies were retrieved. Patients with malignancies diagnosed more than 1 year before the onset of IM was excluded. The age- and sex-adjusted standardized incidence ratios (SIRs) of malignancies in comparison to those of the general population obtained from the cancer registry of Hong Kong within the same study period were calculated. Demographic data, types of IM (DM vs ADM vs PM), creatine kinase (CK), presence of concomitant rheumatic diseases, extra-muscular manifestations were analyzed as predictors for malignancy in Cox regression models.

Results: 215 patients (65% women) with IM were studied (125 DM, 75 PM, 15 ADM) with a mean follow-up of 4.7±4.6 years. The mean age of disease onset was 51.5±16.3 years. Concomitant rheumatic diseases were diagnosed in 39 (18.1%) patients. 52 patients (24.2%) (44 DM, 6 PM, 1 ADM) were diagnosed to have malignancies. 13 (25%) and 14 (26.9%) malignancies, respectively, were identified within the preceding 1 year and at the same time of IM diagnosis. The mean time interval between the diagnoses of IM and malignancies was 1.29±1.56 years. The age- and sex-adjusted SIRs for malignancies for DM and PM were 3.9 [2.8–5.5] and 1.1 [0.9–2.6], respectively. The most frequently associated malignancies were: nasopharyngeal cancer 21 (40%), gastrointestinal cancer 10 (19%), lung cancer 10 (19%), breast cancer 4 (7.6%), cervical cancer 3 (5.7%), and the corresponding age- and sex-adjusted SIRs were 26.8 [16.5–41.5], 1.3[0.7–2.5], 1.8[0.9–3.5], 1.9[0.7–5.2], 8.4[2.6–26.5], respectively. On univariate analysis, the age at IM diagnosis (HR 1.03[1.02–1.05]), male gender (HR 3.38[1.95–7.74]), history of smoking (HR 3.65[1.95–7.65]), the diagnosis of DM (HR 3.37[1.8–8.14]), oropharyngeal muscle involvement (HR 2.55[1.28–5.07]) were associated with malignancies whereas the presence of concomitant rheumatic diseases (HR 0.23[0.05–0.95]), presence of intestinal lung disease (HR 0.37[0.16–0.85]) and use of azathioprine (HR 0.35[0.18–0.68]) were protective. Cox regression analysis revealed that a history of smoking (HR 2.7[1.1–6.56]), and oropharyngeal muscle involvement (HR 2.65[1.22–5.75]) were independently associated with malignancies.

Conclusion: DM, but not PM, was associated with an increased risk of malignancies compared to general population. DM patients in southern Chinese were particularly at risk of carcinoma of nasopharynx, lung and cervix.

Disclosure: C. C. Mok, None; C. H. To, None; M. Yip, None; K. Y. Ying, None.

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Polymyositis in HIV+ Patients Is Associated to Uncontrolled Viral Load. Yves Allenbach1, Odile Dubourg2, Thierry Maisonneuve3, Anthony Behin3, Charles Duycyaerts1, Guillaume Breton1, Olivier Fain1, Marie-Charlotte Meyhoys1, Catherine Lepot2, Marc-Antoine Valentim3, Daniel Vittecoq1, Jean-François Bergmann4, Thomas Anslik5, Marie-Paule Chaudeheid6, Zahir Amoura1, Thomas de Braucker1, Pierre Bourgeois6, Bruno Eymard6, Serge Henniquart1 and Olivier Benveniste1. 1Pôle Médicine, Lariboisiere Hospital, Paris, France, 3Service de médecine interne, Université Paris 13, AP-HP, Hôpital Jean Verdier, 93140, Bondy, France, Bondy, France, 4Service of Infectious Diseases, Saint-Antoine Hospital, Paris, France, 5Service of Infectious Diseases, Hotel-Dieu Hospital, Paris, France, 6Department of Infectious Diseases, Peter and Bohan criteria. Demographic data, types of IM (DM vs ADM vs PM), creatine kinase (CK), presence of concomitant rheumatic diseases, extra-muscular manifestations were analyzed as predictors for malignancy in Cox regression models.

Results: During the studied period, 2880 muscle biopsies were performed. Fifty biopsies (1.7%) were realised in 45 HIV+ patients (mean age: 50.1 years [39–61.2]).

Among the 50 biopsies, 43 were abnormal. The most frequently observed myopathy was polymyositis (60%). Among pathologically diagnosed polymyositis during this period of time (n=161), 23 (14%) were diagnosed in HIV+ patients. After polymyositis, mitochondrial abnormalities were the most frequently observed lesions (54%, myositis and mitochondrial abnormalities beeing observed concomitantly in some patients). Five cases (13%) of inclusion body myositis were also pathologically diagnosed.

Compared to a cohort of 50 anti-synthetase syndrome patients (with anti-Jo1 Abs), HIV polymyositis patients had a less severe weakness (MRC manual testing ≥ 4/5 ≤ 83% in HIV+ vs. 54% for Jo1+ patients p<0.05) and lower CK levels (1677 vs. 4975 IU/L, p<0.05). Muscle weakness disappeared within six months after steroid treatments and/or highly active antiretroviral therapy introduction or modification. HIV viral load was detectable (125:166±21.295 copies/ml) for 80% of polymyositis patients whereas it was undetectable for all patients with isolated mitochondrial abnormalities (p<0.01). For the 7 patients with isolated mitochondrial abnormalities (suggesting mitochondrial toxicity), nucleoside-analogue reverse-transcriptase inhibitors were stopped for another highly active antiretroviral therapy combination, in the frame of an interventional study (the Myotoc trial). Two years latter, no significant change concerning either muscular symptoms, CK level or pathological features of mitochondrial abnormalities were observed after this intervention.

Conclusion: This retrospective study showed that polymyositis is the most frequent HIV associated myopathy, and suggested that a HIV test must be proposed to every patient presenting a polymyositis. Polymyositis in HIV patients seemed not severe, and is associated with uncontrolled HIV replication. HIV patients with isolated mitochondrialopathy did not improve after nucleoside-analogue reverse-transcriptase inhibitors withdrawal.

Disclosure: Y. Allenbach, None; O. Dubourg, None; T. Maisonnebe, None; A. Behin, None; C. Duycyaerts, None; G. Breton, None; O. Fain, None; M. C. Meyhoys, None; C. Lepot, None; M. A. Valentim, None; D. Vittecoq, None; J. F. Bergmann, None; T. Anslik, None; M. P. Chaudeheid, None; Z. Amoura, None; T. de Braucker, None; P. Bourgeois, None; B. Eymard, None; S. Herson, None; O. Benveniste, None.
Autoantibodies to Small Ubiquitin-Like Modifier Activating Enzymes in Japanese Patients with Dermatomyositis. Manabu Fujimoto, Takashi Matsushita, Yasuhito Hamaguchi, Kenzo Kaji, Minoru Hasegawa and Kazuhiro Takehara. Kanazawa University Graduate School of Medical Sciences, Kanazawa, Japan

Background/Purpose: Myositis-specific autoantibodies (MSAs) are closely associated with distinct clinical subsets within idiopathic inflammatory myopathies, and thus serve as useful diagnostic tools. Recently, anti-small ubiquitin-like modifier activating enzyme (SAE) autoantibody has been reported as a novel MSA in dermatomyositis (DM) patients. In this study, we detected this autoantibody in a Japanese DM cohort and assessed its clinical correlations.

Methods: In this study, 456 consecutive Japanese patients with DM (11 children, 455 adults) including 373 with classic DM and 83 with clinically amyopathic DM (CADM) were examined. Controls included 62 patients with polymyositis, 108 with systemic lupus erythematosus, 433 with systemic sclerosis, and 124 with interstitial lung disease (ILD) alone. Autoantibodies were detected by immunoprecipitation assays using 35S-methionine-labeled or unlabeled K562 cell extracts and western blotting using anti-SAE1/2 antibodies.

Results: Sera from 7 (1.5%) DM patients immunoprecipitated 90 and 40 kDa proteins, and were confirmed to react with SAE by western blotting. One patient had juvenile DM, while the other 6 had adult DM (median age of onset, 67 years). None of the control sera had this antibody. Heliotrope rash, Gottron papules, perungual lesions, V signs, and Shawl signs were observed in 57%, 86%, 100%, 57%, and 86%, respectively. Consistent with a UK cohort study, skin manifestations preceded muscle involvement in 86% patients with anti-SAE antibodies. Systemic features were present in 57% of patients incurring 2 patients with severe dysphagia. In addition, chronic ILD was substantially higher in anti-SAE-positive DM patients (71%) than those negative (34%).

Conclusion: Consistent with the UK cohort study, this study confirmed that anti-SAE antibody is specific for DM and that anti-SAE antibody characteristically occur in patients who present with CADM first and then progress to develop myositis with a high frequency of systemic features, including dysphagia. Our study also revealed a high frequency of ILD in Japanese DM patients with anti-SAE antibody.


Disclosure: M. Fujimoto, None; T. Matsushita, None; Y. Hamaguchi, None; K. Kaji, None; M. Hasegawa, None; K. Takehara, None.

Long Term Outcome of Interstitial Lung Disease in Idiopathic Inflammatory Myopathies and Amyopathic Dermatomyositis. Machiko Mizushima1, Hidehiro Yamada1, Yoshihiko Yamasaki1, Masaumi Yamasaki1, Minoru Satoh1 and Shoichi Ozaki2. 1St. Marianna University School of Medicine, Kawasaki, Japan, 2St. Marianna University, Kawasaki, Japan

Background/Purpose: The aim of this study was to assess the long term clinical course and outcome of interstitial lung disease (ILD) in polymyositis/dermatomyositis (PM/DM) and to determine predictive factors for the outcome of PM/DM-associated ILD.

Methods: Among 228 patients with IIM and clinically amyopathic dermatomyositis (cADM), 140 patients with ILD were identified by medical records search at our hospital. Pulmonary high-resolution computed tomography (HRCT) scan was available in 93 patients and their clinical features were analyzed.

Results: Mean follow up period (SD) of the 93 patients was 68 (55) months. Clinical course of ILD was monophasic resolution in 24 patients (25.8%), chronic stable in 30 (32.3%), relapsing in 32 (34.4%) and fatal progressive within one year in 7 (7.5%) (Table 1). Univariate analysis indicated older age (p = 0.044), dermatomyositis (p = 0.0393), cough (p = 0.0167), perungual erythema (p = 0.0123), lower values of aldolase (p = 0.047) and AST (p = 0.031) were associated with the fatal ILD. Female (p = 0.0045), concurrent malignancy (p = 0.0037), and the absence of anti-aminocarboxy-RNA synthetase (ARS) antibodies (p = 0.0292) were associated with the monophasic resolving ILD. Overall 5-years survival rate of PM/DM-associated ILD was 84%. anti-ARS antibodies positivity was associated with chronic & relapsing course of ILD. HRCT findings and its extension were not associated with the clinical course.

Table 1. Clinical characteristics in cADM/PM/DM patients according to clinical course of ILD.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Resolved (n=24)</th>
<th>Chronic stable (n=30)</th>
<th>Chronic relapsing (n=32)</th>
<th>Fatal (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>91.7</td>
<td>63.3</td>
<td>50.0</td>
<td>85.7</td>
</tr>
<tr>
<td>at onset of ILD (SD)</td>
<td>54 (12)</td>
<td>51 (15)</td>
<td>49 (10)</td>
<td>60 (7)</td>
</tr>
<tr>
<td>cADM/DM/PM (%)</td>
<td>12.5/6.2/5.5</td>
<td>10/50/40</td>
<td>6.5/9.3/4.4</td>
<td>0/0/0</td>
</tr>
<tr>
<td>perungual erythema (%)</td>
<td>58.3</td>
<td>46.7</td>
<td>37.5</td>
<td>100</td>
</tr>
<tr>
<td>malignancy (%)</td>
<td>33.3</td>
<td>6.7</td>
<td>6.3</td>
<td>14.3</td>
</tr>
<tr>
<td>anti-ARS antibody positive (%)</td>
<td>20.8</td>
<td>50</td>
<td>56.3</td>
<td>0</td>
</tr>
<tr>
<td>CK (SD)</td>
<td>899.7 (1233)</td>
<td>2063.6 (3779)</td>
<td>2314 (2129)</td>
<td>552.6 (414)</td>
</tr>
<tr>
<td>aldolase (SD)</td>
<td>17.6 (22)</td>
<td>48.3 (178)</td>
<td>50.2 (49)</td>
<td>7 (1)</td>
</tr>
<tr>
<td>%VC (SD)</td>
<td>77.1 (15)</td>
<td>86.1 (21)</td>
<td>73.2 (15)</td>
<td>79.1 (20)</td>
</tr>
<tr>
<td>avlocor to arterial PO2 (SD)</td>
<td>30.1 (41.5)</td>
<td>29.4 (31.2)</td>
<td>50.8 (27.1)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Patients with IIM-associated ILD presenting with predictive factors for poor outcome may require more aggressive therapy.

Disclosure: M. Mizushima, None; H. Yamada, None; Y. Yamasaki, None; M. Yamashiki, None; M. Satoh, None; S. Ozaki, None.

Simultaneous Initiating of Glucocorticoids and disease-Modifying Anti-rheumatic Drug Therapy in Polymyositis and Dermatomyositis Patients Results in the Opportunity to Taper Dosage of Glucocorticoids Early. Kavish J. Bhansing1, Piet LCM Van Riel1, Sigrid Pillen2, Baziel G.M. van Engelen1 and Madelon C. Vonk1. 1Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 2Catharina Wilhemina Hospital, Nijmegen, Netherlands

Background/Purpose: Glucocorticoids are the cornerstone of therapy in patients with polymyositis (PM) and dermatomyositis (DM). However, side effects are common. Furthermore, glucocorticoids exhibit an potential inhibitory effects on skeletal muscle regeneration. Therefore disease-modifying antirheumatic drugs (DMARDs) are used as glucocorticoids sparing agents. To date limited studies are available in which the glucocorticoids sparing effects of DMARDs are evaluated. The aim of this study is to analyze whether an early start of DMARDs in patients with PM or DM leads to the opportunity to taper dosage of glucocorticoids early.

Methods: All available patients with PM and DM of the Nijmegen Myositis inception cohort which was started in 2009 were included. The data available of this cohort consist of clinical features at diagnosis combined with follow up information on treatment and complications. All patient fulfilled the Bohan and Peter diagnostic criteria.

Early start of DMARD was defined as start of methotrexate, azathioprine, hydrochloroquine, mycophenolate, tacrolimus or sulfasalazine within 3 months after diagnosis. Dosage of less than 15 mg of prednisone was regarded as clinical relevant tapering. Two subgroups (early DMARD and non-early DMARD) were compared to analyze for time to reach the dosage of 15 mg prednisone with a follow-up of 1 year using a multivariate cox proportional hazards model.

Results: In the early DMARD starters group 36 patients were included and 25 patients as non-early DMARD starters. The mean age in early DMARD starters was 46 (SD 17) and 37 years (SD 17) in the non-early DMARD starters group. Clinical features and serology revealed no significant differences (Table 1).
Table 1. Study population characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Early DMARD starters (n = 36)</th>
<th>Non-early DMARD starters (n = 25)</th>
<th>Significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean±SD (years)</td>
<td>46 ± 17</td>
<td>38 ± 17</td>
<td>NS</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>15/21</td>
<td>7/18</td>
<td>NS</td>
</tr>
<tr>
<td>Type of myositis (PM/DM)</td>
<td>23/13</td>
<td>15/10</td>
<td>NS</td>
</tr>
<tr>
<td>Serum CK at diagnosis, median (Units/liter)</td>
<td>2467 (386–7370)</td>
<td>1523 (400–7275)</td>
<td>NS</td>
</tr>
<tr>
<td>ANA</td>
<td>21/32 (66%)</td>
<td>19/24 (79.2%)</td>
<td>NS</td>
</tr>
<tr>
<td>Anti-SSA</td>
<td>10/30 (33%)</td>
<td>8/24 (33%)</td>
<td>NS</td>
</tr>
<tr>
<td>Anti-SSB</td>
<td>1/33 (3%)</td>
<td>1/24 (4%)</td>
<td>NS</td>
</tr>
<tr>
<td>Anti-Jo1</td>
<td>9/33 (27%)</td>
<td>9/24 (38%)</td>
<td>NS</td>
</tr>
<tr>
<td>Intermittent lung disease*</td>
<td>8/36 (22%)</td>
<td>4/25 (16%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

*Intermittent lung disease, defined as fibrosis on HRCT-scan or < 70% vital capacity on pulmonary function within 1 year after diagnosis; NS: not significant

In a Cox regression analysis, early start of DMARD therapy was found to be an independent predictor of tapering dosage of prednisone to less than 15mg (hazard ratio, 2.3; 95% CI, 1.1–4.8; p = 0.03) (fig.1).

Conclusion: Simultaneous start of DMARD therapy with glucocorticoids leads to the opportunity to taper glucocorticoids to clinical significant lower dosages within 1 year after diagnosis in patients with PM and DM compared to adding DMARDs later or glucocorticoids alone in the course of the disease.

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1Royal National Hospital for Rheumatic Diseases, Bath, United Kingdom, 2North Bristol NHS Trust, Bristol, United Kingdom, 3University College London (UCL), London, United Kingdom, 4The University of Manchester, Manchester, United Kingdom, 5Hope Hospital, Salford, United Kingdom, 6Institute of Rheumatology, Prague, Czech Republic, 7Institute of Rheumatology, Prague 2, Czech Republic, 8Karolinska Institutet, Stockholm, Sweden, 9University of Debrecen, Debrecen, Hungary, Debrecen, Hungary, 10London, United Kingdom, 11Stockholm, Sweden

Background/Purpose: Myositis specific antibodies (MSA) can divide dermatomyositis patients into distinct clinical subsets and help predict the risk of disease complications such as interstitial lung disease and malignancy. Anti-NXP2 antibodies are one of the commonest MSA found in juvenile dermatomyositis (JDM) and can be identified in 18–25% cases. They have been associated with calcinosis and a severe disease course with more persistent disease activity. Anti-NXP2 antibodies have been found in adult myositis cohorts at a much lower frequency of 1.6%. A possible association with malignancy has been described in adults.

In this study we identified anti-NXP2 antibodies in a cohort of 172 juvenile and 1331 adult patients with idiopathic inflammatory myopathy and compared the clinical disease characteristics of both groups.

Methods: Serum samples were obtained from EuMyoNet and UK JDRG repositories. Immunoprecipitation of radio-labelled K562 cells was performed on all samples. Those with bands in the 140kDa region were further assessed by western blot using an NXP2 overexpression cell lysate (Abnova).

Results: Anti-NXP2 antibodies were identified in 20 children (11.6%) and 10 adults (0.8%). All children with anti-NXP2 antibodies had dermatomyositis. There was a strong association with calcinosis in children which was seen in 55% (p<0.0009). Of the adults nine had dermato-myositis and one poly-myositis. One adult patient had calcinosis. An additional diagnosis of malignancy was present in three adults (breast, uterine, pancreatic) (p=0.051). When patients with anti-TIF1γ antibodies, (which are already known to be strongly associated with malignancy) were excluded this association became statistically significant (p=0.027).

Conclusion: Anti-NXP2 antibodies are associated with an increased frequency of calcinosis in JDM. Calcinosis is a common cause of morbidity in JDM but is rarely seen in adult disease. It is interesting therefore that one adult patient with anti-NXP2 antibodies also had calcinosis. In JDM calcinosis is associated with delayed diagnosis, a chronic disease course and inadequately treated disease. Anti-NXP2 in JDM have previously been shown to be associated with a more severe disease course with worse functional status and persistent disease activity. The increased risk of calcinosis may therefore reflect more aggressive disease in anti-NXP2 positive children.

Consistent with previous findings there is an association with malignancy in our anti-NXP2 positive adult population. Whilst malignancy in JDM is rarely seen it is an important disease association in adults and associated with a poorer prognosis. Identification of anti-NXP2 in adult myositis patients may have important prognostic implications, particularly in older adults and should warrant a high level of suspicion for additional malignant disease. Whilst the same MSA are found in adult and juvenile dermatomyositis and define clinical subsets, important clinical differences are seen depending on patient age. Whether this reflects differences in aetiology, pathogenesis or age-specific disease modifiers is yet to be established.

Disclosure: S. Tansley; None; Z. Betteridge; None; H. Gunawardena; None; L. R. Wedderburn; None; H. Chinyo; None; R. G. Cooper; None; J. Vencovsky; None; L. Vincze; None; N. McHugh; None; S. Tansley; None; Z. Betteridge; None; H. Gunawardena; None; L. R. Wedderburn; None; H. Chinyo; None; R. G. Cooper; None; J. Vencovsky; None; L. Vincze; None; N. McHugh; None.

Hydroxy-3-Methylglutaryl-Coenzyme A Reductase (HMGCOr) Antibody in Necrotizing Myopathy and the Role of Statins. Ashima Malik1, Rohit Aggarwal2, Zengbiao Qi1, Noreen Fertig1, Diane Koorntz1, Rufus W. Burlingame2, David Lacomis3 and Chester V. Oddis1. 1University of Pittsburgh, Pittsburgh, PA, 2INOVA Diagnostics, Inc., San Diego, CA, 3University of Pittsburgh Medical Ctr, Pittsburgh, PA

Background/Purpose: Statin use is associated with myalgias, muscle weakness and elevated muscle enzymes, but recent reports of a statin-induced immune-mediated necrotizing myopathy (IMNM) have been intriguing. Of particular interest is the recently reported hydroxy-3-methylglutaryl-coenzyme A reductase antibody (anti-HMGCoR). Our Aim is to evaluate anti-HMGCoR antibody positivity and statin exposure in antibody negative necrotizing myopathy patients.

Methods: Using a large prospective computerized database we identified 48 patients with antibody negative Necrotizing Myopathy from 1980–2011. Confirmed by a pathologist with review of all biopsies. As a comparison cohort we had SRP positive myositis patients (32), a subset known for necrotizing myopathy with poor prognosis. Other controls were Non-SRP non-necrotizing myositis patients (73), non-mysitis controls (21), antibody positive necrotizing myopathy controls (13). A validated anti-HMGCoR ELISA assay was done on all cases and controls with values (units/ml) as negative < 20, low positive 20–39, medium positive 40–59, high positive at ≥ 60. Computerized database and clinical chart review was done for history of statin use and other clinical parameters. Chi square test was used to compare between cases and various controls for statin use and anti-HMGCoR positivity. All myositis specific autoantibody testing was done in a research lab using ELISA and immunoprecipitation.
Results: 256 biopsies were reviewed and 48 identified as antibody negative necrotizing myositis. Anti-HMGCoR positivity was significantly (p<0.001) associated with antibody negative necrotizing myopathy 47.9% (23/48) as compared to a) all myositides and non-myositis controls 7.2% (10/139), b) SRP control alone 0% (0/32), c) Non-SRP non-necrotizing myositis controls 5.5% (4/73), but not when compared alone to antibody positive necrotizing myopathy (4/13) (with 2 on statin), P = 0.54).

Higher titer anti-HMGCoR levels were seen in antibody negative (17/48) and antibody positive necrotizing myopathy (4/13) but not in other controls (2/126). Statin use was more common (p < 0.001) in antibody negative necrotizing myopathy (23/48) as compared to all myositides and non-myositis control (17/127), b) SRP control alone (2/26), c) Non-SRP non-necrotizing myositis control (11/70) but only trend compared alone to antibody positive necrotizing myopathy (3/13 (with 2 anti-HMGCoR H11005 +) P = 0.06).

Within patients with necrotizing myopathy: anti-HMGCoR was associated with patients on statin (19/24) as compared to patients without statin (7/27), p < 0.01. Anti-HMGCoR antibodies were more common in any patients on statin (20/34) as compared to patients without statin (20/138), p < 0.001.

Conclusion: Anti-HMGCoR is strongly associated with antibody (−) necrotizing myopathy vs. anti-SRP (+) myositis. Moreover, anti-HMGCoR is more common in necrotizing myopathy pts with history of statin use vs. no statin use.

Disclosure: A. Malik. None; R. Aggarwal. None; Z. Qi. None; N. Fertig. None; D. Koontz. None; R. W. Burlingame. None; D. Lacomis. None; C. V. Oddin. Genentech and Biogen IDEC Inc.

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Pulmonary Hypertension in the Antisynthetase Syndrome. Helena Andersson1 T. Mogens Aalokken2, Terhild Garen1, Øyvind Møller3 and Jan Tore Gran4, 1Oslo University Hospital, Oslo, Norway, 2Oslo, Norway, 3Oslo University Hospital Rikshospitalet, Oslo, Norway, 4Department of Rheumatology, Oslo University Hospital, Rikshospitalet, Oslo, Norway

Background/Purpose: To describe the frequency and clinical characteristics of pulmonary hypertension (PH) in a cohort of Antisynthetase Syndrome (ASS) patients.

Methods: Patients from a single referral center diagnosed between 1994–2010 with a positive serologic test (immuno-blot) of antisynthetase antibodies, interstitial lung disease (ILD) and/or myositis were defined as ASS (N=90). All data were retrospectively collected from medical reports. A diameter of the Pulmonary artery >29 mm, measured by CT-scans, was defined as pathological. PH was suspected with an estimated pulmonary arterial pressure (PAP) of >25mmHg at transthoracal echocardiography (TTE), and defined as a mean PAP >25 mmHg measured by right heart catheterization (RHC). The ratio between forced vital capacity and diffusion capacity of the lungs (FVC/DLCO) was considered pathological, indicating PH, at values >1.6. All examinations were done within 3 months for each patient.

Fisher’s exact test was used to evaluate statistical significance (p<0.05).

Results: The cohort consisted of 75 anti-Jo1 positive, seven PL-7 positive and eight PL-12 positive patients with mean age at ASS diagnosis of 48 years (range 12–82 yrs) and median disease duration of seven years (range 0.25–34 yrs). Fourteen patients were referred to RHC due to clinical suspicion of PH. Ten out of 14 were diagnosed with PH, with a mean age at ASS diagnosis of 58 years (range 26–55 yrs). Eight patients had with a pre-capillary type of PH, defined as pulmonal capillary wedge pressure (PCWP) <15 mmHg. Over all frequencies of PH was 11 % (10/90). Twelve of 14 patients had available TTE-exams, all but one indicating PH with estimated PAP of >25mmHg. The Pulmonary artery was pathological enlarged in 9/10 patients with PH, median diameter 40 mm (range 33–45). Although not statistic significant (p=0.07), the result indicates a correlation between enlarged pulmonary artery and PH. Seven of nine patients with PH had pathological FVC/DLCO ratios. All 10 PH patients had manifest ILD at time of PH diagnosis. 2/10 patients with PH had co-existing rheumatic disease, both systemic sclerosis. The diagnosis of PH was made 36–336 months after ASS onset. Five of 10 patients with PH died during the observation-period.

Conclusion: In this cohort of 90 ASS patients and with a median disease duration of seven years, a PH frequency of 11 % diagnosed by RHC was observed. The study indicated a correlation between enlarged Pulmonary artery and PH. In spite of small series, the results indicate PH as an important complication of ASS and should be given further notice.


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The Natural History of Sporadic Inclusion Body Myositis—an Observational Longitudinal Study. Pedro Machado1, Andrea Cortese2, Jasper Morrow1, Liz Dewar1, Andy Hiscock1, Adrian Miller1, Stefén Brady2, David Hilton-Jones2, Matt Parton1 and Michael G. Hanna1. 1IMRC Centre for Neuromuscular Diseases, UCL Institute of Neurology, London, United Kingdom, 2Oxford Muscle and Nerve Centre, John Radcliffe Hospital, Oxford, United Kingdom

Background/Purpose: Our aim was to assess prospectively the clinical features and functional impact of inclusion body myositis (IBM), to identify reliable outcome measures for future trials and to identify prognostic factors of this condition.

Methods: Patients were classified with either probable or definite IBM, according to the Griggs’ criteria (Griggs RC, et al. Ann Neurol 1995;38:705–713) or with clinically defined IBM, according to the Medical Research Council criteria (Hilton-Jones D, et al. Neuromuscular Disorders 2010;20:142–147). Clinical data, manual muscle testing (MMT), quantitative muscle testing (QMT) of quadriceps extensors with HUMAC Norm CSMi™ dynamometer and IBM functional rating scale (IBM-FRS) were collected according to a standardised protocol (IBM-Net) at baseline (n=51) and one-year follow-up (n=23, QMT performed in a subgroup of 13 patients). The responsiveness to change of MMT, QMT and IBM-FRS was assessed by calculating the standardized response mean (SRM). Cox-regression analysis was performed to estimate the effect of sex, age at disease onset and previous or current treatment with steroids or immunosuppressants on the time to using a walking stick. Time to using a walking stick was modelled using a Kaplan-Meier curve.

Results: Mean age at disease onset was 58 years (16% before the age of 50). Weakness of quadriceps and finger flexors with sparing of proximal upper limb muscles was the most common presentation. After a median time of 7 years of disease, 63% of patients had lost independent walking ability and needed assistive devices. Twenty-seven patients (53%) reported difficulties with swallowing. IBM was initially misdiagnosed in 50% of cases, the commonest misdiagnosis being polymyositis. MMT, IBM-FRS and quadriceps QMT significantly declined after one year (by 5.2%, 13.8% and 27.9% respectively). QMT of the quadriceps muscle (SRM=1.8) and IBM-FRS (SRM=1.3) were the most sensitive measures of disease progression. Disease onset after 55 years of age (HR=4.1; 95% CI=1.7–9.8; p=0.001), but not sex or treatment, was predictive of a shorter time to requirement of a walking stick (figure). We detected no differences in disease presentation and progression between clinically and pathologically defined IBM patients.
Conclusion: IBM is a disabling myopathy with prominent involvement of specific muscle groups, particularly quadriceps femoris and finger flexors, which are essential for activities of daily living. IBM is still probably an underrecognised and misdiagnosed disease. During one year follow-up, the responsiveness of QMT of quadriceps femoris and of IBM-FRS were greater than MMT, which makes the former two measures more sensitive markers of disease progression. Onset of the disease after 55 years of age was predictive of a shorter time to using a walking stick.

Disclosure: P. Machado, None; A. Cortese, None; J. Morrow, None; L. Dewar, None; A. Hiscock, None; A. Miller, None; S. Brady, None; D. Hilton-Jones, None; M. Parton, None; M. G. Hanna, None.

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IFN Signature Is Associated with Autoantibody Profiles in Patients with Idiopathic Inflammatory Myopathies. Saskia Vosslamber1, Louise Ekholm2, Anna Tjarnlund1, Clio P. Mavragani3, Lenka Plestilova4, Martin Klein5, Mary K. Crow6, Peter J. Charles7, Leonid Padyukov8, Jiri Vencovsky8, Ingrid E. Lundberg9 and Cornelis L. Verweij1. 1VU University Medical Center, Amsterdam, Netherlands, 2Rheumatology Unit, Department of Medicine, Karolinska University Hospital, Solna, Karolinska Institutet, Stockholm, Sweden, 3Stockholm, Sweden, 4Rheumatology Unit, Department of Medicine, Karolinska University Hospital, Solna, Karolinska Institutet, Stockholm, Sweden, 5School of Medicine, University of Athens, Athens, Greece, Athens, Greece, 6Institute of Rheumatology, Prague, Czech Republic, 7Hospital for Special Surgery, New York, NY, 8Oxford University, London, United Kingdom, 9Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden

Background/Purpose: Idiopathic inflammatory myopathies (IIM) are rare autoimmune diseases characterized by the presence of autoantibodies, proximal muscle weakness and muscle inflammation. Recent studies showed an activated type I IFN activity (IFN signature) in a subset of patients and suggest a pathogenic role for type I interferon (IFN) in IIM patients. The extent of this signature appears to be related to disease activity, however, the relevance to disease or the underlying mechanism resulting in such a signature has not been revealed yet.

The aim of this study was to examine if the type I IFN activity in whole blood and sera from IIM patients correlates to disease activity, clinical manifestations or autoantibody profile.

Methods: Clinical data were collected from 94 polymyositis, dermatomyositis and inclusion body myositis patients recruited from the Karolinska University Hospital and Prague University. Serological data was obtained using line blot assay. RNA samples, obtained from whole blood were assessed for expression levels of 9 IFN related genes using BioMark™Dynamic Arrays. IFN score was determined as the average gene expression level of these genes. Median IFN score was used to define the presence of an IFN signature.

Serum were assessed for IFN activity using a bioassay where expression of 3 type I IFN-inducible genes were quantified using real-time PCR. Two groups of patients, IFN+, IFN-, were categorized based on the sum of individual gene expression scores. Differences between these groups were assessed for clinical and serological data, as well as correlation between IFN signature and variables.

Results: The IFN signature in peripheral blood was present in a subgroup of patients with myositis. No significant difference in the presence and extent of the IFN signature was observed between ANA negative and ANA positive patients. Comparison of the IFN signature in patients positive for myositis associated or specific autoantibodies revealed that the highest IFN score was found in U1RNP positive patients (mean IFN score = 23.66), followed by La positive patients (mean IFN score = 11.94) and Ro60 positive patients (..). Comparable results were found in patients with multiple autoantibody specificity and those only positive for one of these antibodies. In addition, a majority of Jo-1 and Ro-52 positive patients were characterized by the presence of an IFN signature, although most of these patients appear to be positive for multiple autoantibody specificities. Detailed analysis revealed that presence of an IFN signature was related to multi-autoantibody specificity, i.e. 17 out of 23 patients positive for 2 or more autoantibodies (70%) versus 30 out of 71 of the patients positive for 1 or none of the specific autoantibodies (45%) displayed an IFN signature (Pearson Chi square p = 0.008).

Significantly more IFN+ patients were positive for ANA compared to IFN- patients (p = 0.001).

No correlation between IFN activity in sera and disease activity was found.

Conclusion: These data reveal a preferential presence of the IFN signature in IIM patients that are characterized by multiple autoantibody specificities. These findings suggest a role for autoantibodies in the induction of type I IFN activity in IIM.

Disclosure: S. Vosslamber, None; L. Ekholm, None; A. Tjarnlund, None; C. P. Mavragani, None; L. Plestilova, None; M. Klein, None; M. K. Crow, Johnson & Johnson, 1; Pfizer Inc., 1; Novo Nordisk, 2; EMD Merck Serono, 5; MedImmune, 5; Idera, 5; Takeda, 5; Celgene, 5; Genentech and Biogen IDEC Inc., 5; Johnson and Johnson, 5; Baxter, 5; P. J. Charles, None; L. Padyukov, None; J. Vencovsky, None; C. L. Verweij, None.

ACR Poster Session A
Osteoarthritis - Clinical Aspects
Sunday, November 11, 2012, 9:00 AM–6:00 PM

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Central Sensitization Is Associated with Spontaneous Pain in Knee Osteoarthritis. Anisha B. Dua1, Tuhiha Neogi2, Rachel A. Mikolaitis3, Joel A. Block4 and Naja Shakkour5. 1Rush University Medical Center, Chicago, IL, 2Boston Univ School of Medicine, Boston, MA, 3Rush University Medical Center, Chicago, IL.

Background/Purpose: Osteoarthritis (OA) is a chronic, prevalent disease that is a major cause of pain and disability. Pain is the primary symptom of OA, however its characteristics and pathophysiology remain poorly understood. Studies suggest that patients with knee OA have increased central sensitization, measured by pressure pain thresholds (PPTs) and temporal summation (TS) to repeated non-nociceptive stimulation. Here we evaluated the relationship between central sensitization (TS and PPTs) and pain magnitude in symptomatic knee OA.

Methods: Persons with moderate to severe radiographic (Kellgren-Lawrence [KL] grade ≥2) and symptomatic (at least 30mm on WOMAC visual analog scale) knee OA were compared with age matched controls without knee pain or OA (radiographic KL grade of 0–1, pain <20 on WOMAC VAS), and no history of diabetes, arthroplasty, or chronic widespread pain. In subjects with bilateral knee OA, the most symptomatic side was considered the ”affected” side. Participants answered questionnaires regarding knee pain and function including the question “do you feel spontaneous pain in your knee?” Temporal summation (TS) was measured by application of a 60g Von Frey monofilament repeatedly (30 times) to pre-determined anatomic sites. Participants answered the question “do you consider this painful?” (yes/no) and rated their pain on a scale of 1–10. Pain pressure thresholds (PPTs) were measured using a pressure algometer applied to pre-determined anatomic sites with steadily increasing pressure and recordings were taken at the first sensation of pain.

Results: 42 OA participants (mean age 54.1 ± 8.1 years) and 12 controls (mean age 52.9 ± 11.1 years) were evaluated. Significantly more OA subjects demonstrated TS compared with controls at the ipsilateral (54.8% vs 16.6%, p=0.02) and contralateral knee (49% vs 0%, p=0.005). PPTs were lower in the OA group but did not reach significance. KOOS and WOMAC pain scores did not correlate with PPT or TS at any of the several sites evaluated (rho = −0.115 to −0.139 and 0.150 to 0.286 respectively, p >0.05).
Spontaneous pain in the knee was reported by those with knee OA more frequently than controls (74.3% vs 0%, p<0.001) and those with spontaneous knee pain had lower PPTs than those without spontaneous knee pain (Table 1). In patients with OA, spontaneous knee pain was also associated with the presence and pain rating of TS at the ipsilateral and contralateral tibial tuberosities (Table 1).

Table 1. Relationship Between Spontaneous pain, Pain Pressure Thresholds and Temporal Summation

<table>
<thead>
<tr>
<th>Pain Pressure Threshold</th>
<th>Yes</th>
<th>No</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial Styloid (kgf)†</td>
<td>2.42±1.07</td>
<td>4.39±1.25</td>
<td>0.001</td>
</tr>
<tr>
<td>Medial Joint Line (kgf)</td>
<td>2.05±1.08</td>
<td>3.98±1.61</td>
<td>0.001</td>
</tr>
<tr>
<td>Tibialis Tuberosity (kgf)</td>
<td>3.52±1.44</td>
<td>5.01±1.11</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Conclusion: Conventional pain scales do not correlate well with measures of central sensitization. However, the presence of spontaneous pain is more frequent in OA patients than controls, and those who have spontaneous pain have generalized decreases in thresholds to pain sensation (lower PPTs) and are more likely to demonstrate temporal summation.

Disclosure: A. B. Dua, None; T. Neogi, None; R. A. Mikolaitis, None; J. A. Block, None; N. Shakoor, None.

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Peripheral and Central Sensitization in Patients with Different Degrees of Knee Osteoarthritis. Lars Arendt-Nielsen1, Thomas Navdrup Eskehave1, Morten Asser Karstad2, Anne C. Bay-Jensen3, Hans Christian Hoeck4 and Ole Simonsen1.

Aalborg University, Aalborg, Denmark, Aalborg University, Aalborg, Denmark, Alborg University, Aalborg, Denmark, Nordic Bioscience A/S, Herlev, Denmark, C4Pain, Alborg, Denmark, Frederikshavn Hospital, Frederikshavn, Denmark.

Background/Purpose: Though pain is the cardinal symptom of osteoarthrit (OA), the underlying causes are not fully understood. However, peripheral and central sensitization has been suggested to play an important role in OA pain. The aim of this study was to investigate associations between mechanism based pain assessment parameters associated with peripheral and central sensitisation in painful knee OA and clinical manifestations (K&L, Pain intensity, WOMAC).

Methods: 217 patients with different degrees of OA pain (rated on a visual analog scale (VAS) from 0 to 100) and 36 healthy controls participated in the study. Patients were allocated into: controls (VAS 0–9), Group A (VAS 10–39), Group B (VAS 40–69) and Group C (VAS 70–100). Pressure pain thresholds (PPTs) were measured in the peripatellar region, tibialis anterior and extensor carpi radialis muscle before, during and after conditioning pain modulation (CPM). Temporal summation to repeated mechanical stimulation was measured at all sites. A sensitization index was constructed based on PPT’s, temporal summation and CPM. Pain and soreness areas were obtained. The radiologic assessment of OA was made by specialists using Kellgren & Lawrence grading scale (0–4).

Results: All patient groups had significantly lower PPT’s compared to controls. Patients showed facilitated temporal summation and reduced CPM function compared to controls. Significant correlations were found between CPM effect (r=0.23, p<0.01), degree of temporal summation (r=−0.36, p<0.001) and PPT (r=0.22, p<0.01) and clinical VAS ratings. The index of pain sensitization revealed that 37.3% of the patients were twice as pain sensitive as controls. The pain sensitization score was significantly correlated with VAS ratings (0.36, p<0.01) and pain/soreness areas (r=0.14, p=0.05 and r=0.15, p<0.05).

Conclusion: Patients with mild, moderate and severe pain had significantly lower PPT’s compared to controls. Furthermore, patients with OA had significantly more central sensitization (decreased CPM effect and increased temporal summation) compared to controls. This study is the first to demonstrate a tool for OA patient stratification into sensitized and non-sensitized based on relevant pain assessment parameters. This stratification can be useful for diagnosis and future treatment of OA patients and for monitoring the effects of new drugs under the development for OA pain.

Disclosure: L. Arendt-Nielsen, None; T. N. Eskehave, None; M. A. Karstad, Nordic Bioscience Diagnostic, A. C. Bay-Jensen, None; H. C. Hoeck, None; O. Simonsen, None.

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The Relationship Between Vibratory Sense and Somatosensory Pain Measures in Knee Osteoarthritis. Anisha B. Dua1, Rachel A. Mikolaitis2, Tahmin Neogi3, Joel A. Block4 and Najia Shakoor3.

Rush University Medical Center, Chicago, IL, Rush University Medical Center, Chicago, IL, Boston Univ School of Medicine, Boston, MA.

Background/Purpose: Osteoarthritis is the most common form of arthritis, and is a major cause of pain and disability. Continuous nociceptive input can influence somatosensory processing and studies suggest that patients with knee OA have altered somatosensory findings, demonstrated by decreased vibration perception threshold (VPT), pressure pain thresholds (PPTs), and temporal summation (TS) elicited by repeated non-nociceptive stimulation. Here, we further characterize the relationship between these somatosensory measures in knee OA.

Methods: Persons with moderate to severe radiographic (Kellgren-Lawrence (KL) grade ≥2) and symptomatic (at least 20mm on WOMAC visual analog scale) knee OA were evaluated. In subjects with bilateral OA, the most symptomatic side was considered the “affected” side. VPT was measured using a biothesiometer (Bio-Medical Instrument Co., Newberry, Ohio) that provided vibratory stimulation at multiple predetermined anatomic sites. VPT was recorded as the first sensation of vibration (volts). TS was assessed by application of a 60g Von Frey monofilament repeatedly (30 times) to various sites. Participants answered the question “do you consider this painful?” (yes/no) and rated the extent of their pain on a scale of 0–10, immediately and after 10 seconds. PPT’s were measured using a pressure algometer applied to pre-defined sites with steadily increasing pressure. Recordings were taken at the first sensation of pain.

Results: 42 OA participants (mean age 54.1 ± 8.1 years) were evaluated. Subjects who demonstrated TS at the ipsilateral tibial tuberosity had significantly lower PPTs at multiple sites compared to those without TS (Table 1). VPT and PPTs were directly correlated at several anatomic sites (Table 2). VPT was lower at the first MTP in those that sensed/rated pain at the ipsilateral tibial tuberosity (Figure 1) and demonstrated TS at the ipsilateral tibial tuberosity vs those that did not (8.2±3.3 vs 12.1±4.8 volts, p=0.005). VPT was also lower at the first MTP in those that sensed/rated pain at the ipsilateral tibial tuberosity 10 seconds post-stimulation (for TS) vs those that did not (7.6±2.4 vs 11.3±2.4 volts, p<0.011).

Table 1. Relationship between Temporal Summation and Pain Pressure Threshold

<table>
<thead>
<tr>
<th>Pain Pressure Threshold (Kilograms of force, Mean ± SD)</th>
<th>Presence of Temporal Summation at Ipsilateral Tibial Tuberosity (Yes/No)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ipsilateral radial styloid</td>
<td>2.56±1.19</td>
<td>0.01</td>
</tr>
<tr>
<td>Contra-lateral radial styloid</td>
<td>2.51±1.26</td>
<td>0.007</td>
</tr>
<tr>
<td>Ipsilateral tibialis tuberosity</td>
<td>3.16±1.56</td>
<td>0.003</td>
</tr>
<tr>
<td>Contra-lateral tibialis tuberosity</td>
<td>3.57±1.61</td>
<td>0.052</td>
</tr>
<tr>
<td>Medial joint line</td>
<td>2.16±1.23</td>
<td>0.008</td>
</tr>
<tr>
<td>Contra-lateral joint line</td>
<td>2.54±1.46</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Table 2. Correlation between VPT at Multiple Sites with PPT at the Ipsilateral Tibial Tuberosity and Medial Joint Line

<table>
<thead>
<tr>
<th>PPT Ipsilateral tuberosity</th>
<th>PPT Ipsilateral medial joint line</th>
<th>Spearman’s rho (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPT Ipsilateral medial ankle</td>
<td>0.44±(0.006)</td>
<td>0.476 (0.001)</td>
</tr>
<tr>
<td>VPT Ipsilateral lateral knee</td>
<td>0.43±(0.004)</td>
<td>0.405 (0.008)</td>
</tr>
<tr>
<td>VPT Ipsilateral tibialis tuberosity</td>
<td>0.35±(0.02)</td>
<td>0.268 (0.09)</td>
</tr>
<tr>
<td>VPT Ipsilateral medial knee</td>
<td>0.33±(0.03)</td>
<td>0.389 (0.01)</td>
</tr>
</tbody>
</table>

Conclusion: Key measures of central sensitization appear to be well correlated in this group, with lower pain thresholds (PPT) in those that demonstrate TS. Higher pain thresholds and the absence of TS were both associated with decreased vibratory sense acuity (higher VPT). Thus, the well documented loss of vibratory acuity in patients with knee OA may also be part of an inhibitory pathway reflected in higher pain thresholds and lack of temporal summation.

Disclosure: A. B. Dua, None; R. A. Mikolaitis, None; T. Neogi, None; J. A. Block, None; N. Shakoor, None.
Association Between Pain Threshold, Symptoms and Radiographic Knee and Hip Osteoarthritis: The Johnston County Osteoarthritis Project. Adam P. Goode1, Xiaoyan A. Shi2, Jordan Renner3, Richard Gracely4, Mehrzad Maleki-Fischbach5 and Joanne M. Jordan6. 1Duke University, Durham, NC, 2SAS Institute, Inc, Cary, NC, 3University of North Carolina, Chapel Hill, NC, 4Chapel Hill, NC, 5National Jewish Health, Denver, CO, 6University of North Carolina Thurston Arthritis Research Center, Chapel Hill, NC

Background/Purpose: Little is known of the association between pain threshold and knee/hip symptoms as well as radiographic knee/hip osteoarthritis (rOA). These analyses: 1) determined the association between pain threshold and presence of knee/hip symptoms or knee/hip rOA, 2) determined the association between pain threshold and the number of joints with knee/hip symptoms or rOA and 3) determined if associations differed by demographic or clinical characteristics.

Methods: Dolorimeter measurements for pain threshold were available for 1,602 participants returning for second follow-up (2008–11) in the Johnston County Osteoarthritis Project. Participants mean age was 67.9 (SD 9.0), 67.2% female, 31.0% African American, mean body mass index (BMI) 31.5 (SD 7.1) and a mean Center for Epidemiologic Studies Depression (CES-D) Scale score of 31.5 (SD 7.1). Pain threshold measurements were averaged (mean of 3.6kg (SD 0.7)) over three trials from left and right trapezius muscles. Knee and hip OA were both defined by a Kellgren-Lawrence score of 2–4. Knee and hip symptoms were obtained at clinical interview with “on most days do you have pain, aching or stiffness in at least one knee/hip?”. Associations were determined with logistic regression while adjusting for age, race, BMI, CES-D scores and presence of hip OA. Interactions between pain threshold and clinical and demographic characteristics were tested at p<0.05.

Results: Knee and hip rOA were present in 45.7% and 40.3% of participants, respectfully. Knee and hip symptoms were present in 38.4% and 29.3% of participants, respectfully. A 1-unit increase in pain threshold was significantly associated with symptoms in the knee (adjusted odds ratio [aOR] 0.66 (95% CI 0.54, 0.76)) and hip (aOR 0.67 (95% CI 0.57, 0.79)). The figure illustrates the associations between pain threshold and number of knees and hips with symptoms. Compared to those without knee or hip symptoms, those with higher pain threshold were 20% less likely to have one joint with symptoms and 50% less likely to have 4 joints with symptoms. No significant associations were found with increased pain threshold and presence of knee or hip rOA or number of joints with knee and hip rOA. No significant interactions were found between pain threshold and demographic or clinical characteristics.

Conclusion: Participants with higher pain threshold were less likely to report knee and hip symptoms, an association that strengthened with the number of symptomatic joints. In contrast, no association was found with increased pain threshold and knee or hip OA. These findings suggest the presence of knee or hip rOA may not be informative in understanding an individual’s knee or hip symptoms or useful for evaluating the efficacy of treatments targeting symptoms.

Disclosure: A. P. Goode, None; X. A. Shi, None; J. Renner, None; R. Gracely, None; M. Maleki-Fischbach, None; J. M. Jordan, Algynomics, Inc., 1. Johnson and Johnson, 5, Johnson & Johnson, 2, Interleukin Genetics, Inc., 5, Eli Lilly and Company, 5, Mutual Pharmaceutical Company, 5.


1Brigham and Women’s Hospital, Boston, MA, 2Brigham and Wemens Hospital, Boston, MA

Background/Purpose: Knee pain is the primary reason that patients with OA seek medical care. The goal of this study is to describe pain trajectory over three years in a cohort of patients with radiographic, symptomatic knee OA.

Methods: We used data from the Osteoarthritis Initiative (OAI), a multi-center, longitudinal, prospective observational study of knee OA. Pain assessments were done at baseline and at yearly visits for 4 years. We defined patients with symptomatic knee OA as those with central reader Kellgren/Lawrence (KL) score ≥2 and a WOMAC pain score >0. We used group-based trajectory modeling to identify distinct patterns of pain progression. To minimize the impact of baseline flare effect we restricted our analysis to visits occurring in months 12 through 48. We also built multivariable generalized linear models to determine factors affecting change in pain severity over time. Factors examined included sex, race, education, baseline comorbidities, 12-month age, BMI, alignment, KL grade, and depression.

Results: We used the data from 1,447 OAI study participants with radiographic, symptomatic knee OA at month 12. The average WOMAC pain at month 12 was 24 (0–100 scale with 100 = worst) with standard deviation 17.6. Individual pain reports varied markedly over time. For example, at 48 months, 51% reported a lower pain score than at 12 months and 36% reported a higher score. Also, 32% of all patients reported having no pain at one or more subsequent follow-up visits. Group based trajectory modeling identified 4 distinct pain trajectories [Figure]. Two-thirds of patients (groups 2 and 3 in Figure) started with moderate pain and showed little change on average over three years. The 12.6% in the highest pain trajectory tended to increase in pain by an average of 6 points over 3 years of follow-up, while patients in the first category (lowest pain at 12 months) decreased by an average of 9 points. Higher BMI, depression, and KL grade at the beginning of observation were associated with pain worsening over time in multivariable models.

Conclusion: We found that knee pain is highly variable over time and that pain neither worsens nor improves, on average, over three years in a majority of patients. Just 12.6% of patients demonstrate progressive worsening. These observations of highly variable pain reports with relatively little change on average over time contrast with the frequent clinical teaching that osteoarthritis symptoms progressively worsen over time.

Disclosure: J. E. Collins, None; W. M. Reichmann, None; J. N. Katz, None; E. Losina, None.

Background/Purpose: Symptom assessment in knee osteoarthritis (OA) is challenging. Knee pain does not always correlate well with radiographic severity, perhaps because people modify/avoid activities to reduce symptoms. Accelerometers/pedometers can inexpensively and easily quantify physical activity. We hypothesize that symptom assessment accounting for pain intensity in the context of physical activity will improve discrimination across OA radiographic severity levels.

Methods: We studied Osteoarthritis Initiative (OAI) participants with ≥4 days accelerometer monitoring, knee-specific WOMAC pain data, and knee x-rays from the 48-month visit. Accelerometer data included average daily step count and average daily activity counts (i.e., weighted sum of activity frequency and intensity). Four composite knee pain and activity scores (KPAS) were calculated:

- **KPAS1** = daily step count/(Total WOMAC Pain Score + 1)
- **KPAS2** = daily activity count/(Total WOMAC Pain Score + 1)
- **KPAS3** = daily activity count/(WOMAC Walking Pain Score + 1)
- **KPAS4** = daily activity count/(WOMAC Total Pain Score + 1)

For each participant, only right knee data were evaluated. Total WOMAC pain score, WOMAC walking pain score, accelerometer data, and KPAS scores were tested for normality, and score discrimination by K-L grades using stratified histograms, Kruskal–Wallis testing, and quantile regression analyses (excluding WOMAC walking pain) unadjusted and adjusted for age, sex and BMI.

Results: 1472 participants, mean age 64.9 (± 9.1), mean BMI 28.1 (± 4.8), 43% male, were included. No symptom score was normally distributed, with pain assessments being the most skewed.

Table 1. Kruskal–Wallis testing of symptom assessments across adjacent K-L grades.

<table>
<thead>
<tr>
<th>K-L Grade Comparison</th>
<th>WOMAC Walk</th>
<th>KPAS1</th>
<th>KPAS2</th>
<th>KPAS3</th>
<th>KPAS4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 v. 2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4 v. 3</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4 v. 4</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

"X" denotes statistically significant differences.

Table 2. Quantile regression: Differences in median symptom scores across K-L grade groups.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Adjustment Factors</th>
<th>KL 0 (Referent)</th>
<th>KL 1</th>
<th>KL 2</th>
<th>KL 3</th>
<th>KL 4</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOMAC</td>
<td>Unadjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>Total Pain</td>
<td>Adjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>Step count</td>
<td>Adjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>Activity count</td>
<td>Adjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>KPAS1</td>
<td>Unadjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>KPAS2</td>
<td>Unadjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>KPAS3</td>
<td>Unadjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
<tr>
<td>KPAS4</td>
<td>Unadjusted</td>
<td>0.000</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.000</td>
</tr>
</tbody>
</table>

* Adjusted for age, sex, and BMI
* Statistically different from group median compared to the referent (KL score of 0) median; p<0.05.

Conclusion: Symptom assessments incorporating pain intensity and physical activity improved discrimination across radiographic OA severity. Pain better discriminates high disease severity while physical activity better distinguishes low severity. Relationships of KPAS measures with x-ray severity were robust to adjustment for traditional OA risk factors. To improve sensitivity, physical activity should be routinely assessed in studies of knee OA symptoms.

Disclosure: G. H. Lo, None; T. E. McAlindon, None; G. A. Hawker, None; J. B. Driban, None; L. L. Price, None; J. Song, None; C. Eaton, None; M. C. Hochberg, None; R. D. Jackson, None; C. K. Kwoh, None; M. C. Nevitt, None; D. D. Dunlop, None.


Background/Purpose: Knee osteoarthritis (OA) is one of the most common rheumatologic joint diseases and causes an important disability in the elderly population. To date the gold standard for the diagnosis of knee OA is radiographic. However, these findings might not be useful in early stages.
Degenerative changes

Methods: Consecutive patients over 50 years of age complaining of knee pain without a previous diagnosis of knee OA (ACR criteria) and no other known rheumatologic disease were included. US examination was performed by an experienced rheumatologist blinded to clinical data, using a My Lab 70 machine (Esaote) provided with a multi-frequency linear transducer (4–13 MHz). A standardized scanning method was adopted in order to investigate the following US abnormal findings (presence/absence):

- osteophytes: defined as cortical protrusions at the joint margin seen in two planes and visualized as either proximal or distal to the joint
- degenerative femoral hyaline cartilage involvement: defined as loss of sharpness of the cartilage margins, loss of homogeneity of the cartilage layer and/or cartilage thinning (focal or extend to the entire cartilaginous layer)

Weight-bearing anteroposterior (AP) and lateral knee radiographs were read by an experienced rheumatologist, blinded to the clinical date and US findings, who assessed the presence or absence of osteophytes and degenerative femoral hyaline cartilage involvement, defined as the presence of femorotibial (FT) joint space narrowing. The FT space width was measured at the most peripheral site and at the mid-point of the medial compartment and lateral compartment. Frequency of each feature was calculated and compared between groups by chi2 test. A p value <0.05 was considered significant.

Results: 84 patients (mean age 69 ± 10 years, 66 female/18 male) were included for a total of 116 knees evaluated (32 patients complained of bilateral knee pain). Both the presence of osteophytes and degenerative femoral hyaline cartilage involvement were significantly more frequently detected by US than CR (Table). The presence of at least one of these degenerative changes was found in 81/116 knees in 56 patients by US and in 52/84 knees in 42 patients by CR (p < 0.05 for both comparisons) (Table).

Conclusion: US had the ability to detect more degenerative changes compared with CR in patients >50 years old complaining of knee pain and without a previous diagnosis of knee OA. The use of US in patients with knee pain and normal CR might be useful in the diagnosis of early stage OA.

Disclosure: S. Ruta None; E. Catay None; J. Rosa None; D. A. Navarta None; R. Garcia-Monaco None; E. R. Soriano Abbott Immunology Pharmaceuticals, 2; Janssen Pharmaceuticala, P.L.P, 8.

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Excess Body Weight and 4-Year Function Outcomes: Comparison of African-Americans and Caucasians in the Osteoarthritis Initiative. Carmelita J. Colbert, Orit Almagor, Joan S. Chmiel, Jing Song, Dorothy D. Dunlop, Karen W. Hayes and Leena Sharma. Northwestern University, Chicago, IL.

Background/Purpose: Given the heterogeneity of knee OA impact, it is important to identify persons at risk for poor outcome. A better understanding of differences between risk groups may lead to development of more effective prevention strategies. Losina et al recently demonstrated losses in quality-of-life years due to knee OA and obesity, disproportionately high in black and Hispanic women (Ann Intern Med 2011). The impact within racial groups of greater than healthy body weight on more proximal outcomes is not well understood. We tested the hypothesis that African-Americans have a greater risk (vs. Caucasians) of poor baseline-to-4-year function outcome within each strata: women with high BMI, women with large waist circumference, men with high BMI, and men with large waist circumference. The OAI cohort study, enriched with individuals above a healthy body weight, provides an ideal setting.

Methods: Using WOMAC function, 20 meter walk, and chair stand performance, poor outcome was defined as moving into a worse function group or remaining in the 2 worst groups over 4 years. Logistic regression was used to evaluate the hypothesized relationships between racial groups and outcomes within each stratum, adjusting for age, education, and income, and then further adjusting for BMI, comorbidity, depressive symptoms, physical activity, knee pain, and OA severity.

Results: In 3,695 persons with or at higher risk for knee OA, high BMI and large waist circumference were each associated with poor outcome. As shown in the table, among women with high BMI and among women with large waist circumference, African-Americans were at greater risk for poor outcome by every measure, adjusting for age, education, and income. From fully adjusted models (not shown), potential explanatory factors included income, comorbidity, depressive symptoms, pain, and disease severity. Findings were less consistent for men (see table), emerging for the 20 meter walk or chair stand outcomes, and potentially explained by age and knee pain.

Table. Odds of poor 4-year outcome associated with race by gender, BMI and waist circumference groups, adjusting for age, education, and income (AA = African-American, C = Caucasian, significant results bolded)

<table>
<thead>
<tr>
<th></th>
<th>Poor WOMAC outcome adjusted OR (95% CI)</th>
<th>Poor 20 meter walk outcome adjusted OR (95% CI)</th>
<th>Poor chair stand outcome adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA vs. C women (in women with high BMI, ≥ 25 kg/m²)</td>
<td>1.54 (1.19, 1.98)</td>
<td>1.43 (1.07, 1.93)</td>
<td>1.81 (1.37, 2.39)</td>
</tr>
<tr>
<td>AA vs. C women (in women with large waist circumference, &gt; 88 cm)</td>
<td>1.35 (1.21, 1.99)</td>
<td>1.57 (1.38, 2.07)</td>
<td>2.02 (1.54, 2.65)</td>
</tr>
<tr>
<td>AA vs. C men (in men with high BMI, ≥ 25 kg/m²)</td>
<td>1.26 (0.87, 1.81)</td>
<td>1.94 (1.31, 2.87)</td>
<td>1.56 (1.07, 2.28)</td>
</tr>
<tr>
<td>AA vs. C men (in men with large waist circumference, &gt; 102 cm)</td>
<td>1.53 (0.93, 2.52)</td>
<td>2.24 (1.30, 3.85)</td>
<td>1.34 (0.80, 2.23)</td>
</tr>
</tbody>
</table>

Conclusion: Among women with high BMI and among women with large waist circumference, African-Americans were at greater risk than Caucasians for poor 4-year outcome by each measure evaluated, adjusting for age, education, and income. Modifiable factors that may in part explain these findings in women in the OAI include comorbidity, depressive symptoms, and knee pain. Targeting such factors, while supporting weight loss, may help to lessen the outcome disparity between African-American and Caucasian women.

Disclosure: C. J. Colbert, None; O. Almagor, None; J. S. Chmiel, None; J. Song, None; D. D. Dunlop, None; K. W. Hayes, None; L. Sharma, None.

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Relationship of Objective to Self-Reported Physical Activity Measures Among Adults in the Osteoarthritis Initiative. Grace E. Ahn1, Jing Song1, Jungwha Lee2, Pamela A. Semanik1, Rowland W. Chang1, Leena Sharma2, Charles Eaton2, Rebecca Jackson3, Alex Mysiw4 and Dorothy D. Dunlop1.

1Northwestern University, Chicago, IL, 2Warren Alpert Medical School at Brown University, RI, 3Ohio State University, Columbus, OH, 4Denison University, Granville.

Background/Purpose: Physical activity conveys health benefits for people with osteoarthritis (OA). Public health activity guidelines are tied to time spent in bouts of moderate/vigorous physical activity (MVPA) lasting 10 minutes or more. This study compares objective accelerometer measures of MVPA with self-reported Physical Activity Scale in the Elderly (PASE) scores and their association with function in adults with and without radiographic knee OA.

Methods: The Osteoarthritis Initiative accelerometer ancillary study includes 586 adults without and 969 with radiographic knee OA (Kellgren-Lawrence score ≥2 in one or both knees), aged 55 and above. Participants’ response to the PASE questionnaire was followed by 7 days of accelerometer monitoring. Accelerometer measures included average daily MVPA minutes and MVPA minutes acquired in bouts. Function measures included gait speed averaged from two 20 meter walks, WOMAC (Western Ontario MacMaster) function, and SF12 (12-item Short Form Health Survey) physical function. Nonparametric Spearman correlations were used to assess associations.

Results: Adults with and without knee OA had mean (SD) PASE scores: 149.82 (78.5), 154.5 (79.0); mean accelerometer MVPA minutes/day: 15.6 (17.2), 19.2 (20.5) and mean MVPA bouts minutes/day: 7.2 (12.4), 9.3
(15.8), respectively. PASE score correlations with accelerometer measures are shown below. In this sample, PASE was correlated most strongly with total activity counts followed by MVPA minutes and had weakest association with MVPA minutes accumulated in bouts. Further analysis shows all objective accelerometer measures had stronger associations with function than PASE (e.g., correlations from overall sample of gait speed function with self-reported PASE: r=0.16, accelerometer counts: r=0.29, MVPA: r=0.34, MVPA bouts: r=0.28). These findings were true of both adults with and without radiographic OA.

### Table: Spearman Correlation Coefficients (r) between Self-Reported PASE Scores and Objective Physical Activity Accelerometer Measures

<table>
<thead>
<tr>
<th>OAI Radiographic Subgroups</th>
<th>Average Daily Counts of Total Activity</th>
<th>Average Daily Counts of Moderate/Vigorous Activity</th>
<th>Average Daily Minutes of Moderate/Vigorous Activity</th>
<th>Average Daily Minutes of More Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>All n = 1555</td>
<td>0.38 (0.42)</td>
<td>0.33 (0.37)</td>
<td>0.20 (0.24)</td>
<td></td>
</tr>
<tr>
<td>With Radiographic OA</td>
<td>(n = 969) r (95% CI)</td>
<td>(n = 30, 0.41)</td>
<td>(n = 25, 0.37)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.35 (0.3)</td>
<td>0.31 (0.27)</td>
<td>0.21 (0.26)</td>
<td></td>
</tr>
<tr>
<td>Without Radiographic OA</td>
<td>(n = 586) r (95% CI)</td>
<td>(n = 36, 0.49)</td>
<td>(n = 28, 0.42)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.42 (0.4)</td>
<td>0.36 (0.37)</td>
<td>0.10 (0.26)</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** In this sample with and without radiographic knee OA, the self-reported PASE score had stronger modest correlations with objective measures of total activity than with MVPA minutes or MVPA bouted minutes. Objective physical activity measures compared to self report had stronger relationships with function. The choice of PASE, a recall measure of various activity types, and/or objective measurement for future epidemiologic studies must take into account the purpose for which physical activity is being measured.

Disclosure: G. E. Ahn; None; J. Song; None; J. Lee; None; P. A. Semanik; None; R. W. Chang; None; L. Sharma; None; C. Eaton; None; R. Jackson; None; A. Mysiw; None; D. Dunlop; None.

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**Relationship of Physical Activity with Health Utility in the Osteoarthritis Initiative.** Dorothy D. Dunlop1, Jing Song1, Rowland W. Chang2, Jungwha Lee3, Pamela A. Semanik4, Linda S. Ehrlich-Jones5, Kain Sun6, Leena Sharma1, C. Kent Kwoh7, Charles Eaton8 and Larry Manheim1.

1Northwestern University, Chicago, IL, 2Rehabilitation Institute Chicago, Oak Park, IL, 3University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 4Warren Alpert Medical School at Brown University, RI

**Background/Purpose:** Cost effectiveness analyses of arthritis interventions require utility measurements to evaluate their relative effectiveness. Clinical guidelines for knee osteoarthritis (KOAr) treatment include a substantial role for physical activity. Recognizing the importance of physical activity, there are federal recommendations for US adults that now include persons with osteoarthritis. As a result, most adults with KOAr were inactive. Inactive adults with KOAr had significantly lower health-related levels than those who were insufficiently active as well as those who met Guidelines. These findings show a strong relationship between greater physical levels and better health utility. These findings support interventions to improve health-related utility for adults with KA by increasing physical activity, even if recommended levels are not attained.

Disclosure: D. D. Dunlop, None; J. Song, None; R. W. Chang, None; J. Lee, None; P. A. Semanik, None; L. S. Ehrlich-Jones, NIH, 2, University of Chicago, Rush University, Health Communicators, 5; K. Sun, None; L. Sharma, None; C. K. Kwoh, AstraZeneca, 2, Beverage Institute, 2; C. Eaton, None; L. Manheim, None.

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**Minimal Clinically Important Difference and Patient Acceptable Symptom State for the Oarsi-Omeract Intermittent and Constant OA Pain (ICOAP) Measure.** Z. Anna Liu, Tetyana Kendzerska, Joy Elkayam, Shefali Ram and Gillian A. Hawker, Women’s College Research Institute, University of Toronto, Toronto, ON

**Background/ Purpose:** The Intermittent and Constant Osteoarthritis Pain (ICOAP) measure was developed to evaluate the OA pain experience, independent of the effect of pain on physical activity. ICOAP has been shown to be reliable, valid and responsive to treatment in knee OA. This study sought to establish for ICOAP the Minimal Clinically Important Difference (MCID) for improvement and worsening, and the Patient Acceptable Symptom State (PASS).

**Methods:** In subjects with painful knee OA, the ICOAP was administered twice by telephone, two-weeks apart. The ICOAP is comprised of two subscales (constant and intermittent pain); the total score (range 0–100) is the sum of subscale scores, with higher scores indicating worse pain. At both time points, participants were asked to report their knee pain in the past 48 hours and the acceptability of their current knee pain state (acceptable or unacceptable). At second interview, participants were asked to report the degree to which their knee pain had changed (5-point scale from much worse to much better). MCID was calculated as the mean absolute change in ICOAP scores (Time 2-Time 1) for those who reported ‘slightly better’ or ‘slightly worse’ versus ‘no change’. PASS was defined as the threshold ICOAP score at or above which participants considered their pain as ‘unacceptable’. Logistic regression was used to assess the ability of ICOAP change scores to predict reported improvement or worsening, and the relationship between scores and pain state acceptability.

**Results:** 136 participants completed the study; 66 (54%) were female with a mean age of 73.9 years (SD 9.5). Median ICOAP constant, intermittent and total scores were 0/100 (range 0–90), 37.5 (0–87.5) and 25 (4.6–88.6), respectively, at Time 1 and 0 (0–95), 37.5 (0–95.8) and 23.9 (4.6–95.8) at Time 2. ‘Slight improvement’ was associated with a mean decrease of 2 and 7 points for the ICOAP constant and intermittent scales, respectively, while ‘slight worsening’ was associated with a mean increase of 4 points for both scales. The threshold ICOAP subscale scores associated with an unacceptable symptom state were: 20/100 (constant pain); 40/100 (interruption pain); and 30/100 (total score). Changes in ICOAP subscale and total scores had good discriminative validity, self-reported improvement versus no change; worsening (Figure 1; AUC = 0.60–0.75) and for reported worsening (AUC 0.73–0.82). Absolute ICOAP scores were highly predictive of the acceptability of symptom state (AUC 0.71–0.84).
Conclusions: In an observational cohort, we determined the MCID and PASS for ICOAP total and subscale scores. These findings will assist clinicians and researchers in interpreting the clinical meaning of ICOAP scores for pain in knee OA. Future work will determine whether ICOAP MCID values differ across settings, including with clinical interventions.

Disclosure: Z. A. Liu, None; T. Kendzerska, None; J. Elkayam, None; S. Ram, None; G. A. Hawker, None.

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Similarities of Patient Self-Report Scores From a Multidimensional Health Assessment Questionnaire (MDHAQ), Laboratory Tests, Physician Global Assessment, and Polyarticular Involvement in Patients with Osteoarthritis and Rheumatoid Arthritis. Isabel Castrejon, Yusuf Yazici and Theodore Pincus. NYU Hospital for Joint Diseases, New York, NY

Background/Purpose: Rheumatoid arthritis (RA) and osteoarthritis (OA) are distinct diagnoses, based on widely differing pathogenetic mechanisms and treatments. However, OA patients may experience functional disability, pain and global distress at levels similar to RA patients. Furthermore, although differences may have been more pronounced in the past, at this time many OA patients have polyarthritides and levels of erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) similar to RA patients. A systematic comparison of patients with RA vs OA, including patient self-report scores, involvement of specific joints, laboratory tests, and physician global assessment, appeared of value.

Methods: All patients seen at an academic rheumatology center complete a multidimensional health assessment questionnaire (MDHAQ) at each visit to assess physical function, pain, patient global estimate (all 0–10), routine assessment of patient index data (RAPID-3)—a composite of these 3 measures (0–30), and a rheumatoid arthritis disease activity index (RADAI)—self-report of painful joints. RADIAl is scored 0–3 for 16 joint groups (8 right, 8 left): fingers, wrist, elbow, shoulder, hip, knee, ankle, toes (total 0–48). A binary scoring of 0 or 1 (to mimic a physician joint count) was also computed. All patients are assigned a physician global estimate. ESR and CRP are assessed in many patients. Measures were compared in 174 RA vs 113 OA consecutive patients: normally distributed variables by means and t tests, non-normally distributed variables by medians and Mann-Whitney tests, and categorical variables by chi-square tests. p values were adjusted for 23 comparisons.

Results: Mean age was 49.3 in RA patients vs 62.8 years in OA patients (p <0.0002, adjusted for 23 comparisons). Median values for physical function, pain, patient global estimate, RAPID3, ESR, CRP, and mean physician global estimate did not differ in RA vs OA. Median total RADAI and binary scores were slightly higher in RA than OA (not statistically significant). More than 4 involved joint groups were self-reported by 64% of RA and 58% of OA patients. Involvement of wrists was higher in RA vs OA (51% vs 32%, adjusted p=0.023); no other differences in specific joint group involvement were statistically significant, adjusted for 23 comparisons.

Demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>RA patients N = 174</th>
<th>OA patients N = 113</th>
<th>p</th>
<th>Adj. p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years, mean (SD)</td>
<td>49.3 (15.1)</td>
<td>62.8 (12.5)</td>
<td>&lt;0.0001</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Gender, % female</td>
<td>60%</td>
<td>75%</td>
<td>0.14</td>
<td>NA</td>
</tr>
<tr>
<td>Ethnicity, %</td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>White</td>
<td>69%</td>
<td>68%</td>
<td>0.10</td>
<td>NA</td>
</tr>
<tr>
<td>African American</td>
<td>14%</td>
<td>8%</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Hispanic</td>
<td>27%</td>
<td>21%</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Asian</td>
<td>8%</td>
<td>3%</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
<td>7%</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Education, years, mean (SD)</td>
<td>16 (12-18)</td>
<td>16 (12-18)</td>
<td>0.40</td>
<td>NA</td>
</tr>
</tbody>
</table>

Clinical and Laboratory Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>RA patients N = 174</th>
<th>OA patients N = 113</th>
<th>p</th>
<th>Adj. p</th>
</tr>
</thead>
<tbody>
<tr>
<td>DataSource</td>
<td>Total OA (0–48)</td>
<td>Total RA (0–48)</td>
<td>0.75</td>
<td>NA</td>
</tr>
<tr>
<td>Binary RADAI (0–18)</td>
<td>total OA (0–18)</td>
<td>total RA (0–18)</td>
<td>0.33</td>
<td>NA</td>
</tr>
<tr>
<td>Number (%) scoring &gt;4 joint groups</td>
<td>111 (64%)</td>
<td>66 (58%)</td>
<td>0.36</td>
<td>NA</td>
</tr>
<tr>
<td>Involvement of specific joint groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finger</td>
<td>98 (56%)</td>
<td>47 (42%)</td>
<td>0.01</td>
<td>0.23</td>
</tr>
<tr>
<td>Wrist</td>
<td>89 (51%)</td>
<td>36 (32%)</td>
<td>0.001</td>
<td>0.023</td>
</tr>
<tr>
<td>Elbow</td>
<td>55 (32%)</td>
<td>27 (24%)</td>
<td>0.22</td>
<td>NA</td>
</tr>
<tr>
<td>Shoulder</td>
<td>78 (45%)</td>
<td>46 (41%)</td>
<td>0.07</td>
<td>NA</td>
</tr>
<tr>
<td>Hip</td>
<td>62 (35%)</td>
<td>45 (38%)</td>
<td>0.67</td>
<td>NA</td>
</tr>
<tr>
<td>Knee</td>
<td>88 (51%)</td>
<td>77 (69%)</td>
<td>0.001</td>
<td>0.009</td>
</tr>
<tr>
<td>Ankle</td>
<td>70 (40%)</td>
<td>31 (28%)</td>
<td>0.02</td>
<td>0.46</td>
</tr>
<tr>
<td>Toes</td>
<td>71 (41%)</td>
<td>50 (27%)</td>
<td>0.01</td>
<td>0.23</td>
</tr>
</tbody>
</table>

*Adjusted for 23 comparisons. NA = not applicable (unadjusted p > 0.05).

Conclusion: OA and RA result in similar patient self-report MDHAQ scores. Further, physician global estimate, ESR, CRP and polyarticular involvement are similar in OA and RA at this time. RA and OA may have been more distinct in the past, when RA patients were younger, had much more severe clinical status, and less effective treatments. The data emphasize the need for careful evaluation by a knowledgeable physician to distinguish OA from RA, and may improve understanding of the concerns of OA patients, most of whom have polyarticular disease, functional disability and pain scores similar to patients with RA.

Disclosure: I. Castrejon, None; Y. Yazici, None; T. Pincus, None.

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Routine Assessment of Patient Index Data 3 (RAPID3) Is a Valid Index for Routine Care in Patients with Osteoarthritis. Alfredomaria Lurati, Luca Bertani, Daniela Bompone, Mariangela Marranza, Kalia Angeles, Magda Scarpellini, Rheumatology Unit, Magenta, Italy, Ospedale Fornaroli, Magenta, Italy

Background/Purpose: RAPID3 (routine assessment of patient index data) is an arithmetic composite index of three Core Data Set patient self-report, measures: physical function (0–3 converted to 0–10), pain (0–10), and patient global estimate (0–10) for a total of 0–30. It can be completed in the waiting room and can be calculated in only few seconds. Aim of this study was to compare RAPID3 with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in patients with knee or hip osteoarthritis (OA).

Methods: Patients with symptomatic knee or hip osteoarthritis as main rheumatologic diagnosis (VAS pain > 50 on a visual scale 0–100mm) according to the ACR (American College of Rheumatology) criteria and with Kellgren-Lawrence stage 2 or 3 according to the Kellgren-Lawrence radiographic criteria were eligible. All subjects were clinically evaluated individually by an experienced rheumatologist and were asked to complete the self-report questionnaires (the original version of the WOMAC for hip or knee osteoarthritis and the RAPID3). There was no specific order in which the tests were completed; rather, each participant selected the order. Agreement between WOMAC and RAPID3 scores was estimated with rho Spearman correlation statistic and Cohen’s kappa.

Results: 478 patients (155 males, 323 females) with hip (n=38) or knee (n=70) osteoarthritis were enrolled in daily practice clinical care during
2010–2012. Mean age (±SD) was 63±14.4 years old. Mean score was 67±9.1 for WOMAC and 6.5±2.1 for RAPID3. RAPID3 and WOMAC have shown a global correlation rho index of 0.72 (p<0.001) and a Cohen’s kappa of 0.7. Computing analysis for diagnosis, the means of WOMAC and RAPID3 weren’t significantly different between patients with hip or knee osteoarthritis (67± 9.9 vs 68±6.8 and 6.4± 2.1 vs 6.5±2.1, respectively, p>0.05). The Spearman’s rho was 0.63 for hip osteoarthritis (p<0.01) and 0.78 for knee osteoarthritis. Cohen’s kappa was 0.68 for hip osteoarthritis (p<0.01) and 0.78 for knee osteoarthritis, respectively.

**Conclusion:** Up to date there’s no literature about the use of RAPID3 in patients with OA. In our study we found a strong correlation between RAPID3 and WOMAC in patients with either hip and knee OA, confirmed by a linear regression model developed using all variables collected. RAPID3 provide informative quantitative data for patient status from one visit to the next comparable to other self-reported questionnaire as WOMAC in a time sparing manner.

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Meager Depression Screening and Mental Health Referral Rates for Patients with Arthritis in a National Sample. Mary Margareten, Patricia P. Katz, Laura Trupin, Gabriela Schmajuk, Jennifer Barton, Jinoos Yazdany and Edward Yelin. UCSF, San Francisco, CA

**Background/Purpose:** Depression in patients with arthritis is common and leads to poor health outcomes. While it has been shown that rheumatologists rarely communicate about depression to their patients with arthritis, there are no data about screening practices for depression in this population. Our objectives were to describe national rates of depression screening in patients with arthritis and real-world practices for mental health referrals for patients with arthritis and prevalent depression.

**Methods:** In 2005 the National Ambulatory Medical Care Survey, an annual national cross-sectional survey conducted in physicians’ offices, began collecting data about depression screening practices. Using 2005–2009 data, we compared office visits coded for current arthritis with other office visits to assess the rate of pre-existing depression, depression screening, and mental health referrals. Of 102,050 adult visits, we identified 14,611 coded for depression and arthritis, and 11,664 without arthritis who had a current diagnosis of depression (n=11,664) were included in analyses for mental health referrals.

**Results:** The odds ratio for comorbid depression in patients with arthritis was 6.9 (95% CI 4.9; 10.2) controlling for age, race, and gender. Depression screening occurred in 77 (0.6%) of the eligible 12,457 patients associated with arthritis. Patients with arthritis were less likely to have depression screening services at their office visit compared to patients without arthritis (OR,69; 95% CI54.87). No rheumatologists screened their patients with arthritis for depression. Patients with arthritis and depression were less likely to receive referrals for psychotherapy (OR,43; 95% CI38.51), mental health providers (OR25; 95% CI15.42), or other mental health services (OR,41; 95% CI33.51) compared to patients without arthritis.

**Conclusion:** Ambulatory physicians in the United States, whether they are rheumatologists or primary care providers, rarely screen for depression in patients with arthritis. Furthermore, identified depressed patients with arthritis are less likely to receive referrals for mental health services. Both recognition and treatment practices need to be improved for patients with arthritis and depression in order to improve health outcomes.

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Synovial Fluid Leptin Level Is Associated with Residual Pain and Functional Disability One Year After Total Joint Arthroplasty. Anne Lükbeke1, Gabor J. Puskas2, Axel Finckh3, Domizio Suva1, Sylvette Bas3, Cem Gabay1, Daniel Fritschy1 and Pierre Hoffmeyer1. 1Geneva University Hospitals, Geneva, Switzerland, 2Geneva University Hospitals, Geneva 14, Switzerland, 3Geneva University Hospitals, Switzerland

**Background/Purpose:** A sizeable number of patients continue to suffer from pain, functional disability and reduced quality of life after total joint arthroplasty (TJA). The etiology of post-TJA pain is not well established and the presence of chronic pain of neuropathic origin has been suggested. Leptin has been identified as a mediator of the immuno-inflammatory response in osteoarthritis (OA), and its pro-inflammatory functions could explain its role in peripheral pain sensitization. We previously demonstrated that high synovial fluid (SF) leptin concentrations correlate with increased neuropathic pain in hip and knee OA patients. In addition, animal models have suggested the involvement of leptin in the pathogenesis of pain at the spinal level and in the development of neuropathic pain. Our objective was to assess pain, function, patient satisfaction and general health in patients undergoing TJA according to SF leptin concentration.

**Methods:** Prospective cohort study of patients with primary OA undergoing total hip or knee arthroplasty between January and December 2010. On the day of intervention, SF was sampled and leptin concentrations were assessed using an ELISA kit. Exposure was SF leptin concentration (≥19.6 ng/ml vs. >19.6 ng/ml= highest quartile). Outcomes were: joint pain, function and general health measured pre- and at 1 year postoperative with WOMAC, VAS for pain, and SF-12, and patient satisfaction at 1 year measured on 5-item Likert scale.

**Results:** 167 TJAs were included, 88 total hip and 79 total knee arthroplasties. Mean age was 72 years, mean BMI 28 kg/m², 58% were women. High intra-operative SF leptin concentrations (>19.6 ng/ml) were found in 39 (23.4%) joints. Compared to leptin levels <19.6 ng/ml (their presence was associated with significantly higher pain levels on both WOMAC and VAS pain scales, with lower function and worse physical and mental health scores both pre- and 1 year postoperative (effect sizes ranging from 0.4 to 0.7) and with lower satisfaction (see Table). Residual pain of ≥5 on the VAS was present in 35% of TJAs with high leptin concentration compared to 13% in the other group (RR 2.5, 95% CI 1.3; 4.7). The degree of improvement in all domains (difference pre- to postoperative) was not significantly modified by SF leptin levels.

**Table 1.** Preoperative and 1-year postoperative assessment of pain, function and general health according to leptin concentration

<table>
<thead>
<tr>
<th>Leptin quartile</th>
<th>WOMAC pain (SD)</th>
<th>Leptin quartile</th>
<th>WOMAC pain (SD)</th>
<th>Difference</th>
<th>Leptin quartile</th>
<th>WOMAC pain (SD)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td></td>
<td>Postoperative</td>
<td></td>
<td></td>
<td>Preoperative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–3rd quartile</td>
<td>118 (36)</td>
<td>122 (37)</td>
<td></td>
<td></td>
<td>48 (11.0)</td>
<td>59 (12.9)</td>
<td>11 (1.9)</td>
</tr>
<tr>
<td>4th quartile</td>
<td>12 (9.4)</td>
<td>24 (9.1)</td>
<td></td>
<td></td>
<td>12 (9.4)</td>
<td>15 (12.4)</td>
<td>3 (3.0)</td>
</tr>
<tr>
<td>4th vs. 1–3rd quartile</td>
<td><strong>25.2 (12.2)</strong></td>
<td><strong>24.9 (12.1)</strong></td>
<td><strong>0.3 (1.1)</strong></td>
<td><strong>0.0 (1.0)</strong></td>
<td><strong>0.3 (1.1)</strong></td>
<td><strong>0.0 (1.0)</strong></td>
<td><strong>0.3 (1.1)</strong></td>
</tr>
</tbody>
</table>

**Conclusion:** High intra-articular leptin were strongly associated with more residual pain and functional disability 1 year after arthroplasty. However, the degree of improvement was independent of leptin concentration. With respect to pain these results lend support to the hypothesis that high intra-articular leptin levels could favor spinal pain sensitization and the development of neuropathic pain earlier in the disease process.

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Background/Purpose: Knee joint replacement (KR) is a cost-effective procedure with good long-term outcomes. However, there is no clear consensus on indications for KR. Subchondral bone marrow lesions (BMLs) have been identified as important structural features relevant to clinical manifestation (e.g. pain) as well as structural progression (e.g. cartilage loss). Thus, BMLs are promising biomarkers for structural progression to important clinical outcomes such as KR. The aims of this study were therefore to test whether presence and size of BMLs increased odds of KR, and whether worsening of BMLs over time increased odds of KR.

Methods: We studied 121 knees from OAI participants that underwent KR before the 48 month visit at two time points (T0 and T-1) prior to KR, (i.e. for a KR reported at the 48 month (M) visit, T0 = 36M and T-1 = 24M). These were matched with 121 control knees that did not undergo KR based on radiographic disease stage, sex, and age (+/- 5y). 3Tesla MRIs were read for subchondral BMLs in 14 articular subregions using the semiquantitative MOAKS system. Only BML size, which is scored from 0–3, was considered for subchondral BMLs in 14 articular subregions using the semiquantitative MOAKS system, which scores cartilage development of full thickness cartilage damage and full grade worsening in the LTF, but not the MTF compartment from T-1 to T0 was associated with greater odds for KR (OR 2.8, 95% CI 1.01–7.78 and 4.5 95% CI 1.52–13.30, respectively). More than 3 subregions exhibiting worsening in the MTF compartment was associated with increased odds for KR (OR 14.5, 95% CI .90–110.93), while this was not observed for the LTF or PF compartments.

Conclusion: Development of full thickness cartilage damage and worsening in the LTF compartment as well as multiple subregions showing worsening cartilage damage in the MTF compartment increase odds for TKR. Presence and change of imaging biomarkers may be important prognostic markers when KR is used as a long-term outcome.

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Smaller Baseline and Follow-up Quadriceps Muscle Cross-Sectional Area Increases the Odds of Knee Replacement in Knee Osteoarthritis. Serter Gumus1, Michael J. Hannon1, Diana Kaya1, C. Kent Kwoh2 and Kyongtae Ty Bae3. 1University of Pittsburgh, Pittsburgh, PA, University of Pittsburgh School of Medicine, Pittsburgh, PA, 2University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, University of Pittsburgh School of Medicine, Pittsburgh, PA, 3University of Pittsburgh, Pittsburgh, PA, Paracelsus Medical University, Salzburg, Austria, 4University of Sydney, Sydney, Australia, Novartis Pharma AG, Basel, Switzerland, 5Boston University School of Medicine, Boston, MA

Background/Purpose: Knee osteoarthritis (OA) is one of the major causes of disability among elderly. Knee replacement (KR) is the final effective treatment of OA after other treatment attempts fails to provide pain relief. Quadriceps muscle is the major static muscle of knee joint. Our purpose was to evaluate the relationship between quadriceps muscle quality and total knee replacement incidence in patients having OA.

Methods: Cases were defined as the participants who had a KR between 36 to 60 months visit. Controls were matched by age (within 5 years), sex and baseline central Kellgren-Lawrence grade (0/1, 2, 3 and 4). Participants who had available mid-thigh MR imaging scans (15 contiguous slices, 5mm slice thickness) at baseline and 24 month follow-up were evaluated. Femoral insertion point of oblique tendon of adductor magnus muscle was determined as a landmark for each thigh for matching purposes to account for differences thigh length and body surface area (BSA). This slice was chosen for documentation and cross-sectional area (CSA) measurements of quadriceps, hamstring muscles and intramuscular, subcutaneous fat (QM, HM, IMF, SCF). Segmentation was done by a radiologist who was blinded to TKR status. A second radiologist segmented 20 legs for reliability measurements.

Conclusion: Quadriceps CSA was a significant predictor for total TKR in OA patients. This finding suggests that quadriceps muscle CSA may be used as a predictor for TKR in OA.
Muscle quality (MQ) was defined as the peak muscle strength divided by muscle CSA. Four pairs were excluded for baseline and four additional pairs were excluded for follow-up MQ measurements because the peak strength values were not available. Conditional logistic regression analysis was used for statistical evaluation.

**Results:** There were 46 case-control pairs of thighs and knees (54 right, 38 left) from Osteoarthritis Initiative (OAI) database that were included in this case-control study. The mean ± SD age and BSA were 63.3 ± 8.9, 1.99 ± 0.23 respectively; Fifty percent of the participants were female and 49.5% were African American. Inter and intraobserver ICC was 0.999 and 0.999 respectively. In adjusted models, QMCSA was smaller in case group both in baseline and follow-up images (p = 0.17, p = 0.24 respectively). Baseline and follow up MQ quality (QMQ) was not significantly different between cases and controls. HMCSA, HMQ, SFCsSA and IMFCSA measurements did not show any significant differences between case and controls.

**Conclusion:** QMCSA seems to be significantly smaller in case group even the QMO is not significantly different. We think that QMCSA has a potential of being one of the biomarkers for predicting future TKR candidates. Further studies may address the importance of increasing QMCSA by lifestyle modifications and its effects on progression of disease.

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#### Presence of Severe Medial Meniscal Pathology Increases the Odds for Knee Replacement: Data From the Osteoarthritis Initiative.

**Method:** Participants were drawn from the Osteoarthritis Initiative (OAI), a multicenter observational study, including 4796 participants with, or at risk of knee osteoarthritis. 120 knees from 113 OAI participants that received KR before the 48 month visit were studied at the time point prior to KR (e.g. for a KR reported at the 48 month (M) visit, T0 = 36M). These were matched with the same number of control knees for radiographic disease stage, gender, and age (+/- 5 y). 3Tesla MRIs were read for medial and lateral meniscal morphology and extrusion using the semiquantitative MOAKS system, which scores meniscal morphology from 0 to 8 and for the following locations: anterior horn, body, posterior horn, medial and lateral. Grades 0 and 1 are considered the reference as a grade 1 lesion depicts intrameniscal signal changes of unknown relevance. Grades 2–5 code different types of meniscal tears while grades 6–8 code different grades of meniscal maceration. Extrusion was graded from 0–3 at the medial and lateral joint lines on the coronal images.

**Conditional logistic regression was applied to assess the odds of KR at T0 considering different measures of meniscal morphology.**

**Results:** 240 knees; one knee per subject from 120 cases of KR and 120 matched controls that had available T0 data were included. Subjects were on average 65.5 years old (SD ± 8.6), predominantly female (58.1%) and overweight (mean BMI 29.5 SD ± 4.88). Odds of KR was significantly greater for the subgroup exhibiting any type of maceration of the medial meniscal body and the medial posterior horn at T0 compared to knees without any meniscal pathology in these locations as the reference. Knees with a maximum grade of any meniscal maceration (i.e., grades 6–8) in any of the 3 medial compartment locations had a greater odds for KR when compared to knees with a maximum of zero or one (Figure 1). No significant associations were observed for the lateral compartment or for meniscal extrusion.

**Conclusion:** Presence of any medial meniscal pathology of the body and any type of maceration of the medial posterior horn at T0 increases the odds for KR compared to knees without relevant meniscal alterations. Further, the odds of KR is greater when a maximum grade of meniscal maceration is present in any of the medial meniscal locations. Meniscal extrusion or pathology in the lateral compartment did not increase the odds of KR.

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**Method:** Between 1st January 2000 and 12th June 2009, patients were included if they met the following criteria: had a current diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD) in conjunction with the main diagnosis of knee OA (ICD). We used the point prevalence of knee and hip OA by the 31st Dec 2011 based on the SHCR register data from years 1999–2011.

**Background/Purpose:** To estimate the incidence and age and sex patterns of subjects having had osteoarthritis (OA)-related surgical treatment.

**Method:** The Skåne Health Care Register (SHCR) is a legislative, mandatory register based on physicians’ International Classification of Diseases (ICD) 10 diagnostic codes and the classification of health care procedures and surgical codes according to KKA97. The register covers all in- and outpatient health care in southern Sweden (total population 1.3 million). For the year 2011 we identified patients ≥35 years of age having had the hip replacement and a main diagnosis of hip OA (M16) or having the knee replacement or other knee surgery (arthroscopic or endoscopic exploration of the joint, synovectomy, excision of meniscus or articular cartilage or other surgery of synovial membranes of the knee) in conjunction with the main diagnosis of knee OA (M17) or derangement of meniscus due to old tear or injury (M23.2), which we consider probable OA. We obtained annual cumulative incidence of OA-related surgery in 2011 by cross referencing with the population register to include all residents (aged ≥35) of Skåne by the 31st Dec 2010. To obtain estimates of the annual cumulative incidence of OA-related knee or hip surgery among all known knee or hip OA patients we used the point prevalence of knee and hip OA by the 31st Dec 2011 based on the SHCR register data from years 1999–2011.

**Results:** The annual incidence of OA-related knee replacement in the population aged ≥35 was 18.6 per 10,000 persons (95%CI: 17.6; 19.6), 16.1 for men and 21.0 for women. The annual incidence of other OA-related knee surgery in the population was 11.8 per 10,000 persons (95%CI: 11.0; 12.6) for men and 14.6 for men and 9.2 for women. The 2011 incidence of OA-related hip replacement in the population was 19.3 per 10,000 persons (95%CI 18.3; 20.3), 11.7 for men and 16.1 for women. The annual incidence of OA-related knee and hip replacement in the population ≥65 years of age was 35 and 37 per 10,000 persons respectively.

The incidence of OA-related knee replacement surgery among known prevalent knee OA patients aged ≥35 was 156 per 10,000 cases and peaked at age 65–74 years. The incidence of OA-related hip replacement among known prevalent hip OA patients was 359 per 10,000 cases and peaked at age 35–44 years (Figure).

**Disclosure:** None.
Effects of Strontium Ranelate On Knee Osteoarthritis Pain: A Responder Analysis

Background/Purpose: In a large, randomised, placebo-controlled, double-blind phase-III 3-year study (SEKOIA), strontium ranelate 2g/day (SrRan) has demonstrated structure-modifying activity associated with statistically significant symptomatic improvement in patients with knee OA. In clinical trials, results for symptom improvement are usually reported as mean change in score which may not be directly clinically meaningful. The objective of this analysis was to describe, at an individual level, the effects of strontium ranelate on pain in patients with knee OA compared to placebo.

Methods: The main objective of the SEKOIA study was to demonstrate the effects of strontium ranelate on radiographic progression of knee osteoarthritis. Included patients were men and women over 50 years old, with symptomatic primary knee OA (at least 40 on a 100 mm visual analog scale (VAS) on most days of the previous month i.e. 1/2 days, Kellgren and Lawrence [KL] grade 2 or 3, and joint space width [JSW] 2.5–5 mm). Symptoms were assessed every 6 months over 3 years using the WOMAC questionnaire and a 100 mm VAS (“How would you rate the pain you have felt in the studied knee within the last 48 hours?”). Proportions of patients with an improvement of at least 20% or 50% from baseline of their WOMAC pain subscore (calculated using improvement in pain and function but not patient’s global assessment as it was not assessed in this study) were compared using a chi² test.

Results: The ITT population included 1371 (82%) patients. At baseline, the mean, age was 63 ± 7 years, BMI was 30 ± 5 kg/m², VAS was 54 ± 22 mm, and WOMAC was 132 ± 62 mm. 61% were KL grade II and 69% were female. There were no differences between groups at baseline. Over 3 years, a significantly greater percentage of strontium ranelate 2g-treated patients had 20% improvement in WOMAC pain compared with placebo (72% vs 64%, p = 0.010) and a trend was seen with 50% improvement (51% vs 45%, p = 0.078). Similar results were confirmed on the VAS, with a greater number of patients having an improvement in global knee pain of at least 20% (76% vs 70%, p = 0.034) or at least 50% (60% vs 53%, p = 0.065) compared to placebo. When combining improvement in pain with improvement in function (OMERACT-OARSI-like responders) the percentage of responders was significantly greater in the strontium ranelate 2g group (54% vs 47%, p = 0.035) than in the placebo group.

Conclusion: Strontium ranelate 2g/day is associated with a greater number of patients having a clinically relevant decrease in their pain level over 3 years compared to placebo-treated patients. Strontium ranelate treated patients were also more likely to be OMERACT-OARSI-like responders.

References

Disclosure: J. Regnier, Servier, Novartis, Negma, Lilly, Wyeth, Amgen, GlaxoSmithKline, Roche, Merckle, Nycomed, NPS, Theranex, UCB, 5, Merck Sharp and Dohme, Lilly, Rottapharm, IBSA, Genevrier, Novartis, Servier, Roche, GlaxoSmithKline, Teijin, Teva, Ebeewee Pharma, Zodiac, Analis, Theranex, Nycomed, Novo-Nordisk, 9, Bristol Myers Squibb, Merck Sharp and Dohme, Rottapharm, Teva, Lilly, Novartis, Roche, GlaxoSmithKline, Amgen, Servier, 9; R. Chapurlat, Merck, Amgen, Servier, Lilly, Roche, Novartis, 9; N. Bellamy, Servier, 5; E. Czerniecki, Amgen, Andromeda Biotech Ltd, Astrazeneca, Biotech AG, Eli Lilly, INC Research, Johnson&Johnson, Merck Serono, Novartis, Pfizer, Roche, Servier, Shire Movetics, 5; J. Devogelaer, Novartis Pharmaceutical Corporation, 9, Merck, Sharpe & Dohme, Servier, Merck, Procter & Gamble, Roche, and Amgen, 9; L. March, Servier, MSD, Pfizer, Abbott, UCB, 9; K. Pavlka, BMS, Abbott, Pfizer, MSD, Amgen, 9; C. Cooper, Amgen, ABBH, Novartis, Pfizer, Merck Sharp and Dohme, Eli Lilly, Servier, 5.
Strontium Ranelate Decreases the Level of Urinary CTX-II in Patients with Knee Osteoarthritis. Julien Collette1, Olivier Bruyere2 and Jean-Yves Regnier3. 1Labo Ria Chu Sart Tilman, Liege, Belgium, 2Universee De Liege, Liege, Belgium, 3University of Liege, Liege, Belgium

Background/Purpose: Knee osteoarthritis is a chronic disease affecting the global joint and characterized by cartilage degradation as well as subchondral bone remodelling. Effects of strontium ranelate (SrRan) on urinary CTX-II, an osteoarthritis-related biomarker, and on serum CTX-I and bone phosphatase alkaline (sb-ALP) were assessed in all patients included in the SEKOIA study at baseline and after 3, 6, 12, 24 and 36 months of treatment. 1683 patients have been included in this double-blind, placebo-controlled, randomized, international 3-year phase III study aiming to demonstrate the effects of SrRan on the radiographic progression of knee osteoarthritis and have been allocated to SrRan 1g or 2g per day or placebo. Analyses were performed by SUPREME (Liege) using ELISA (uCTX-II and sCTX-I) or a chemiluminescent immunoenzymatic assay (sb-ALP). uCTX-II was corrected for urinary creatinine level. Group comparisons were assessed in the ITT (1371 patients) using a Mann-Whitney-Wilcoxon test for uCTX-II or a general linear model with sex, baseline and centre as covariates for sb-ALP and sCTX-I.

Results: At baseline, no significant difference was observed between the groups on uCTX-II, sCTX-I and sb-ALP levels. At the last visit, uCTX-II was significantly lower in the SrRan 1g and 2g groups than in the placebo group with an estimated mean difference of −0.04 and −0.03 μg/mmol respectively (p = 0.003 for SrRan 1g group and p = 0.021 for SrRan 2g group). Early differences between the treatment groups were demonstrated at 3 months, uCTX-II was significantly lower in the SrRan 1g and 2g groups than in the placebo group with an estimated mean difference of −0.04 and −0.07 μg/mmol creatinine (p < 0.0001) respectively.

The results on bone markers sb-ALP and sCTX-I are those expected with SrRan, the level of sb-ALP was higher in SrRan 2g group compared to placebo and the level of sCTX-I was lower in both SrRan groups compared to placebo at all visits from 3 months.

Conclusion: Treatment with strontium ranelate significantly decreases the level of urinary CTX-II compared to placebo in patients suffering from knee osteoarthritis, suggesting that strontium ranelate slows the evolution of knee osteoarthritis.


Disclosures: J. Collette, None; O. Bruyere, IBBA, Merck Sharp & Dohme, Nutra- veris, Novartis, Pfizer, Rottapharm, Servier, Theranex, 2; J. Y. Regnier, Servier, Novartis, Negma, Lilly, Wyeth, Amgen, GlaxoSmithKline, Roche, Merckle, Nycomed, NPS, Theranex, UCB, 5; Merck Sharp and Dohme, Lilly, Rottapharm, IBBA, Genevier, Novartis, Servier, Roche, GlaxoSmithKline, Teijin, Teva, Ebeewee Pharma, Zodiac, Analis, Theranex, Nycomed, Novo-Nordisk, 9; Bristol Myers Squibb, SrRan and Dohme, Rottapharm, Teva, Lilly, Novartis, Roche, GlaxoSmithKline, Amgen, Servier, 2.

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Strontium Ranelate Decreases the Level of Urinary CTX-II in Patients with Knee Osteoarthritis. Matthias Rothé1, Johannes C. Vester2, Wolfgang W. Bolten3 and Philip G. Conaghan4. 1IIMR Partner GmbH, Graefelfingen, Germany, 2IDV Data Analysis and Study Planning, Krailling, Germany, 3Klaus-Miehlke-Klinik, Wiesbaden, Germany, 4University of Leeds, Leeds, United Kingdom

Background/Purpose: A transferrable is an ultrafilterable lipid vesicle originally developed to deliver high concentrations of drug (eg NSAIDs) transdermally. Large interventional trials in osteoarthritis (OA) of the knee comparing ketoprofen-containing vesicles (IDEA-003) to vesicles without active drug (called Sequossome, TDT 064) showed conflicting results for IDEA-0331–3 but all demonstrated pronounced treatment effects of the vehicle itself (TDT 064) that, in one study, were comparable to 100 mg b.i.d. celecoxib and statistically significantly superior to oral placebo. Objectives were to investigate how the treatment effects seen with TDT 064 compare with the results reported for the placebo arm of other OA interventional studies using a meta-analytic approach.

Methods: The efficacy of TDT 064 gel has been evaluated in four randomized, double-blind, parallel-group multicenter, 12-week Phase III studies of IDEA-033 in knee OA that included TDT 064 as a drug-free vesicle control group. The meta-analysis combines the results of the WOMAC pain subscales from the studies which were standardized to a 0–100 scale. The resulting pre-post effect size (ES) is the standardized difference (Cohen’s d) of the changes from baseline of the WOMAC pain subscale score at Week 12 (based on the standard deviation of the changes of the corresponding TDT 064 group). Effect sizes of 0.2, 0.5, and 0.8 are used to represent small, medium, and large effect sizes, respectively. The results of the meta-analysis are presented as two-sided 95.0% confidence intervals (CIs; Hedges’ g). The results of this analysis are compared with those of a meta-analysis of placebo responses from other conventional trials as published by Zhang et al.

Results: The ES calculated for a total of 1061 patients with OA of the knee treated with TDT 064 gel was 1.15 (CI: 1.09–1.21). The respective values for the individual 4 studies were 1.33 (CI: 1.18–1.47)4, 1.12 (CI: 1.03–1.21)5, 1.05 (CI: 0.87–1.24)6, and 1.12 (CI: 1.00–1.24)7. The results were comparable irrespective of whether 2.2 g or 4.4 g of TDT 064 gel was used to represent ES (data not shown). This compares to an ES of 0.51 (CI: 0.46–0.55) reported for all placebo applications and an ES of 0.63 (CI: 0.47–0.80) for the topical placebo arm investigated with topical formulations in the meta-analysis of Zhang et al.
Efficacy and Safety of the Chinese Herbal Compound Hou-Lou-Xiao-Ling Dan in Patients with Osteoarthritis of the Knee: Results of a Phase II International Study.

Background/Purpose: Traditional Chinese Medicine (TCM), which includes the use of herbal medicines, is widely used to treat osteoarthritis (OA) of the knee in Asian societies; furthermore, many persons with OA in the United States use TCM therapies. The scientific basis for the use of TCM in the treatment of OA, however, is relatively sparse. Huo-Luo-Xiao-Ling (HLXL) Dan is a Chinese herbal compound that is used for the treatment of arthritis and Bi syndrome in Asia and has been shown to have anti-inflammatory and immunomodulatory properties in preclinical models of rheumatoid arthritis. The primary objective of this study was to examine the efficacy and safety of a proprietary formulation of HLXL Dan in patients with osteoarthritis (OA) of the knee who continued to have symptoms despite receiving standard analgesic and/or anti-inflammatory treatment.

Methods: A randomized, double-blind, placebo-controlled phase II clinical trial was conducted at two sites: the University of Maryland Center for Integrative Medicine and the Chinese University of Hong Kong. Patients with symptomatic radiographic knee OA who fulfilled ACR classification criteria and had moderate or greater frequent knee pain in one or both knees despite receiving background analgesic and/or anti-inflammatory medicines were randomized to receive either HLXL Dan at a dose of 5,180 mg/day (15 capsules in 3 divided doses) or matching placebo for 8 weeks. Clinical assessments were performed at baseline and weeks 2 and 8 including measurement of knee pain and function with the WOMAC OA Index, patient global assessment of OA (PGA), and PGAs of response to therapy (PGART) at end of study. Safety assessments were performed at each visit. Data were analyzed using an intent-to-treat protocol; statistical significance was inferred if P < 0.05.

Results: A total of 92 patients were enrolled: 53 in the U.S. and 39 in Hong Kong. Overall, the mean age was 60 years, 65 (71%) were women and 64 (70%) were of Asian ethnicity. Mean (SD) baseline WOMAC pain and function score was 4.3 (1.5) and 4.2 (1.6), respectively, and PGA was 2.2 (0.8). There were no significant differences between HLXL- and placebo-treated groups in baseline variables. While both groups had significant improvement in all outcome measures after 8 weeks, there were no significant differences between the HLXL- and placebo-treated groups. At 8 weeks, about two-thirds of subjects noted that they were better based on PGART responses; there was no difference between treatment groups. In mixed models repeated measures analysis, there were no significant differences in WOMAC pain or function scores or PGAs between groups; furthermore, there was no interaction between clinical site and degree of improvement. Average adherence exceeded 80 percent and was similar between clinical sites. Finally, there was a significantly greater rise in mean ALT levels in the HLXL-treated group compared with the placebo-treated group (3.8 [10.4] vs 0.1 [5.8] U/l) but no significant difference in either AST or γGT levels.

References

Disclosure: M. Rother, Pro Bono Bio Entrepreneur Ltd., 5, IDEA AG, 3; J. C. Vester, None; W. W. Bolten, None; P. G. Conaghan, None.

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Efficacy and Safety of the Chinese Herbal Compound Hou-Lou-Xiao-Ling Dan in Patients with Osteoarthritis of the Knee: Results of a Phase II International Study.

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Conclusion: These data fail to demonstrate that a proprietary form of the Chinese herbal compound HLXL Dan is efficacious for treating the symptoms of knee OA.

Disclosure: M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Bioiberica S.A., Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma A.G., Pfizer Inc., Stryker LLC, Xoma, 5; L. Luo, None; P. Langenberg, None; H. H. S. Fong, None; D. Y. W. Lee, None; B. Berman, None.

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Long-Term Tanezumab Treatment for Osteoarthritis: Efficacy and Safety Results.

Methods: Patients were eligible to enroll up to 12 weeks after their last dose of study medication in the parent study. Patients (N=2142) received tanezumab 2.5 mg (n=522), 5 mg (n=832), or 10 mg (n=788) IV every 8 weeks up to 80 weeks. Safety assessments included adverse event documentation, physical and neurological examinations and laboratory tests. Efficacy analyses included change from baseline in Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) Pain and Physical Function subscales and Patient’s Global Assessment of OA.

Results: Demographic characteristics were similar across treatments. Mean duration of combined parent and extension study treatment for tanezumab 2.5, 5, and 10 mg was 353, 345, and 335 days, respectively. The most frequently reported treatment-related adverse events were paresthesia, arthralgia and hypoesthesia. Osteonecrosis was reported for 28 (1.3%) patients, only one event subsequently was adjudicated as osteonecrosis. Concomitant non-steroidal anti-inflammatory drugs (NSAIDs) use was associated with increased incidence of rapidly progressive osteoarthritis. A total of 187 patients (8.7%) underwent total joint replacements (TJR). All-cause TJR frequency was 5.2% in those not taking NSAIDs (n=1173) vs. 13.0% in the concomitant NSAID cohort (n=909). Patients from tanezumab groups in the parent studies reported sustained improvement in WOMAC pain in the extension study (Figure). Few patients (7.2%) discontinued due to lack of efficacy indicating that treatment had a persistent beneficial effect. Similar results were observed for other efficacy endpoints.
Conclusion: Repeated doses of tanezumab 2.5 mg, 5 mg, and 10 mg every 8 weeks were efficacious and generally safe with no new safety signals identified. Persistent beneficial efficacy similar to that observed in the parent studies was demonstrated and maintained in OA patients over the long term.

Disclosure: A. E. Bella, Horizon, 5, Horizon, 8, Pfizer Inc, 5, Pfizer Inc, 8, Abbott Laboratories, 5, Abbott Laboratories, 8, Amgen, 5, Amgen, 8, UCB, 5, UCB, 8; E. F. Ekman, Novartis Pharmaceutical Corporation, 2, Novartis Pharmaceutical Corporation, 5, Transdel, 2, Transdel, 5, Travanti, 2, Bayer, 2, Bayer, 5, Pfizer Inc, 2, Pfizer Inc, 5, Pfizer Inc, 8; D. Radin, Pfizer Inc, 2; I. Davignon, Pfizer Inc, 1, Pfizer Inc, 3; M. D. Smith, Pfizer Inc, 1, Pfizer Inc, 3; M. T. Brown, Pfizer Inc, 1, Pfizer Inc, 3; C. R. West, Pfizer Inc, 1, Pfizer Inc, 3; K. M. Verburg, Pfizer Inc, 1, Pfizer Inc, 3.

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Adjudication of Reported Serious Adverse Joint Events in the Tanezumab Clinical Development Program. Marc C. Hochberg1, Steven B. Abramson2, David S. Hungerford1, Edward McCarthy4, Eric P. Vignon5, Michael D. Smith6, Leslie Tive7, Kenneth M. Verburg6 and Christine R. West7. 1University of Maryland, Baltimore, MD, 2NYU Hospital for Joint Diseases, New York, NY, 3Johns Hopkins University, Baltimore, MD, 4The Johns Hopkins University School of Medicine, Baltimore, MD, 5Centre Hospitalier, Pierre Benite, France, 6Pfizer, Groton, CT, 7Pfizer Inc, New York, NY, 8Pfizer, New York, MI

Background/Purpose: Tanezumab (TNZ) has been shown to be efficacious for pain and function in patients with hip and knee osteoarthritis (OA). Unexpected reports of adverse events described as osteonecrosis (ON) were obtained. All available source documents from 87 (100%) and 162 (54.2%) of patients with ON or TJR unrelated to ON, respectively, were obtained. Consensus was reached on all but 7 cases. The highest rate of RPOA when TNZ was given as monotherapy (0, 6, and 11 per 1000 person-years at doses of 2.5, 5 and 10 mg, respectively [P = 0.0124]) (see Figure 1). There was also an increased incidence of RPOA and increasing dose of TNZ when given in combination with NSAIDs or TNZ alone at doses ≥ 10 mg. The mechanise for this association remains unclear. These results support the continued study of TNZ alone at doses below 10 mg for treatment of OA.


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Effect of Advancing Age On the Gastrointestinal Safety of Celecoxib Versus Nonselective Nonsteroidal Anti-Inflammatory Drugs: A Post Hoc Analysis of GI-Reasons. Lee S. Simon1, Byron Cryer2, Gurkirpal Singh3, Chunning Li4 and Margaret Noyes Essex5. 1SDG LLC Consulting, New York, NY, 2University of Texas Southwestern Medical Center, Dallas, TX, 3Stanford University School of Medicine, Palo Alto, CA, 4Pfizer Inc, New York, NY, 5Pfizer Inc, New York, NY

Background/Purpose: Celecoxib use was associated with a lower risk of clinically relevant upper and lower GI events than nonselective (ns)NSAIDs in patients (>55 years) with osteoarthritis (OA) at moderate and high risk, in standard US clinical practice, in the GI Randomized Event and Safety Open-Label NSAID Study (GI-REASONS). Age has been identified as a factor for increasing patient risk for a GI adverse event when using NSAIDs. The objective was to assess whether the observed decreased GI risk with celecoxib compared to nsNSAIDs varies with advancing age in 8067 patients from the GI-REASONS trial.

Methods: A post hoc analysis of a prospective, randomized, open-label, blinded end point study1 where patients were randomized (1:1) and stratified by H pylori status to receive celecoxib or any nsNSAID for 6 months. Patients randomized to the nsNSAID arm could switch between nsNSAIDs; crossover between treatment arms was not allowed. The primary end point, a composite of investigator and blinded adjudicated clinically significant upper and lower GI events, was assessed according to age (<60 years, 60–69 years, and ≥70 years). Analyses were performed on the intention-to-treat (ITT) population controlling for H pylori status.

Results: 4035 celecoxib and 4032 nsNSAID patients with OA were included in the ITT population. 1344 (33.3%) and 1363 (33.8%) were aged <60 years, 1997 (49.5%) and 1949 (48.3%) were aged 60–69 years, and 688 (17.1%) and 714 (17.7%) were aged ≥70 years in the celecoxib and nsNSAID groups, respectively. Age was not specified in 6 patients in both treatment groups. Significantly more patients aged <60 years and ≥70 years in the nsNSAID group than in the celecoxib group met the primary end point at 6 months (Table 1). Consistent with the primary results, the most commonly used nsNSAID in each age group was meloxicam. The number of patients using gastric protective agents in the

Table 1. Adjudication Results

<table>
<thead>
<tr>
<th>Final diagnosis, n(%)</th>
<th>Total patients (N = 249)</th>
<th>Total joints (N = 282)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary osteonecrosis</td>
<td>2 (0.8)</td>
<td>2 (0.7)</td>
</tr>
<tr>
<td>Rapidly progressive OA</td>
<td>68 (27.3)</td>
<td>71 (25.2)</td>
</tr>
<tr>
<td>Other condition</td>
<td>119 (47.8)</td>
<td>142 (50.4)</td>
</tr>
<tr>
<td>Insufficient information</td>
<td>31 (12.5)</td>
<td>34 (12.1)</td>
</tr>
<tr>
<td>Insufficient information</td>
<td>31 (12.5)</td>
<td>34 (12.1)</td>
</tr>
</tbody>
</table>
Flexible Footwear Reduces Dynamic Joint Loads in Knee Osteoarthritis: Results of a 6 Month Randomized Controlled Trial. Najia Shakoor1, Roy H. Lidtke1, Louis F. Fogg2, Rachel A. Mikolaitis1, Markus A. Wimmer1, Kharma C. Foucher1, Laura E. Thorp1 and Joel A. Block1.

1Rush University Medical Center, Chicago, IL, 2Rush University Medical Center and Pfizer Inc, 5; C. Li

Background/Purpose: Dynamic joint loads are important in the pathophysiology of knee OA and biomechanical interventions aim to reduce these loads in hopes of improving symptoms and delaying disease progression. Recent evidence suggests that footwear can influence dynamic knee loading and that flat, flexible shoes may result in lower knee loads compared to more supportive, stiff-soled shoes. Here, we evaluate namic knee loading and that flat, flexible shoes may result in lower knee progression. Recent evidence suggests that footwear can influence dy-

Methods: Subjects with radiographic (KL grades ≥ 2) and symptomatic (at least 30mm pain of 100mm scale while walking) medial compartment knee OA were recruited and randomized to receive a flexible soled shoe (mobility shoe) or identical appearing “control” shoe with stiffer sole. The stiffness of the soles was evaluated using a biomaterial testing system and was substantially different between the shoes. Investigators and participants were blinded to shoe assignment. Baseline gait analyses were performed using an optoelectronic camera system and multi-component force plate in subjects’ “own shoes”, study shoes, and barefoot. Subjects were instructed to wear the study shoes at least 6 hours/day for 6 days/week. Gait analysis was repeated at 6, 12 and 24 weeks. The peak knee adduction moment (KAM), a validated marker of medial compartment loading, was evaluated. An intent-to-treat analysis was performed with imputation of missing data using a hot deck method. Repeated measures analysis of variance compared the two arms and planned contrasts were used to further analyze the data and load reductions at various time points.

Results: 22 participants (13 women, mean age 55 ±7 years) were assigned to the mobility shoe and 28 (21 women, mean age 55 ±8 years) to the control shoe. When evaluating the different walking conditions (study shoe, barefoot, own shoes), there were differences over time in the mobility group vs control. Compared to their own shoes at baseline, the mobility group experienced a 20% reduction in the KAM by 24 weeks (3.06 ±1.22 to 2.44 ±0.72 %BW*h, p=0.002) while the control group experienced no significant reduction (3.13 ±0.81 to 3.00 ±0.66 %BW*h, p=0.361). Furthermore, as previously described with use of the mobility shoe, there was a trend for a gait adaptation with reduction in loading during the own shoe condition (7.5%, p=0.154) and barefoot gait (13%, p=0.111) in the mobility shoe group from baseline to 24 weeks (Figure).

Conclusion: Flexible footwear may be an effective biomechanical intervention for the management of knee OA.
rheumatic diseases such as RA, OA, ankylosing spondylitis (AS), low back pain or painful shoulder. The difference in efficacy between ketoprofen and ibuprofen/diclofenac was statistically significant (0.459, 95% CI 0.33–0.58; P=0.00) at all point-estimates of the mean weighted size effect (Fig 1). The test of heterogeneity for the efficacy outcome was not statistically significant (c² = 18.07 - df= 12 - P = 0.1136). Concerning the estimated efficacy outcomes, ketoprofen was superior to ibuprofen/diclofenac in all of the 13 RCTs, reaching a statistically significant difference for the estimated efficacy outcomes, ketoprofen was superior to ibuprofen/diclofenac in all of the 13 RCTs, reaching a statistically significant difference (P < 0.05) in nine studies. The heterogeneity for the efficacy outcome was not different across the studies and this guarantees that the compared trials are homogeneous and the meta-analysis results reliable and valid. The meta-analysis showed that the effect of therapeutic doses of ketoprofen was strongly greater than the effect of therapeutic doses of ibuprofen or diclofenac.

**Figure 1.** The size effect of ketoprofen and ibuprofen/diclofenac.

**Conclusion:** Findings of this meta-analysis support strong recommendation that the efficacy of orally administered ketoprofen in relieving moderate-severe rheumatic pain and in improving functional status and general conditions is significantly better than that of diclofenac/ibuprofen.

**Disclosure:** F. Atzeni, None; P. C. Sarzi-Puttini, Donpé SpA, S; L. Lanata, Donpé SpA, 3; M. Bagnasco, Donpé SpA, 3.

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**Methods:** Subjects with mild to moderate medial compartment radiographic knee OA were randomized to wear either the mobility shoe or “non-flexible” control shoe. All participants and investigators were blind to treatment group allocation. Participants were asked to wear the shoes 6 hours per day at least 6 days per week. Subjects underwent DXA scanning of bilateral knees at baseline and at 24 and 48 weeks after starting the intervention. These scans were evaluated in a blinded manner by a trained investigator using a previously validated method. The BMD of the medial and lateral regions of the tibial plateau were measured in each knee. Repeated measures ANOVA (rm-ANOVA) was used to evaluate changes in BMD over time in each group.

**Results:** Nine subjects in the mobility shoe group and 13 subjects in the control group had BMD data available at all three time points (0, 24, and 48 weeks). The mobility shoe group demonstrated a significant reduction in the medial proximal tibial BMD of the affected knee from 0 to 24 to 48 weeks (P=0.01, see Table). The control group did not demonstrate a statistically significant reduction in medial proximal tibial BMD over this time (see Table). There were no significant changes in lateral tibial BMD in either group from 0 to 24 to 48 weeks (see Table).

**Conclusion:** The mobility shoe yielded a significant reduction in medial tibial BMD over 48 weeks of use. A control walking shoe did not yield similar results. These results support the use of the mobility shoe in lead to potentially beneficial structural changes in subchondral bone as the result of a dynamic load reducing intervention.

**Disclosure:** J. B. Gan, None; L. E. Thorp, None; R. H. Lidtke, Shoe patent, 9; R. A. Mikolaitis, None; L. F. Fogg, None; J. A. Block, None; N. Shakoor, Shoe patent, 9.

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**Reducing Loads in the Contralateral Side in Medial Knee Osteoarthritis; A 3-Year Follow-up Study.** Roy H. Lidtke and Joel A. Block. Rush University Medical Center, Chicago, IL

**Background/Purpose:** No strategies have been shown to prevent Medial knee osteoarthritis (MKOA). For those with symptomatic unilateral MKOA, the contralateral knee may be at risk for developing MKOA. Early adaptation of load reducing strategies may reduce the development of the disease in the contralateral knee.

**Methods:** 90 subjects (69F 21M, Age 60±8, BMI 28.3±4.0) with radiographic and symptomatic medial knee OA (K-L grade 2–3, ambulatory pain >30 mm on a 100 mm VAS) were randomized into a control group fitted with bilateral neutral foot orthosis or a treatment group fitted with 7 degree valgus posted foot orthosis. The knee joint with greater pain was labeled as the index side. Subjects underwent gait analyses using an optoelectronic camera system and multi-component force plate. Subjects walked at their normal speed, and comparisons were performed after matching for speed. The peak external knee Adduction Moment (KAddM) (%body weight * height, %BW*Ht) was calculated and used as the primary endpoint. Subjects were evaluated at baseline and again at 36 months with and without the orthosis. Changes in the peak KAddM between conditions and time variable were calculated and expressed as a percentage change in the control condition. Nonparametric confidence intervals were calculated with the binomial method around the percentage of change to assess statistical significance with significance set at p<0.05.
Results: After 3 years the contralateral knee showed a 5.01±0.09% (Median=±IQR) increase in medial knee load when the control orthosis was added while there was a (-5.29±0.72% (Median=±IQR) decrease in the medial knee load with the addition of the wedge orthosis in the treatment group. In the wedge treatment group the median drop in knee adduction moments between baseline and 36 months was (-7.61±0.84% in the contralateral knee and (-6.49±0.13% on the index side (Median=±IQR). Interestingly After 3 years in the control treatment group there was a 10.66±0.52% increase in the medial knee loads on the index side while there was a (-11.29±0.74% decrease in the medial knee loads on the contralateral side (Median=±IQR).

Conclusion: The contralateral knee may be at risk in subjects with MKOA. These data suggest that the contralateral knee may get better benefit using load reducing strategies such as valgus wedge foot orthosis. The greatest sustained reduction of knee loads was seen in the contralateral knee of the control group. Since the control group was wearing custom foot orthosis posted to perpendicular to the ground it may be that a non-valgus posted custom foot orthosis on the contralateral side may be of benefit for reducing the progression of knee osteoarthritis.

Disclosure: R. H. Lidtke, None; J. A. Block, None.

Knee Joint Stabilization Therapy in Patients with Osteoarthritis of the Knee: A Randomized, Controlled Trial. Jesper Knoop, Joost Dekker, Marike van der Leeden, Martin van der Esch, Carina A. Thorstensson, Martijn Gerritsen, Ramon E. Voorneman, Wilfred F.H Peter, Mariette de Rooy, Suzanne Romvili, Willem F. Lems, Leo D. Roorda and Martijn P.M. Steultjens. 1Reade, centre for rehabilitation and rheumatology, Amsterdam, Netherlands, 2VU University Medical Centre, Department of Rehabilitation Medicine, EMCBO Institute and Department of Psychiatry, Amsterdam, Netherlands, 3Reade, Amsterdam, Netherlands, 4University of Gothenburg, Institute of Neuroscience and Physiology, Gothenburg, Sweden, 5VU University Medical Center, Amsterdam, Netherlands, 6Glasgow Caledonian University, Glasgow, Scotland

Background/Purpose: Patients with knee osteoarthritis (OA) and instability of the knee joint may not benefit optimally from regular strengthening training. Therefore, we evaluated the effectiveness of a newly developed exercise program which initially focused on knee joint stabilization, before starting with muscle strengthening exercises and training of daily activities in knee OA patients and instability of the knee joint, compared to muscle strengthening exercises and training of daily activities only.

Methods: A single-blind, randomized, controlled trial involving 159 patients with knee OA and knee joint instability, randomly assigned to two treatment groups. Both groups received a supervised exercise program for 12 weeks, consisting of muscle strengthening exercises and training of daily activities, but only in the experimental group exercises initially focused on knee joint stabilization (i.e. included activities to maintain knee joint stability). Outcome measures included activity limitations (WOMAC physical function, primary outcome), pain and knee stability.

Results: Both treatment groups demonstrated large (20–40%) and clinically relevant reductions in activity limitations, pain and knee instability, which were sustained six months post treatment. No differences in effective- ness between experimental and control treatment were found on WOMAC physical function (B = -0.36 (-2.85–2.12)) or any secondary outcome measure.

Conclusion: Both exercise programs were effective in reducing activity limitations and pain and restoring knee stability in knee OA patients with instability of the knee. Against this background, no additional effect of initial knee joint stabilization training, before starting muscle strengthening exer- cises and training of daily activities could be demonstrated, emphasizing a dominant role of muscle function in stabilizing the knee joint.

Disclosure: J. Knoop, None; J. Dekker, None; M. van der Leeden, None; M. van der Esch, None; C. A. Thorstensson, None; M. Gerritsen, None; R. E. Voorneman, None; W. F. Peter, None; M. de Rooy, None; S. Romvili, None; W. F. Lems, None; L. D. Roorda, None; M. P. M. Steultjens, None.

Osteopontin in Patients with Primary Knee Osteoarthritis: Relation to Disease Severity. Ramy Abdelnab. Am Shams University, Cairo, Egypt

Background/Purpose: To investigate the role of plasma and synovial fluid Osteopontin in primary knee osteoarthritis in relation to disease severity grading.
Differences Between Patients with Hip and Knee Osteoarthritis. Kim F. Le Marshall1, Bradley Yee2, Paul A. Dieppe2, Albert Leung1, Carolyn Page2, Peter F. Choong3, Michelle Dowsey4 and Keith K. Lim1. 1Western Hospital, Melbourne, Australia, 2University of Plymouth Campus, Plymouth, United Kingdom, 3St Vincent’s Hospital, Melbourne, Australia

Background/Purpose: This observational study was designed to examine the hypothesis that patients with hip osteoarthritis (OA) have a shorter duration of symptoms but more advanced radiological changes and more severe symptoms at first presentation to our clinic than similar patients with knee OA.

Methods: This pilot case-comparison study compared 35 consecutive hip OA patients and 70 (age and sex matched) knee OA patients from a single tertiary osteoarthritis clinic from 2008 to 2011. BMI, total symptom duration, duration of presenting complaint, Multi-attribute Arthritis Prioritisation Tool (MAPT) scores and Modified Kellgren-Lawrence (MKL) scores were recorded for each patient’s first presentation to the clinic, where available. The MAPT score, designed to prioritise and monitor patients who may require joint surgery, is a severity score (out of a total of 100) derived from a standardised patient questionnaire. Data for the two groups was compared by non-parametric Mann-Whitney U testing, performed by a statistician who was blinded to the study hypothesis.

Results: Both groups had similar age, sex and BMI. The hip MAPT score (median = 71.3, interquartile range 37.9–89.6) was significantly higher than the knee MAPT score (median = 36.9, IQR 11.4–74.8); mean rank for hip group was 64.8 and mean rank for knee group was 47.1 (U = 1638, p = 0.005). The hip MKL scores (median = 4, IQR 4–5) were significantly higher than the knee MKL scores (median 4, IQR 3–4); mean rank for hip group was 65.7 and mean rank for knee group was 46.7 (U = 1690.5, p = 0.002). The total duration of symptoms for the hip group (median = 30, IQR 12–54 months) was significantly less than the duration of symptom for the knee group (median = 48, IQR 24–108 months); mean rank for hip group was 33.6 and mean rank for knee group was 44.1 (U = 545.5, p = 0.045). The duration of presenting complaint for the hip group (median = 6, IQR 3.0–6.5 months) was significantly less than the duration of presenting complaint for the knee group (median = 9.5, IQR 5.5–12.0 months); mean rank for hip group was 32.1 and mean rank for knee group was 45.1 (U = 500, p = 0.012).

Conclusion: In this pilot case-comparison study, patients with hip OA presented after a shorter duration of symptoms with higher MAPT and MKL scores than their knee OA counterparts. In other words, hip OA patients were more likely to present earlier to our clinic but were conversely more likely to have more advanced radiological changes and worse symptoms (by MAPT score) than knee OA patients. These findings support our hypothesis and warrant a larger observational study.

Disclosure: K. F. Le Marshall, None; B. Yee, None; P. A. Dieppe, None; A. Leung, None; C. Page, None; P. F. Choong, None; M. Dowsey, None; K. K. Lim, None.

Use of Drug Combinations in Patients with Osteoarthritis: A Population-Based Cohort Study. Daniel Prieto-Alhambra1 and Rosa Morros2. 1URF0A-IMIM, Parc de Salut Mar; Idiart Jordi Gol; University of Oxford; University of Southampton, Barcelona, Spain, 2DIAP Jordi Gol; Institut Català de la Salut, Spain

Background/Purpose: Patients affected with osteoarthritis (OA) use different drugs in search for relief. We used a large database including medical records and pharmacy invoice data to explore use of drugs in OA patients in the period 2006–2010: non-steroidal anti-inflammatory drugs (NSAIDs), Symptomatic Slow Acting Drugs for OA (SYSADOA), COX-2 inhibitors (COX2i), opioids, and analgesics (paracetamol and metamizol).

Methods: We screened the SIDIAP Database (www.sidiap.org) to identify those aged 40 years or older with a new diagnosis of OA, and ascertained use of NSAIDs, COX2i, SYSADOA, opioids, and analgesics in the period 2006–2010. SIDIAP contains anonymised medical records and pharmacy invoice data of a representative ≥4.9 million people in Catalonia (North-East Spain). We estimated prevalence (and 99% Confidence Intervals) of use of these drugs and their combinations, and the incidence (and 99%CI) of new users among newly diagnosed OA patients in the study period assuming a Poisson distribution.

Results: We identified 238,536 patients with an incident clinical diagnosis of OA. Among these, 128,655(53.9%) were treated with 3 or more drugs, and 60,740(25.5%) with 2 drugs. The most common combinations among the latter were: 1. oral NSAID + analgesic, 2. topical NSAID + analgesic, and 3. oral NSAID + SYSADOA. Besides, 34,802(14.6%) patients received only 1 drug (the 3 most common being, in descending order: oral NSAID, analgesic and SYSADOA), and 14,339(6.0%) were not on pharmacologic treatment. Incidence of use of oral and topical NSAIDs, SYSADOA and analgesics decreased slowly from 2006 to 2010, while opioids increased continuously in the same period [Figure]. Incidence of use of COX2i rose steeply in the period 2006–2008, and continued increasing slowly from then onwards [Figure].

Conclusion: About 75% of OA patients are treated with at least 2 drugs, and more than half receive 3 or more. Incidence of use of commonly used drugs (such as analgesics and topical NSAIDs) is decreasing, whilst prescriptions of opioids increase. In addition, use of COX2i continues to grow, yet
more slowly after 2008, when warnings on the detrimental effects of COX2i on cardiovascular health were published. These data suggest that patients with OA are often polymedicated, and that current guidelines are poorly implemented in general practice. This has potential implications not only in terms of health care costs but also for patient safety.

Disclosure: D. Prieto-Alhambra, None; R. Morros, None.

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Bone Marrow Lesions in Knees with Osteoarthritis: Can Parameters From Dynamic Contrast Enhancement Predict Change in Bone Marrow Lesion Volume or Knee Pain Change? Andrew D. Gait1, Timothy F. Cootes1, Elizabeth J. Marjanovic3, Matthew J. Parkes1, Charles E. Hutchinson2 and David T. Felson1, 1University of Manchester, Manchester, United Kingdom, 2University of Warwick, Coventry, United Kingdom

Background/Purpose: Dynamic contrast enhancement is a powerful tool for highlighting features of a medical image which may not otherwise be seen on "static" scans. While used extensively in other settings, it has not been used until now to study bone marrow lesions (BMLs) in osteoarthritis (OA), lesions which vary over time in volume and change with knee pain.

Methods: We studied 23 patients who had patellofemoral (PF) OA. All met ACR criteria for knee OA and were participating in a trial of PF knee braces. All patients had no treatment at baseline, were on brace at 12 weeks and acquired MRI’s with a gadolinium(Gd)-enhanced dynamic image sequence at both times.

Within these knees, 40 PF or femoral BMLs were manually segmented at baseline and 12 weeks on sagittal Gd-enhanced images (TR 500ms, TE 17ms, FoV 16cm, 384×384). Knee osteoarthritis outcome score (KOOS) pain data was collected at each time.

We assessed dynamic parameters within BMLs in two steps: (1) transforming the segmented BML from the sagittal sequence to the axial dynamic sequence (TR 5.4ms, TE 1.9ms, FoV 14cm, 256×256); (2) using the extended Kety model (Tofts 1997) to calculate the parameters v_e (fractional blood volume, fractional extravascular extracellular volume) and K^trans (transfer coefficient from v_e to v_p,a direct measure of perfusion) at each voxel. The mean of each parameter was calculated for each BML (one to three per patient), taking care to ensure that this was done consistently between the baseline and 12 week images. The distribution of K^trans within the BMLs was heterogeneous and limited to small volumes, so to avoid averaging of diverse values, we examined peak K^trans value in the BML also. To compare with heterogeneous and limited to small volumes, so to avoid averaging of diverse values, we calculated Spearman rank correlation coefficients.

Results: After 12 weeks, change in mean values of the parameters K^trans, v_e and v_p did not correlate either with change in volume of the BML (K^trans: r = 0.02; v_e: r = -0.07; v_p: r = 0.02) or change in KOOS (K^trans: r = 0.18; v_e: r = 0.03; v_p: r = 0.09). Change in the peak value of K^trans correlated better with change in volume of the BML (r = 0.43: p = 0.0056, see figure) but not with KOOS (r = -0.11).

Conclusion: There are no clear correlations between the means of the parameters K^trans, v_e and v_p and change in BML volume or KOOS. The peak K^trans value of a BML may be related to its likelihood of undergoing change.

Disclosure: A. D. Gait, None; T. F. Cootes, None; E. J. Marjanovic, None; M. J. Parkes, None; C. E. Hutchinson, None; D. T. Felson, None.

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Interim Safety Analysis of a Phase 2, Multicenter, Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, Efficacy Study of Apremilast (CC10004) in Subjects with Erosive Hand Osteoarthritis. Jonathan A. Landers4, Wolfgang Ochs1, Herbert Kellner5, Ulf Müller-Ladner5, Mathias Grunke6, Matthias Schneider7 and Georg Schett4, 1University of Erlangen-Nuremberg, Erlangen, Germany, 2Rheumatology Practice, Bayreuth, Bayreuth, Germany, 3Rheumatology Specialty Practice, Zerbst, Germany, 4Centre for Inflammatory Joint Diseases, Munich, Germany, 5Kerckhoff-Klinik GmbH, Bad Nauheim, Germany, 6Medizinische Klinik und Poliklinik IV, University of Munich, Munich, Germany, 7Heinrich-Heine-University, Duesseldorf, Germany

Background/Purpose: Apremilast is a small molecule, specific phosphodiesterase4 inhibitor under investigation for a number of inflammatory conditions, including psoriasis and psoriatic arthritis. We report results of an interim safety analysis of a phase 2, multicenter, randomized, double-blind, placebo-controlled, parallel-group study in 18 patients with erosive hand osteoarthritis (EHOA).

Methods: Subjects with a diagnosis of EHOA, fulfilling the classification criteria of the American College of Rheumatology with a disease duration of ≥6 months, were randomized to oral apremilast 20 mg BID or matching placebo. All subjects with at least the baseline visit reported were included in the analysis. Adverse events (AEs) were graded according to the Common Terminology Criteria for Adverse Events (CTCAE) v3.0.

Results: A total of 76 AEs were reported since the study started in 2010 (EFVP 29-Nov-2010, data lock for interim analysis 30-May-2012). Most AEs were mild to moderate in severity (93.5%); only 5 (6.6%) were grade 3 (severe). No grade 4 or 5 AEs were reported. The most commonly reported AEs were related to "Pain" 38% (Pain-Head/headache in 6/11 patients (55%) and Pain-Joint in 5/11 patients (27%) or "Gastrointestinal" (18%), with the most frequent AEs being headache (16%), fatigue (8%), diarrhea (7%), and joint pain (7%). Thirty-five AEs (46%) were considered possibly treatment related. Of these, 97% were mild to moderate and only 1 (3%) was grade 3 (hypotension). The most frequent treatment-related AEs were headache (9/35 [26%]), fatigue (3/35 [9%]), and diarrhea (3/35 [9%]). No serious AEs or deaths were reported during the study.

Conclusion: Given the lack of treatment options for patients with EHOA, there is an unmet need for an effective treatment to reduce the burden of this disease. Considering the pathophysiography of EHOA, mechanism of action of phosphodiesterase 4 inhibitors, and the reported AEs in earlier trials, we conclude that apremilast may also be well tolerated in patients with EHOA. Apremilast, if proven to be efficacious in ongoing investigations, will be an interesting treatment option for patients with EHOA.

Disclosure: J. Rech, None; W. Ochs, None; W. Spieler, None; H. Kellner, None; U. Müller-Ladner, Actelion Pharmaceuticals Ltd, 5; M. Grunke, None; M. Schneider, None; G. Schett, None.

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The Prevalence of Periarticular Lesions On Magnetic Resonance Imaging and Its Relation to Knee Pain in the Community Residents in Korea. In Je Kim1, Kyeong Min Son2, DH Kim1, Yeong Wook Song3, Ali Guermazi4 and Hyun Ah Kim5, 1Hallym University Kangdong Sacred Heart hospital, Seoul, South Korea, 2Hallym university Chunghun sacred heart hospital, Chunchun, South Korea, 3Chunchun, South Korea, 4Seoul National University Hospital, Seoul, South Korea, 5Boston University School of Medicine, Boston, MA

Background/Purpose: The purpose of this study was to investigate the prevalence of periarticular lesions detected by magnetic resonance imaging (MRI) and its association with knee pain and radiographic knee osteoarthritis (OA) in community residents in Korea.

Methods: Participants (n = 357) were randomly chosen regardless of knee OA or knee pain from the population-based Hallym Aging Study. Demographic data and knee pain data including the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index were obtained by questionnaire.

Conclusion: There are no clear correlations between the means of the parameters K^trans, v_e and v_p and change in BML volume or KOOS. The peak K^trans value of a BML may be related to its likelihood of undergoing change.

Disclosure: A. D. Gait, None; T. F. Cootes, None; E. J. Marjanovic, None; M. J. Parkes, None; C. E. Hutchinson, None; D. T. Felson, None.
We assessed periarticular lesions on 1.5-tesla MRI in the more symptomatic knee. Periarticular lesions included prepatellar or infrapatellar bursitis, anserine bursitis, Baker’s cyst, and tibiofibular bursitis. The association between each lesion and knee pain was examined by logistic regression analysis after adjustment of age, gender, body mass index, radiographic knee OA and other periarticular lesions.

Results: Radiographic knee OA was present in 34.5% of subjects. The most prevalent lesion was Baker’s cyst (27.5%), followed by tibiofibular cyst (9.5%). Anserine bursitis was significantly associated with the presence of knee OA (OR 4.45, 95% CI [1.45–13.61]). Anserine bursitis among the subjects with OA was more common in the subjects with knee pain (21.8%) than in those without pain (7.1%). Anserine bursitis and Baker’s cyst were significantly associated with knee pain (OR 3.47, 95% CI [1.18–10.21] and OR 2.03, 95% CI [1.19–3.45], respectively). Other periarticular lesions were not associated with knee pain or the presence of knee OA.

Conclusion: Incidental periarticular lesions on MRI of the knee are common in the middle-aged and elderly community residents in Korea. Anserine bursitis is related with knee pain and knee OA. Baker’s cyst is associated with knee pain.

Disclosure: I. J. Kim, None; K. M. Son, None; Y. W. Song, None; A. Guermazi, Boston Imaging Core Lab, 1, Stryker, 5, Merck Serono, 5, Genzyme Corporation, 5, AstraZeneca, 5, Novartis Pharmaceutical Corporation, 5, H. A. Kim, None.

ACR Poster Session A
Pediatric Rheumatology - Clinical and Therapeutic Aspects; Pediatric Systemic Lupus Erythematosus, Pediatric Vasculitis and Pediatric Myositis

Sunday, November 11, 2012, 9:00 AM–6:00 PM

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Childhood Onset Angiitis of the Central Nervous System: What Outcomes Can We Expect? Lena Das, Sook Fun Hoh, Terrence Thomas and Thaschewa Arkachaisri. KK Women’s and Children’s Hospital, Singapore, Singapore

Background/Purpose: Imaging findings in large-medium vessel Childhood Onset Primary and Secondary Angiitis of the Central Nervous System (cPACNS & cSACNS) are well described, however, structural changes of individual cerebral vessels after treatment has not been described. Our aim was to describe clinical outcomes and vessel progression using structural magnetic resonance angiography (MRA).

Methods: Children before age 16 with acute onset neuro deficit and MRA findings suggestive of vasculitis-irregularity and/or narrowing of medium to large-sized cerebral vessels with repeated MRA studies, evaluated by pediatric rheumatologists and neurologists at KK Women’s and Children’s Hospital from January 2011–December 2012, were included. Patient demographic and clinical data were analysed. Median and interquartile range (IQR) were used for descriptive data.

Results: 7 patients were identified, 4 - cPACNS and 3 –cSACNS (2-Takayasu Arteritis (TA), 1 - post-varicella CNS vasculitis). Median onset age was 9.0 years (IQR 6.4–14.0) with 5 males. Median follow up duration was 21 months (IQR 7.0–31.0) with 3–6 months duration for repeated MRI/MRA (median numbers of MRI/MRA of 4 (IQR 2.0–6.0)). Motor deficits (hemiparesis) were present in 6/7, status epilepticus in 2/7 and aphasia and/or dysarthria in 4/7. Patient characteristics and distribution/sizes of cerebral vessels involved, along with the clinical outcomes and vessel progression after therapy is depicted in Table 1.

Table 1. Demographic, Clinical and Vessel Progression in Children with Angiitis of the CNS

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Gender</th>
<th>Type</th>
<th>Presentation</th>
<th>Treatment</th>
<th>Follow-up Time (months)</th>
<th>Initial MRA</th>
<th>MRA Outcome</th>
<th>Clinical Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6–6.4</td>
<td>M</td>
<td>P</td>
<td>R hemiparesis, GCS 15</td>
<td>Aspergiloma, TCM</td>
<td>25</td>
<td>L MCA (M1)</td>
<td>L MCA (M1)</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>M</td>
<td>L hemiparesis, Anterior artery, GCS 14</td>
<td>Small pulses, MRAFF</td>
<td>17</td>
<td>H P (M1, M2, M3, ICA)</td>
<td>Improved, MD, No CI.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>M</td>
<td>P</td>
<td>R hemiparesis, Anterior artery, GCS 15</td>
<td>Small pulses, MRAFF</td>
<td>21</td>
<td>L MCA (M1)</td>
<td>No change</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>F</td>
<td>S</td>
<td>R hemiparesis, Anterior artery, GCS 15</td>
<td>Smooth pulses, MRAFF</td>
<td>7</td>
<td>L MCA (M1)</td>
<td>L MCA (M1)</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>M</td>
<td>L hemiparesis, Anterior artery, GCS 15</td>
<td>Smooth pulses, MRAFF</td>
<td>3</td>
<td>R CA, L ACA (M1)</td>
<td>Improved R</td>
<td>L MCA (M1)</td>
</tr>
<tr>
<td>6</td>
<td>1.5</td>
<td>M</td>
<td>S</td>
<td>Status epilepticus, GCS 12</td>
<td>Acyclovir</td>
<td>54</td>
<td>L MCA (M1)</td>
<td>L MCA (M1)</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>F</td>
<td>P</td>
<td>R hemiparesis, Anterior artery, GCS 6</td>
<td>Small pulses, MRAFF</td>
<td>31</td>
<td>L MCA (M1)</td>
<td>L MCA (M1)</td>
</tr>
</tbody>
</table>

*Type: P Primary, S Secondary; GCS Glasgow Coma Scale; MCA Middle cerebral artery; ACA anterior cerebral artery; ICA internal carotid artery; TCM Traditional Chinese Medicine; CTX Cyclophosphamide; *Clinical Outcome: MD Motor Deficit; CI Cognitive Impairment

Conclusion: Despite our small cohort and regardless of the cause, after almost 2 years of follow-up, main arteries including MCA-M1 and ACA-A1, did not seem to recanalize. Interval improvements on MRA seemed to be limited to smaller M2 and M3 branches. Clinical outcomes, especially motor deficits may not follow the cerebral vessel course over time, however. Due to the rarity of diseases, multicenter with larger cohort studies are needed to confirm our initial observations and this is ongoing in our region.

Disclosure: L. Das, None; S. F. Hoh, None; T. Thomas, None; T. Arkachaisri, None.

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Pediatric Rheumatology Practitioners Experience with Biologics in Juvenile Dermatomyositis: Survey Results. Anjali Patwardhan 1, Kelly Rooster-Stevens 2, Harry L. Gewanter 3, Grant B. Syverson 4, Renee F. Modica 5, Kara M. Schmidt 6 and Charles H. Spencer 7. Nationwide Childrens Hospital, Columbus, OH, 2Emory-Children’s Center, Atlanta, GA, 3Pediatric & Adolescent HP, Midlothian, VA, 4Medical College of Wisconsin, Watertown, WI, 5University of Florida, Gainesville, FL, 6Univ of Louisville, Louisville, KY

Background/Purpose: Biologic therapy is increasingly prescribed in rheumatologic disorders. Juvenile dermatomyositis (JDM), the most common inflammatory myopathy in children, can be challenging to manage in a subset of patients. There are multiple reports of cytokine involvement in JDM. There is a paucity of information regarding the use of biologics for JDM among pediatric rheumatology practitioners, and only one clinical trial investigating a biologic in JDM. The purpose of the study is to examine pediatric rheumatology (PR) experience in North America with biologic therapy in children with JDM.

Methods: The Childhood Arthritis and Rheumatology Research Alliance JDM Subcommittee on Biologics developed a 15-question on-line survey. Of the 231 pediatric rheumatology practitioners contacted, 105 (45%) participated between 2/17-3/20/2012.

Results: Over half (57%) of the respondents currently managed 1–10 patients with JDM; 10% of respondents reported ≥20 patients with JDM in their practice. Sixty-one percent of respondents had used biologics in patients with JDM, with 32%, 5%, and 4% prescribing rituximab, etanercept and infliximab, respectively; 17% had prescribed more than one biologic. The majority of respondents (89%) had used biologics in combination with other therapies, while 11% had used biologics as monotherapy in JDM. The biologics used by the respondents were, rituximab, infliximab, etanercept and anakinra and abatacept. Among the respondents that used biologics, uncontrolled disease was the primary rationale for prescribing this medication. Over half of respondents used biologics after the patients failed other therapies; 11% of respondents used biologics for systemic (internal organ) involvement and 15% had used biologics for severe ulcerative disease. Seventy-three percent of patients that used biologics noted improvement, while 10% reported worsened disease. Over half (53%) of respondents that used biologics noted improvement in calcinosis, while 64% reported side effects (common and uncommon). Among the respondents that had not used biologics (39%) in JDM, 88% would use this therapy if the opportunity arose; nearly half (47%) of these respondents had not used biologics because of
uncertainty regarding effectiveness in JDM. Seventy percent of practitioners recommended that biologics be formally studied in patients with JDM; 24% of respondents were unsure and 6% felt biologics should not be studied in patients with JDM

**Conclusion:** Several PR have used biologics in the management of pediatric patients with JDM. Among respondents that have not used biologics in this patient population, most would be interested in prescribing biologics. This survey supports the rationale for considering clinical trials and consensus protocols to elucidate the safety and effectiveness of biologics in children with JDM. Further information will be gathered by the CARRA JDM Subcommittee on Biologics through second survey to prioritize specific medications for investigation

**Disclosure:** A. Patwardhan, None; K. Ronster-Stevens, None; H. L. Gewanter, None; G. D. Syverson, None; R. F. Modica, None; K. M. Schmidt, None; C. H. Spencer, None.

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**Development of a Longitudinal, Prospective Cohort of Young Adults with Childhood-Onset Systemic Lupus Erythematosus.** Aimee O. Hersh, Er- tekhia K. Akhter, and John F. Bohnsack.

1. University of Utah, Salt Lake City, UT, 2 UC San Francisco, San Francisco, CA, 3 University of California San Francisco, San Francisco, CA

**Background/Purpose:** Data on the adult outcomes of childhood-onset systemic lupus erythematosus (cSLE) are lacking, and a feasible methodology is needed to obtain long-term follow-up on these patients after transition from pediatric to adult rheumatology care. The purpose of this study was to use established methodology to develop a prospective longitudinal cohort study of young adults with cSLE, in order to assess long-term clinical, socioeconomic and behavioral health outcomes.

**Methods:** Based on prior methodology utilized in the University of California San Francisco Lupus Outcomes Study (Yelin, 2007), a 45 minute baseline in-depth telephone interview survey was developed which includes patient-reported validated items pertaining to multiple domains including demographic and socioeconomic characteristics, cumulative disease manifestations, recent SLE activity and assessment of the transition from pediatric to adult rheumatology care. The survey was pilot tested and revised based on responses from the pilot testing. The initial cohort was developed by querying the clinical database from the University of Utah pediatric rheumatology clinic to identify patients diagnosed with cSLE (age <18 years at diagnosis) who are currently 18-30 years of age and met ACR criteria for SLE at diagnosis. Potential subjects were contacted by mail using the last known address in their medical record; interested subjects who received mailings returned a response card indicating their interest in study participation. These subjects were contacted by phone and completed the baseline interviews, and will be interviewed annually.

**Results:** 109 potential subjects were identified and contacted by mail, 50 subjects indicated an interest in participating; no response forms were returned which precluded participation in the study. Twenty-six potential subjects were not reachable due to out of date contact information and 8 returned which declined participation in the study. Twenty-six potential subjects indicated an interest in participating; no response forms were returned which precluded participation in the study.

**Conclusion:** Dyslipidemia has been infrequently investigated in pediatric populations with autoimmune rheumatic diseases. However, lipid abnormalities in these diseases may occur due to multiple risk factors such as body composition, chronic inflammation, autoantibodies, lipodystrophy, sedentaryism and therapy, especially glucocorticoid. The objectives of this study was to evaluate the presence of dyslipidemia in Juvenile Dermatomyositis (JDM) and its possible risk factors.

**Disclosure:** A. Patwardhan, None; K. Ronster-Stevens, None; H. L. Gewanter, None; G. D. Syverson, None; R. F. Modica, None; K. M. Schmidt, None; C. H. Spencer, None.

**Background/Purpose:** Dyslipidemia has been infrequently investigated in pediatric populations with autoimmune rheumatic diseases. However, lipid abnormalities in these diseases may occur due to multiple risk factors such as body composition, chronic inflammation, autoantibodies, lipodystrophy, sedentaryism and therapy, especially glucocorticoid. The objectives of this study was to evaluate the presence of dyslipidemia in Juvenile Dermatomyositis (JDM) and its possible risk factors.

**Methods:** 25 JDM patients were compared to 25 healthy controls according to demographic data, body composition, fasting lipoproteins, glycemia, insulin, antibodies and muscle enzymes. The following JDM scores were assessed: Childhood Myositis Assessment Scale (CMAS), Manual Muscle Testing (MMT), Disease Activity Score (DAS), Myositis Disease Activity Assessment Analogue Scale (MYOACT) and Myositis Intention to Treat Activity Index (MYTAX).

**Results:** Abnormal lipid profile was found in nine patients and four controls (36% vs. 16%, p=0.196). JDM patients demonstrated significant higher levels of triglycerides (TG) [80 (31–340) vs. 61 (19–182) mg/dL, p=0.011] and higher frequency of abnormal levels of high density lipoproteins (HDL) (28% vs. 4%, p=0.04) when compared to controls. JDM patients with dyslipidemia demonstrated significantly lower median of HDL levels compared to those with this condition [29 (0–49) vs. 50 (39–72) mg/dL, p=0.005] and also had significant higher TG levels [128 (31–340) vs. 69 (46–138) mg/dL, p=0.011]. JDM with dyslipidemia demonstrated a higher frequency of low HDL levels (77% vs. 0%, p=0.001), and also a higher frequency of increased levels of TG (44% vs. 0%, p=0.01), and TC (33% vs. 0%, p=0.03). Positive anti-LPL antibody was detected in just one JDM patient with abnormal lipid profile. JDM with dyslipidemia had higher ESR (26 vs. 14.5 mm/1st hour, p=0.006), CRP (2.1 vs. 0.4 mg/dL, p=0.01), DAS (6 vs. 2, p=0.008), MYOACT (0.13 vs. 0.01, p=0.012), MYTAX (0.06 vs. 0, p=0.018), and lower scores of CMAS (47 vs. 52, p=0.024) and MMT (78 vs. 80, p=0.001) compared to JDM without dyslipidemia. Positive correlations were detected between TG levels and CRP(r=0.697, p=0.001), DAS (r=0.610, p=0.001), MYOACT (r=0.661, p=0.001), MYTAX (r=0.511, p=0.008), and negative correlations with CMAS (r=-0.506, p=0.009) and MMT (r=-0.535, p=0.005). No differences were found between these groups regarding body composition, lipodystrophy, anti-LPL antibodies, and treatment (current and cumulative doses of prednisone, methotrexate and hydrochloroquine) (p=0.05), except by higher frequency of cyclosporine use in patients with dyslipidemia (33% vs. 0%, p=0.03).

**Conclusion:** Dyslipidemia in JDM patients was characterized by increased levels of TG and low levels of HDL, and disease activity and cyclosporine use were the main factors associated to these metabolic abnormalities.

**Disclosure:** K. T. Kozu, None; C. A. Silva, Grants; 2. E. Bonfa, Grants; 2. A. M. Sallum, None; R. M. R. Pereira, None; V. S. Viana, None; E. F. Borba, None; L. M. A. Campos, None.

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**Evaluating Cardiovascular Risk Factors of Impaired Glucose Tolerance, Diabetes Mellitus, and Metabolic Syndrome in a Primarily Latino Population with Pediatric Rheumatic Diseases Associated with Vasculitis.** Sara M. Stern, Jamie Wood, Katherine AB Marzan, Andreas Reiff, Lampo Abu-Shaham and Diane Brown. Children’s Hospital Los Angeles, Los Angeles, CA

**Background/Purpose:** Pediatric (PED) systemic rheumatic diseases associated with vasculitis (DAV) such as Systemic Lupus Erythematosus (SLE), Mixed Connective Tissue Disease (MCTD) and the various systemic vasculitides (SV) were previously largely fatal but are now chronic diseases (DZ). However, as adults these patients (pts) appear to have advanced cardiovascular disease (CV) with atherosclerosis that begins in childhood and is impacted by risk factors. The objective of this study was to evaluate PED...
pts with DAV for risk factors of CV: diabetes mellitus (DM), impaired glucose tolerance (IGT), and metabolic syndrome (MS).

Methods: A prospective study of 14 PED pts with DAV at a tertiary care children’s hospital. Each pt had 3 manual blood pressures (BP), a waist circumference, and a physical exam. After an overnight fast, a 2-hour oral glucose tolerance test (OGTT), fasting insulin level, fasting lipid panel, c-peptide, and hemoglobin A1c (HbA1c) were completed. Outcome measures included the OGTT, HbA1c, and triglyceride (TG) levels, homeostatic model insulin resistance index (HOMA-IR) and a diagnosis of MS. MS was established when 3 of 5 criteria (CR) were met: waist circumference ≥ 90% for age and gender (A&G), high TG (≥ 90% A&G), low HDL (<10% A&G), high BP (systolic or diastolic BP > 90% for height, A&G or taking BP medication), and IGT (OGTT 2-h glucose ≥ 140 mg/dL). Insulin resistance (IR) was defined as a HOMA-IR > 3.0.

Results: 14 pts (12F:2M) 11.5 to 16.9 yrs old were included: 10 pts with SLE, 2 with MCTD, 1 with granulomatosis with polyangiitis (GPA/WG), and 1 with microscopic polyangiitis (MPA). Mean age of DZ onset was 12 yrs with mean DZ duration of 2.6 years. 12/14 pts were Latino. The majority of pts were Tanner (T) 1–3 (T 3.3%, T 4.2%, T 5.3% for pubic hair and T4–5 (T 4.2%, T 5.3%) for breast development. 10 pts had normal BMIs, I was <5%, 2 were between 5th and 5th%ile, and I was >95th%ile. Al SLE pts had mild DZ activity by SLE Disease Activity Index (SLEDAI) and both pts with SV had a Birmingham Vasculitis Activity Scale of 1. All pts had a history of steroid use with 10 pts currently using steroids: 4 (1–5 mg), 2 (6–15 mg), 4 (16–30 mg) daily.

Conclusion: High rates of elevated c-peptide levels and low HDL levels were seen in PED pts with DAV. No pts met criteria for DM. While only 1 pt met formal criteria for MS, IGT, and IR, a majority of pts had components of MS and/or IR. Higher rates (71.4% vs 40.7%) of pts had ≥1 criteria of MS compared to the general adolescent Mexican-American population in the NHANES III study where a less stringent definition was used for MS (S. Cook et al). These findings illustrate that CV risk factors are prevalent in PED.

Disclosure: S. M. Stern, CHLA Bunga Trust Fellowship Research Grant, 2, NIH NCCR CTSL grant 1UL 1RR031986, 2, J. Wood, None, K. A. Marzan, None, A. Reiff, None, B. Shahan, None, D. Brown, None.

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Distribution of Vasculitides in Childhood Arthritis and Rheumatology Research Alliance-Affiliated Pediatric Rheumatology Centers in the United States

United States.

Methods: This is a retrospective observational cohort study using CARRAnet. 55 centers submitted data on patients with defined rheumatologic diagnoses (vasculitis, 35 centers) (May 2010-May, 2012). Not all patients with these diagnoses at each study site were included. Demographic, diagnostic evaluation, disease manifestation, and treatment data were collected using standardized forms and entered into an electronic database. This cohort includes children with vasculitides: granulomatosis with polyangiitis (GPA); Beh et’s disease (BD); Takayasu arteritis (TAK); microscopic polyangiitis (MPA); central nervous system vasculitis (CNSV); systemic polyarteritis nodosa (PAN); cutaneous PAN; Churg-Strauss syndrome (CSS).

Results: 129 children, 1.8% of the registry, had vasculitis (Table 1). The median age of onset was 12.1 years; the median time to diagnosis was 2.8 years. There was a significant difference in the distribution of the age at onset (p<0.01), but not in the distribution of sex, race, or ethnicity (p=0.14, p=0.28, p=0.68), between vasculitides. Most children were treated with glucocorticoids (96%) and a non-biologic disease modifying anti-rheumatic drug (DMARD) (91%); 60% were treated with cyclophosphamide; 33% were treated with a biologic DMARD: tumor-necrosis factor inhibition (14%); CD20-depletion (15%).

Table 1. Demographics and Treatment of Vasculitis in CARRAnet*

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number</th>
<th>% of CARRAnet**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasculitis</td>
<td>129</td>
<td>1.8 (1.5–2.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number</th>
<th>% of CARRAnet**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granulomatosis with Polyangiitis</td>
<td>64</td>
<td>49.6 (40.7–58.5)</td>
</tr>
<tr>
<td>Behet’s Disease</td>
<td>18</td>
<td>14.0 (9.1–21.2)</td>
</tr>
<tr>
<td>Takayasu Arteritis</td>
<td>16</td>
<td>12.4 (7.3–19.4)</td>
</tr>
<tr>
<td>Microscopic Polyangiitis</td>
<td>11</td>
<td>8.5 (4.3–14.8)</td>
</tr>
<tr>
<td>CSS Vasculitis</td>
<td>7</td>
<td>5.4 (2.2–10.9)</td>
</tr>
<tr>
<td>Systemic PAN</td>
<td>7</td>
<td>5.4 (2.2–10.9)</td>
</tr>
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<td>Cutaneous PAN</td>
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<tr>
<td>Churg Strauss Syndrome</td>
<td>2</td>
<td>1.6 (0.2–5.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number</th>
<th>% of CARRAnet**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (% Female)</td>
<td>77</td>
<td>59.7 (50.7–88.2)</td>
</tr>
<tr>
<td>Race (% Caucasian)</td>
<td>98</td>
<td>76.0 (67.7–83.1)</td>
</tr>
<tr>
<td>Ethnicity (% Hispanic)</td>
<td>14</td>
<td>10.9 (6.1–17.7)</td>
</tr>
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</table>

Median**

<table>
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<tr>
<th>Disease</th>
<th>Number</th>
<th>% of CARRAnet**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Onset†</td>
<td>12.1 (10.2–17.6)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Time to Diagnosis†</td>
<td>2.8 (1.0–13.5)</td>
<td>0.03</td>
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</table>

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number</th>
<th>% of CARRAnet**</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Non-biologic DMARD</td>
<td>117</td>
<td>90.7 (84.3–95.1)</td>
</tr>
<tr>
<td>% Cyclophosphamide†</td>
<td>77</td>
<td>59.7 (50.7–88.2)</td>
</tr>
<tr>
<td>% Biologic DMARD</td>
<td>43</td>
<td>33.3 (25.3–42.2)</td>
</tr>
<tr>
<td>% TNF Inhibition</td>
<td>18</td>
<td>14.0 (8.5–21.2)</td>
</tr>
<tr>
<td>% CD20 Depletion‡</td>
<td>19</td>
<td>14.7 (9.1–22.0)</td>
</tr>
</tbody>
</table>

Disclosures: M. A. Lerman, None; P. A. Merkel, None.

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Pediatric automated Neuropsychological Assessment Metrics As a Screening Tool for Neuropsychiatric Childhood-Onset Systemic Lupus Erythematosus

Pediatric automated Neuropsychological Assessment Metrics (P-Neuropsych) is a computerized battery that assesses attention, memory, executive function, psychomotor speed, and academic abilities. This study aimed to investigate whether P-Neuropsych could be used as a screening tool for neuropsychiatric symptoms in children with systemic lupus erythematosus (SLE).

Methods: This was a prospective, observational study conducted at a children’s hospital in the United States. The study included children with systemic lupus erythematosus, aged 6-17 years, and their parents or guardians. The P-Neuropsych battery was administered to all participants, and neuropsychiatric symptoms were assessed using the Pediatric Inventory for Neuropsychiatric Symptoms (PINS). The study was approved by the institutional review board, and all participants provided informed consent.

Results: A total of 50 children with SLE participated in the study. The mean age of the participants was 12.3 years (range 6.5-17.0 years), and 54% were female. The most common neuropsychiatric symptoms reported were anxiety (72%), depression (56%), andattention deficit hyperactivity disorder (ADHD) (48%). The P-Neuropsych scores for attention, memory, executive function, psychomotor speed, and academic abilities were compared between children with and without neuropsychiatric symptoms. A significant difference was found in the scores for attention (p=0.01) and psychomotor speed (p=0.03) between the two groups. These findings suggest that P-Neuropsych could be used as a screening tool for neuropsychiatric symptoms in children with SLE.

Conclusion: P-Neuropsych is a useful tool for screening neuropsychiatric symptoms in children with SLE. Further research is needed to validate the use of P-Neuropsych in larger populations and to explore the potential use of this tool in the clinical setting.
Further research is needed to explore the relationship between cognition performance on the CPT and greater disease symptomatology. Demonstrate that slower performance on the CDD and less accurate recognition memory (Code Substitution Delayed subtest or CDD) and less accurate on the CPT subtest (p's < .05). Using Pearson correlations, slower MNc and lower AC scores on the CDD were associated with less accurate on the CPT, particularly on the CPT that measures working memory based on observation, self-report and poor performance patterns (e.g. low AC and high MNc scores). Pts were grouped by presence vs. absence of neuropsychiatric SLE (NPSLE) symptoms. Those with at least one symptom were significantly slower on a test of memory (Code Substitution Delayed subtest or CDD) and less accurate on the CPT (p's < .05).

Results: Initial baseline data for 34 of an expected 200 pts were analyzed (94% females; mean age of 15.8 yrs; White 41%, Black 35%, Hispanic 18%, Asian 6%). 2 pts repeated a grade, and 5 received special school services. PedANAM completion required 35–55 minutes. Mean reaction time for correct responses (MNc in msec) and accuracy (AC; % of correct responses) were measured for each subtest. All pts completed testing. Six pts responded randomly and unusually quickly, which may indicate reduced motivation. Overall, pts had the greatest difficulty comprehending re-requirements on the continuous performance subtest (CPT) that measures working memory based on observation, self-report and poor performance patterns (e.g. low AC and high MNc scores). In particular, the number of correct responses per minute. The purpose of this study was to (1) assess the reproducibility & (2) investigate the criterion validity of the PedANAM, using the cSLE Neuropsychological Battery as external standard.

Methods: cSLE patients and best-friend controls completed the PedANAM twice at baseline and then every 6 months. NPT was done at baseline and repeated after 18 months. Performance on Formal Neurocognitive Testing was standardized to age/gender/race-specific z-scores (mean 0, standard deviation 1) and then used to measure overall and domain-specific cognition (attention, processing-speed, working memory, VCA). Neurocognitive dysfunction (NCD) was graded as: no-NCD: all z-scores > –1; mild/moderate NCD: at most two z-scores < –1 but > –2 or one z-score < –2; severe: at least three z-scores < –2 or two z-scores < –2. Intra-class and Spearman correlation coefficients were done to assess reproducibility and responsiveness to change.

Results: Among 40 cSLE & 40 controls (85% females), 13 (16.25%) had NCD at baseline and 18-month follow-up data were available for 24 cSLE and 16 control patients. Most subtests had good reproducibility in mean reaction time (MNc) and fair-good reproducibility in accuracy (AC) and consistency (CVC) (Table 1). Changes of AC scores were found positively related to changes of NCD domain scores. In particular, improved (worsening) NCD attention was found positively related to changes of NCD domain scores. In particular, improved (worsening) NCD attention was found positively related to changes of NCD domain scores. In particular, improved (worsening) NCD attention was found positively related to changes of NCD domain scores.

Conclusion: This study demonstrated acceptable feasibility of the PedANAM to monitor cognitive status in a clinical setting. A few pts had difficulty with comprehension of test directions, particularly on the CPT, which may warrant re-evaluation of current test directions. These data demonstrate that slower performance on the CDD and less accurate performance on the CPT are related to greater disease symptomatology. Further research is needed to explore the relationship between cognition and cSLE activity.

Disclosure: P. Vega-Fernandez, None; E. Muscal, None; N. M. Ruth, None; F. Zelko, None; A. Vincant, University of Oklahoma. E. C. Thomas, None; M. S. Klein-Gitelman, None; D. Canter, None; A. Tian, None; L. Ravindra, None; H. Liu, None; J. Hummel, None; D. M. Levy, None; H. Brunner, None; T. Roebuck-Spencer, None.

Table 1. Test-Retest reliability of the PedANAM of the PedANAM Scores

<table>
<thead>
<tr>
<th>PedANAM Subtests</th>
<th>Mean reaction time for correct response (MNc)</th>
<th>Percentage of correct responses (AC)</th>
<th>Consistency (CVC = SD of MNc/MNC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code Substitution Delayed</td>
<td>0.58 (0.44, 0.71)</td>
<td>0.38 (0.21, 0.55)</td>
<td>0.21 (0.02, 0.40)</td>
</tr>
<tr>
<td>Code Substitution</td>
<td>0.80 (0.73, 0.88)</td>
<td>0.44 (0.27, 0.61)</td>
<td>0.43 (0.27, 0.60)</td>
</tr>
<tr>
<td>Continuous Performance Test</td>
<td>0.71 (0.61, 0.81)</td>
<td>0.78 (0.70, 0.86)</td>
<td>0.68 (0.57, 0.79)</td>
</tr>
<tr>
<td>Logical Relations</td>
<td>0.77 (0.69, 0.86)</td>
<td>0.23 (0.03, 0.43)</td>
<td>0.15 (0.00, 0.35)</td>
</tr>
<tr>
<td>Matching to Sample</td>
<td>0.64 (0.52, 0.76)</td>
<td>0.52 (0.37, 0.67)</td>
<td>0.57 (0.42, 0.72)</td>
</tr>
<tr>
<td>Matching Grids</td>
<td>0.77 (0.68, 0.85)</td>
<td>0.43 (0.25, 0.60)</td>
<td>0.38 (0.21, 0.56)</td>
</tr>
<tr>
<td>Mathematical Processing</td>
<td>0.91 (0.87, 0.95)</td>
<td>0.25 (0.05, 0.45)</td>
<td>0.62 (0.49, 0.75)</td>
</tr>
<tr>
<td>Procedural Reaction Time</td>
<td>0.47 (0.32, 0.62)</td>
<td>0.10 (0.00, 0.31)</td>
<td>0.15 (0.00, 0.38)</td>
</tr>
<tr>
<td>Spatial Processing</td>
<td>0.71 (0.61, 0.82)</td>
<td>0.26 (0.03, 0.49)</td>
<td>0.34 (0.17, 0.51)</td>
</tr>
<tr>
<td>Simple Reaction Time</td>
<td>0.68 (0.57, 0.79)</td>
<td>not estimable</td>
<td>not estimable</td>
</tr>
</tbody>
</table>

Values are intraclass correlation coefficients and 95% confidence intervals (in brackets).

The Pediatric Automated Neuropsychological Assessment Metrics - Reproducibility and Responsive to Change in Cognition in Childhood-Onset Lupus. Patricia Vega-Fernandez, Marisa S. Klein-Gitelman, Jessica Hummel, Erin C. Thomas, Jennifer L. Huggins, Frank Zelko, Tresa Roebuck-Spencer, Jun Ying and Hermine Brunner. Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 1Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago, IL, 2Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 3Anne and Robert C. Lurie Hospital, Feinstein School of Medicine, Northwestern University, Chicago, IL, 4Children’s Memorial Hospital, Chicago, IL, 5University of Oklahoma, Norman, OK, 6University of Cincinnati, Cincinnati, OH, 7University of Cincinnati, Cincinnati Medical Center and PRSCG, Cincinnati, OH

Background/Purpose: The Childhood-onset Systemic Lupus Erythematosus (cSLE) Neuropsychological Battery (ACRJP 2010; 62: 1029–33) was introduced to standardize neuropsychological testing (NPT), specifically probing the domains Attention, Working Memory, Psychomotor Speed, Viscustructural Ability (VCA). The Pediatric Automated Neuropsychological Assessment Metrics (PedANAM) software was developed to measure cognition in children ≥ 10 years. Performance on the PedANAM subtests is assessed by accuracy (AC = % of correct answers), mean reaction time for correct responses (MNc), & throughout (TP), the number of correct responses per minute. The purpose of this study was to (1) assess the reproducibility & (2) investigate the criterion validity of the PedANAM, using the cSLE Neuropsychological Battery as external standard.

Methods: cSLE patients and best-friend controls completed the PedANAM twice at baseline and then every 6 months. NPT was done at baseline and repeated after 18 months. Performance on Formal Neurocognitive Testing was standardized to age/gender/race-specific z-scores (mean 0, standard deviation 1) and then used to measure overall and domain-specific cognition (attention, processing-speed, working memory, VCA). Neurocognitive dysfunction (NCD) was graded as: no-NCD: all z-scores > –1; mild/moderate NCD: at most two z-scores < –1 but > –2 or one z-score < –2; moderate/severe: at least three z-scores < –1 or two z-scores < –2. Intra-class and Spearman correlation coefficients were done to assess reproducibility and responsiveness to change.

Results: Among 40 cSLE & 40 controls (85% females), 13 (16.25%) had NCD at baseline and 18-month follow-up data were available for 24 cSLE and 16 control patients. Most subtests had good reproducibility in mean reaction time (MNc) and fair-good reproducibility in accuracy (AC) and consistency (CVC) (Table 1). Changes of AC scores were found positively related to changes of NCD domain scores. In particular, improved (worsening) NCD attention was found positively related to improved (or worsening) AC scores in Matching to Sample, Procedural Reaction Time, and Spatial Processing (r’s > 0.3, p’s < 0.05) over 18 months. Positive and negative relationships were also found between NCD domain scores and PedANAM MNc and CVC scores respectively (Table 2).
Table 2. Relationship between changes of PedANAM score & changes of NCD domain scores*  

<table>
<thead>
<tr>
<th>PedANAM parameter</th>
<th>PedANAM Subtest</th>
<th>ALL study participants (N=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Code Substitution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dileted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Code Substitution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Logical Relations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Matching to Sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Matching Girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mathematical Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presencial Reaction Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spatial Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summber Memory SarcS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Code Substitution</td>
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<tr>
<td></td>
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<td>Matching to Sample</td>
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<tr>
<td></td>
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<td>Matching Girls</td>
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<tr>
<td></td>
<td></td>
<td>Mathematical Processing</td>
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<tr>
<td></td>
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<td>Presencial Reaction Time</td>
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<tr>
<td></td>
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<td>Spatial Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summber Memory SarcS</td>
</tr>
<tr>
<td>Percentage of correct responses (AC)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.32</td>
</tr>
<tr>
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<td></td>
<td>-0.33</td>
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<tr>
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<td>-0.44</td>
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<td>-0.50</td>
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<td></td>
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<td>-0.32</td>
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<td></td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.41</td>
</tr>
</tbody>
</table>

Conclusion: The PedANAM has good reproducibility especially for MCN measures. Changes cognitive domain scores were found significantly related to changes of performance scores of several PedANAM subtests over 18 months of follow up. These results are in line with our earlier research.

Disclosure: P. Vega-Fernandez, None; M. S. Klein-Gitelman, None; J. Hummel, None; E. C. Thomas, None; J. L. Huggins, None; F. Zelko, None; T. Reoebuck-Scyner, University of Oklahoma, 3; J. Ying, None; H. Brunner, None.

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Clinical and Laboratory Features Distinguishing Juvenile Polymyositis and Muscular Dystrophy in Children. Gulnara Mamyrova1, James D. Katz1, Robert V. Jones1, Peter A. Lachenbruch2, Mona Shah3, Olayy Jones4, Anupam Chahal5, Seema Agrawal1, Frederick W. Miller2, Lisa G. Rider2 and the Childhood Myositis Heterogeneity Group6, 1George Washington University, Washington, DC, 2NIEHS, NIH, Bethesda, MD, 3Bethesda, MD

Background/Purpose: We examined demographic, clinical and laboratory features of juvenile polymyositis (JPM) and muscular dystrophy in children to improve classification of these two conditions.

Methods: Thirty-nine patients with probable or definite JPM (31 JPM and 8 JPM overlapping with another connective tissue disease) by Bohan and Peter criteria and 9 patients with various muscular dystrophies (1 Duchenne’s carrier, 8 limb girdle dystrophies) were examined. Differences in demographic and clinical features (including musculoskeletal, cutaneous, gastrointestinal, pulmonary, cardiac, constitutional signs and symptoms), muscle enzyme levels, Magnetic Resonance Imaging (MRI), electromyography (EMG), and muscle biopsy features between patients with JPM and dystrophies were evaluated by Fisher’s exact and Rank sum tests. Backwards step-wise logistic regression modeling, followed by exact logistic regression, was performed to examine significant univariable differences between JPM and dystrophies in a multivariable model.

Results: Delay to diagnosis was longer in patients with dystrophies (median 12.0 months) compared with JPM (median 4.0 months, respectively, p=0.03). In addition, the following demographic, clinical and laboratory features distinguished JPM and dystrophies:

<table>
<thead>
<tr>
<th>Features</th>
<th>JPM n/N (%)</th>
<th>Muscular dystrophies n/N (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>African-American Race</td>
<td>17/39 (43.6)</td>
<td>6/9 (66.7)</td>
<td>0.018</td>
</tr>
<tr>
<td>Insidious illness onset</td>
<td>11/31 (35.5)</td>
<td>7/9 (77.8)</td>
<td>0.05</td>
</tr>
<tr>
<td>Muscle atrophy on MRI</td>
<td>17/37 (45.9)</td>
<td>8/9 (88.9)</td>
<td>0.027</td>
</tr>
<tr>
<td>Muscle atrophy on MRI</td>
<td>4/21 (19.0)</td>
<td>5/6 (83.3)</td>
<td>0.008</td>
</tr>
<tr>
<td>Increased insertional and spontaneous activity/fibillation potentials on EMG</td>
<td>17/18 (94.4)</td>
<td>5/9 (55.6)</td>
<td>0.03</td>
</tr>
<tr>
<td>Complex repetitive discharge on EMG</td>
<td>16/23 (69.6)</td>
<td>2/9 (22.2)</td>
<td>0.02</td>
</tr>
<tr>
<td>Diffuse variation of myofiber size on muscle biopsy</td>
<td>20/38 (52.6)</td>
<td>9/9 (100.0)</td>
<td>0.008</td>
</tr>
<tr>
<td>Fiber hypertrophy on muscle biopsy</td>
<td>3/38 (7.9)</td>
<td>4/9 (44.4)</td>
<td>0.018</td>
</tr>
<tr>
<td>Myofiber fibrosis on muscle biopsy</td>
<td>4/38 (10.5)</td>
<td>5/9 (55.6)</td>
<td>0.007</td>
</tr>
<tr>
<td>Absence of response to treatment with prednisone</td>
<td>2/9 (5.1)</td>
<td>3/9 (33.3)</td>
<td>0.039</td>
</tr>
<tr>
<td>Absence of response to treatment with other immunosuppressive agents</td>
<td>2/9 (5.1)</td>
<td>4/9 (44.4)</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Other features did not differ between JPM and dystrophies, including frequency of abnormal values and levels of serum muscle enzymes (CK, LDH, Aldolase, AST, and ALT); muscle edema and fatty replacement of muscle on MRI; inflammatory features on muscle biopsy; presence of short duration, small amplitude polyphasic motor units action potentials (MUAPS) and positive sharp waves on EMG; and demographic features (age at diagnosis, family history of autoimmune disease). Examining the 8 variables that were significant on univariate analysis in backwards selection stepwise logistic regression, followed by exact logistic regression, revealed less frequent myofiber fibrosis on muscle biopsy (OR = 0.1) and onset speed (OR = 0.16) to be significant predictors of JPM vs. muscular dystrophy. Because there were no African-American patients with dystrophies, a point estimate for race could not be obtained. The final multivariable model, including myofiber fibrosis, onset speed and race, provided a sensitivity of 55.6%, specificity of 97.2%, positive predictive value of 83.3%, and negative predictive value of 89.7%.

Conclusion: Muscular dystrophy can present similarly to patients with idiopathic inflammatory myopathy, particularly polymyositis. Selected demographic, clinical, and laboratory features may be helpful in distinguishing these patients, particularly the presence of myofiber fibrosis on muscle biopsy and a slower illness onset.

Disclosure: G. Mamyrova, None; J. D. Katz, None; R. V. Jones, None; P. A. Lachenbruch, None; M. Shah, None; O. V. Jones, None; A. Chahal, None; S. Agrawal, None; F. W. Miller, None; L. G. Rider, None.

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Hospitalizations for Patients with Childhood-Onset Systemic Lupus Erythematosus in the Pediatric Health Information System Database. Aimee O. Hersh, Charlie Casper, Tellen D. Bennett, Susan L. Bratton, John F. Bohnsack and Rajendu Srivastava. University of Utah, Salt Lake City, UT

Background/Purpose: To describe patient demographics, admission characteristics and clinical care for hospitalized patients with childhood-onset systemic lupus erythematosus (SLE).

Methods: Retrospective cohort study of the Pediatric Health Information System (PHIS) database, January 1, 2004 to December 31, 2010. The PHIS database was developed by the Children’s Hospital Association and contains comprehensive administrative inpatient data from 43 independent, freestanding, pediatric hospitals in the United States. A total of 42 hospitals and 279.6 hospital-years of data were included in this analysis. The study cohort includes subjects with an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) discharge diagnosis code for SLE (710.0) who had their first admission during the study period and were between 5–17 years old. Routine hospitalizations for intravenous (IV) cyclophosphamide were defined as hospitalizations with IV cyclophosphamide administration and a length of stay (LOS) of ≤ 2 days. ICD-9-CM and clinical transaction codes were used to identify commonly performed procedures and medications administered.
Results: We identified 11,647 admissions by 3,085 patients for childhood-onset SLE during the seven-year study period. Subjects had a median age (interquartile range (IQR)) of 14 (12–16) years, 81.7% were female, 36.3% African-American, 25.3% Hispanic, 21.8% White and 5.8% Asian. The median (IQR) and mean (SD) number of admissions per patient were 2 (1–4) and 3.8 (5.1) respectively. Fifty-one percent had a LOS of ≤ 2 days. Short-stay admissions associated with cyclophosphamide administration accounted for 2,108 (or 18.1%) of the total hospital admissions. Over the study period 25.8% of subjects had at least one admission to the intensive care unit. Table 1 summarizes the frequency of commonly performed procedures and administration of relevant medications. Fifty-nine (1.9%) subjects died during the study period resulting in an inpatient mortality per admission of 0.5%.

Table 1. Clinical care for childhood-onset SLE subjects in the PHIS database

<table>
<thead>
<tr>
<th>Procedure</th>
<th>By Admission</th>
<th>By Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imaging, No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td>2069 (16.9)</td>
<td>2235 (72.4)</td>
</tr>
<tr>
<td>MRI</td>
<td>1080 (9.3)</td>
<td>932 (30.2)</td>
</tr>
<tr>
<td>MRA</td>
<td>963 (8.3)</td>
<td>261 (8.5)</td>
</tr>
<tr>
<td>Electroencephalogram (EEG)</td>
<td>514 (4.4)</td>
<td>401 (13.0)</td>
</tr>
<tr>
<td>Ventilation Assistance</td>
<td>218 (1.9)</td>
<td>196 (6.4)</td>
</tr>
<tr>
<td>Procedures, No. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal Biopsy</td>
<td>1080 (9.3)</td>
<td>932 (30.2)</td>
</tr>
<tr>
<td>Dialysis ±</td>
<td>963 (8.3)</td>
<td>261 (8.5)</td>
</tr>
<tr>
<td>Electroencephalogram (EEG)</td>
<td>514 (4.4)</td>
<td>401 (13.0)</td>
</tr>
<tr>
<td>Ventilation Assistance</td>
<td>218 (1.9)</td>
<td>196 (6.4)</td>
</tr>
</tbody>
</table>

Conclusion: Utilizing the PHIS database, we identified a large cohort of hospitalized patients with childhood-onset SLE. Based on subject demographics and the expected frequency of commonly performed procedures and treatment, this cohort appears to be representative of the childhood-onset SLE population in the United States. Further work is needed to determine cause for admissions, subsequent treatment, and longitudinal outcomes for this cohort.

Disclosure: A. O. Hersh, None; C. Casper, None; T. D. Bennett, None; S. L. Bratton, None; J. F. Bohnsack, Novartis Pharmaceutical Corporation, S; R. Srivastava, None.

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Rituximab for Severe Disease Flares in Childhood ANCA Vasculitides.

Marinka Twilt1, Rayfel Schneider2, Audrey Bell-Peter3, Sharon Dell4 and Susanne M. Benseler1. 1The Hospital for Sick Children, Toronto, ON, 2the Hospital for Sick Children, Toronto, ON, 3the Hospital for Sick Children, Toronto, ON, 4the Hospital for Sick Children, Toronto, ON

Background/Purpose: Children with ANCA vasculitides frequently present with life-threatening organ manifestations including alveolar hemorrhage, critical subglottic stenosis and renal failure due to rapidly progressive glomerulonephritis (GN). The current initial management for adults includes high-dose steroids and cyclophosphamide. The majority of patients experience a serious disease flare. In adult studies, Rituximab is highly effective in the treatment of severe vasculitides flares. The aim of this study was to evaluate efficacy and safety of Rituximab for treatment of severe disease flare in children with ANCA vasculitides.

Methods: A single-center cohort study of consecutive children with ANCA vasculitis treated with Rituximab for severe disease flares was performed between January 2009 until July 2011. Children were managed according to a previously implemented protocol. Clinical, laboratory and imaging features, previous therapies, including efficacy and safety were documented in serial assessments. Disease activity was captured by Pediatric Vasculitis Activity Score (PVAS). Safety evaluation included adverse events and disease-related damage domains by Vasculitis Damage index (VDI).

Results: Six children (5 females, 1 male) were included, median age at diagnosis 7.8 years. Diagnosis: All children had lung involvement including 4 presenting with hemorrhage, 3 with renal disease and 3 with ENT involvement, including subglottic stenosis in 2. ANCAs: c-ANCA + PR3 in 4 patients, p-ANCA + MPO in 1 and -ANCA + MPO in 1. All children previously received high dose steroids and cyclophosphamide; previous maintenance treatment included: azathioprine in 1, MMF in 2 and MTX in 4 children. Two patients were still on MTX maintenance at time of flare. Disease flare: median disease duration until time to flare was 16 months (12–62 months); 5/6 had lung flares (hemorrhage, new nodules) and 1 child developed new GN. Treatment: All 6 children received Rituximab (500 mg/m2, 2 doses q2weeks) plus high dose prednisone (2 mg/kg/day, max 60 mg/day) and one patients continued on MTX maintenance. Plasmapheresis just prior to Rituximab was used in 2 children. Efficacy: The median PVAS at time of flare was 6; 4 children had no evidence of active disease at 3 months (PVAS=0), and 5 at 12 months. All patients completely depleted their B-cells. After Rituximab therapy, ANCAs were positive in 4 patients at 3 months and 2 patients after 12 months. Safety: Infusion reactions were uncommon. One child experienced itching, fever and myalgias during the 2nd cycle of infusions. One developed Pneumocystis jiroveci pneumonia. Five children received a second course of Rituximab at 6–13 months posttial course upon return of their B-cells.

Conclusion: A complete response (PVAS=0) was seen in 67% of
children with severe disease flares of ANCA vasculitis following treatment with Rituximab and high dose prednisone. This is a significantly higher response rate than with the current induction treatment for childhood ANCA vasculitides. Retreatment with Rituximab was required in the majority of children. Rituximab therapy was effective and safe; however long-term observations will determine the safety of repeated Rituximab treatment.

Disclosure: M. Twilt, None; R. Schneider, Hoffmann-La Roche, Inc., 5, Hoffmann-La Roche, Inc., 8, Innomar Strategies, 5; A. Bell-Peter, None; S. Del, None; S. M. Benseler, None.

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The Association of N-Methyl-D-Aspartate Receptor Antibodies and Neurocognitive Dysfunction in Pediatric Lupus Patients and in the Offspring of Adult Patients with Lupus. Natasha M. Ruth1, Mary C. Kral2, Stephanie Slan3, Tamara K. Nowling1, Murray H. Passo1 and Gary S. Gilkeson1. 1Medical University of South Carolina, Charleston, SC, 2MUSC, Charleston, SC, 3Medical University of South Carolina, Charleston, SC

Background/Purpose: Approximately 1/5 of all systemic lupus erythematosus (SLE) starts in childhood and central nervous system (CNS) dysfunction is more common in childhood-onset SLE. CNS disease is second only to nephritis as a cause of morbidity and mortality in patients with SLE. Despite these findings, the diagnosis of CNS disease in SLE remains difficult. Anti-NMDA receptor antibodies are anti-double stranded DNA antibodies that cross react with the NMDA receptors NR2a and NR2b. The activation of the NMDA receptor is critical in learning and memory and is expressed on neurons throughout the hippocampus and cortex. The purpose of this study is to measure the prevalence of anti-NR2 glutamate receptor antibodies in patients with childhood onset SLE and JIA and to assess the association between elevated anti-NMDA-NR2 subunit receptor antibodies and neurocognitive dysfunction in pediatric patients with SLE and patients with JIA.

Methods: Patients diagnosed with SLE prior to age 18 were recruited along with a JIA control patient. Each patient underwent formal neurocognitive testing, assessing a range of cognitive domains. Serum NMDA receptor-NR-2 subunit antibody levels were measured in all subjects by ELISA.

Results: 17 lupus patients (16 female, 1 male, 9 African American, 5 Caucasian, 3 others), ages 10–20 and 7 JIA patients (5 female, 2 male, all Caucasian), ages 10–21 completed NMDA receptor antibody testing and of those all but one SLE patient completed formal neurocognitive testing. T-test comparison of the lupus cohort to the JIA cohort revealed that there were group differences for Full Scale IQ (p = .007), single word reading skills (p = .013), and math calculation skills (p = .039). The JIA patients performed better in these areas than did the SLE patients. The SLE patients also had higher NMDA receptor antibody levels and NMDA receptor antibodies correlated significantly (p = .005) with reaction time.

Conclusion: These findings suggest that pediatric patients with lupus have greater cognitive dysfunction than do patients with JIA. Patients with lupus also had higher NMDA receptor antibody levels than did the JIA controls. The higher antibody levels correlated with reaction time which has been a sensitive index of CNS injury in other diseases such as TBI. These preliminary results suggest that checking NMDA receptor antibody levels may be helpful in patients where there is concern for CNS lupus. Further research is necessary to study these antibody levels over time. We are also currently studying these children of mothers with SLE which will provide insight into the effects of fetal exposure during pregnancy.

Disclosure: N. M. Ruth, None; M. C. Kral, None; S. Slan, None; T. K. Nowling, None; M. H. Passo, None; G. S. Gilkeson, None.

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Variation in Healthcare Utilization by Region and Number of Rheumatologists Per State Among Pediatric Medicaid Patients with Lupus Nephritis Prior to End-Stage Renal Disease in the United States, 2000–2004. Linda F. Hiraki1, Candace H. Feldman2, Gracelita S. Alarcon3, Jun Liu4, Michael A. Fischer5, Wolfgang C. Winkelmay2, Karen H. Costenbader6. 1Brigham and Women’s Hospital, Harvard School of Public Health, Boston, MA, 2Brigham and Women’s Hospital, Boston, MA, 3University of Alabama at Birmingham, Birmingham, AL, 4Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 5Stanford University School of Medicine, Stanford, CA, 6Brigham and Women’s Hospital, Harvard Medical School, Boston, MA

Background/Purpose: Unequal healthcare access and utilization may contribute to the striking sociodemographic disparities seen in outcomes for children with lupus nephritis. Medicaid is the U.S. federal-state program providing health insurance to low-income children and parents. We investigated variation in US nationwide frequencies of emergency department (ED), outpatient and inpatient visits among children with lupus nephritis enrolled in Medicaid, 2000–2004, in the months preceding the development of end-stage renal disease (ESRD).

Methods: We identified all children aged 3 to <18 years with SLE (≥3 ICD-9 codes of 710.0, each 30 days apart) in the Medicaid Analytic eXtract (MAX) from 2000–2004. This dataset contains all outpatient and inpatient Medicaid claims for enrollees in 47 U.S. states and the District of Columbia. These data were linked to those from the U.S. Renal Data System, which includes information on essentially all ESRD patients in the U.S., for the same years. We compared utilization of ED, outpatient and inpatient visits per year in the Medicaid enrolled time prior to development of ESRD for those in different categories according to: region of residence in the US, residence in a US designated Health Professional Shortage Area (HPSA), and number of rheumatologist number in state of residence. Multivariable generalized linear models were adjusted for each of these variables along with enrollee age, race, sex, months of Medicaid enrollment and a validated measure of socioeconomic status combining seven US Census zip code level variables.

Results: Of the 254 pediatric lupus nephritis patients identified, the mean age was 14.2 (±2.4) years; 72% were female, 61% were African American and 19% were Hispanic. Mean duration of Medicaid enrollment prior to the onset of ESRD was 28.5 (±16.4) months. Among all patients there was an average of 2.0 (±2.4) ED visits per year, 10.8 (±9.4) outpatient visits and 2.4 (±2.6) inpatient visits. In multivariable adjusted models, children residing in areas with the lowest quartile of rheumatologists per state had on average 4.2 more ED visits per year (p = 0.001) compared with those in the highest quartile of rheumatologists per state. Children residing in the West had on average 5.4 more outpatient visits per year (p = 0.03), and those in the South had 1.2 fewer inpatient visit per year (p = 0.03) than those in the Northeast. We did not observe statistically significant variation in utilization by HPSA.

Conclusion: We observed significant differences in health care utilization among children enrolled in Medicaid with lupus nephritis prior to the onset of ESRD. Low number of rheumatologists per state was the most important factor associated with more annual ED visits. This finding in addition to regional variation in annual inpatient and outpatient visits within this medically complex and low-income Medicaid population deserves further investigation.

Disclosure: L. T. Hiraki, None; C. H. Feldman, None; G. S. Alarcon, None; J. Liu, None; M. A. Fischer, None; W. C. Winkelmay, None; K. H. Costenbader, None.
Validation of Promis Modules for Use in Childhood-Onset Lupus. Alexandria J. Greenler, Laura E. Schanberg, Michael P. Flannery, Shannen Nelson, Janet Wootten, Esi M. Morgan DeWitt and Hernine I. Brunner. Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 2Duke University Medical Center, Durham, NC.

Background/Purpose: The impact of childhood-onset lupus (cSLE) and its treatment on quality of life (QoL) has not been systematically established. The Patient Reported Outcomes Measurement Information System (PROMIS™, http://nihpromis.org) is a publicly available system to measure patient reported outcomes that features electronic data collection. Although several legacy QoL measures have been validated for cSLE, each is no longer than the PROMIS™ Pediatric Short Forms (Short Forms) which are <10 items each. The objective of this study was to investigate the feasibility and construct validity of the Short Forms in cSLE in a clinical setting.

Methods: As part of an ongoing project at two sites, 30 of 100 projected patients completed the Pediatric PROMIS™ Short Forms (Anxiety, Anger, Depression, Fatigue, Mobility, Upper Extremity, Pain, Interference) and legacy QoL measures (Pediatric Quality of Life Inventory™ (PedsQL-GC) & Rheumatology Modules (RM), Simple Measure of Impact of Lupus Erythematosus in Youngsters (SMILEY), and Child Health Assessment Questionnaire (CHAQ)). Questionnaire scores were compared and Pearson correlation analysis was performed in support of the construct validity of the Short Forms when used in cSLE.

Results: Participants (80% female; 48% White, 52% Black or Asian) had a mean age of 15.8 yrs (SD 2.1) and mean SLEDAI score of 5.8 (SD 4.57). No problems were encountered with completion of all PROMIS™ Short Forms (mean score = 50, clinically relevant score difference = 10) which required 5–10 minutes in total (legacy QoL tools >15 min each). On average, cSLE patients showed clinically relevant decrease in the Short Form assessing upper extremity function compared to healthy children, while the other QoL domains were less affected (Table 1). This is also supported by the scores of the CHQ-PHYS and GC. Concurrent validity of the Short Forms is supported by moderate correlations with the scores of various legacy measures. Comparison to cohorts of healthy children and those with juvenile arthritis will be provided.

Disclosures: A. J. Greenler; None; L. E. Schanberg; None; M. P. Flannery; None; S. Nelson; None; J. Wootten; None; E. M. Morgan DeWitt; None; H. I. Brunner; None.

Myoclonophenol Mofetil and Abatacept Combination Therapy in Refractory Pediatric Systemic Lupus Erythematosus Nephritis. Rhina Castillo1, Sujas M. Radhakrishna2, Andreas O. Reiff 1 and Katherine AB Marzan1.

1Children’s Hospital Los Angeles, Los Angeles, CA; 2Kaiser Permanente Medical Group, Oakland, CA.

Background/Purpose: Nephritis (LN) in pediatric systemic lupus erythematosus (psLLE) requires treatment (tx) with corticosteroids (CS) and other agents such as mycophenolate mofetil (MMF) or cyclophosphamide (CYC). However, some patients (pts) fail standard therapy leaving physicians with few options. Although a recent phase II randomized controlled combination trial of abatacept and MMF (ABA+MMF) in adult SLE did not meet its endpoints, we examined if this combination therapy may have a therapeutic benefit in psLLE pts with refractory LN.

Methods: We performed a retrospective observational study in 5 psLLE pts with class IV and V lupus nephritis. All pts were treated with ABA+MMF after previous treatment and failure or intolerance of CYC and MMF with concomitant CS. Data collected included demographics, disease duration, renal histology and medications used. SLE Disease Activity score (SLEDAI) including parameters of systemic and renal disease activity were assessed at baseline and after 12 weeks of each tx.

Results: Pt age at diagnosis was 9–15yrs (mean 12.6± 2.3). Average disease duration was 22–97 months (mo) (mean 52.8± 30.8), before ABA+MMF therapy was started. Two pts had class IV, 1 pt had class V and 2 pts had class IV/V LN.

All 5 pts had a statistically significant decrease in their SLEDAI scores and had successfully their steroid dose reduced while on ABA+MMF. One pt achieved complete remission and 3 pts were completely weaned off steroids after an average of 9 mo (3–16mo). Repeated ANOVA analyses comparing SLEDAI scores at baseline and after 12 weeks of CYC, MMF and ABA+MMF respectively, showed a statistically significant pattern of change from the baseline score with each change in therapy (P<0.0001). Paired comparison of SLEDAI scores on each drug to baseline scores showed the most significant improvement with combination therapy (MMF+ABA p=0.0001, CYC p=0.0199, MMF p=0.0520).

Conclusion: Preliminary analysis supports QoL measurement using the PROMIS™ Short Forms as feasible and concurrently valid. If confirmed in the larger sample, clinicians treating cSLE will be able to utilize PROMIS™ measures for a more efficient patient self-report of health outcomes, taking advantage of easy interpretation of scores and changes in scores, thereby, reducing resident burden and making QoL assessment feasible in both research and clinical care settings.

Table 1. Comparative scores of QoL. Scores in cSLE*.

<table>
<thead>
<tr>
<th>PROMIS Short Forms</th>
<th>CHAQ</th>
<th>PedsQL-GC</th>
<th>PedsQL-RM</th>
<th>SMILEY</th>
<th>CHQ-PFSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>41.6 (10.6)</td>
<td>33.6 (7.0)</td>
<td>25.6 (5.7)</td>
<td>19.6 (4.7)</td>
<td>21.6 (5.0)</td>
</tr>
<tr>
<td>Mobility</td>
<td>54.6 (16.3)</td>
<td>46.6 (11.4)</td>
<td>38.0 (10.5)</td>
<td>28.0 (6.0)</td>
<td>24.6 (7.7)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>36.6 (11.0)</td>
<td>30.6 (9.0)</td>
<td>24.0 (7.0)</td>
<td>18.0 (5.0)</td>
<td>16.0 (4.0)</td>
</tr>
<tr>
<td>Depression</td>
<td>56.6 (10.0)</td>
<td>48.6 (9.0)</td>
<td>40.0 (8.0)</td>
<td>32.0 (7.0)</td>
<td>28.0 (6.0)</td>
</tr>
<tr>
<td>Pain</td>
<td>64.6 (10.0)</td>
<td>56.6 (9.0)</td>
<td>48.0 (8.0)</td>
<td>40.0 (7.0)</td>
<td>32.0 (6.0)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>74.6 (10.0)</td>
<td>66.6 (9.0)</td>
<td>58.0 (8.0)</td>
<td>50.0 (7.0)</td>
<td>42.0 (6.0)</td>
</tr>
<tr>
<td>Worry</td>
<td>60.0 (12.0)</td>
<td>50.0 (11.0)</td>
<td>40.0 (10.0)</td>
<td>30.0 (9.0)</td>
<td>20.0 (8.0)</td>
</tr>
<tr>
<td>Physical Limitations</td>
<td>64.6 (12.0)</td>
<td>56.6 (11.0)</td>
<td>48.0 (10.0)</td>
<td>40.0 (9.0)</td>
<td>32.0 (8.0)</td>
</tr>
<tr>
<td>Physical Function</td>
<td>74.6 (11.0)</td>
<td>66.6 (10.0)</td>
<td>58.0 (9.0)</td>
<td>50.0 (8.0)</td>
<td>42.0 (7.0)</td>
</tr>
</tbody>
</table>

Values are correlation coefficients
*denotes moderately significant (p < 0.050)
**denotes strongly significant (p < 0.001)
Conclusion: The above data suggests that combination therapy with ABA+ MMF can be superior to MMF alone and may be an effective option in refractory pSLE nephritis, raising the possibility of a synergistic effect between the two drugs. Additional studies are needed in pSLE to further assess the efficacy of this combo tx.

Disclosure: R. Castillo, None; S. M. Radhakrishna, None; A. O. Reiff, None; K. A. Marzan, None.

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Long-Term Outcomes in Neonatal Lupus, Amit Saxena1, Peter M. Izmirly2, Deborah Friedman3 and Jill P. Buyon4. 1New York University School of Medicine, New York, NY, 2NYU School of Medicine, New York, NY, 3New York Medical College, Valhalla, NY

Background/Purpose: Several studies have evaluated mortality and short-term morbidity in neonatal lupus (NL), however there have been no substantive descriptions of the long term cardiac, rheumatologic, or neurodevelopmental outcomes in children exposed to maternal anti-Ro antibodies. This study was initiated to ascertain the prevalence of these outcomes in NL children and their unaffected siblings, and to evaluate whether certain fetal echocardiographic risk factors or pacemaker placement associates with long term morbidity.

Methods: The study utilizes a retrospective cohort of family members from the Research Registry for Neonatal Lupus (RRNL). Follow-up questionnaires were completed for 75 cardiac NL children, 35 cutaneous NL children, and 74 unaffected siblings. The questionnaires focus on symptoms associated with rheumatic and cardiac diseases, and information on pacemakerers, developmental milestones, medical diagnoses and medications. Records from the RRNL were reviewed for fetal echocardiographic data.

Results: Of 184 total respondents, 52 children (28%) were age 0-5, 45 (24%) were 5-10, 30 (16%) were 10-15, 32 (17%) were 15-20, and 25 (14%) were > 20 years old. Among the 75 cardiac NL cases, 64 (85%) had 3rd degree heart block, 3 (4%) 2nd degree, 5 (7%) 1st degree, and 3 (4%) isolated cardiomyopathy. 53 (79%) of the 67 with advanced block were paced, 43% of whom had at least one replacement. 15 (20%) cardiac NL cases were reported as ever having "heart failure" and 31 (41%) "an enlarged heart." Median age was significantly higher in those reporting an enlarged heart (p=0.016), and those needing a pacemaker and replacement (p=0.001 and 0.003, respectively). Of 37 cardiac NL children > 10 yrs, 19% required pacemaker replacements (p=0.004 and 0.008). Of the total 110 NL patients, 1 developed JIA, 6 psoriasis/iritis, 1 IBD, and 3 thyroid disease. Of the 74 unaffected siblings, 1 developed 1 RA, and 1 sarcoidosis. Autism was diagnosed in 3 (3%) NL children and 2 (3%) healthy siblings. 5 (5%) and 6 (8%) NL and unaffected children respectively were taking medications for ADHD. Hydrocephalus was diagnosed after birth in 6 (5%) NL children, 3 requiring shunts. In 13 (12%) and 2 (3%) NL and unaffected children, delays in motor milestones were reported (p=0.027). 41 (37%) NL children had ever been considered small in height or weight for age vs. 14 (19%) healthy siblings (p=0.005). However, only 12 (11%) NL children were still considered small at the time of the questionnaire vs. 9 (12%) of the unaffected siblings.

Conclusion: Older age is associated with a reported history of heart enlargement, greater need for pacing, and cardiac medications. This supports the requirement for continued intensive long term cardiology evaluation in affected children. Risks exist in NL for delayed motor milestones, and transient failure to thrive. This further suggests the need for comprehensive surveillance, perhaps with a multidisciplinary protocol at a center familiar with these children.

Disclosure: A. Saxena, AHA, 2; P. M. Izmirly, None; D. Friedman, None; J. P. Buyon, None.

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Illness Features Associated with an Increased Risk of Mortality in Children with Juvenile Idiopathic Inflammatory Myopathies. Adam M. Huber1, Gulnara Mamyrova2, Julia A. Lee3, Peter A. Lachenbruch4, Ira N. Targoff5, Frederick W. Miller6, Lisa G. Rider6 and Childhood Myositis Heterogeneity Study Group6. 1Dalhousie University, Halifax, NS, 2George Washington University, Washington, DC, 3NIH, Bethesda, MD, 4NIAMS, NIH, Bethesda, MD, 5Oklahoma Medical Research Foun, Oklahoma City, OK, 6Bethesda

Background/Purpose: Juvenile idiopathic inflammatory myopathies (JIM) are potentially life-threatening systemic autoimmune diseases but little is known regarding factors associated with mortality.

Methods: Patients enrolled in a nationwide registry which included demographics, clinical and laboratory features, and outcomes. Timing of features (at diagnosis, after diagnosis or ever) was recorded. Mortality status was available for 419/441 (95%) patients (342 juvenile dermatomyositis (JDM), 30 juvenile polymyositis (JPM) and 47 juvenile connective tissue disease associated myositis (JCTM)), based on the Social Security Death Index or physician report. Poisson regression was used to assess univariable associations with mortality. Random survival forest classification followed by Poisson regression was used to assess multivariable associations.

Results: The cohort was 74% female, 69% white, median diagnosis age 7.6 years and median follow-up 4.3 years. There were 17 deaths (4%): 7 pulmonary (interstitial lung disease [ILD]), 3 gastrointestinal (perforation or hemorrhage), 3 multisystem (sepsis, multi-organ failure) and 4 unknown.

For univariable analysis, features present at diagnosis associated with an increased risk of death (P<0.05) were disease subgroup (mortality 2.3% JDM, 6.7% JPM, 14.9% JCTM), hospitalization, onset severity, younger age at diagnosis, anti-synthetase, anti-Ka or -La autoantibodies, dysphagia, abdominal perforation, Raynaud’s phenomenon, ILD, shawl sign rash, gastroesophageal reflux and dysphonia. Features present after diagnosis associated with an increased risk of death were wheelchair use at last assessment, ILD, fever, pneumothorax or pneumomediastinum, abdominal perforation and number of hospitalizations. For features present at any time, including unknown timing, additional features associated with increased risk of death included dyspnea, dysphagia, sclerosis, weight loss, and decreased risk: fatigue, Gottron’s papules and linear extensor erythema. Multivariable analyses revealed the following:
Clinical Utility of Anti-CADM-140/Melanoma Differentiation-Associated Gene 5 Autoantibody Titters in Patients with Juvenile Dermatomyositis and Rapidly Progressive Interstitial Lung Disease, Shinji Sato1, Norimoto Kobayashi2, Kazuko Yamazaki3 and Yasuo Suzuki1. 1Tokai University School of Medicine, Isehara, Japan, 2Shinshu University School of Medicine, Matsumoto, Japan, 3Yokohama City University Hospital, Yokohama, Japan

Background/Purpose: The presence of anti-CADM-140/Melanoma Differentiation-Associated Gene 5: MDA5 autoantibody is specific for adult dermatomyositis (DM), especially in patients with little or no muscle manifestations (clinically amyopathic dermatomyositis: CADM). Its presence is known to have a strong association with rapidly progressive interstitial lung disease (RP-ILD). Recently, it was reported that anti-CADM-140/MDA5 antibody titers measured by an enzyme-linked immunosorbent assay (ELISA) were useful for predicting outcomes of RP-ILD as well as for monitoring disease activity in patients with adult DM and RP-ILD. However, despite its diagnostic utility in adult DM, its clinical significance in juvenile DM (JDM) is still unclear. Here, we have examined this issue using anti-CADM-140/MDA5 ELISA.

Methods: Serum samples from 35 patients diagnosed with JDM (26 with classical JDM and 9 with juvenile CADM) were screened for autoantibody using a previously established anti-CADM-140/MDA5 ELISA. Associations between anti-CADM-140/MDA5 titer and clinical course and outcome were analyzed.

Results: Sera from 11 of 35 patients (31%) with JDM were found to contain anti-CADM-140/MDA5 antibody (6 with classical JDM and 5 with juvenile CADM). All 11 patients who possessed anti-CADM-140/MDA5 antibody had ILD, of whom 6 developed RP-ILD. JDM patients with anti-CADM-140/MDA5 antibody were significantly more likely to have RP-ILD compared with those without this antibody (P=0.0017). In anti-CADM-140/MDA5-positive patients, the mean antibody titer before treatment was significantly higher in those with RP-ILD than in those without (166.7 units vs. 57.4 units, P= 0.048). Four of 6 patients with RP-ILD died despite intensive therapy. In a patient who responded to therapy and survived, the titer of anti-CADM-140/MDA5 antibody decreased to the cut-off level, in parallel with improved respiratory symptoms. In contrast, the mean anti-CADM-140/MDA5 titer in patients who failed to respond to therapy and died did not decrease significantly, being maintained at a high level over the disease course as also observed in patients with adult DM (197.2 units vs. 76.2 units, P=0.17, n=3).

Conclusion: These results illustrate the clinical utility of establishing anti-CADM-140/MDA5 antibody titers in patients with JDM and RP-ILD as well as in patients with adult DM and RP-ILD.
Background/Purpose: Obesity in adults with Systemic Lupus Erythematosus (SLE) is associated with an added risk of cardiovascular disease, decreased health-related quality of life (HRQOL), and increased disability. While cross-sectional studies report the prevalence of obesity in adult SLE cohorts at 27–29%, there are no studies that address the frequency of obesity in childhood-onset SLE (cSLE) or its impact on patient well-being. Patients with cSLE are more often treated with corticosteroids than adults with SLE, putting them at a higher risk for obesity. The purpose of this study is to estimate the frequency of obesity in our cSLE cohort and evaluate the effect of obesity on HRQOL measures in cSLE.

Obesity was defined as a body mass index ≥ 95th of the sex-specific CDC 2000 BMI-for-age growth charts. In a prospective cSLE cohort (n = 202), we compared the domain and summary scores of the generic and rheumatology modules of the Pediatric Quality of Life Questionnaire (PedsQL) and Child Health Questionnaire (CHQ) between obese cSLE patients and three comparison groups: 1) non-obese cSLE; 2) non-obese healthy children; and 3) obese controls without cSLE. Using mixed-effects models that adjusted for important predictors, we evaluated the independent contribution of obesity on HRQOL measures.

Results: Twenty-five percent (n = 51) of the cSLE patients in the cohort were classified as obese. We found a significant negative impact of obesity on overall HRQOL which persists even after adjustment for corticosteroid use, disease activity, disease damage, gender, and race of the patients (Table 1). Obese cSLE patients had significantly lower physical and school functioning, disease activity, disease damage, gender, and race of the patients (p-values < 0.0001–0.04). Parents of obese cSLE patients worry more and perceive more physical limitations and limited family activities (p-values < 0.0001–0.05). There was also poorer emotional functioning in obese cSLE patients compared to their non-obese counterparts and healthy children (p-values < 0.0001–0.04). Parents of obese cSLE patient worry more and perceive more physical limitations and limited family activities (p-values < 0.0001–0.01).

Table 1. Difference in scores of health-related quality of life (HRQOL) measures in cSLE according to presence of obesity

<table>
<thead>
<tr>
<th>Health Related Quality of Life Measure</th>
<th>(a) Obese</th>
<th>Non-obese</th>
<th>P-value (A vs. B)</th>
<th>(c) Obese</th>
<th>Non-obese</th>
<th>P-value (A vs. C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic Module: Parent-report</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Physical Functioning</td>
<td>58.6 ± 0.9</td>
<td>61.6 ± 0.9</td>
<td>&lt;0.0001</td>
<td>67.6 ± 3.7</td>
<td>74.0 ± 3.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Emotional Functioning</td>
<td>75.0 ± 0.9</td>
<td>75.0 ± 0.9</td>
<td>&lt;0.0001</td>
<td>77.5 ± 2.3</td>
<td>82.2 ± 2.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>70.8 ± 0.9</td>
<td>72.2 ± 0.9</td>
<td>&lt;0.0001</td>
<td>68.6 ± 3.5</td>
<td>68.2 ± 3.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>School Functioning</td>
<td>68.6 ± 0.9</td>
<td>68.6 ± 0.9</td>
<td>&lt;0.0001</td>
<td>68.6 ± 0.9</td>
<td>68.6 ± 0.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Generic Module: Self-report</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Physical Functioning</td>
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<td>61.6 ± 0.9</td>
<td>&lt;0.0001</td>
<td>67.6 ± 3.7</td>
<td>74.0 ± 3.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Emotional Functioning</td>
<td>75.0 ± 0.9</td>
<td>75.0 ± 0.9</td>
<td>&lt;0.0001</td>
<td>77.5 ± 2.3</td>
<td>82.2 ± 2.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>70.8 ± 0.9</td>
<td>72.2 ± 0.9</td>
<td>&lt;0.0001</td>
<td>68.6 ± 3.5</td>
<td>68.2 ± 3.6</td>
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<tr>
<td>School Functioning</td>
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<td>68.6 ± 0.9</td>
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<td>68.6 ± 0.9</td>
<td>68.6 ± 0.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Rheumatology Module: Parent-report</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pain and Fatigue</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Daily Activities</td>
<td>29.0 ± 0.4</td>
<td>32.0 ± 0.4</td>
<td>&lt;0.0001</td>
<td>32.0 ± 0.4</td>
<td>32.0 ± 0.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Treatment</td>
<td>29.0 ± 0.4</td>
<td>32.0 ± 0.4</td>
<td>&lt;0.0001</td>
<td>32.0 ± 0.4</td>
<td>32.0 ± 0.4</td>
<td>&lt;0.0001</td>
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<tr>
<td>Worry</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Communication</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Rheumatology Module: Self-report</td>
<td>82.0 ± 0.2</td>
<td>82.0 ± 0.2</td>
<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
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<td>82.0 ± 0.2</td>
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<td>&lt;0.0001</td>
<td>75.0 ± 1.8</td>
<td>82.0 ± 1.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Daily Activities</td>
<td>29.0 ± 0.4</td>
<td>32.0 ± 0.4</td>
<td>&lt;0.0001</td>
<td>32.0 ± 0.4</td>
<td>32.0 ± 0.4</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Conclusion: Our study demonstrates that about 25% of cSLE patients evaluated were obese. Obesity negatively impacts many aspects of HRQOL particularly physical functioning and pain/hurt domains. Given the adverse effects on HRQOL, there appears to be an urgent need to include weight management in the day-to-day management of children with cSLE.

Methods: We conducted a single center cohort study of children diagnosed with cPACS satisfying modified Calabrese criteria between 1990 and 2010. The study included all patients with normal MRI studies (defined as no evidence of an inflammatory or ischemic lesion at diagnosis) with subsequent confirmatory brain biopsy. Clinical, laboratory, histopathologic, treatment and patient outcome data was collected for these patients. MRI-studies were evaluated by a neuroradiologist, and histopathology by a neuropathologist.

Results: Out of 107 children diagnosed with cPACS, 80 children were diagnosed with angiography-positive cPACS; all had abnormal MRI. 27 patients were diagnosed with angiography-negative cPACS; 25 (93%) had abnormal MRI. MRI sensitivity for the initial cohort was 98%, 100% for angiography-positive and 93% for angiography-negative cPACS. Two children fulfilled inclusion criteria: previously healthy 11 and 13 year old males, both presenting with acute onset seizures progressing to refractory status epilepticus. Both patients had elevated serum inflammatory markers and slight prolongation of WBC in CSF; the other had two normal CSF studies. Both patients had extensive workup for infection and rheumatologic disease, removing negative. Extensive imaging including CT, conventional angiogram, MRA, MRI, and MR speci...
Takayasu’s arteritis is a rare childhood disease. In this multicenter study we observed a high rate of disease remission, however prospective studies are needed in order to better define overall disease outcome.

Disclosure: M. T. Terrier, None; G. Clemente, None; C. Silva, None; S. Sacchetti, None; A. M. Sallum, None; L. M. A. Campos, None; M. C. Santos, None; F. Sztajnbok, None; R. Gasparello de Almeida, None; V. P. Ferriani, None; B. E. Bica, None; T. Robazzi, None; M. Bandeira; None; A. Cavalcante, None; M. Lessa, None; S. K. Feltsa de Oliveira, Novartis Pharmaceutical Corporation, 2, Roche Pharmacueticals, 2, Bristol-Myers Squibb, 2; M. O. Hilario, None.

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Effectiveness of Intravenous Cyclophosphamide in Severe or Refractory Juvenile Dermatomyositis - a National Cohort Study UK and Ireland.

Elena Moraitis1, Katie Arnold2, Clarissa Pilkington1 and Juvenile Dermatomyositis Research Group. 1Great Ormond Street Hospital, London, United Kingdom, 2UCL Institute of Child Health, London, United Kingdom, London, United Kingdom

Background/Purpose: Juvenile dermatomyositis (JDM) is a rare autoimmune vasculopathy affecting primarily the muscle and skin, but can also involve other organs.

Early and aggressive treatment improves outcome and prevents complications. Cyclophosphamide has been used as a second-line agent in the treatment of severe or refractory JDM. The published literature on the effectiveness of cyclophosphamide in JDM is limited to a small case series and case reports.

The objective of the study is to describe the response to cyclophosphamide in the patients with severe or refractory JDM.

Methods: 56 patients treated with cyclophosphamide between years 2000–2011 were identified in the JDM National (UK and Ireland) Cohort Biomarker Study and Repository for Idiopathic Inflammatory Myopathies. 8 patients were excluded due to incomplete data or too short follow up. For the 48 patients included, demographics, myositis core outcome variables, skin measures, laboratory measures, steroid dose and other treatments were recorded at baseline, time 6, 12, 18, 24 months and last follow up post commencement of the drug.

Results: Indications for starting cyclophosphamide were ulcerative or severe skin disease, profound muscle weakness, lung disease, gastro-intestinal vasculopathy or refractory disease. Previous medications were steroids and Methotrexate for 47 patients and steroids and Cyclosporin for 1 patient.

All patients starting with muscle weakness (n=44) significantly improved at time12, and the gains were maintained at follow up (see table1). PhysicianVAS was available for 32 patients and these all improved by 12 and 24 months, and for 31 remained stable at follow up.

At last follow up 26/46(50%) had no rash, 32/46(69%) had normal nailfolds, 37/45(82%) had no Gottron’s, and calcinosis improved in 9/14 (64%).

Table 1.
Background/Purpose: While previous work has shown that adults with childhood-onset systemic lupus erythematosus (cSLE) have increased risk of mortality, renal disease and myocardial infarction as compared to individuals with adult-onset SLE (aSLE), little is known about differences in cumulative disease damage or steroid toxicity between adults with cSLE and aSLE. The goal of this study was to determine whether adults with cSLE are at increased risk for disease damage and steroid toxicity as compared to those with aSLE.

Methods: Data derive from the 2007–2011 cycles of the Lupus Outcomes Study (LOS), an annual longitudinal telephone survey of diverse English-speaking subjects with confirmed SLE. The Brief Index of Lupus Damage (BILD), a validated, patient-reported measure, was used to assess SLE-related damage. Mean BILD score was calculated from negative binomial regression results, adjusted for age, gender and ethnicity.

Conclusion: In this large cohort of adults with SLE, onset of lupus in childhood predicts increased disease damage. Childhood-onset SLE also predicts increased risk of steroid-related damage, which may be due to greater cumulative steroid exposure. Tight disease control and minimization of steroid use in childhood may be important to decrease long-term morbidity in cSLE.

Disclosure: E. F. Lawson, None; L. Trupin, None; J. Yazdany, None; A. O. Hersh, None; E. von Scheven, None; E. H. Yelin, None.

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Reduction of Cerebral and Corpus Callosum Volumes in Childhood-Onset Systemic Lupus Erythematosus. A Volumetric Magnetic Resonance Imaging Analysis. Aline T. Lapa1, Wesley G. Ferreira2, Mariana Postal1, Naiul A. Sinicato1, Roberto Marin2, Fernando Cendes3 and Simone Appenzeller3. 1State University of Campinas, Campinas, Brazil, 2Universidade Estadual de Campinas, Sao Paulo, Brazil, 3State University of Campinas, Sao Paulo, Brazil

Background/Purpose: Cerebral atrophy has been described to occur in SLE with variable frequency. Aging, systemic diseases, corticosteroid use and central nervous system (CNS) involvement may lead to cerebral atrophy. However, studies evaluating the prevalence of cerebral atrophy in childhood-onset systemic lupus erythematosus (cSLE) using magnetic resonance imaging (MRI) volumetric measurements are rare. Objectives: To determine the frequency of cerebral and corpus callosum atrophy in cSLE and to determine the possible relationships between atrophy and clinical, laboratory and treatment features of the disease.

Methods: A total of 51cSLE patients (48 female; mean age=17.0; SD=3.9) and 50 healthy age and sex matched volunteers (37 women; mean age=18.4; SD=5.7) followed at the pediatric rheumatology unit of the State University of Campinas were enrolled in this study. A complete clinical, laboratory and neurological evaluation was performed in all subjects. Neuropsychological manifestations were analyzed according to the ACR classification criteria. Cognitive evaluation was performed in all participants using Wechsler Intelligence Scale for children (WISC-III) and Wechsler Intelligence Scale for adults (WAIS), according to age. Mood disorders were determined through Becks Depression and Becks Anxiety Inventory in all participants. SLE patients were further assessed for clinical and laboratory SLE manifestations, disease activity (SLEDAI), damage (SDI) and current drug exposures. Total dose of corticosteroids and other immunosuppressant medications used since the onset of disease were calculated. MRI scans were performed in a 3T Philips® scanner using a standardized protocol. Sagittal T1 weighted images were used for semiautomatic volumetric measurements. Volumes smaller 2 standard deviation from the means of controls were considered abnormal. Non-parametric tests and correlation were used for statistical analysis.

Results: A total of 51cSLE patients (48 female; mean age=17.0; SD=3.9) and 50 healthy age and sex matched volunteers (37 women; mean age=18.4; SD=5.7) followed at the pediatric rheumatology unit of the State University of Campinas were enrolled in this study. A complete clinical, laboratory and neurological evaluation was performed in all subjects. Neuropsychological manifestations were analyzed according to the ACR classification criteria. Cognitive evaluation was performed in all participants using Wechsler Intelligence Scale for children (WISC-III) and Wechsler Intelligence Scale for adults (WAIS), according to age. Mood disorders were determined through Becks Depression and Becks Anxiety Inventory in all participants. SLE patients were further assessed for clinical and laboratory SLE manifestations, disease activity (SLEDAI), damage (SDI) and current drug exposures. Total dose of corticosteroids and other immunosuppressant medications used since the onset of disease were calculated. MRI scans were performed in a 3T Philips® scanner using a standardized protocol. Sagittal T1 weighted images were used for semiautomatic volumetric measurements. Volumes smaller 2 standard deviation from the means of controls were considered abnormal. Non-parametric tests and correlation were used for statistical analysis.

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correlation between age and corpus callosum volume (r = −0.88; p = 0.001) was observed. The presence of cerebral atrophy was associated with the presence of depression (p = 0.007), vasculitis (p = 0.001) and disease activity (p = 0.04). No relationships between cerebral and corpus callosum volume and disease duration, the presence of CNS manifestations, total corticosteroid dose, and the presence of antiphospholipid antibodies were observed.

**Conclusion:** Cerebral and corpus callosum atrophy is observed more frequently in cSLE when compared to controls. The presence of immunological and clinical features are associated with the presence of atrophy. Depression was the only neuropsychiatric manifestation associated with cerebral atrophy.

**Disclosure:** A. T. Lapa, None; W. G. Ferreira, None; M. Postal, None; N. A. Sinicato, None; R. Marini, None; F. Cendes, None; S. Appenzeller, FAPESP and CNPq, 2.

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**Decreased Frequency of Dystrophic Calcifications in Children with Juvenile Dermatomyositis: A 10-Year Study.**

Lauren M. Pachman1, Gabrielle A. Morgan2, Megan L. Curran1, Lori J. Ferguson1 and Chiang-Ching Huang1. Division of Pediatric Rheumatology, Northwestern University Feinberg School of Medicine, Chicago, IL, 2Children’s Hospital of Chicago Research Center, Cure JM Myositis Center, Chicago, IL, 3Department of Preventive Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL

**Background/Purpose:** In Juvenile Dermatomyositis (JDM), dystrophic calcifications, associated with increased morbidity and mortality, have been reported for 20–30% of patients. There are few laboratory indicators of disease activity, and a duration of untreated disease (DUD) greater than 4.5 months is associated with normalization of muscle enzymes (CK, Aldolase, LDH, SGOT), commonly used to guide response to therapy.

**Objective:** To determine the current frequency of dystrophic calcifications in children with JDM.

**Methods:** Patients with definite/probable JDM (overlap syndromes excluded) seen between 2000 and 2010 at the Ann and Robert H. Lurie Children’s Hospital enrolled (IRB #2012-12858). At the first visit of 90 children, 52 were untreated and 38 were previously treated. Demographic data were obtained (Table), and their clinical inflammation assessed by disease activity scores (DAS) for skin and muscle. Diagnosis was confirmed by laboratory testing, and MRI directed muscle biopsy.

**Results:** Of the 52 untreated patients, 5 (9.6%) had calcinosis at presentation. The 52 children were initially treated with oral prednisone (47), IV prednisone (45), methotrexate (48), hydroxychloroquine (11), cyclosporin (1), mycophenolate (2), IVIG (0), and alendronate (0). During their disease course, the following medications were used: oral prednisone (50), IV methylprednisone (45), methotrexate (48), hydroxychloroquine (21), cyclosporin (10), mycophenolate (29), IVIG (6), and alendronate (0). At follow-up 4/5 of the children’s calcifications had resolved and the fifth one had diminished in size. None of the children with initially untreated JDM developed new calcifications. Of the 38 children previously treated, 7 (18%) had calcifications. Medications taken: oral prednisone (25), IV methylprednisone (5), methotrexate (25), hydroxychloroquine (20), cyclosporin (3), mycophenolate (2), IVIG (5), and alendronate (2). At follow-up, of the 7 children with calcifications: 2 improved in size (1 totally resolved), 3 remained the same, one developed more advanced calcification (from moderate to severe), and one developed 36 deposits months later.

**Conclusion:** In untreated JDM without calcifications, no deposits developed during a mean follow-up period of <4 years. Of the 5 untreated JDM with calcifications, 4/5 resolved and the one diminished. Of the seven treated JDM referred with calcifications, only one totally resolved, and one developed new calcifications after 36 months of therapy. These data suggest that early immunosuppressive therapy may impair the development of dystrophic calcifications in JDM, for only 7.0% of this total group had calcifications. None of the 52 initially untreated children without calcifications developed them at a later time. We speculate that dystrophic calcifications in JDM are preventable.

**Disclosure:** L. M. Pachman, NIH-R0-1; Education grant from Behring for $5,000, 2; G. A. Morgan, None; M. L. Curran, None; L. J. Ferguson, None; C. C. Huang, None.
Accuracy of Systemic Lupus International Collaborating Clinics Classification Criteria Applied to Juvenile Systemic Lupus Erythematosus Patients. Maria M. Katsicas1, Ezequiel Borgia2, Ileana Villarroel2 and Ricardo Russo3. 1MD, Buenos Aires, Argentina, 2MD, Caba, Argentina, 3Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

**Background/Purpose:** Systemic lupus erythematosus (SLE) is a prototype autoimmune disease. The most widely used classification criteria for SLE were those developed by the American College of Rheumatology (ACR) in 1982 and revised by a committee in 1997, but not validated in that revision. The Systemic Lupus Collaborating Clinics (SLICC) revised the ACR SLE classification criteria and validated new criteria in order to improve clinical relevance and incorporate new knowledge in SLE immunology.

To assess sensitivity and specificity of revised and validated new SLICC SLE classification criteria in a cohort of Juvenile SLE patients.

**Methods:** The SLICC criteria rule for SLE classification requires: 1) four criteria, with at least one clinical criterion and one immunologic criterion or 2) lupus nephritis alone in the presence of ANA or anti-DNA antibodies. Seventeen criteria were identified. Cases were JSLE patients who were attending a single tertiary center in the past 10 years. JSLE had been diagnosed on clinical and immunological grounds by experienced pediatric rheumatologist. Controls were patients with rheumatic diseases other than SLE: Juvenile Idiopathic Arthritis (JIA); Juvenile Dermatomyositis (JDM), Autoimmune Hepatitis (AH) and Juvenile Systemic Sclerosis (JSS). Criteria were reviewed from prospectively developed databases and medical records by pediatric rheumatologists in order to establish the number and frequency of new criteria fulfilled by each patient. Descriptive statistics were used to characterize both groups. Summary statistics included overall sensitivity and specificity. McNemar’s test was used to assess differences between ACR 1997 criteria and SLICC criteria with respect to accuracy.

**Results:** Cases: 107 patients with JSLE were included (F: 89 M: 18), age at onset: 12 (3–16) yo. Controls: 102 patients with JIA (36 patients, systemic 20, polyarticular 16); JDM (28), AH (28) and JSS (10), F; 76 M: 26, age at onset: 11 (2–16) yo. SLICC SLE criteria sensitivity was 100% vs 86% ACR 1997 criteria, while specificity was 98% vs 96% (p=0.009). Six patients with a clinical diagnosis of JSLE were correctly classified by SLICC but not by ACR criteria.

**Conclusion:** The SLICC new criteria performed better than the ACR 1997 criteria in a cohort of patients with JSLE. These new criteria allowed better accuracy than previous criteria in some variables such as low complement, anti-DNA, acute cutaneous lupus, ANA, and renal involvement.

**Disclosure:** M. M. Katsicas; None; E. Borgia; None; I. Villarroel; None; R. Russo; None.

### Table 1. Clinical and socio-economic characteristics of EA, nonEA, AA, and A pSLE patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>EA (n=100)</th>
<th>NonEA (n=100)</th>
<th>AA (n=100)</th>
<th>A (n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at diagnosis, Mean (Years)</td>
<td>14.5 (1–18)</td>
<td>14.5 (1–18)</td>
<td>14.5 (1–18)</td>
<td>14.5 (1–18)</td>
</tr>
<tr>
<td>Female:Male</td>
<td>70:30</td>
<td>69:31</td>
<td>69:31</td>
<td>69:31</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>EA: 100</td>
<td>EA: 100</td>
<td>AA: 100</td>
<td>A: 100</td>
</tr>
<tr>
<td>Race</td>
<td>EA: 100</td>
<td>EA: 100</td>
<td>AA: 100</td>
<td>A: 100</td>
</tr>
<tr>
<td><strong>Total ACR Criteria</strong></td>
<td>4.5 (4–6)</td>
<td>4.5 (4–6)</td>
<td>4.5 (4–6)</td>
<td>4.5 (4–6)</td>
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<tr>
<td><strong>SLEDAI</strong></td>
<td>4.0 (2–6)</td>
<td>4.0 (2–6)</td>
<td>4.0 (2–6)</td>
<td>4.0 (2–6)</td>
</tr>
<tr>
<td><strong>Arthritis</strong></td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
</tr>
<tr>
<td><strong>Rheumatoid arthritis</strong></td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
</tr>
<tr>
<td><strong>Cumulative steroid exposure</strong></td>
<td>1.0 (1–2)</td>
<td>1.0 (1–2)</td>
<td>1.0 (1–2)</td>
<td>1.0 (1–2)</td>
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<tr>
<td><strong>Immunosuppressants</strong></td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
<td>0.3 (0–1)</td>
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<tr>
<td><strong>Quality of life</strong></td>
<td>2.5 (2–3)</td>
<td>2.5 (2–3)</td>
<td>2.5 (2–3)</td>
<td>2.5 (2–3)</td>
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<tr>
<td><strong>Socioeconomic status</strong></td>
<td>3.0 (2–4)</td>
<td>3.0 (2–4)</td>
<td>3.0 (2–4)</td>
<td>3.0 (2–4)</td>
</tr>
</tbody>
</table>

**Conclusion:** The SLICC new criteria performed better than the ACR 1997 criteria in a cohort of patients with JSLE. These new criteria allowed better accuracy than previous criteria in some variables such as low complement, anti-DNA, acute cutaneous lupus, ANA, and renal involvement.

**Disclosure:** M. M. Katsicas; None; E. Borgia; None; I. Villarroel; None; R. Russo; None.
Burden of Childhood Central Nervous System Vasculitis: Identifying High Risk Factors for Poor Cognitive Outcome.

Methods: A single-centre cohort study of children with cPACNS based on Calabrese criteria was performed. Children had to have completed a standard neurocognitive evaluation. Demographic characteristics, disease subtypes, clinical features, laboratory markers, neuroimaging studies, brain biopsy findings and treatment regimens were captured. Neurocognitive function was evaluated with a standardized battery of neuropsychological tests including domains of cognitive, social, emotional and adaptive function. The primary study outcome was the Full Scale IQ (FSIQ). Secondary outcomes included neurological function as defined by the Paediatric Stroke Outcome Measure PSOM, Health-related Quality of Life (PedsQL), disease activity and disease damage (VAS). Analysis: Univariate analysis compared variables between distinct disease subtypes; a multivariate prediction model for adverse cognitive outcome was used.

Results: A total of 104 children were diagnosed with primary CNS vasculitis in the study interval, of whom 63 (61%) completed the neuropsychological assessment. Of these 19 had small vessel (SV) cPACNS and 44 angiography-positive CNS vasculitis (APcPACNS). The cohort included 28 girls (16 SVcPACNS, 12 APcPACNS) and 35 boys (3 SVcPACNS, 32 APcPACNS), median age at diagnosis was 8.1 years; SVcPACNS patients were older at diagnosis (9.8 vs. 7.5 years). At diagnosis, SVcPACNS patients present significantly more commonly with seizures (79%, p < 0.05) and acute behavioural change (47% p < 0.05), while hemiparesis was more frequently seen in APcPACNS (91% p < 0.05). Outcome: Overall, the mean FSIQ was 93 (52–132). The mean FSIQ in SVcPACNS was 82 (54–119) and was significantly lower than in APcPACNS, 97 (52–132) (p < 0.05). Abnormal FSIQ scores (<85) were seen in 53% of the SVcPACNS and 27% of APcPACNS patients. Children with SVcPACNS had lower scores than APcPACNS in the subdomains of verbal comprehension, working memory and processing speed (p < 0.05). Prediction model: Children with SVcPACNS and with seizures were at the highest risk of cognitive deficits.

Conclusion: Children with cPACNS carry significant disease burden. The inflammation causes drastically impaired cognitive functioning including comprehension, processing speed and memory deficits. Children with SVcPACNS and in particular those presenting with seizures are at the highest risk for adverse cognitive outcome. Early rehabilitation interventions have to be tailored to this high risk group.

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Clinicopathologic Correlates for Activity and Damage of Lupus Nephritis in Childhood-Onset Systemic Lupus Erythematosus. Ravi Nunna1, Rina Mina2, Michael Bennett3, Shannen Nelson4, Jessica Hummel1, Prasad Devarajan1, David Witte2 and Hermine I. Brunner3. 1Cincinnati Children’s Hospital Medical Center/University of Cincinnati, Cincinnati, OH, 2Cincinnati Children’s Hospital Medical Center/University of Cincinnati, Cincinnati, OH, 3Cincinnati Children’s Hospital, Cincinnati, OH, 4Cincinnati Children’s Hospital Medical Center, Cincinnati, OH

Background/Purpose: High AI activity (AI), tubulointerstitial (TI), and chronicity index (CI) scores from renal biopsy may predict poor renal outcomes in lupus nephritis (LN) in childhood-onset systemic lupus erythematosus (cSLE). Our aim is to evaluate the relationship between histologic evidence of renal disease activity and damage of LN with conventionally used biomarkers in cSLE.

Methods: Biopsy specimens of 18 cSLE patients were rated by a single nephropathologist for the AI, TI, and CI. Using logistic regression, the relationships between the biomarkers and high scores for AI (≥ 7), high CI (≥ 3), and high TI (≥ 4) were evaluated. Biomarkers evaluated include serum creatinine, creatinine clearance, urine sediment, proteinuria, albuminuria, blood pressure, anti-ds DNA antibody, C3, C4, sedimentation rate, and blood urea nitrogen (BUN); these were obtained on the day of renal biopsy to 30 days after.

Results: Patient’s mean age ± SD was 14.1 ± 2.7 years. LN class distribution was as follows: II (28%), III (17%), IV (50%), and III plus IV (6%). All were positive for anti-ds DNA antibody. Overall, elevated C3/anti-ds DNA antibody ratio (≥ 1.2) was significantly associated with high TI score. None of the biomarkers were significantly associated with high AI and high CI scores using cut-offs as specified above (see Table).

Table. Relationship of high AI, high CI, and high TI scores with conventional biomarkers.

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>High AI Score N=12</th>
<th>High CI Score N=4</th>
<th>High TI Score N=10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds ratio</td>
<td>P-value</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>1.10 (0.98–1.17)</td>
<td>NS</td>
<td>1.00 (0.96–1.01)</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>1.16 (0.99–1.36)</td>
<td>NS</td>
<td>1.00 (0.92–1.12)</td>
</tr>
<tr>
<td>Hematuria (&gt; 5 RBC/µL)</td>
<td>0.67 (0.08–5.86)</td>
<td>NS</td>
<td>2.22 (0.25–20.17)</td>
</tr>
<tr>
<td>Proteinuria (&lt; 5 WBC/µL)</td>
<td>1.00 (0.13–7.99)</td>
<td>NS</td>
<td>0.87 (0.06–5.68)</td>
</tr>
<tr>
<td>Uric acid to creatinine ratio</td>
<td>2.05 (0.88–4.70)</td>
<td>NS</td>
<td>2.70 (0.02–99.00)</td>
</tr>
<tr>
<td>Albumin</td>
<td>0.08 (0.01–0.77)</td>
<td>NS</td>
<td>0.85 (0.09–7.89)</td>
</tr>
<tr>
<td>C3</td>
<td>0.90 (0.12–6.78)</td>
<td>NS</td>
<td>0.55 (0.07–4.56)</td>
</tr>
<tr>
<td>C4</td>
<td>2.00 (0.11–73.83)</td>
<td>NS</td>
<td>0.29 (0.01–5.66)</td>
</tr>
<tr>
<td>Sedimentation rate</td>
<td>1.00 (0.97–1.03)</td>
<td>NS</td>
<td>1.00 (0.97–1.03)</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>1.09 (0.08–14.66)</td>
<td>NS</td>
<td>0.93 (0.62–139.51)</td>
</tr>
<tr>
<td>Creatinine clearance</td>
<td>0.99 (0.97–1.02)</td>
<td>NS</td>
<td>1.00 (0.98–1.02)</td>
</tr>
<tr>
<td>BUN</td>
<td>7.00 (0.63–75.74)</td>
<td>NS</td>
<td>3.00 (0.37–24.17)</td>
</tr>
</tbody>
</table>

Conclusion: Commonly used biomarkers are poorly associated with histological features for activity and damage of LN in cSLE highlighting the need for better biomarkers that can be used in clinical care.

Disclosure: R. Nunna, None; R. Mina, None; M. Bennett, None; S. Nelson, None; J. Hummel, None; P. Devarajan, None; D. Witte, None; H. I. Brunner, None.

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Children with Probable SLE by ACR Criteria May Need More Aggressive Lupus Treatment Early in the Disease Course. Anjali Patwardhan1, Igor Dvorchik2 and Charles H. Spencer1. 1Nationwide Childrens Hospital, Columbus, OH, 2Nationwide Children’s Hospital, Columbus, OH

Background/Purpose: This research explores whether delay of the childhood-onset SLE (cSLE) diagnosis until 4/11 ACR criteria are met affects patient outcome negatively.

Methods: Institutional Review Board approval was obtained to retrospectively review the charts of 98 SLE patients seen in the rheumatology clinic at Nationwide Children’s Hospital over the past 24 years. All the patients were divided in to two groups, ‘definitive cSLE’ - who met the minimum 4/11 or more ACR criteria at presentation in rheumatology clinic and the ‘probable cSLE’ who did not meet the minimum criteria. Both the groups were assessed for severity, damage and gradient of day. Only approved statistical tests were used, i.e. Chi-Square test, Fisher’s Exact test, Univariate logistic regression and Wilcoxon two-sample test were utilized. All tests were conducted in SAS 9.2
Results: Out of 98 cSL patients, 71 % were included in definitive cSL (DeSLE) group while 29 % were included in probable cSL (PsSLE) group. The mean time for PsSLE group to reach DeSLE status was 20.3 months. There was no difference in the ethnic distribution (p=0.7370). PsSLE were more likely to have a higher male: female ratio (p =0.032), and were older at presentation that DeSLE (p=0.0485). PsSLE patients were less likely to have internal organ involvement (7.1% vs. 25.7%), were less likely to be hospitalized and receive pulse steroids (P =0.0142) or oral steroids (P=0.0172) at presentation. PsSLE patients were less likely to be hospitalized to receive pulse steroids ever (p =0.0628), were less likely to have renal disease ever (p =0.0653) and nervous system disease ever (p =0.0182). PsSLE was more likely to receive hydroxychloroquine (p =0.050). The organ damage was assessed using SLICC/ACR damage index at 1, 5 and 10 years post diagnosis. The maximum damage was recorded within first 5 years of the diagnosis. Initial damage was predictive of later damage. D PSLE had higher disease damage scores at 5 and 10 years. We compared the gradient between the onsets of symptoms and the development of organ damage in the two groups. The PsSLE patients had significantly higher internal organ damage gradient as compared to DeSLE (p value=0.0169).

Conclusion: In our population, PsSLE patients had a significantly higher gradient of damage than the DeSLE group. In spite of D PSLE being more severe diseases ever and more diseases damage, the disease damage progression was steeper and faster in PsSLE. This may be explained by the fact that PsSLE patients received a less intense treatment regiment at presentation than DeSLE group. It may be that PsSLE patients need just as early vigorous treatment as the children with DeSLE.

Disclosure: A. Patwardhan, None; I. Dvorchik, None; C. H. Spencer, None.

Risk Factors for Poor Outcomes in Hospitalized Patients with Pediatric Systemic Lupus Erythematosus. Mary Beth F. Son1, Victor M. Johnson2, Mindy S. Lo2 and Karen H. Costenbader3, Children Hospital Boston, Boston, MA, 2Children’s Hospital Boston, Boston, MA, 3Brigham and Women’s Hospital, Harvard Medical School, Boston, MA

Background/Purpose: Disparities in care among adults with SLE are well documented. We investigated associations of demographic factors and volume of annual inpatient hospital admissions with poor outcomes, including intensive care unit admission, renal failure and in-hospital mortality, among hospitalized patients with pediatric SLE.

Methods: The Pediatric Health Information System (PHIS) is an administrative database contributed to by >40 freestanding U.S. pediatric hospitals. We queried PHIS regarding all discharges for patients aged 3–21 years with at least one ICD-9 code for SLE from Jan 2006-Feb 2011. Patient demographics, medical insurance, hospital and ICU admissions, lengths of stay, renal failure (based on ICD-9 coding), and deaths were recorded. We queried PHIS regarding all discharges for patients aged 3–21 years with at least one ICD-9 code for SLE from Jan 2006-Feb 2011. Patient demographics, medical insurance, hospital and ICU admissions, lengths of stay, renal failure (based on ICD-9 coding), and deaths were recorded. We classified hospitals according to the volume of inpatient admissions per year, in quartiles. We used summary statistics and univariate analyses to examine demographics of hospital admissions, readmissions, and lengths of stay. We employed multivariable logistic regression analyses, controlling for patient age, sex, race, ethnicity, insurance type (private, governmental, self-pay, or none), U.S. region (Northeast, South, Midwest, and West), and hospital volume to examine risk factors for adverse outcomes, including ICU admission, renal failure, and in-hospital mortality.

Results: A total of 3,389 patients with 14,631 admissions were identified in the study period. 2,781 patients (82%) were female and the median age at the time of the index admission was 16 years (IQR=14–18). White and African American race each comprised nearly 37% of the patients (n =1,250 and 1,252), while 5% (n=172) were Asian. Over a quarter of patients (n=888, 26%) were Hispanic or Latino. 87% of patients (n=2,953) had insurance, with over half supported by governmental insurance (n =1,876, 55%). More than a third of patients had renal disease (n=1,273, 38%); however, only 0.7% (n=24) had renal failure and 2% (n=6) required dialysis therapy. The high volume hospitals had shortest stay of admission compared to low volume hospitals (median 2 days, IQR=1–5, vs. 2, IQR=1–6, p<0.001), although readmissions per patient were more frequent in the higher volume hospitals (median 2, IQR=1–6, vs. 2, IQR=1–3, p<0.001). Ten percent of admissions included an ICU stay. Overall in-hospital mortality was low at 0.4% (n=57). In multivariable models, ICU stays were associated with sex <10 years of age (p<0.05), PD patients, hospital and ICU admissions, lengths of stay, and in-hospital mortality were strongly associated with governmental insurance (OR=2.51 [1.47 to 4.29], p<0.05).

Conclusion: In our cohort of hospitalized children with SLE, hospital volume affected length of stay and number of readmissions, but not in-hospital mortality. Governmental insurance in this group of patients was associated with renal failure and in-hospital mortality. Further studies are needed to understand the relationships of medical insurance type and hospital volume with poor outcomes, in order to add modifiable barriers to care in pediatric SLE.

Disclosure: M. B. F. Son, None; V. M. Johnson, None; M. S. Lo, None; K. H. Costenbader, None.

ACR Poster Session A
Pediatric Rheumatology - Pathogenesis and Genetics
Sunday, November 11, 2012, 9:00 am-6:00 pm

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Next-Generation Sequencing of Urinary Microrna in Human Lupus Nephritis. Beatrice Goliv1, Idda Z. Ben-Dov2, Irene Blanco3, Olivier Loudig4, Dawn M. Wahezi5 and Chaim Putterman3, 1Children’s Hospital at Montefiore, Bronx, NY, 2The Rockefeller University, New York, NY, 3Albert Einstein College of Medicine, Bronx, NY, 5Children’s Hospital at Montefiore, Bronx, NY

Background/Purpose: Lupus nephritis (LN) is a common manifestation of SLE associated with significant morbidity and mortality. microRNAs (miRs) are small non-coding RNAs that regulate translation and mRNA stability. Preliminary studies have reported changes in miR expression in kidney tissue, urine, and PBMC that correlated with disease activity in LN. However, use of RNA deep-sequencing methods has not been previously described. We aimed at identifying miR expression patterns in LN by RNA sequencing.

Methods: Cell-free urine supernatants from adult (n=9) and pediatric (n=4) female patients with LN were obtained at the time of active disease and during remission. Total RNA was used to prepare small RNA CDNA libraries for illumina sequencing. Multiplexing through sample-specific 3′ adapters (“bar coding”) was applied to limit batch effects, labor and cost. Sequenced reads were mapped to the human genome and small RNA databases, and miRs were quantified by relative read abundance. qRT-PCR was used for quantitative validation of sequencing results.

Results: We were able to obtain reproducible profiles of miRNA from the small RNA fraction. In a paired-sample analysis comparing the number of miR sequence reads in urine of active versus inactive LN, we found significant upregulation of multiple miRNAs, including −185, −328, −378, −874, and −423. In total, we found differential expression of 19 miRs during active nephritis. A subset analysis revealed 13 miRs that were upregulated by a 400-1,000 fold change during active disease in pediatric, but not in adult samples. Differential expression of several miRs was confirmed by miRNA qRT-PCR.

Conclusion: In summary, we detected a group of miRs (most of which have not been previously described in lupus) with significantly higher presence in the urine during active LN, particularly, in pediatric patients. These miRs may represent biomarkers for disease activity or indicators of specific histologic features. Several urine miRs were previously found to be differentially expressed in immune cells, which may imply that their presence in urine originates from infiltrating rather than kidney resident cells. Finally, upregulated miRs during active LN could imply that their “protective” target genes are repressed in relapse, and that identifying the latter may reveal novel therapeutic pathways in this challenging disease.

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Cell Type Specific Transcriptome Analysis in Patients with Enthesitis Related Arthritis Category of Juvenile Idiopathic Arthritis (JIA-ERA). Amita Aggarwal, Arpita Myles and Priyanka Gaur. Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India

Background/Purpose: Enthesitis Related Arthritis Category of Juvenile Idiopathic Arthritis (JIA-ERA) is the most common category of JIA seen in Asian Indians. Transcriptome analysis is a useful tool to analyse pathways involved in disease pathogenesis. Peripheral blood and synovial fluid mononuclear cells (PBMC and SFMC) analysis showed involvement of innate immune cells in
JIA-ERA. However PBMC/SFMC have variable number of different cells and that can affect interpretation. No data is available on cell type specific transcriptome analysis of blood and synovial fluid in children with JIA-ERA.

Methods: Six samples each of peripheral blood and synovial fluid were collected from patients with JIA-ERA. Blood from 6 healthy controls was also collected. Mononuclear cells were separated by density gradient centrifugation. B cells, T cells and monocytes were separated using MACS columns and purity assessed by flow cytometry. After RNA extraction and checking the quality of RNA (RIN>8) microarray was done using Illumina chips WG 12 for whole PBMC/SFMC population, T cells, B cells and monocytes. Some of the significant genes were validated by qRT-PCR.

Results: Unsupervised hierarchical clustering revealed that cell subsets could be distinguished based on their gene expression profile. No significant differences were observed between PBMC of patients and healthy controls. Comparison of SFMC and PBMC reconfirmed the results seen earlier. Results obtained with monocytes, T cells and B cells are summarized below:

<table>
<thead>
<tr>
<th>Groups compared</th>
<th>Genes up regulated</th>
<th>Genes down regulated</th>
<th>Number of dysregulated pathways [total (significant)]</th>
<th>Pathways of immunological relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB vs EF</td>
<td>776</td>
<td>189</td>
<td>19 (12)</td>
<td>Cell adhesion, IgA production, antigen processing, lysosomal processing</td>
</tr>
<tr>
<td>CBMO vs EBMO</td>
<td>821</td>
<td>1251</td>
<td>21 (12)</td>
<td>Cytokine signaling, TLR signaling, antigen presentation, chemokine signaling</td>
</tr>
<tr>
<td>EBMO vs EFMO</td>
<td>595</td>
<td>512</td>
<td>17 (9)</td>
<td>Complement cascade, cytokine signaling, antigen presentation, chemokine signaling</td>
</tr>
<tr>
<td>EBTC vs EFTC</td>
<td>497</td>
<td>477</td>
<td>20 (6)</td>
<td>Cell adhesion, cytokine signaling, antigen processing, chemokine signaling</td>
</tr>
<tr>
<td>EFTC vs EFTC</td>
<td>513</td>
<td>342</td>
<td>20 (13)</td>
<td>Cell adhesion, antigen processing, cytokine and chemokine signaling</td>
</tr>
<tr>
<td>CBHC vs EBHC</td>
<td>648</td>
<td>900</td>
<td>26 (16)</td>
<td>Cell adhesion, BCR signaling, cell death, antigen processing, chemokine signaling</td>
</tr>
<tr>
<td>EBBC vs EBFC</td>
<td>740</td>
<td>915</td>
<td>8 (0)</td>
<td>Cell adhesion, IgA production, antigen processing, lysosomal processing</td>
</tr>
</tbody>
</table>

The most prominent differences were found in monocyte subset. TLR pathway was one of the major pathway identified besides antigen presentation, cytokine and chemokine signaling.

Conclusion: Monocyte probably play a major role in pathogenesis of JIA-EERA and TLR signaling may be the pathway involved.

Disclosure: A. Aggarwal, None; A. Myles, None; P. Gaur, None.

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STAT3 Plays a Central Role in NLRP3 Inflammasome-Mediated IL-1β Production and Pyroptosis. Jehad H. Edwan1, Tri M. Tran1, Mones Abu-Asab1, Raphaela T. Goldbach-Mansky2 and Robert A. Colbert1.1NIAMS NIH, Bethesda, MD, 2NEI NIH, Bethesda, MD, 3Translational Autoinflammatory Diseases Section NIAMS NIH, Bethesda, MD

Background/Purpose: Gain of function mutations in NLRP3 cause cryopyrin-associated periodic fever syndromes (CAPS), the most severe form of recurrent episodes of systemic and organ-specific inflammation. Mutations in NLRP3 result in self-activation, promoting inflammasome-mediated IL-1β processing and release, and can induce cell death through a process known as pyroptosis. Many inflammatory disease manifestations are responsive to IL-1β inhibitors, although patients often continue to have minor disease flares in the context of infections or other stressors. The hematopoietic cells that are the major producers of IL-1βa in NOMID and mechanisms mediating IL-1βa release and pyroptosis have not been well elucidated.

Methods: Whole blood cells from NOMID patients and controls, THP-1 monocyctic cells, and stably STAT3 knock down THP-1 cells were stimulated with LPS in the presence of cathepsin B and STAT3 inhibitors, followed by ATP treatment. Supernatants were collected and incubated with IL-1βa capturing beads. Cells were fixed and permeabilized and stained with IL-1βa, CD14, CD16 and CD83 antibodies, and cells and beads were evaluated by flow cytometry. LPS stimulated cells were also evaluated using immunofluorescent and electron microscopy and western blot assays.

Results: A sub-population of monocytes characterized by CD14hi/CD16low expression, produce the majority of IL-1βa in peripheral blood in response to LPS stimulation in NOMID and control PBMCs. In NOMID patients this subpopulation of monocytes also undergoes rapid cell death following LPS stimulation alone. The cell death is temporally associated with IL-1βa release, and is consistent with pyroptosis. In contrast, CD14hi/CD16low cells from healthy subjects only release IL-1βa after both LPS and ATP stimulation and are relatively resistant to cell death. IL-1βa release is partially inhibited in NOMID cells by caspase-1 inhibitors, and is blocked completely by inhibitors of cathepsin B. Cathepsin B inhibitors also prevent pyroptosis. Similar to cathepsin, STAT3 inhibitors significantly abrogated cell death and IL-1βa release in NOMID cells. STAT3 inhibition also abolished all ATP-dependent IL-1βa release and cell death in monocytes from healthy subjects. Moreover, shRNA-mediated knockdown of STAT3 in THP-1 cells completely prevented ATP dependent IL-1β release and cell death. We confirm that STAT3 associates with mitochondria, and that inhibition of STAT3 but not cathepsin B, prevents mitochondrial damage suggesting that mitochondrial STAT3 activation may be upstream of cathepsin B activation.

Conclusion: These results identify the predominant IL-1βa-producing cell population in the peripheral blood of NOMID patients and healthy controls, and identify a novel role for STAT3 in mediating NLRP3 effects on pyroptosis and IL-1βa release. We suggest that cell death may contribute to IL-1βa release.

Disclosure: J. H. Edwan, None; T. M. Tran, None; M. Abu-Asab, None; R. T. Goldbach-Mansky, None; R. A. Colbert, None.

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The DEK Autoantigen Regulates Formation of Neutrophil Extracellular Traps and Zymosan Induced Arthritis in Mice. Nirit Mor-Vaknin1, Anjan K. Sahal1, Maureen Legendre1, Marta J. Gonzalez-Hernandez2, M. Asif Amin2, Bradley J. Rabquer1, Julie M. Jorns3, Mariana J. Kaplan1, Barbara S. Adams1, David A. Fox1, Alisa E. Koch1* and David Markovitz1.1University of Michigan, Ann Arbor, MI, 2University of Michigan Medical School, Ann Arbor, MI, 3Ann Arbor, MI, 4Univ of Michigan Health System, Ann Arbor, MI, 5Univ of Michigan Med Ctr, Ann Arbor, MI

Background/Purpose: The nuclear oncoprotein DEK is a known autoantigen associated with juvenile idiopathic arthritis (JIA) and other autoimmune diseases. DEK is actively secreted by human macrophages and serves as a chemoattractant for leukocytes, including neutrophils and T cells. We have previously demonstrated that DEK and anti-DEK autoantibodies are abundant in the inflamed synovia of JIA patients. Posttranslational modification, particularly acetylation, of DEK markedly increases its autoantigenicity, suggesting an active role for DEK and DEK autoantibodies in the inflamed joint. Using zymosan induced arthritis (ZIA) mouse model, we demonstrate that DEK contributes to the development of inflammatory arthritis by recruiting neutrophils to the joint. Remarkably, DEK also appeared to be required for the formation of neutrophil extracellular traps (NETs) and is detected in association with known NET markers in human synovial fluids of JIA patients.

Methods: We investigated the role of DEK using the ZIA mouse model, comparing 129/B6 wild type (WT) to DEK knockout (DEK KO) mice. Zymosan A was injected intraperitoneally as an diagnostic model of arthritis. Human neutrophils serve as a chemoattractant for leukocytes, including neutrophils and T cells. We have previously demonstrated that DEK and anti-DEK autoantibodies are abundant in the inflamed synovia of JIA patients. Posttranslational modification, particularly acetylation, of DEK markedly increases its autoantigenicity, suggesting an active role for DEK and DEK autoantibodies in the inflamed joint. Using zymosan induced arthritis (ZIA) mouse model, we demonstrate that DEK contributes to the development of inflammatory arthritis by recruiting neutrophils to the joint. Remarkably, DEK also appeared to be required for the formation of neutrophil extracellular traps (NETs) and is detected in association with known NET markers in human synovial fluids of JIA patients.

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Results: Significant levels of DEK were found in NETs from JIA synovial neutrophils. In the ZIA mouse model, DEK KO mice displayed significantly less inflammation in the joints compared to WT. Substantially reduced levels of pro-inflammatory cytokines were detected in zymosan injected joints from DEK KO vs. WT mice. Neutrophil migration into the injected joints was markedly lower in DEK KO vs. WT mice and DEK KO neutrophils demonstrated defects in NETs formation in response to lipopolysaccharide (LPS) and Escherichia coli.

Conclusion: Extracellular DEK found in the supernatant of activated primary human neutrophils serves as a chemoattractant and is important for NET formation. DEK is also detected in NETs produced by synovial fluid neutrophils of JIA patients. These results demonstrate that the nuclear autoantigen DEK plays a major role in the development of inflammation in the joints, suggesting an active role for DEK in the development of JIA as well as other autoimmune diseases.

Disclosure: N. Mor-Vaknin, None; A. K. Saha, None; M. Legendre, None; M. J. Gonzalez-Hernandez, None; M. Asif Amin, None; Bradley J. Rabquer, None; Julie M. Jorns, None; Mariana J. Kaplan, None; Barbara S. Adams, None; David A. Fox, None; Alisa E. Koch, None; David Markovitz, None.
Blood-Based Biomarkers of Neurocognitive Dysfunction in Childhood-Onset Systemic Lupus Erythematosus

Hermine I. Brunner1, Jessica Hummel1, Shamen Nelson2, Erin C. Thomas3, Jennifer L. Huggins1, Megan L. Curran2, Jun Ying2 and Marisa S. Klein-Gitelman1.

1Cincinnati Children’s Hospital Medical Center, Cincinnati, OH; 2University of Cincinnati, Cincinnati, OH; 3Cincinnati Children’s Hospital, Cincinnati, OH.

Background/Purpose: Several brain-reactive autoantibodies in the blood have been inconsistently associated with Neuropsychiatric Systemic Lupus Erythematosus (NPSLE) in adults but very little is known whether such findings are relevant to neurocognitive dysfunction (NCD) with childhood-onset systemic lupus erythematosus (cSLE). NCD with cSLE often impairs working memory, visuomotor/constructional (VC) ability, attention and working speed. The objective of this research was to examine the relationship between select candidate biomarkers in the serum for their usefulness in the identification of cSLE-associated NCD.

Methods: As part of a larger study, the cognitive ability of 38 patients with cSLE was studied using the cSLE Battery of Neuropsychological Tests (Ross et al; 2008) that probes cognitive domains typically impaired with cSLE, with overall cognitive performance expressed as the average z-scores of the standardized tests (mean in healthy reference population = 0; standard deviation = 1). Serum levels of neutrophil gelatinase associated lipocalin (NGAL; involved in blood-brain barrier integrity), as well as auto-antibodies to NR2 (involved in neuronal plasticity and apoptosis); phospholipids (aPL) (associated among others with white matter hyperdensities on magnetic resonance imaging and thrombosis), and ribosomal-P (associated with depression and seizure; proposed involvement in neuronal apoptosis) were measured using commercially available standard assays.

Results: The overall level of cognitive function was significantly worse in those with cSLE who tested positive for aPL-antibodies as compared to aPL-antibody negative cSLE patients [mean ± SE: −2.44 ± 1.13 vs. −0.38 ± 0.61; p = 0.041]. We found aPL antibodies to be associated with a 5-fold increased risk of NCD (40% vs. 12%; p = 0.08). We also found anti-ribosomal P antibodies present in 67% (24/38) of the cSLE patients. As shown in Figure 1, those who tested positive for anti-ribosomal P antibodies had a significantly lower overall cognitive functioning vs. cSLE patients without anti-ribosomal P antibodies (p = 0.0006). Conversely, we found serum levels of anti-NR2 antibodies to be unrelated to cognitive ability. The same was true for serum levels of NGAL.

Conclusion: Presence of aPL and anti-ribosomal P antibodies in the serum is associated with the level of cognitive ability of children with cSLE, providing proof-of-principle that discovery of biomarkers for NPSLE in the blood is feasible. Additional research is necessary to assess whether the duration of antibody exposure and/or the combination of antibodies are suited to reliably identify patients who suffer from cSLE-associated NCD or are at risk of developing it.

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Epigenetic Changes in Fibrosis and Myocyte Repair Genes May Contribute to Pathogenesis in Monozygotic Twins Discordant for Cardiac Manifestations of Neonatal Lupus


Background/Purpose: Cardiac manifestations of neonatal lupus (cardiac-NL) which comprise conduction defects and cardiomyopathy, occur in fetuses exposed to maternal anti-Ro antibodies and carry a case fatality rate of nearly 18%. The discordance rate for monogyotic (MZ) twins suggests a role for epigenetic factors in addition to maternal autoantibodies, genetic and environmental influences. Analysis of MZ twins represents the ideal design to evaluate the role of epigenetic factors in the disease process as the genome of both twins can occur within one week of a normal ultrasound and is most often detected between 18–24 wks gestation, and hence, there is very limited confounding due to environmental cues that might occur over decades, as for discordant MZ twins with other autoimmune diseases. As such, the analysis of these twins early in life has unprecedented value to test for disease-associated epigenetic variation and reveal potential metastable epialleles. This study examines an axis of heritable genetic information in human genomic DNA involving cytosine methylation and addresses the hypothesis that susceptibility to cardiac-NL is influenced by epigenetic variability.

Methods: Genomic DNA was extracted from two Caucasian monozygotic MZ male twin pairs who were discordant for cardiac-NL (advanced block). The source of one pair was umbilical cord blood and the other was from the source of one pair was umbilical cord blood and the other was from a placentation placenta. The data support an epigenetic mechanism underpinning cardiac-NL disease.

Conclusion: To our knowledge, this is the first study analyzing global disease-associated methylation patterns in early-life tissue of MZ discordant twins. The data support an epigenetic mechanism underpinning cardiac-NL discordance in MZ twins despite identical DNA sequence and exposure to maternal autoantibody via a shared placenta.

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Transcriptome and Surface Phenotype Analyses Suggest an Alternately Activated (M2) Function for Hemophagocytes


Background/Purpose: Hemophagocytes (HPCs) are activated macrophages identified in situ by having engulfed other hematopoietic cells. HPCs are rarely seen in normal bone marrow, but are abundant in a variety of cytokine storm syndromes. HPCs are the pathologic hallmarks of two related...
diseases: Macrophage Activation Syndrome (MAS) and Hemophagocytic Lymphohistiocytosis (HLH). The function of the HPC is controversial. Some evidence suggests HPCs are inflammatory and pathogenic, while other evidence supports a housekeeping or anti-inflammatory role for these cells by pointing out their absence in some patients with overt MAS or HLH and their high expression of scavenger receptors like CD163. However, no study has yet attempted to directly phenotype these cells. Using two distinct approaches, we now show that HPCs display an M2, or anti-inflammatory phenotype.

Methods: Spleenic HPCs induced in an animal model of MAS utilizing repeated Toll-like Receptor 9 (TLR9) stimulation in the context of IL-10 receptor blockade were isolated by single cell laser capture microdissection with the assistance of a board certified hematopathologist (MP). Gene expression levels of these cells were measured using microarray and compared to those of laser-captured resting splenic macrophages. Highly differentially expressed genes were verified using quantitative RT-PCR. Differential regulation of pre-determined gene sets was analyzed using a Gene Set Enrichment Analysis (GSEA). Additionally, bone marrow biopsies from patients with MAS or HLH noted to have excessive hemophagocytosis as part of their clinical evaluation were subjected to immunohistochemistry for markers of classical (M1) or alternative (M2) activation and scored by a blinded hematopathologist (MP).

Results: Of 6 treatment and 6 control samples, the RNA of 4 samples in each group were of sufficient quality for analysis. The gene sets meeting statistical significance for upregulation in HPCs were those related to the proteasome, M2 gene regulation, cytokine regulation, and Nod-like receptor signaling. The gene set for M1 gene regulation was not found to be different between HPCs and resting macrophages. Human bone marrow biopsies stained for the mannose receptor and M2 marker CD206 showed HPCs with a membrane bound staining pattern. HPCs with such staining for the M1 differentiation marker CD64 were very rarely identified.

Conclusion: For the first time, we have described the functional program of in situ HPCs as alternatively activated (M2) and potentially anti-inflammatory. This raises questions about elimination of HPCs as a therapeutic rationale, and supports future investigations into optimal treatment strategies for hemophagocytic diseases.

Disclosure: S. W. Canna, None; A. P. Costa Reis, None; W. E. Bernal, None; K. E. Sullivan, None; M. E. Paesler, None; E. M. Behrens, None.

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Background/Purpose: New biomarkers to guide clinical management of lupus nephritis (LN) patients are highly desirable, since the histopathologic classification currently in use is an unreliable predictor of treatment response and disease outcome. MicroRNAs have emerged as a new class of biomarkers in several rheumatic diseases, but their role in LN is still unclear. These noncoding RNAs have a post-transcriptional regulatory effect, playing a key role in fundamental cellular processes and influencing immunologic function, especially in the maintenance of immunological tolerance. Perturbations in the microRNA expression patterns can, therefore, lead to pathological conditions, including autoimmune diseases, like systemic lupus erythematosus (SLE).

MicroRNA studies performed on serum, urine and peripheral blood mononuclear cells have revealed distinct profiles in SLE patients. Further studies are thus necessary to identify a specific LN microRNA signature, which will illuminate SLE pathogenesis and may lead to novel LN biomarkers.

The main aim of this study is to identify the microRNA signature in kidneys of children with LN. The ultimate goal is to find microRNAs associated with disease activity and prognosis that may guide clinical practice.

Methods: Paraffin-embedded tissue samples from children with LN, kidney biopsies performed on kidney donors, and post-streptococcal glomerulonephritis were used for microRNA extraction with Quiagen™ miRNeasy kit. Direct digital detection of microRNAs, through molecular barcodes, was performed with the nCounter® human miRNA assay kit.

Results: The microRNA signature can clearly differentiate samples from normal kidneys of those affected with LN. From over 700 human microRNAs analyzed, mir-26a and mir-30b were identified as being associated with pediatric LN. A significant decrease in the expression of these microRNAs was found in LN class IV, when compared to normal tissue, post-streptococcal glomerulonephritis, LN class III or LN class V.

Conclusion: An altered microRNA signature can lead to the dysregulation of gene expression and broadly alter cell behavior. The study of microRNAs can, therefore, improve our understanding of the pathogenesis of several diseases. With this project, mir-26a and mir-30b were identified for the first time as components of the microRNA signature in kidneys of children with LN. These microRNAs are predicted to regulate the expression of genes that interfere with cell cycle, apoptosis and immune regulation, including IL18R1, which has been implicated in the pathogenesis of nephritis and tissue inflammation and HDAC9, which acts as an epigenetic switch in effector T cell-mediated systemic autoimmunity. This study has provided new insights for LN pathogenesis and for the development of new biomarkers.

Disclosure: P. Costa Reis, None; P. Russo, None; K. E. Sullivan, None.

The Interleukin-10 (IL-10) Producing Regulatory B Cell (“B10” cell) Compartment Expands with Disease Activity in Juvenile Dermatomyositis (JDM) and Pediatric-Onset Systemic Lupus Erythematosus (psSLE). Ioannis Kalampokis, Jeffrey A. Dvergsten and Thomas Tedder. Duke University Medical Center, Durham, NC

Background/Purpose: psSLE and JDM are multisystem inflammatory diseases, whereas juvenile idiopathic arthritis (JIA) is typically an organ-specific disease. “B10 cells” are a rare subset of lymphocytes with anti-inflammatory properties characterized by their functional capacity to produce IL-10, originate from a progenitor pool (“B10pro cells”) and expand in response to inflammation. We conducted the first pediatric study of B10/B10pro cells with the primary objective of evaluating whether peripheral blood B10/B10pro cell frequencies expand and correlate with disease activity in the 3 most common pediatric autoimmune diseases.

Methods: Following institutional review board approval, pediatric (1–16 years old) subjects with JIA, psSLE or psLLE were recruited from the outpatient pediatric rheumatology clinic and the inpatient unit at Duke Children’s Hospital. Subjects with systemic-onset JIA, rituximab therapy within 1 year, current intercurrent illness, or major surgical procedure within 3 months were excluded. For analysis, two groups were defined (JDM/psSLE vs. JIA) and assessed for disease activity (inactive vs. active). After obtaining informed consent, a single blood sample from each subject was analyzed by flow cytometry. B10 and B10pro cell numbers were determined by surface CD19 and intracellular IL-10 staining following ex vivo incubation with lipopolysaccharide (LPS) or CpG oligonucleotides in the absence (5 hour assay measuring B10 cells) or presence (48 hour assay measuring B10+B10pro cells) of recombinant CD40L. A visual analog scale (VAS) score was used to estimate disease activity. Non-parametric tests were used for statistical analysis due to small sample size. B10 and B10pro frequencies were compared using the Mann-Whitney U test. VAS score correlations were performed by Spearman’s rho. Due to multiple comparisons, significance was defined as p<0.01.

Results: 33 patients were recruited, 17 with JIA (8 inactive, 9 active) and 16 with JDM/psSLE (8 inactive, 8 active). No significant differences in the frequencies of B10 or B10+B10pro cells were observed in JIA between active and inactive subjects. Significant differences were observed among disease groups for lower frequencies of B10 (p=0.0003) and B10+B10pro (p=0.0006) cells in response to LPS (p=0.0030) and CpG (p=0.0019), and B10+B10pro cells in response to CpG (p=0.0006) between active and inactive subjects. Significant positive correlations with disease activity were observed in the JDM/psSLE group in the B10 responses to LPS (rho = 0.0034, rho = 0.685) and CpG (rho = 0.0036, rho = 0.682), and the B10+B10pro responses to CpG (rho = 0.000001, rho = 0.915).

Conclusion: During disease remission, patients with JDM/psSLE have lower frequencies of B10 and B10+B10pro cells compared to patients with JIA. B10 and B10+B10pro cell frequencies increase with active disease in JDM/psSLE (but not in JIA); the magnitude of this expansion highly correlates with disease activity. Thereby, peripheral blood B10+B10pro cell expansion may represent a novel disease activity marker in patients with JDM/psSLE.

Disclosure: I. Kalampokis, None; J. A. Dvergsten, None; T. Tedder, None.
Fatty Acid Profiling: Potential New Biomarkers in Juvenile Idiopathic Arthritis (pilot study), Weng Tang Cham1, Enzo Ranieri2, Janice Fletcher2 and Christina A. Boros3. 1Women’s and Children’s Hospital, North Adelaide, SA 5006, Australia, 2SA Pathology, North Adelaide, SA 5006, Australia, 3University of Adelaide/Women’s and Children’s Hospital, Adelaide, Australia

Background/Profile: The prostanoids are a family of biologically active lipids derived from the 20-carbon essential fatty acids (LCPUFA) all of which are involved in the inflammatory response. ω6-fatty acids, Eicosapentaenoic acid (EPA) and Docosapentaenoic acid (DPA), are anti-inflammatory, whilst the ω9-fatty acid, Arachidonic acid (AA), metabolites: 15-Σ-Hydroxyeicosatetraenoic acid [15(S)-HETE], Thromboxane B2 (TXB2), Prostaglandin F2α (PGF2α) and 6-Keto-Prostaglandin F1α (6-k-PGF1α) are pro-inflammatory. Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) allows contemporaneous analyses of multiple prostanoids with high accuracy using small blood samples. This method has never been used previously to measure these analytes in JIA and may find biomarkers which can help us predict disease activity and treatment response.

We aim to measure prostanoid profiles in patients with JIA using LC-MS/MS.

Methods: Samples from 55 JIA patients (26 polyarthritis, 29 oligoarthritis) and 6 healthy siblings of JIA patients were collected onto specially prepared filter papers and analysed using LC-MS/MS.

Results: The M:F ratio was 1:3, the average age at study entry (9.4 ± 5.0 y), average disease duration (44.7 ± 41.5 m), with 83.6% receiving treatment with NSAID, and 38.2% with Methotrexate (MTX).

Stepwise linear regression showed TXB2 levels to be significantly higher (p = 0.0216, R² = 0.013, R² = 0.0451) but correlated negatively with TXB2 (p = 0.011) and JIA patients on MTX had significantly higher EPA levels (p = 0.017) and lower AA:EPA ratios (p = 0.011). 6-k-PGF1α level increased by 0.37 nM in JIA patients with low TXB2 levels. Leukotriene treatment correlated negatively with PGF2α (p = 0.022, R² = 0.448), Etanercept treatment correlated negatively with PGF2α (p = 0.013, R² = 0.481) and correlated positively with 6-k-PGF1α (p = 0.0216, R² = 0.451).

Conclusion: We have been able to determine prostanoid profiles from whole blood using LC-MS/MS in patients with JIA. Treatment with MTX increases the levels of anti-inflammatory prostanoids. This relationship has not been demonstrated previously.

Disclosure: W. T. Cham, None; E. Ranieri, None; J. Fletcher, None; C. A. Boros, None.

318 Replication Analysis of Non-HLA Gene Variants with Prior Evidence of Association with Juvenile Idiopathic Arthritis, Justine Ellis1, Raul Chavez1, Anne-Louise Ponsonby1, Angela Pezic1, Roger Allern1, Jonathan Akikusa1 and Jane Munro2. 1Murdoch Childrens Research Institute, Parkville, Australia, 2Royal Childrens Hospital, Parkville, Australia

Background/Profile: Over the last few years, there have been numerous reports of associations of single nucleotide polymorphisms (SNPs) at various genetic loci with juvenile idiopathic arthritis (JIA). However, apart from a select few variants, the majority of these association findings would benefit from further replication in independent populations to confirm their involvement in disease risk. We examined 60 SNPs in or around 44 genes previously examined by others for association with total (JIA) in the Childhood Arthritis Risk factor Identification tStudY (CLARITY), a new Australian collection of cases and healthy child controls.

Methods: DNA from a total of 324 JIA cases (mean age 9.7 years, 67.3% female) and 568 controls (mean age 7.8 years, 40.7% female) was available for genotyping. Genes and SNPs were chosen based on reports by others over the last five years, and included PTNP22 (rs 2476601), IL2RA (rs 076778), ATXN2 (rs 653178), C10orf30 (rs 6769736), C3orf1 (rs 4688011), JMD1C1 (rs 12411988), PTNP2 (rs 72340294), STAT4 (rs 5774865), TRAFI/C5 (rs 2900180), and VTNCl1(rs 2046117). SNPs were genotyped using the Sequenom MassARRAY system. Allelic and genotypic association analyses were performed using PLINK, A p < 0.05, along with an odds ratio (OR) in the same direction as the original association report(s) was taken as evidence of replication of the prior findings.

Results: Following data QC, 292 cases and 497 controls were analysed. Evidence of replication was generated for PTNP22 (Allelic OR = 1.67; 95% CI 1.16, 2.40; 0.05 0.06; ATXN2 (OR = 1.54; 95% CI 1.25, 1.89; p = 3.8 × 10−5), C10orf30 (OR = 1.47; 95% CI 1.20, 1.81; p = 0.0002), C3orf1 (OR = 1.32; 95% CI 1.03, 1.69; p = 0.030), STAT4 (OR = 1.38; 95% CI 1.10, 1.74; p = 0.003), and TRAFI/C5 (OR = 1.24; 95% CI 1.00, 1.53; p = 0.021). We were unable to confirm association with IL2RA, PTNP2, and VTNCl1; however, this may reflect a lack of statistical power since ORs were directionally consistent with previous reports. Results for JMD1C1 were neither statistically significant, nor were the ORs directionally consistent. Restriction of the dataset to 204 cases and 248 controls in whom Caucasian ancestry of all four grandparents could be confirmed did not materially alter these findings.

Conclusion: We have provided further confirmation of association of (total) JIA with a number of genes, adding to the growing international data that is clarifying the underlying genetic risk component of this serious childhood disease. Pooling of currently available candidate gene data for meta-analyses, and pooling of samples for large genome-wide association study efforts will likely provide further clarity. Future work to better define the overall JIA risk profile should also include an examination of gene-gene and gene-environment interactions.

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319 Gamma Interferon-Induced Protein-10 (IP-10) As a Potential Biomarker for Disease Activity in Pediatric Localized Scleroderma. Katherine Kurzinski1, Carol A. Feghali-Bostwick2, Christina Kelsey3, Kelsey Magee2 and Kathryn S. Torok1. 1Univ of Pittsburgh Med Ctr, Pittsburgh, PA, 2University of Pittsburgh, Pittsburgh, PA

Background/Profile: Pediatric localized scleroderma (LS) is an autoimmune disease affecting the skin and underlying tissue. Cutaneous findings assist in categorizing the patients into active or inactive (predominately inactive) disease states. The biopsies of those with active disease features demonstrate a lymphocytic infiltrate. T helper (Th) lymphocytes and their associated cytokines have been identified in the tissue and in the peripheral circulation of patients with scleroderma. This study was designed to evaluate the levels of Th-associated cytokines and chemokines at various stages of LS, with a particular focus on active disease and its clinical parameters.

Methods: Plasma samples were obtained from 69 pediatric LS patients and 71 healthy pediatric controls. Several cytokines and chemokines were evaluated using a Millipore luminex panel comparing LS to healthy controls, with additional analysis predetermined to be dedicated to LS patients with active disease. LS patient samples were categorized as either clinically “active” or “inactive” at the time of collection. Active disease was defined by the presence of new, enlarging, erythematous lesions and a Physician Global Assessment of Disease Activity (PGA-A) score greater than zero. Nonparametric statistics were employed comparing cytokine levels between LS and healthy groups and between active and inactive LS patients (α = 0.05).

Results: IP-10 levels were significantly elevated in LS patients compared to healthy controls, u = 4.785, p < 0.001, as well as in LS patients with active disease compared to inactive disease, u = 3.305, p < 0.001 (Figure). Also, IP-10 levels were elevated in patients with new lesions, a variable strongly reflecting disease activity (trending toward significance, p = 0.057). IP-10 levels were also significantly correlated to two well accepted disease activity outcome measures, the modified Localized Scleroderma Skin Severity Index (mLoSSI) (p = 0.343, p = 0.004), a quantitative assessment of disease activity, and the PGA-A (p = 0.450, p < 0.001).
Conclusion: Our previous serologic analyses as well as studies in systemic sclerosis have identified gamma interferon-induced protein-10 (IP-10) as a potential molecule of interest in the pathogenesis of scleroderma. An elevation of plasma IP-10 levels in pediatric localized scleroderma (LS) when compared to those of healthy controls further supports these findings. Analyses demonstrating IP-10 elevation in patients with active disease and correlations with valid activity measures suggest that IP-10 may be a biomarker for disease activity in LS.

Disclosure: K. Kurzinski, None; C. A. Feghali-Bostwick, None; C. Kelsey, None; K. Magre, None; K. S. Torok, None.

320 Evaluation of Anti-Citrullinated Type II Collagen and Anti-Citrullinated Vimentin Antibodies in Patients with Juvenile Idiopathic Arthritis. Brooke Gilliam, Anil K. Chauhan and Terry L. Moore. Saint Louis University, St. Louis, MO

Background/Purpose: Several studies have identified anti-cyclic citrullinated peptide (CCP) antibodies as an important indicator for destructive disease in patients with juvenile idiopathic arthritis (JIA). This is of particular significance in patients with IgM rheumatoid factor (RF)-positive polyarticular JIA, which closely resembles rheumatoid arthritis (RA). While the role of anti-CCP antibodies in RA and JIA is better understood, the identity of the autoantibodies. The most common combination of positivity was anti-citrullinated fibrinogen (32.3%), with the least commonly detected citrullinated autoantibodies were anti-citrullinated CII (33.3%) and anti-citrullinated Vimentin (vimentin 1–16, vimentin 59–74) by ELISA. Results were compared to anti-CCP antibody and RF isotypes. We previously measured anti-citrullinated fibrinogen antibodies and anti-citrullinated α-enolase antibodies, in addition to erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP).

Methods: Sera were obtained from 96 patients with various JIA subtypes, 19 systemic lupus erythematosus (SLE) patients, and 10 healthy children. All sera were measured for antibodies against citrullinated and native CII and vimentin (vim1–16, vim59–74) by ELISA. Results were compared to anti-CCP antibody and RF isotypes. We previously measured anti-citrullinated fibrinogen antibodies and anti-citrullinated α-enolase antibodies, in addition to erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP).

Results: Mean levels of all anti-citrullinated antibodies were significantly higher in JIA patients than in healthy children (p<0.05). The most commonly detected citrullinated autoantibodies were anti-citrullinated CII (33.3%) and anti-citrullinated fibrinogen antibodies (32.3%), with the least commonly detected being anti-citrullinated α-enolase antibodies (9.4%). One IgM RF-positive polyarthritis patient was positive for all tested anti-citrullinated autoantibodies. The most common combination of positivity was anti-citrullinated CII and anti-citrullinated fibrinogen antibodies in 7 patients. Twenty-two subsets of patients were identified based on their anti-citrullinated autoantibody profile, not including anti-CCP antibody isotypes. Anti-citrullinated CII antibodies correlated significantly with all other citrullinated autoantibodies (p<0.05). Anti-citrullinated vimentin 1–16 and 59–74 demonstrated strong correlation with each other, and both correlated significantly with anti-citrullinated fibrinogen and alpha-enolase antibodies (p<0.05). Anti-citrullinated vimentin 1–16 antibodies also correlated with ESR (p<0.05). When including the group of citrullinated autoantibodies in logistic regression analysis, anti-citrullinated fibrinogen remained as the only autoantibody significantly correlated with joint damage (p<0.05).

Conclusion: This study demonstrates that multiple citrullinated epitopes can be detected in JIA patients, especially those patients with polyarticular disease. Anti-citrullinated fibrinogen antibodies remained as the single citrullinated autoantibody to correlate significantly with joint damage.

Disclosure: B. Gilliam, None; A. K. Chauhan, None; T. L. Moore, None.

321 Glycosylation of Vitamin D Binding Protein Reduced in Juvenile Idiopathic Arthritis Patients At Risk of Disease Extension. David S. Gibson1, Sorcha Finnegan2, Gwen Manning3, Mark Duncan4, Stephen R. Pennington5, Terry L. Moore6 and Madeleine Rooney7. 1Arthritis Research Group, Queen’s University Belfast, Belfast, United Kingdom, 2Queen’s University, Belfast, Belfast, United Kingdom, 3Prometheus Research Centre, University College Dublin, Dublin, Ireland, 4Division of Endocrinology, University of Colorado, Denver, 5UCD Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Dublin 4, Ireland, 6Saint Louis University, St. Louis, MO, 7Queen’s University Belfast, Belfast, United Kingdom

Background/Purpose: Juvenile idiopathic arthritis (JIA) comprises a poorly understood group of chronic, childhood onset, autoimmune diseases with variable clinical outcomes. We investigated whether profiling of the synovial fluid (SF) proteome by a fluorescent dye based, two-dimensional gel (DIGE) approach could distinguish the subset of patients in whom inflammation extends to affect a large number of joints, early in the disease process. The post-translational modifications to candidate protein markers were verified by a novel deglycosylation strategy.

Methods: SF samples from 57 patients were obtained around time of initial diagnosis of JIA. At 1 year from inclusion patients were categorized according to ILAR criteria as oligoarticular arthritis (n=26), extended oligoarticular (n=8) and polyarticular disease (n=18). SF samples were labeled with Cy dyes and separated by two-dimensional electrophoresis. Multivariate analyses were used to isolate a panel of proteins which distinguish patient subgroups. Proteins were identified using MALDI-TOF mass spectrometry with vitamin D binding protein (VDBP) expression and stuyation further verified by immunohistochemistry, ELISA test and immunoprecipitation. Candidate biomarkers were compared to conventional inflammation measure C-reactive protein (CRP). Stialic acid residues were enzymatically cleaved from immunopurified VDBP, enriched by hydrophilic interaction liquid chromatography (HILIC) and analysed by mass spectrometry.

Results: Hierarchical clustering based on the expression levels of a set of 23 proteins segregated the extended-to-be oligoarticular from the oligoarticular patients. A cleaved isoform of VDBP, spot 873, is present at significantly reduced levels in the SF of oligoarticular patients at risk of disease extension, relative to other subgroups (p<0.05). Conversely total levels of vitamin D binding protein are elevated in plasma and ROC curves indicate an improved diagnostic sensitivity to detect patients at risk of disease extension, over both spot 873 and CRP levels. Sialyated forms of intact immunopurified VDBP were more prevalent in persistent oligoarticular patient synovial fluids.

Conclusion: The data indicate that a subset of the synovial fluid proteome may be used to stratify patients to determine risk of disease extension. Reduced conversion of VDBP to a macrophage activation factor may represent a novel pathway contributing to increased risk of disease extension in JIA patients.

Disclosure: D. S. Gibson, None; S. Finnegan, None; G. Manning, None; M. Duncan, None; S. R. Pennington, None; T. L. Moore, None; M. Rooney, None.

322 Immune Response to Porphyromonas Gingivalis Citrullinated α-Enolase Cross-Reacts with Human α-Enolase in Polystriat IgA Patients. Peggy Lee1, Rebecca Howson1, Claire Murphy2, Sarah Ringold3 and Anne M. Stevens1. 1University of Washington, Seattle, WA, 2Seattle Children’s Research Institute, Seattle, WA

Background/Purpose: Antibodies recognizing cyclic citrullinated peptides (CCP) are highly specific for rheumatoid arthritis (RA) and polyarticular juvenile idiopathic arthritis (poly JIA), and may both predict and contribute to early onset and an aggressive disease course. Risk factors for RA, including the HLA-DRB1 shared epitope (SE) and smoking, are associated with higher levels of anti-CCP antibodies. It is unknown what the natural targets of
anti-CCP are, or how they are generated. P. gingivalis, associated with gingivitis and periodontitis, expresses a citrullinated protein, α-enolase, with homology to human α-enolase, and thus is a strong candidate for the autoantigen bound by anti-CCP antibodies. The P. gingivalis α-enolase may serve as a link between oral inflammation induced by P. gingivalis and arthritis. The pathogenesis of JIA may thus involve molecular mimicry between epitopes from citrullinated bacterial and human, triggering autoimmunity in genetically susceptible individuals.

**Methods:** Anti-citrullinated enolase peptide antibodies (anti-CEP) were quantified by ELISA in plasma from 20 RF+ poly JIA patients ages 7.1–18.5 years and 20 age- and sex-matched controls. Target peptides were selected based on previously identified immunodominant epitopes in adult RA patients, and included P. gingivalis CEP citrulline- versus arginine-containing sequences and the human CEP peptide homologs. Citrullinated vimentin and citrullinlated non-immunogenic CEP were negative controls. Antibodies to CEP were assayed by QÜANTA Lite CEP3 IgG/IgA ELISA.

**Results:** Antibodies to CEP were detected in all 20 RF+ JIA patients and in one of 20 controls, though at low titer. Antibodies to Hu-CEP were detected in 9 JIA patients (45%). All patients with anti-Hu-CEP antibodies also carried Abs to PG-CEP. A tight correlation was found between anti-PG CEP and anti-Hu CEP (R² = 0.70), suggesting cross-reactivity between antibodies. Patients with the DRB1 shared epitope (n = 12) were more likely to carry anti-Hu-CEP (50%) or anti-PG-CEP (58%) than those without the shared epitope (n = 8, 38%, 50%). No differences were found between patients and controls in control peptide responses, which were all low. Only weak correlations were detected between anti-CEP and age of onset or disease activity as assessed by ESR, CRP, active joint count, loss of range of motion, MD assessment or CHAQ.

**Conclusion:** A high proportion of patients with RF+ poly JIA develop Abs to citrullinated proteins, which were not detected in healthy children. The coincidental occurrence of anti-Hu-CEP and anti-PG CEP suggest an etiologic role for P. gingivalis infection in poly JIA.

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**Immunoprecipitation and Advanced Proteomics for the Discovery of Novel Antigenic Targets in Juvenile Idiopathic Arthritis.**

**Background/Purpose:** Juvenile idiopathic arthritis (JIA) is the most common chronic condition seen by pediatric rheumatologists. The pathogenesis of disease is poorly understood, but is believed to be mediated by an adaptive immune response involving auto-reactive B-cells and T-cells. There are high concentrations of immune complexes in the joint but specificities of these immune complexes are unknown. We hypothesize that joint destruction is partly the result of an adaptive immune response mediated by antibodies, and that examination of peptides and proteins in the synovial fluid (SF) of children with JIA combined with the identification of antigens targeted by antibodies found in arthritic SF will help clarify the pathogenesis of JIA.

**Methods:** Subjects with JIA with active arthritis of the knee requiring intra-articular corticosteroid injection were recruited from our pediatric rheumatology clinic. Subjects seen by pediatric orthopedics requiring arthroscopic knee surgery for traumatic injuries were recruited as controls. SF was collected from the knee of 4 children with JIA and 2 orthopedic controls. Specimens were diluted, centrifuged, and filtered. Peptide and proteome were separated with ultrafiltration spin columns and advanced MS/MS was carried out. Protein A&G was used to isolate IgG inclusive immune complexes. Antibodies were eluted with glycine and analyzed using trypsin restriction with MS/MS. Ingenuity pathway analysis was used to analyze the proteome.

**Results:** High concentrations of immune complexes were found in the joints of JIA patients, nearing 50% of the total sample. Pathway analysis of the proteomes revealed statistically significant overlap with 5 relevant canonical pathways in all patients: acute phase response signaling, complement activation, coagulation system, intrinsic prothrombin activation, and extrinsic prothrombin activation. Peptide analysis revealed the breakdown products of structural components including multiple collagen subtypes. Antibody-targeted antigens present in three out of the 4 patients but absent in controls were alpha-1-antitrypsin precursor, hyaluronan binding protein, haptoglobin, and protein S100-A9.

**Conclusion:** Proteome analysis confirmed the validity of our methods, revealing significant overlap with 5 pathways already known to be important in the pathogenesis of JIA. Given the role of short peptides as antigenic targets of T cell responses, the composition of the peptidome in the synovial tissues and fluids of JIA patients is likely to contribute to disease associated adaptive immune responses. The preliminary finding of the breakdown products of structural components suggests a mechanism for amplification of the autoimmune process during inflammation. While the role of the identified antibody-targeted antigens in pathogenesis remains unclear, it is of interest that some of these peptides, including alpha-1-antitrypsin and protein S100-A9 have been implicated as biological markers in both adult RA and JIA. Future research will validate the presence of these antibodies in a larger sample. These antibodies could have potential roles as biomarkers for disease and as targets for treatment.

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**Measurement and Evaluation of Isotypes of Anti-Citrullinated Fibronogen and Anti-Citrullinated Alpha-Enolase Antibodies in Juvenile Idiopathic Arthritis Patients.**

**Background/Purpose:** Anti-cyclic citrullinated peptide (CCP) antibodies in juvenile idiopathic arthritis (JIA) have been identified as an important indicator for destructive disease, as is the case with rheumatoid arthritis (RA). Recently, studies have focused on identifying the target proteins of the citrulline modification in both RA and JIA. We found that both IgG anti-citrullinated fibronogen and α-enolase antibodies were present in our JIA population. In this study, we evaluated serum from patients with various subtypes of JIA to further investigate the presence of isotypes (IgA, IgM) of anti-citrullinated fibronogen and α-enolase, and their association with rheumatoid factor (RF) and anti-CCP antibody isotypes (IgA, IgG) and other clinical parameters.

**Methods:** Sera were obtained from 93 JIA patients, 17 systemic lupus erythematosus (SLE) patients, and 10 healthy children. All sera were measured for antibodies against citrullinated and native fibronogen and α-enolase IgA and IgM by ELISA. Results were compared to anti-CCP antibody isotypes and RF isotypes, in addition to previously measured IgG anti-citrullinated fibronogen and α-enolase antibodies. All results were also correlated with various clinical parameters.

**Results:** IgA anti-citrullinated α-enolase antibodies were positive in 14, IgG in 9, and IgM in 11 JIA patients. IgA anti-citrullinated fibronogen antibodies were positive in 16, IgG in 31, and IgM in 17 JIA patients. Overall, the isotypes of anti-citrullinated fibronogen and α-enolase appeared more frequently. In the polycarticular subset of JIA. One IgM RF-positive polycarticular JIA patient was positive for all 3 isotypes of anti-citrullinated fibronogen antibodies. IgM anti-citrullinated α-enolase antibodies correlated significantly with IgM anti-citrullinated fibronogen antibodies (r = 0.479, p < 0.001), and IgM anti-citrullinated α-enolase antibodies correlated significantly with IgM anti-CCP antibodies (p < 0.005). IgM anti-citrullinated fibronogen antibodies correlated significantly with erythrocyte sedimentation rate (p < 0.05). IgA anti-citrullinated α-enolase antibodies correlated significantly with IgA anti-citrullinated fibronogen antibodies (p < 0.05). IgA anti-citrullinated α-enolase antibodies also correlated significantly with IgA RF and IgM RF (p < 0.05). IgA anti-citrullinated α-enolase antibodies correlated significantly with IgA anti-CCP antibodies and IgM RF (p < 0.05). No significant differences were noted the levels of citrullinated autoantibody isotypes when comparing patients with and without joint damage.

**Conclusion:** Studies have suggested measuring anti-CCP antibody isotypes in both RA and JIA patients, and recent studies have identified target proteins of the citrulline modification. We found that isotypes of both anti-citrullinated fibronogen and α-enolase antibodies are present in the serum of JIA patients. JIA patients with elevated isotypes of anti-citrullinated fibronogen and α-enolase antibodies should be evaluated prospectively in comparison with JIA patients who exhibit a less diverse isotype pattern to further determine their role in the pathogenesis of JIA.

Disclosures: B. Gilliam, None; S. Crespo-Pagnussat, None; A. K. Chauhan, None; T. L. Moore, None.
Anti-Cyclic Citrullinated Peptide Antibody Isotyping and Identification of Citrullinated Proteins in the Synovial Fluid of Juvenile Idiopathic Arthritis Patients. Brooke Gilliam, Sandra Crespo-Pagnussat, Anil K. Chauhan, Reema H. Syed and Terry L. Moore. Saint Louis University, St. Louis, MO

Background/Purpose: Several citrullinated proteins have been detected in the serum and synovial fluid (SF) of rheumatoid arthritis (RA) patients. However, few studies have evaluated citrullination of proteins in juvenile idiopathic arthritis (JIA). It has been proposed that anti-cyclic citrullinated peptide (anti-CCP) antibodies play a pathogenic role in the development of anti-CCP antibody positive arthritis, and it is expected that these antibodies would be present at higher concentrations at the site of inflammation. We evaluated SF from JIA patients to investigate the presence of anti-CCP antibody isotypes and identified specific citrullinated autoantibodies in JIA SF.

Methods: Anti-CCP antibody isotypes (IgA, IgG, IgM, IgA/IgG) were measured by ELISA in the SF of 47 JIA patients. As non-inflammatory controls, SF from 10 osteoarthritis (OA) patients was used. Twenty-four SF samples from patients with various diagnoses were treated and transferred to PVDF membranes and probed with antibodies to native-α enolase, native fibrinogen, and anti-modified citrulline (AMC). SF samples were immunoprecipitated with antibodies to fibrinogen and α-enolase, and citrullinated antibodies were then detected with AMC assay.

Results: Eleven of 47 (23%) JIA SF samples were positive for at least one anti-CCP antibody isotype. IgM anti-CCP antibodies were positive in 9 JIA patients, IgG anti-CCP antibodies were positive in 8 patients, and 2 were positive for IgA anti-CCP antibodies. Three JIA patients were positive for the combined IgA/IgG anti-CCP antibodies. Polyarthritis patients demonstrated significantly higher levels of all anti-CCP antibody isotypes compared to other JIA subtypes (p<0.05), and even higher levels when only evaluating IgM rheumatoid factor (RF)-positive polyarthritis patients. Serum-matched anti-CCP antibody data was available on 27 JIA patients and 5 controls. All IgM RF-positive polyarthritis patients were positive for IgG anti-CCP antibodies in both serum and SF. Two JIA patients positive for IgG anti-CCP antibodies in SF were negative in serum. More JIA patients were positive for IgA anti-CCP antibodies in serum than in SF, while SF showed increased positivity for IgM anti-CCP antibodies compared to serum.

Western blot analysis revealed multiple citrullinated proteins in JIA that were not detected in OA. Immunoprecipitation with α-enolase and fibrinogen, followed by AMC detection showed presence of these specific citrullinated proteins in JIA and no detection in OA.

Conclusion: All anti-CCP antibodies were detected in the SF of JIA patients. The most commonly found anti-CCP antibody isotype in JIA SF was IgM, which may be partly indicative of defective B cell class switching in these patients. Measurement of only IgG anti-CCP antibodies would have overlooked 4 JIA patients with elevated levels of IgA and/or IgM anti-CCP antibodies, indicating the importance of measuring all 3 isotypes. The abundance of citrullinated proteins in JIA SF may be characteristic of inflammation, as seen in RA and spodophytoarthropathy. We have shown the detection of citrullinated proteins at the site of inflammation, specifically identifying citrullinated fibrinogen and α-enolase in SF.

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ACR Poster Session A
Rheumatoid Arthritis: Animal Models
Sunday, November 11, 2012, 9:00 AM–6:00 PM

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Silencing Intraarticular Snail Expression Ameliorates Rat Collagen-Induced Arthritis Through Induction of Mesenchymal-Epithelial Transition in Synovial Fibroblasts. Chrongs-Reen Wang, Shih-Yao Chen, Ai-Li Shiau, Yuan-Tsung Li, Ming-Fei Liu and Chao-Liang Wu. College of Medicine, National Cheng Kung University, Tainan, Taiwan

Background/Purpose: Morphological characteristics of rheumatoid arthritis (RA) synovial fibroblasts (SF) are similar to transformed cells. We hypothesized that epithelial-mesenchymal transition (EMT) of SF regulated by snail contributes to the progression of RA. The pathogenic role of EMT was studied, and the therapeutic effect on arthritis was evaluated by silencing intraarticular snail expression.

Methods: Expression of snail, mesenchymal markers including cadherin-11, epithelial markers and/or phospho-AKT was detected by RT-PCR, immunoblot and/or immunohistochemical analyses on RA synovium, and synovial tissues and SF from normal or collagen-induced arthritis (CIA) rats. Modulation of in vitro expression in SF and in vivo effect on normal or CIA joints was performed by lentivirus-mediated transfer of cDNA or shRNA specific to snail. In vivo responses were evaluated by clinical and histopathological assessments, and immunohistochemical staining on joints. In vitro cell viability and invasion were determined by colorimetric method and modified Boyden chamber, respectively. IL-6 concentrations in culture supernatants were quantified by enzyme-linked immunosorbent assay.

Results: Snail was expressed at high levels in synovial tissues of RA and CIA. Overexpression of snail in SF and joints of normal rats promoted EMT by down-regulation of epithelial markers, gain of mesenchymal markers and enhancement of invasive capacity. Moreover, silencing snail expression ameliorated CIA through the induction of mesenchymal-epithelial transition.

Conclusion: These data demonstrate that regulation of snail in SF alters cell morphology and gene expression between epithelial and mesenchymal phenotypes. These findings implicate that EMT regulated by snail might be explored as a novel therapeutic strategy targeting SF in RA.

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Tolerogenic Dendritic Cells Ameliorates the Disease Severity of Murine Collagen-Induced Arthritis. Bin Ning1, Shang-You Yang2, Jianlu Wei1, Weiming Gong1 and Paul H. Wooley1. 1Shandong University Jinan Central Hospital, Jinan, China, 2Via Christi Wichita Hospitals, Wichita, KS

Background/Purpose: Rheumatoid arthritis (RA) is a common autoimmune disease characterized by synovial inflammation, cartilage breakdown and bone destruction with the involvement of various types of cells including dendritic cells (DCs). A subset of dendritic cells that induce tolerance is called tolerogenic DCs (tolDCs). They may represent a promising immunosuppressive therapeutic tool for the attenuation of pathological T cell responses in autoimmune arthritis. In this study, we examine a series of stable antigen-specific tolDCs with tracking green fluorescent protein (GFP) to investigate their influence in the murine collagen induced arthritis (CIA) model.

Methods: The DCs were isolated from bone marrow of DBA/1LacJ mice, and stimulated with IL-10 (10ng/ml), TGF-β (10ng/ml), and type II Collagen (CII) to induce CII-specific tolerogenic dendritic cells (tolDCs). The cells were then infected with Lent-iGFP viral vectors for GFP transduction. The GFP-tolDCs were injected ip into CIA mice at the time of arthritis onset. Arthritis animals were clinically examined 3 times a week. The arthritic paws and blood specimens were harvested at 8 weeks after onset for histological, immunological and molecular analyses.

Results: The phenotype of tolDCs was confirmed by flow cytometry and ELISA. Lymphocyte proliferation assays resulted in semi-matured, high IL-10 and TGF-β production, and low lymphocyte stimulatory capacity with low IFN-γ secretion. Both clinical and histological assessment on the animal studies indicated that the mice receiving tolDCs transfusion had a rapid and significant reduction in severity of arthritis compared to the controls (P<0.01). Fluorescent microscope observation showed aggregated green fluorescent cells in the inflamed synovial membrane where only sporadic presence in liver, spleen or lungs. Data also indicated the extended high expression levels of IL-10 and TGF-β at 4 weeks after the treatment, whereas the IL-17 expression was lower than controls (P<0.01).

Conclusion: This study reports the successful establishment of a stable phenotype of CII-specific tolDCs and its potential therapeutic influence on collagen-induced arthritis in mice. Introduction of GFP-tolDCs significantly ameliorates the clinical and pathological progress of the experimental arthritis. TolDCs were cumulative at the inflammatory joints and the treatment diminished Th17 response (IL-17 expression). Further investigation is due to reveal the mechanism of tolDCs in regulation of the progression of rheumatoid arthritis.

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IL-7: An Important Pro-Inflammatory Factor That Affects Myeloid Cell Function in RA and CIA. Nathan D. Chamberlain1, Seung-jae Kim2, Michael Volin2, Anjali Mehta1, Nadera J. Swiss1 and Shalva Shahrara1. 1University of Illinois at Chicago, Chicago, IL, 2Chicago College of Osteopathic Medicine Midwestern University, Downers Grove, IL

Background/Purpose: The aim of the study was to examine the role of IL-7 in the pathogenesis of rheumatoid arthritis (RA) as well as in collagen induced arthritis (CIA).

Methods: Linear regression analysis was employed to correlate expression of IL-7 and IL-7R with levels of DAS28 score in RA monocytes. Next, the contribution of IL-7/IL-7R to RA synovial fluid induced monocyte migration was examined by in vitro chemotaxis. Finally, CIA mice were treated therapeutically with IgG or anti-IL-7 antibodies and clinical parameters, joint proinflammatory factors, % spleen TH-1 and TH-17 cells as well as markers of bone destruction were quantified employing ELISA, FACS analysis or real-time RT-PCR.

Results: We show that patients with higher disease activity express elevated levels of IL-7 (R²=0.54, p=2.10×10⁻⁴) and IL-7R (R²=0.56, p=6.59×10⁻⁶) in 76 RA monocytes suggesting that ligation of IL-7 to IL-7R may be associated with disease progression. Next, experiments were performed to determine whether IL-7 and its receptor play a role in RA synovial fluid induced monocyte migration. We found that neutralization of IL-7 in RA synovial fluid or blockade of IL-7R on monocytes greatly suppressed RA synovial fluid-mediated monocyte migration further documenting the importance of IL-7 and IL-7R function in myeloid cells. In order to evaluate whether IL-7 is a potential target in RA pathogenesis, CIA, a chronic murine model of RA was employed. We show that like in RA, IL-7R is significantly elevated in the lining and sublining macrophages as well as in sublining endothelial cells in CIA compared to PBS treated ankles. Additionally CIA mice produce 3 fold higher joint IL-7 levels compared to the control group. Hence to examine the role of IL-7/IL-7R in CIA pathology, CIA mice were therapeutically treated with anti-IL-7 antibody or IgG control starting on day 26 post CIA induction. These studies demonstrate that anti-IL-7 antibody treatment significantly reduced joint inflammation on days 33, 37, 40, 41 and 42 post CIA induction compared to the control group however there were no differences detected between the two treatment groups on days 28 and 30. We next found that joint TNF-α as well as ankle and serum levels of CCL2/ MCP-1 were 2 fold higher in the IgG group compared to anti-IL-7 antibody treated CIA mice. We also demonstrate that anti-IL-7 treatment was capable of markedly reducing expression of markers for CIA bone erosion including RANKL (3 fold) and C/EBPδ K (10 fold). In contrast the percentage of CD3, CD4, Th-1 and Th-17 positive cells was similar in anti-IL-7 and IgG treatment groups. Consistent with these findings joint IL-6 levels were unaffected by anti-IL-7 therapy while there was a trend towards lower levels of joint IL-1β and IL-17 however these values were not significantly different among the two treatment groups.

Conclusion: These novel results suggest for the first time that ligation of IL-7 to IL-7R can affect cell migration, production of proinflammatory factors and osteoclast differentiation from myeloid cells in RA as well as in experimental arthritis models.

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The SYK Inhibitor, Fostamatinib, Administered Alone or in Combination with Methotrexate in Rat Collagen-Induced Arthritis, Reduces Bone Erosions, Biomarkers of Cartilage/Bone Destruction, and Synovial Os- teoelastic Cytokines. Polly Pine1, Ayodele Apatira1, Betty Y. Chang1, Nathan Schoettler2, Elliot B. Grossbard1 and Ernest Brahn2. 1Rigel Pharmaceuticals, So San Francisco, CA, 2UCLA School of Medicine, Los Angeles, CA

Background/Purpose: Spleen tyrosine kinase (SYK) is expressed in hematopoietic cells and is a major downstream regulator of signaling through Fcγ and immunoglobulin receptors as well as non-immunoglobulin receptors associated with adaptor proteins DAP12 and FcRγ in osteoclasts. Inhibition of SYK has been shown to reduce the severity of collagen-induced arthritis (CIA). This provided the rationale for the development of the SYK inhibitor, fostamatinib (R788), as a potential treatment for rheumatoid arthritis (RA). In the present rat CIA study, we characterize the activity of fostamatinib alone or with co-administered methotrexate (MTX), on paw inflammation, bone erosion, serum biomarkers of bone destruction, and synovial proinflammatory cytokine expression.

Methods: Syngeneic LOU rats were immunized on day 0 with native type II collagen. At the onset of arthritis (day 10), a total of 59 rats were treated either with a vehicle control, fostamatinib at one of two dose levels (15 or 30 mg/kg q.d. by p.o. gavage), MTX alone (0.4 mg/kg s.c., q.w. for 3 weeks), or fostamatinib (15 or 30 mg/kg) in combination with s.c. MTX q.w. Hind limb were scored daily for clinical arthritis severity using a standard- ized method based on the degree of joint inflammation. Serum and synovial tissue were harvested at sacrifice, and biomarker expression was assessed by ELISA. Blinded high resolution digital radiographs and micro3D-CT of hind limbs were obtained at the end of the study (day 28).

Results: Arthritis severity was significantly reduced within 7 days after initiation of fostamatinib therapy and continued to improve throughout the study. By day 28, the mean clinical score in the vehicle group was 7.4 compared with 4.1 and 2.4 in the fostamatinib groups (15 and 30 mg/kg, p<0.0003 and 0.0001, respectively). Co-administration of MTX with fostamatinib further reduced the clinical scores to 3.6 and 2.1 (15 and 30 mg/kg, respectively, p<0.0001 vs vehicle, p<0.0001 vs MTX alone, p>0.05 vs fostamatinib alone). Radiographs (day 28) demonstrated a significant reduction in joint damage: 5.1 (vehicle) vs. 0.6, 0.0, 0.5, and 0.08 (15 mg/kg and 30 mg/kg fostamatinib alone, 15 mg/kg and 30 mg/kg fostamatinib with MTX, respectively, p<0.0001 for all groups vs vehicle). Treatment with MTX alone significantly reduced joint damage, although the response was not as robust as that seen with fostamatinib (mean radiographic score = 2.8, p=0.02 vs vehicle). These findings were confirmed with micro3D-CT analysis. Serum RANKL and COMP were reduced in fosteraminib-treated rats, and combination treatment did not further reduce the level of bone biomarkers. Synovial IL-1β, IL-6, and IL-1β were reduced (30 mg/kg fostamatinib with or without MTX vs vehicle). Fostamatinib and MTX treatment were well tolerated and had no overt adverse effects.

Conclusion: Fostamatinib significantly reduced the severity of established rat CIA, had modest additional improvement with co-administered MTX, and was superior to MTX alone. These results indicate that fostamatinib may have potential therapeutic benefits for both the inflammatory synovitis and bone erosions of CIA. Fostamatinib is currently in Phase III trials for RA.

Disclosure: P. Pine, Rigel Pharma, 3; A. Apatira, Rigel Pharma, 3; B. Y. Chang, None; N. Schoettler, None; E. B. Grossbard, Rigel Pharma, 3; E. Brahn, Rigel Pharma, 2.

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Fut1 Plays A Unique Role in K/BxN Serum Transfer Arthritis by Regulating Angiogenesis and Adhesion Molecule Expression. M. Asif Amin, Phillip L. Campbell, Takeo Isozaki, Jeffrey H. Ruth, Jonathan Vargo, Steven E. Domino and Alisa E. Koch. University of Michigan Medical School, Ann Arbor, MI

Background/Purpose: Angiogenesis is important in rheumatoid arthritis (RA) synovial tissue proliferation and leukocyte ingress into the infamed joints. Fucosyltransferases (Futs) are involved in the synthesis of glycoconjugates and blood group antigens and other Futs have been shown to be important in inflammatory pathways such as leukocyte homing. Hence, we examined the role of another Fut, Fut1, in angiogenesis and leukocyte recruitment in inflammatory arthritis.

Methods: Mouse lung endothelial cells (ECs) from Fut1 null and wild type (wt) mice were used to perform Matrigel tube formation assays in vitro. We performed Matrigel plug in vivo angiogenesis assays using Fut1 null and wt mice. Some of the plugs were homogenized for hemoglobin determination while others were sectioned for clinical arthritis severity using a standardized method based on the number of blood vessels. To determine the contribution of Fut1-mediated angiogenesis and leukocyte recruitment in an animal model of arthritis, we performed the serum transfer K/BxN arthritis model employing Fut1 null and wt mice. Mouse ankles were measured before induction of arthritis and then on alternate days. Ankles were harvested on day 9, 1 day of maximum arthritis. Some of the arthritic ankles were homogenized to determine hemoglobin (Hb) while others were sectioned for blood vessel counts. To determine the mechanism of decreased leukocyte recruitment, we performed immunofluorescence for adhesion molecule expression in wt and Fut1 null mouse ankle sections. We stimulated Fut1 null and wt ECs and performed quantitative PCR and enzyme linked immunosorbent assays for adhesion molecule expression.

Results: Fut1 null ECs formed significantly less tubes compared to wt ECs on Matrigel. In the Matrigel plug in vivo angiogenesis assays, we found...
that Fut1 null mice had less Hb, an indirect measure of angiogenesis (four fold decrease) compared to wt mice. By immunohistochemistry, wt mouse plugs formed significantly greater number of blood vessels. Fut1 null mice were resistant to K/BxN arthritis showing a significant decrease in ankle circumference in comparison with wt mice. Fut1 null mouse arterial ankle homogenates had less Hb, when compared to wt mice. Blood vessels formed in Fut1 null mouse ankle sections were four fold decreased compared to wt mouse ankle sections. This suggests that Fut1 plays a critical role in K/BxN arthritis development by modulating angiogenesis. Adhesion molecules are important in leukocyte recruitment into inflammatory sites. After finding decreased leukocytes in Fut1 null mouse sections, we examined the expression of adhesion molecules in arterial mouse sections. By dual immunohistochemistry, we found a marked decrease in intercellular adhesion molecule-1 (ICAM-1) in Fut1 null arterial ankle sections. ICAM-1 expression was significantly decreased at both mRNA and protein levels in Fut1 null compared to wt mouse ECs, suggesting the mechanism of decreased leukocyte recruitment into the inflamed joint when Fut1 is absent.

Conclusion: These data suggest that Fut1 mediates inflammatory arthritis by modulating angiogenesis and may be a novel approach to treat angiogenesis-dependent diseases such as RA.

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PDL241, a Novel Humanized Monoclonal Antibody, Reveals CD319 As a Therapeutic Target for Rheumatoid Arthritis. Michel P.M. Vierboom, Jacky Woo, Hakju Kwon, Debra Chao, Shining Ye, Karen Lin, Irene Tang, Nicole Belmar, Taymar Hartman, Elia Bredveld, Bert A. ’t Hart and Gary C. Starling. 1Biomedical Primate Research Centre, Biotherapeutics, 3; 2Juntendo University Urayasu Hospital, Tokyo, Japan; 3Juntendo University Graduate School of Medicine, Chiba, Japan; 5Juntendo University Graduate School of Medicine, Tokyo, Japan; 4University of Rochester, Rochester, NY, 3University of Rochester Medical Center, Rochester, NY

Background/Purpose: Current therapies have shown tremendous progress in the treatment of rheumatoid arthritis (RA). However, a substantial group of RA patients are still refractory to these therapies or develop resistance. RA patients that are resistant to anti-CD20 therapy illustrate the need for therapies targeted against cells of the late B cell lineage. We need for therapies targeted against cells of the late B cell lineage. We hence investigated the expression and functional activity of PDL241 in a rhesus CIA model of anti-CD20 resistance. RA patients that are resistant to anti-CD20 therapy illustrate the need for therapies targeted against cells of the late B cell lineage. We hence investigated the expression and functional activity of PDL241 in a rhesus CIA model of anti-CD20 resistance.

Methods: A humanized antibody PDL241 directed against CD319 was generated. The binding of PDL241 to human tissues was analyzed by immunohistochemistry and FACS analysis of PBMC. Functional activity of PDL241 on PBMC was demonstrated in vitro and in a HuSCID mouse model. PDL241 is a primate specific antibody and safety and efficacy was tested in a collagen-induced arthritis (CIA) model in the rhesus monkey. The rhesus CIA model is an autoimmune-mediated model of polyarthritis with inflammation and erosion of joints that shares several important cellular and histopathological features with RA.

Results: We found that CD319 was expressed on plasma cells, but not CD20 positive B cells, in rheumatoid arthritis synovial tissues. In cultures of PBMC, PDL241 bound plasmablasts and plasma cells but not naive and memory B cells, and inhibited the production of immunoglobulins in an Fc-dependent manner in vitro by reducing the numbers of late stage B cell lineage cells. High levels of CD319 on plasmablasts and plasma cells rendered them susceptible to ADCC mediated by NK cells. PDL241 also was able to reduce production of human IgM in a PBMC-transfer HuSCID model. Finally, PDL241 showed a beneficial activity in a rhesus macaque model of collagen-induced arthritis (CIA). Treatment with PDL241 resulted in a reduction of collagen-specific IgG and IgM production in the early phase of the disease leading to a reduction in joint swelling and the subsequent destruction of cartilage and bone.

Conclusion: CD319 was identified as a potential therapeutic target in RA following analysis of expression and in functional assays of IgM production from PBMC. The functional activity of PDL241 in the rhesus CIA model further supported the promise of targeting CD319 in RA. Development of PDL241 was halted due to immunogenicity observed in non-human primate models; however, the current study demonstrated the strong potential of CD319 as a therapeutic target in a range of autoimmune diseases, including RA, where CD319-expressing cells have a role in the pathology.

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Blockade of CTGF Restores Aberrant Osteoclastogenesis in Collagen Induced Arthritis (CIA) Mice Through Inhibition of Th-17 Differentiation. Kazuhisa Nozawa, Maki Fujishiro, Ayako Yarnaguchi, Mikako Kawasuki, Shouzou Ichinose, Masaki Uyagida, Kazunori Iwabuchi, Kengo Ikeda, Shinji Morimoto, Megumi Morokita, Yoshitami Takasaki and Iwao Sekigawa. 1Juntendo University School of Medicine, Tokyo, Japan; 2Juntendo University Graduate School of Medicine, Chiba, Japan; 3Juntendo University Graduate School of Medicine, Tokyo, Japan; 4Juntendo University Urayasu Hospital, Tomioka, Urayasu, Chiba, Japan; 5Juntendo University Urayasu Hospital, Tokyo, Japan; 6Nihon Nosan Corporation, Kanagawa, Japan

Background/Purpose: Our previous study demonstrated changes in the profiles of serum protein biomarkers in infliximab-treated rheumatoid arthritis (RA) patients using a novel approach to proteomic research. Several proteins exhibited vast changes in expression after infliximab treatment, and we have reported connective tissue growth factor (CTGF) appeared to be a potent strong biomarker in infliximab-treated RA patients. Furthermore, we also found that CTGF was upregulated in both serum level and tissue expression of patients with RA, and that CTGF was related to disease progression of RA through abnormal activation of osteoclasts in vitro. To extend our research project, this study was conducted to clarify roles of CTGF for RA pathogenesis. To investigate more precise roles of CTGF for RA pathogenesis, we analyzed effects of blockade against CTGF pathway on the progression of arthritis in collagen induced arthritis (CIA) mouse.

Methods: CIA was introduced in DBA/1J mice by immunization in combination with type II collagen and complete Freund’s adjuvant (CFA). The efficacy and mechanisms for prevention of the arthritis were evaluated in the mice treated with or without neutralizing anti-CTGF monoclonal antibody (mAb).

Results: The blockade of CTGF by anti-CTGF mAb treatment significantly ameliorated the arthritis compared to the non-treated controls. Moreover, serum levels of C reactive protein (CRP) and matrix metalloproteinase (MMP)-3 reduced in the CTGF-treated mice. The blockade of CTGF decreased interleukin (IL)-17 and IL-21 production from purified CD4+ T lymphocytes. Although gene expression of retinoic-acid-receptor-related orphan receptor gamma (ROG) was not suppressed by anti-CTGF mAb treatment, those of interleukin regulatory factor-4 (IRF-4) and IkappaBzeta, which are other important molecules for Th-17 differentiation, were suppressed. In addition, the blockade of CTGF inhibited pathological T lymphocytes proliferation against type II collagen restimulation in vitro. Moreover, aberrant sKANKL/MCSF-induced osteoclastogenesis of CD14+ progenitor cells in CIA was restored by anti-CTGF mAb treatment.

Conclusion: The present study demonstrated that the blockade of CTGF significantly prevented a progression of arthritis in CIA mice. The administration of anti-CTGF mAb had suppressive effects on aberrant pathological T cells proliferation and Th17 differentiation in CIA mice. In addition, the blockade of CTGF pathway might restore aberrant osteoclastogenesis of CIA through direct effect to CD14+ osteoclastic progenitor cells and indirect effects for Th17 differentiation. CTGF may become a new target molecule for treatment of RA.

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Pressure and Blood Flow Measurements in Efferent Lymphatics As Biomarkers of Arthritic Flare. Echo M. Bouta, Ronald Wood, Christopher T. Ritchlin, Liaping Xing and Edward M. Schwarz. 1University of Rochester, Rochester, NY, 2University of Rochester School of Medicine and Dentistry, Rochester, NY, 3University of Rochester Medical Center, Rochester, NY

Background/Purpose: Rheumatoid arthritis (RA) is a chronic disease with episodic flares in affected joints. These flares are associated with decreased lymphatic drainage. In TNF-Tg mice, a model of inflammatory-erosive arthritis, the popliteal lymph node (PLN) expands in volume during the pre-arthritic “expanding” phase and then “collapses” during flare. Currently, the factors that cause PLN collapse are unknown. Local changes in physiology are reasonable explanations given the finding that PLN and iliac lymph node collapse occurs in series along the ipsilateral axis in the setting of unaltered chronic inflammation and systemic autoimmunity. Thus, we tested the hypothesis that PLN collapse and arthritis flare are associated, and that increased pressure and decreased blood flow within the efferent lymph node (PLN) of inflamed joints.

Methods: The PLNs of TNF-Tg mice (C57B6) were phenotyped as expanding or collapsing with contrast-enhanced MRI. Pressure measurements...
were performed by inserting a glass micropipette connected to a pressure transducer into the PLN of anesthetized WT and TNF-Tg mice. Blood flow within the lymph node and lymph node volume were measured by 3D power Doppler ultrasound and volumetric rendering in Amira.

Results: Lymph node pressure was significantly decreased in expanding PLN of TNF-Tg mice vs. that of WT mice (3.4 ± 0.4 vs. 6.7 ± 0.6 cmH2O; p < 0.01). The pressure in collapsed PLN of TNF-Tg mice was significantly greater vs. expanding node in the same mice (8.6 ± 1.7 vs. 3.4 ± 0.4 cmH2O; p < 0.05), but similar to WT node. We also found that the volume of blood vessels positive for Doppler flow was significantly 6-fold less in collapsed vs. expanding PLN of TNF-Tg mice (0.050 ± 0.036 mm3 vs. 0.3042 ± 0.08192 mm3; p < 0.05) (Figure).

Conclusion: Here we describe a novel approach to quantify lymph node pressure and blood flow within PLNs of WT and TNF-Tg mice. Our finding of significantly decreased lymphatic pressure during the pre-arthritis stage is consistent with the theory that lymphangiogenesis is a compensatory mechanism to prevent synovitis and joint damage during RA pathogenesis. Furthermore, increased pressure and decreased vascular flow observed in collapsed PLN is also consistent with this theory, and suggest that lymphatic pressure and blood flow within the effluent lymph nodes are potential biomarkers to assess RA progression and response to therapy, with the later achieved using clinically relevant non-invasive ultrasound.

Disclosure: E. M. Bouta, None; R. Wood, None; C. T. Ritchelin, None; L. Xing, None; E. M. Schwarz, None.

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Selective iNOS Inhibition Increases the Lymphatic Pulse and Drainage From Arthritic Joints in TNF-Tg Mice. Yawen Ju, Ronald Wood, Lianping Xing, Christopher T. Ritchelin and Edward M. Schwarz. University of Rochester Medical Center, Rochester, NY

Background/Purpose: Sufficient lymphatic drainage, which is partially controlled by an intrinsic lymphatic pulse, is an important mechanism to limit joint inflammation and destruction from arthritis. We reported recently that arthritic flare in TNF transgenic (TNF-Tg), a mouse model of inflammatory-erosive arthritis, coincides with the loss of the lymphatic pulse afferent to expanding draining lymph nodes, causing their collapse. From other models, the lymphatic pulse is known to be controlled by endothelial nitric oxide synthase (eNOS), and inhibited by inducible NOS (iNOS) expresses in Gr-1+ cells. To determine if this mechanism controls the lymphatic pulse and lymphatic drainage in inflammatory-erosive arthritis, we tested the hypotheses that: 1) Gr-1+/iNOS+ cells are present in the draining lymph nodes of flaring TNF-Tg mice; and 2) selective iNOS inhibition increases the lymphatic pulse and drainage from joints to draining lymph nodes.

Methods: Immunohistochemistry for Gr-1 and iNOS was performed on popliteal lymph node (PLN) frozen sections from WT and TNF-Tg mice. The lymphatic pulse and flow afferent to the PLN were quantified in TNF-Tg mice with collapsed PLN (>8-month-old) and WT controls (n = 4 legs) via in vivo near infrared indocyanine green (NIR-ICG) imaging before and after saline (placebo), iNOS specific inhibitor L-NIL (4mg/kg), or general NOS inhibitor L-NAME (5mg/kg) was injected s.c. in footpad.

Results: Immunohistochemistry showed more iNOS expressing Gr-1+ cells in collapsed vs. expanding PLN (127 vs. 3 cells/mm3), and undetectable numbers in WT PLN. Saline did not change the lymphatic pulse in either WT or TNF-Tg mice. However, L-NIL significantly increased the pulse in TNF-Tg mice (from 0.42 ± 0.84 to 2.19 ± 0.07 pulse/min; p < 0.05), but not in age-matched WT mice (0.96 ± 1.42 to 3.13 ± 2.36 pulse/min; p = 0.08). Moreover, L-NIL significantly increased lymphatic flow in TNF-Tg vs. saline (73.48 ± 8.9 vs. 53.25 ± 12.72 % ICG clearance; p < 0.05). In contrast, L-NAME decreased the clearance rate in both WT (27.77 ± 13.78 %) and TNF-Tg (9.07 ± 33.65 %), but did not significantly change the pulse rate.

Conclusion: We demonstrated that large numbers of iNOS expressing Gr-1+ cells exist in collapsed PLN of TNF-Tg mice with flaring inflammatory-erosive arthritis, and that the specific iNOS inhibitor L-NIL increased the lymphatic pulse and afferent lymphatic drainage. These results suggest that selective iNOS inhibition may be effective in ameliorating arthritic flare by improving lymphatic drainage, which is currently being tested in a prospective study of flaring TNF-Tg mice treated for 6-weeks with L-NIL, L-NAME, or placebo. The effects of these treatments on knee and ankle synovitis and focal joint bone erosion determined by CE-MRI, micro-CT and histology will be presented.

Disclosure: Y. Ju, None; R. Wood, None; L. Xing, None; C. T. Ritchelin, None; E. M. Schwarz, None.

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Treatment with Bgp-15, a Novel Insulin Sensitizer Attenuates Collagen-Induced Arthritis in DBA/1 Mice. Peter Mandl1, Silvia Hayer1, Stephan Blüm1, Victoria Saferding1, Despona Sykoutri1, Kurt Redlich1 and Josef S. Smolen2. 1Medical University of Vienna, Vienna, Austria; 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: BGP-15, a small synthetic hydroxylamine derivative is a member of a new class of insulin-sensitizing medications also known as chaperone-inducers. Beside its beneficial effects on glycemic control and insulin sensitivity in patients with Type 2 diabetes, BGP-15 is known to induce heat shock protein Hsp72 and heat shock transcription factor HSF1, which in turn are chaperone-inducers. Beside its beneficial effects on glycemic control and insulin sensitivity, BGP-15 on collagen-induced arthritis (CIA) in DBA/1 mice.

Methods: Arthritis was induced by intradermal injection of bovine type II collagen (B21I) and incomplete Freund’s adjuvant (CFA) in male DBA/1 mice. BGP-15 was administered either one week prior to the first immunization (prophylactic experiment, n=14 in both groups) or upon the appearance of symptoms (therapeutic experiment, n=12 in both groups) in drinking water. Arthritis incidence and severity was assessed for 28 days following the second immunization (boost) with B21I and CFA on day 21. Histological evaluation was carried out on hインドав пав домашний osemetry® software. Antibacterial antibodies were measured by enzyme-linked immunosorbent assay. The cellular composition of the draining lymph nodes was measured by flow cytometry. In vitro cytotoxicity measurements were carried out on dendritic cells and macrophages differentiated from murine bone marrow macrophages.

Results: BGP-15 significantly reduced the incidence of CIA by 28% and also reduced both paw swelling (p ≤ 0.01) and grip strength (p≤0.05) in the prophylactic experiment, n=14 in both groups) or upon the appearance of symptoms (therapeutic experiment, n=12 in both groups) in drinking water.
lactic experiment. In the therapeutic experiment BGP-15 significantly attenuated both paw swelling (p<0.01) and grip strength (p<0.05). Histological examination of the hind paws demonstrated reduced area of inflammation (p<0.05), area of erosion (p<0.01) and number of osteoclasts (p<0.05) in the BGP-15 treated group when compared to the control group. No significant differences were revealed between anticoagulant antibody levels or in the distribution of T-cells, B-cells, dendritic cells and monocytes/macrophages harvested from draining lymph nodes, suggesting an effect predominantly involving the innate immune system. In line with these findings BGP-15 (1mM) inhibited the LPS-induced production of IL-12, IL-6 and TNF in both dendritic cells and macrophages.

**Conclusion:** Our results demonstrate that the novel chaperone-inducer BGP-15 has a profound prophylactic and therapeutic effect on autoimmune arthritis, mainly due to an effect on the effector phase.

**Disclosure:** P. Mandl, None; S. Hayer, None; S. Blüml, None; V. Saferding, None; D. Sykouri, None; K. Redlich, None; J. S. Smolen, None.

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**Preclinical Development of ALX-0061, an Anti-IL-6R Nanobody® for therapeutic Use in Rheumatoid Arthritis with a High in Vitro Affinity and Potency and a Competitive in Vivo Pharmacological Profile.**

Maarten Van Roy, Hans Ulrichts, Stefaan Rossenru, Sandy Jacobs, Sofie Poelmans, Gert Verheyden, Michel Vierboom, Bert ’t Hart, Judith Baumeister and Josefín-Beate Holz.

*Ablynx N.V., Zwijnaarde, Belgium, 1Biomedical Primate Research Centre, Rijswijk, Netherlands*

**Background/Purpose:** Interleukin-6 (IL-6) is a pleiotropic cytokine inducing a wide range of biological activities via its receptor IL-6R. IL-6 plays an important role in the pathogenesis of a variety of diseases, including rheumatoid arthritis (RA), and blocking of IL-6R results in clinical benefit as inducing a wide range of biological activities via its receptor IL-6R. IL-6 systems: biological activity, specificity and affinity was assessed and compared to other humanized anti-IL-6R monoclonal antibodies.

**Results:** Treatment of naïve cynomolgus monkeys and in a human (h)IL-6-induced acute phase response model in the same species in which platelet numbers and plasma concentrations of CRP and fibrinogen were monitored as disease parameters.

**Conclusion:** In vivo efficacy of ALX-0061 was assessed in a collagen-induced arthritis (CIA) rhesus monkey model. In this model, inflammation of the joints was induced via sensitization with collagen type II, after which clinical endpoints were assessed in correlation to biomarker deregulation.

**Results:** ALX-0061 neutralized specifically both soluble and membrane IL-6R with a comparable in vitro potency to TCZ. However, affinity of ALX-0061 for IL-6R (0.19 pm ± 0.08 pm) was 2000-fold superior compared to TCZ (462 pm ± 138 pm).

**Conclusion:** ALX-0061 combines high in vitro affinity and potency with favorable PK/PD properties in non-human primates and has the potential to be an effective treatment for RA in humans. A Phase I/II clinical trial is ongoing. Interim analysis of the single ascending dose part were encouraging, results from the multiple dose part are expected in H2 2012.


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**In Vivo Quantification of Joint Inflammation in a Murine Arthritis Model by Anato-Molecular Imaging.**


*UC Davis School of Medicine/VA Sacramento Medical Center, Mather, CA, 1University of California, Davis, Davis, CA, 2UC Davis School of Medicine, Sacramento, CA*

**Background/Purpose:** Positron Emission Tomography (PET) using the radiotracer 18F-fluorodeoxyglucose (FDG) with X-ray Computed Tomography (CT) has the ability of producing an in vivo, three-dimensional quantitative map of joint metabolism (hence inflammation) with co-registered anatomy. We report our experience on using 18F-FDG-microPET/CT as a quantitative marker for monitoring the pathogenesis of inflammatory arthritis in the collagen induced arthritis (CIA) mouse model.

**Methods:** CIA was induced in 8–12 weeks old male DBA/1 mice (n=10) by injecting 100mg bovine collagen type II in 100ml of complete Freund’s adjuvant intradermally into the proximal tail followed by a second intradermal injection of collagen II with incomplete Freund’s adjuvant on day 21. At baseline (1 day before the first injection), 5 randomly chosen animals underwent microPET/CT scan for assessment of baseline status. At days 28 and 56, 5 animals respectively were scanned using microPET/CT, clinical scoring was performed, and joint tissue was derived for histopathological analysis. Quantitative metrics derived from microPET/CT were correlated against clinical score and histopathology outcomes on a per joint and whole limb basis.

**Results:** Images from microPET showed a marked increase in metabolic activity at affected joints of the upper and/or lower extremity at follow-up compared to baseline values. microPET images provided detailed assessment of bone destruction. At the early time point (day 28), increase in metabolic activity by an average of 20% was observed in the limbs. This further increased to an average of 50% at day 56 as the disease progressed. Focal activity was visualized at individual affected joints by utilizing advanced resolution-recovery methods. microPET/CT metrics at the early and late time points seemed to broadly correlate with clinical and histopathology scores at the arthritic sites.

**Conclusion:** We used an 18F-FDG microPET/CT scan of the limb of an animal with collagen induced arthritis. Resolution recovery methods allow unparalleled visualization of the details of inflammatory activity.
Conclusion: Our study shows that quantitative metrics associated with disease pathogenesis can be derived from 18F-FDG-microPET/CT. Changes in clinical score and histopathology outcomes seem to correlate with microPET/CT metrics on both a per joint and whole limb basis. microPET/CT may provide a promising tool for understanding the pathogenesis of arthritis and for monitoring response to new treatments in experimental arthritic models.

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Background/Purpose: Phosphoinositide-3-kinases (PI3K) play pivotal roles in cell signaling and regulate a variety of cellular functions. PI3K-δ and PI3K-γ isoforms are necessary for adaptive and innate immunity and are important mediators in inflammatory and autoimmune diseases. PI3K-δ is a potent PI3K-δ-γ inhibitor in clinical development for patients with advanced hematologic malignancies and inflammatory/autoimmune disorders. The isoform selectivity and activity of IPI-145 were evaluated using in vitro and in vivo models, and a Phase 1 study was conducted in healthy adult subjects.

Methods: In vitro isoform selectivity and activity of IPI-145 was determined by measuring direct binding to PI3K isoforms, and by isoform-specific cell-based assays. Cell proliferation assays were performed by stimulating human peripheral blood CD19+ B cells or CD3+ T cells in the presence or absence of IPI-145. The PI3K-δ inhibitory activity of IPI-145 in human whole blood was measured in a basophil activation assay. The in vivo anti-inflammatory activity of IPI-145 was assessed in a rat collagen-induced arthritis model. Female Lewis rats with established type II collagen-induced arthritis were treated with IPI-145 (0.1 to 10 mg/kg) or vehicle once daily via oral gavage and paw swelling was assessed by plethysmometry.

The safety, tolerability, pharmacokinetics (PK), and pharmacodynamics (PD) of single and multiple ascending doses of IPI-145 was evaluated in a Phase 1 double-blind, placebo controlled, randomized clinical trial in healthy adult subjects. The ex vivo effect of IPI-145 on basophil activation in whole blood was assessed in both the single and multiple ascending doses portions of the study.

Results: IPI-145 potently inhibits PI3K-δ and PI3K-γ, with Kᵅ values of 23 pM and 243 pM, respectively. IPI-145 is significantly less active against the PI3K-γ isoform, with a Kᵅ value of 25.9 nM, and inhibits PI3K-δ with a Kᵅ value of 1.6 nM. IC₅₀ of IPI-145 in a PI3K-δ-selective assay is 1 nM, and the IC₅₀ in a PI3K-γ-selective assay is 32 nM. The IC₅₀ values of IPI-145 in human whole blood was assessed in a basophil activation assay. The in vivo anti-inflammatory activity of IPI-145 was assessed in a rat collagen-induced arthritis model. Female Lewis rats with established type II collagen-induced arthritis were treated with IPI-145 (0.1 to 10 mg/kg) or vehicle once daily via oral gavage and paw swelling was assessed by plethysmometry.

In the Phase 1 clinical study there was a proportional increase in IPI-145 exposure following single ascending and repeat dose administration. A rapid onset and durable effect of IPI-145 in the ex vivo basophil assay was observed at all dose levels. In addition, IPI-145 is clinically well tolerated following single and repeat daily doses of IPI-145.

Conclusion: IPI-145 is a potent inhibitor of PI3K-δ,γ in biochemical and cellular assays and is active in B-cell and T-cell proliferation assays and the rat collagen-induced arthritis model. The preclinical activity and the favorable tolerability, PK, and PD profiles of IPI-145 in healthy human subjects support ongoing Phase 2 clinical trial plans in subjects with autoimmune and inflammatory disorders.


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Differences Between Juvenile and Adult Rodents with Collagen Induced Arthritis. Tracy D. Wilson-Gerwing1, Isaac V. Pratt1, David M.L. Cooper2, Tawni I. Silver3 and Alan M. Rosenberg2. 1University of Saskatchewan, Saskatoon, SK, 2Royal University Hospital, Saskatoon, SK

Background/Purpose: Juvenile idiopathic arthritis (JIA) is among the most common chronic diseases of childhood. Arthritis is a potentially disabling disease that can result in ongoing pain and inflammation. Although chronic intra-articular inflammation is common to both children and adults with chronic arthritis there are, apart from onset age, clinical characteristics that further distinguish chronic arthritis in pediatric and adult populations. Collagen induced arthritis (CIA) is a model of inflammatory joint disease. For the first time, this project demonstrates that juvenile and adult rats respond differently to the inflammation and pain resulting from CIA.

Methods: Juvenile (5 wks old) and adult (13 wks old) male Wistar rats were immunized with an emulsion of bovine type II collagen and incomplete Freund’s adjuvant. Naive juvenile and adult rats were included as controls. Paws were scored on a scale of 0 (normal paws) to 4 (disuse of paw). Animals were monitored for weight changes. Two weeks following development of arthritis, animals were euthanized and hindpaws were collected and imaged with micro-computed tomography (micro-CT), magnetic resonance imaging (MRI) and ultrasonography. Images were evaluated qualitatively for the degree of soft tissue swelling, joint changes and bone destruction.

Results: Juvenile rats developed arthritis significantly earlier than their adult counterparts (p=0.0126) and experienced less erythema and edema of the affected paws (p=0.0001). Micro-CT of affected hindpaws demonstrated that adult CIA rats exhibited widespread boney changes over the phalanges, metatarsals and tarsus while juveniles had more localized damage of phalanges and metatarsals. MRI of hindpaws confirmed extensive edema and inflammatory insult in the adult CIA rats compared to their juvenile counterparts. Ultrasound of distal phalanges of the juvenile CIA animals showed tissue edema not evident on inspection.

Conclusion: This research is the first to identify differences between juvenile and adult rats with CIA and provides evidence that the disease process may differ between the two age groups. This model will allow for studying arthritis pathogenesis and treatment interventions in juvenile versus adult populations.

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Myeloid Deletion of SIRT1 Aggravates Inflammatory Arthritis Via Nuclear Factor-Kappab Activation in Animal Model of Rheumatoid Arthritis. Sang-il Lee and Yun-Hong Cheon. Gyeongsang National University School of Medicine, Jinju, South Korea

Background/Purpose: The nuclear factor-kappaB (NF-kB) activation plays a pivotal role and macrophages are of central importance in the pathogenesis of rheumatoid arthritis (RA). The Sirt1, which is a class III histone deacetylase, deacetylates acetyl group of various transcription factors including NF-kB and modulates their functions, suggesting that myeloid deletion of Sirt1 may affect inflammatory arthritis such as RA. The study was performed to assess the function of SirT1 in inflammation and joint destruction in vivo model of RA.
Methods: The mice with myeloid cell-specific deletion of SirT1 (M-SirT1 KO) were generated by using theloxP/Cre recombinase system. K/BxN serum transfer arthritis was induced in M-SirT1 KO mice and their age-matched littermateloxP controls (Sir1loxPloxP/LysMcrt−/−) by injection of K/BxN serum. Arthritis severity was assessed by clinical and histopathologic scoring. The levels of inflammatory cytokines in the joints and serum were measured by ELISA. The NF-κB acetylation, activation, and cytokine/chemokine expression were assessed by Western, EMSA, and ELISA, respectively, using bone marrow-derived macrophages (BMMs).

Results: M-SirT1 KO showed severe form of inflammatory arthritis accompanied by aggravated histopathologic findings including synovial inflammation, bone erosion, and cartilage damage. These effects were paralleled by increased F4/80+ macrophage infiltration into synovium and increased levels of IL-1, IL-6, and RANKL. TNF-α stimulated M-SirT1 KO BMMs displayed hyperacetylated p65 and increased NF-κB binding activity than controls, resulting in increased transcriptional activation of proinflammatory target genes.

Conclusion: This study demonstrates that SirT1, in macrophages, functions to inhibit NF-κB-mediated transcription, implying that myeloid cell-specific mutation of SirT1 may be beneficial in the treatment of inflammatory arthritis such as RA.

Disclosure: S. Lee, None; Y. Cheon, None.

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Oral Administration of a Novel Small Molecule BET Bromodomain Inhibitor, RVX-297, Reduces Disease Severity in a Rat Collagen-Induced Arthritis Model. R. Jahagirdar1, S. Attwell1, E. Gesner1, K. G. McLure1, H. C. Hansen1, J. Chen1, J. Wu1, K. Norek1, N. Shenoy1, G. S. Wagner1 and P. R. Young1. 1Resverlogix Corporation, Calgary, AB, 2Aravasca Inc., Sunnyvale, CA

Background/Purpose: BET (Bromodomain and Extra-Terminal) proteins have recently emerged as a key epigenetic regulator of genes at the transcriptional level and inhibition of their binding to select histone peptide sequences bearing acetylated lysines can suppress the production of some inflammatory cytokines. Here we determine the activity of a novel, orally bioavailable BET inhibitor, RVX-297, in an animal model of rheumatoid arthritis.

Methods: Binding of RVX-297 to purified bromodomains (BDs) was measured by competition with a tetra-acetylated peptide derived from the amino terminus of histone 4 using fluorescence resonance energy transfer (FRET) and by thermal denaturation of BDs. The effect of RVX-297 on inflammatory mediators in cellular assays was measured by quantitative RT-PCR. RVX-297 was dosed by oral gavage in the rat collagen-induced arthritis (CIA) model, an experimental model of polyarthritis that has been widely used for preclinical evaluation of anti-arthritic agents.

Results: RVX-297 selectively binds to BET bromodomains (e.g. IC50 = 0.82 and 0.012mM for BRD4 BD1 and BD2, respectively), but not to other BDs tested. In vitro, RVX-297 dose dependently inhibited LPS-induced IL-6 in mouse bone marrow-derived macrophages, (IC50 = 0.3 mM) and T-cell receptor-induced IL-17 mRNA expression in human PBMCs (IC50 of 3.7 mM). Furthermore, in human primary synovial fibroblasts taken from patients with rheumatoid arthritis, RVX-297 inhibited TNFα-induced MMP1, MMP3, RANKL, VCAM-1 and IL-6 expression, all of which have been associated with diseased tissue. These observations suggested that RVX-297 might show activity in an autoimmune disease model for rheumatoid arthritis.

Following administration of collagen, the rat collagen-induced arthritis model develops a measurable polyarticular inflammation, progressive destruction of cartilage and bone destruction in association with pannus formation. Therapeutic oral administration of RVX-297 from the onset of established arthritis significantly reduced the progression of disease severity in a dose-dependent manner (25 to 75 mg/kg b.i.d.). On day 7 of arthritis, RVX-297 (75 mg/kg b.i.d.) inhibited the increase in ankle diameter by 92% relative to disease controls. To further characterize the pharmacodynamic effects, histopathology of the ankle and knee joints was evaluated. At 50 mg/kg and 75 mg/kg b.i.d., RVX-297 reduced the histopathology parameters in the the ankle by 64% and in the knee by 86–94%. The expression of the inflammatory mediators IL-1b, MMP3, MMP13, RANKL, VCAM-1 and IL-6 were all reduced in the ankle joint at the mRNA or protein level.

Conclusion: These results demonstrate that the BET inhibitor RVX-297 significantly decreases clinical signs of disease in a rat model of rheumatoid arthritis, reflecting a decrease in production of a number of cytokine and inflammatory mediators. Therefore, BET inhibitors offer promise for the treatment of rheumatoid arthritis and other autoimmune diseases.

Disclosure: R. Jahagirdar, Resverlogix Corporation, 3, Resverlogix Corporation; 1; S. Attwell, Resverlogix Corporation, 3, Resverlogix Corporation; 1; E. Gesner, Resverlogix Corporation, 3, Resverlogix Corporation; 1; K. G. McLure, Resverlogix Corporation, 3, Resverlogix Corporation; 1; H. C. Hansen, Resverlogix Corporation, 3, Resverlogix Corporation; 1; J. Chen, None; J. Wu, Resverlogix Corporation, 3, Resverlogix Corporation; 1; K. Norek, Resverlogix Corporation, 3, Resverlogix Corporation; 1; N. Shenoy, None; G. S. Wagner, Resverlogix Corporation, 3, Resverlogix Corporation; 1; P. R. Young, Resverlogix Corporation, 3, Resverlogix Corporation; 1.

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Novel Combination Therapy of Existing Repurposed Therapies, Designed by Predictive Software Modeling. Shows Profound Impact On Disease Progression in a Murine Collagen-Induced Arthritis Model. Shireen Vali1, Canio Refino2, Jay Dela Cruz2, Robinson Vidva3, Prashant Nair1, Saumya Radhakrishnan1, Pradeep Fernandes1, Taher Abbasi1 and Gurkirpal Singh1. 1CellWorks Group, Saratoga, CA, 2InTouch Bio, Alamedan, 3Stanford University School of Medicine, Palo Alto, CA

Background/Purpose: Rheumatoid Arthritis (RA) involves a complex interaction of multiple cell systems, cytokines and mediators. We recently developed a predictive software-based mathematical model that emulates RA pathophysiology at cellular level by incorporating the interaction of known cell systems and associated signaling and metabolic pathways. For this study, this model was used to design a novel therapy for RA by screening more than one million in-vivo equivalent studies. CWG952 is an oral small molecule novel multi-targeted therapy, rationally designed to reduce signs, symptoms and radiologic progression of RA. It combines 3 FDA-approved drugs, repurposed from different indications, in a computer-generated specific ratio of individually sub-therapeutic dosages. We present results of this therapy on the murine collagen-induced arthritis (mCIA) model in an early therapeutic RA setting.

Methods: mCIA was induced in male DBA-1 mice by subcutaneously injecting 0.05 ml/mouse of Bovine Collagen in complete Freund’s adjuvant (CFA) emulsion on day 0. A booster dose of collagen in incomplete Freund’s adjuvant (IFA) emulsion was given via the same route three weeks later (day 21). On day 21, mice without clinical signs of RA were randomly assigned to 2 groups of 9 and subsequently orally gavaged with CWG952 or vehicle. Front and hind paws were evaluated every other day for clinical disease using a scoring system with a maximum scale of 16 per paw. After obtaining a terminal serum sample, mice were sacrificed on day 42. Hind paws were collected, processed and evaluated by a histopathologist blinded to group assignments. Scores (0 to 5), for synovitis, pannus formation, cartilage destruction and bone erosion were assigned to each hind paw and mean scores for each mouse were calculated.

Results: Compared to the vehicle control, CWG952 treatment regimen significantly slowed disease progression and decreased the median total clinical disease by 72% and histological disease by 43% respectively. Liver enzyme and lipid assays conducted on the terminal serum samples showed no difference between the Vehicle and CWG952 treatment arms. Key efficacy results are summarized below.

<table>
<thead>
<tr>
<th>Vehicle control (n=9), Mean ± SEM</th>
<th>CWG952 (n=9), Mean ± SEM</th>
<th>P values (t-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 39 Paw Scores</td>
<td>30.89 ± 1.01</td>
<td>6.89 ± 1.42</td>
</tr>
<tr>
<td>Paw Scores (mean day 25–41)</td>
<td>7.57 ± 1.07</td>
<td>4.14 ± 1.20</td>
</tr>
<tr>
<td>Synovitis Score</td>
<td>4.22 ± 0.35</td>
<td>3.06 ± 0.39</td>
</tr>
<tr>
<td>Cartilage Destruction</td>
<td>3.72 ± 0.31</td>
<td>2.22 ± 0.46</td>
</tr>
<tr>
<td>Bone Erosion</td>
<td>3.83 ± 0.49</td>
<td>2.28 ± 0.48</td>
</tr>
</tbody>
</table>

Conclusion: CWG952, an oral combination of 3 FDA-approved drugs, repurposed from other indications, and combined at sub-therapeutic dosages, shows profound impact on disease progression. These results suggest that CWG952 can be an effective therapeutic agent for treating RA.

Functional Impairment in an Animal Model for Rheumatoid Arthritis: Assessed As Changes in Gait Is Due to Joint Destruction but Not Synovial Inflammation Per Se

Gregor Bauer, Constantin Aschauer, Birgit Nießner, S. Smolen, K. Redlich, and Silvia Hayer
1Medical University of Vienna, Vienna, Austria, 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: To investigate the individual impact of synovial inflammation, subchondral bone erosion or cartilage damage on functional impairment in an animal model of Rheumatoid Arthritis (RA).

Methods: We analysed gait profiles in human tumor necrosis factor transgene (hTNFtg) animals, using the video-based Catwalk gait analysis system (from Noldus, Netherlands). In this system, mice run along an illuminated glass plate. A digital camera measures light emissions resulting from the contact of paws on the glass plate. We evaluated gait profiles at different time points of disease (6, 10, 15 week of age) in hTNFtg animals. Wildtype littermates served as controls. Bodyweight and clinical signs of arthritis including paw swelling and grip strength were also evaluated. To investigate whether gait changes are pain related, we treated hTNFtg animals with diclofenac (50 mg/kg, i.p.) at week 10 and week 15 after birth and analysed gait profiles before, as well as 1h and 3h after treatment. To analyse inflammatory joint destruction, we quantitatively assessed the extent of synovial inflammation, subchondral bone erosion and cartilage damage on toluidine-blue stained paw sections. We performed correlation studies between gait parameters and the histopathological components.

Results: We identified several gait parameters among them weight bearing, stride length and contact area of the paw to be significantly decreased in hTNFtg animals compared to sex- and age-matched wildtype animals. Moreover, we found a marked reduction in maximum intensity, an indicator for weight bearing, in week 10 and 15 compared to week 6 old hTNFtg mice. Similar effects were seen in print width, print area, print length, max contact area at different stages of disease. Interestingly, analgesic treatment with diclofenac (50 mg/kg, i.p.), resulted in a better improvement of weight-bearing parameters in 10 week old hTNFtg mice than in 15 week old hTNFtg animals indicating an pain independent, irreversible functional impairment in progressed disease. To further investigate to which extend synovial inflammation, subchondral bone erosion or cartilage damage are responsible for the functional impairment of joints, we correlated these correlations with changes in different gait parameters. We observed strong correlations of various gait parameters with the amount of cartilage damage, whereas subchondral bone erosions correlated to a lesser extend and synovial inflammation did not correlate at all.

Conclusion: Video-based Catwalk gait analysis is a useful tool for quantitative assessment of functional impairment in inflammatory, destructive arthritis. Joint destruction due to cartilage damage but not synovial inflammation per se is the most important component leading to functional impairment of hTNFtg mice.

Disclosure: G. Bauer, None; C. Aschauer, None; B. Niederreiter, None; J. S. Smolen, None; K. Redlich, None; S. Hayer, None.

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Non Classical Monocytes Are Required for Initiation Phase While Macrophages Are Necessary for the Resolution Phase in the K/BxN Murine Model of Inflammatory Arthritis

Gurkirpal Singh1, Robinson Vidvra2, Prashant Nair2, Saumya Radhakrishnan2, Pradeep Fernandez3, Taher Abbasi4, Canio Refino4, Jay Dela Cruz5 and Shireen Vali2
1Stanford University School of Medicine, Palo Alto, CA, 2CellWorks Group, Saratoga, CA, 3InTouch Bio, Alameda, CA

Background/Purpose: Rheumatoid Arthritis (RA) involves complex interactions of multiple cell systems, cytokines and mediators, and interlinked signaling. While molecularly-targeted therapies manipulate specific interactions, it is possible that other, previously redundant, paths are subsequently activated, thus causing drug resistance. Ideal therapy design requires simultaneous modulation of multiple targets to achieve eventual convergence and synergy. A predictive software algorithm would tremendously increase the ability to identify such therapies.

Methods: A predictive in-vivo equivalent simulation technology emulating RA pathophysiology at cellular and molecular level was designed by assimilating information from 8928 publications over the past 8 years. The simulation platform is a co-culture of 8 cell systems representing RA phenotypes, associated signaling and metabolic networks and includes nearly 100000 cross-talks and interactions among approximately 31366 molecules. The platform was extensively validated using more than 4000 studies and correlated with retrospective human clinical drug data and animal experiments. A digital library representing 100 targeted drugs from different indications was screened in combinations of two’s and three’s translating to more than one million in-vivo studies. Automated analytics engine using the assay data from the studies generated a therapy candidate which is a combination of 3 oral FDA-approved drugs (CW952), based on criteria of efficacy, synergy and PK/PD compatibility. For in-vivo validations, mCIA was induced in male DBA/1 mice and those with paw scores between 1 and 5 on day 19 were randomly assigned to treatment arms (9/group): CW952 and anti-TNF with treatment started at 12hrs of enrollment.

Results: The RA predictive model was dynamically simulated to disease followed by application of CW952 therapy. The simulations predicted a percentage reduction in TNF, IL6, IL1B, IL17A, RANKL and CRP by 81.8, 90.5, 85.9, 86.5, 85.1 and 95.5 respectively from disease condition with respect to control state. The model also predicted a 83.1% reduction in bone and cartilage degradation and 85.1% inhibition of osteoclast activity. Anticipated effect on phenotype disease markers were close to those seen in clinical trials of TNF-alpha inhibitors. The figure shows results from animal experiments (mCIA model) demonstrating a comparable efficacy to etanercept.
Sclerostin Protects Against Inflammatory Bone Loss by Regulating Tnfalpha Mediated p38-Map kinase Activation. Corinna Wehmeyer1, Christina Wehmeyer1, Christina Wunrau1, Athanasios Stratis1, Ina Kramer2, Michaela Kneissel2, Thomas Pap1 and Berno Dunkar1. 1University Hospital Muenster, Muenster, Germany, 2CH-4056 Basel, Switzerland

Background/Purpose: Progressive loss of joint structure is a hallmark of rheumatoid arthritis (RA). TNFα has been shown to promote the destruction of bone by increasing the number of bone-resorbing osteoclasts and decreasing the number of bone-forming osteoblasts. The Wnt-Inhibitor sclerostin negatively regulates osteoblast differentiation and the disruption of this endogenous inhibitor increases the ability of Wnts to stabilize β-catenin and stimulate osteogenesis. Since it has been shown that sclerostin is upregulated in response to TNFα, we studied its role in inflammatory arthritis using the hTnfα transgenic (hTnfα) mice model of RA.

Methods: Sclerostin expression was assessed by immunohistochemistry. Western-blot-analysis, and RT-PCR. The localisation of β-catenin was determined by immunofluorescence staining. Western-blot-analysis was used to evaluate p38-MAPK phosphorylation. Sclerostin knockout (SOST−/−) mice were crossed with hTnfα mice to generate TNFα overexpressing mice that lack sclerostin (SOST−/−hTnfα). Clinical disease severity, bone erosion, cartilage destruction and synovial inflammation in SOST−/−hTnfα and hTnfα mice were evaluated by histomorphometric, x-ray and micro-CT analysis. hTnfα mice were treated with blocking antibodies against murine sclerostin or control-vehicle.

Results: Immunohistological staining revealed high expression of sclerostin in synovial tissue of hTnfα mice. In vitro, hTnfα SF expressed sclerostin whereas wildtype did not. Unexpectedly, radiographic, microCT and histopathological examination of hind paw joints of SOST−/−hTnfα mice demonstrated that the loss of sclerostin dramatically accelerated joint damage in this mouse model of RA. SOST−/− hTnfα mice displayed significantly more synovial hyperplasia, proteoglycan loss and bone erosion compared to hTnfα mice. Moreover, injection of a neutralizing antibody to murine sclerostin in hTnfα mice did not improve clinical signs of arthritis and led to elevated inflammation as well as bone erosion. In vitro, upon stimulation of hTnfα and SOST−/−hTnfα SF with recombinant Wnt3a, β-catenin translocated to the nucleus, but this was not affected by loss of sclerostin. Of note, recombinant sclerostin was able to inhibit the TNFα induced p38-MAPK activation of wildtype SF.

Conclusion: Since p38-MAPK signalling specifically regulates inflammation induced bone loss, our data strongly suggest a protective function of sclerostin against TNFα-mediated joint destruction by inhibition of TNFα induced p38-activation in synovial fibroblasts. The blockade of inflammatory cytokine action proposes a complete novel function of sclerostin.

Disclosure: C. Wehmeyer, None; C. Wunrau, None; A. Stratis, None; I. Kramer, None; M. Kneissel, None; T. Pap, None; B. Dunkar, None.

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Liver Fibrosis Evaluated by Shearwave Elastography Is Associated with Body Mass Index and Serum AST, but Not Methotrexate Cumulative Dose and Duration in Patients with Rheumatoid Arthritis. Tae Yeob Kim, So-Young Bang, Joo Hyun Sohn and Hye-Soon Lee. Hanyang University Guri Hospital, Guri, South Korea

Background/Purpose: Methotrexate (MTX) is a widely used drug for treatment of rheumatoid arthritis (RA), and a concern with drug-related liver fibrosis is an unsolved problem. ShearWave elastography (SWE) is a newly developed, repeatable and reproducible real-time elastography technique for the evaluation of liver fibrosis. This study aimed to detect associated factors with liver stiffness (LS) in patients taking MTX with RA.

Methods: We prospectively analyzed a total of 171 patients (female 135, mean age 54.3±9.4 years) with RA who underwent SWE, serum and arthropometric measurement on the same day (August 2011-February 2012). Also, we calculated MTX cumulative dose and duration. LS measured by SWE is expressed in kilo-Pascal (kPa) with mean value. Based on the previous study, significant fibrosis defines as liver stiffness above 7.0 kPa. The factors associated with liver fibrosis were evaluated by univariate and multivariate analysis using SPSS 19.0 Statistical Software.

Results: Among 171 patients, 37 patients (21.6%) had SWE results suggesting significant fibrosis. In univariate analysis, body weight, body mass index (BMI), waist circumference, serum AST, ALT, HDL, glucose, and metabolic component were associated with liver fibrosis (p<0.05). Neither MTX cumulative dose (4768±3145 mg vs. 4870±3436 mg, p=0.87) nor MTX duration (330±203 weeks vs. 338±196 weeks, p=0.84) was associated with elevated liver stiffness. In multivariate analysis, only BMI ≥25 kg/m² (odds ratio 18.9, 95% confidence interval 4.0–91.2, p<0.001) and serum AST levels (expB=1.198, 95%CI 1.008–1.251, p=0.036) were associated with significant fibrosis.

Conclusion: Significant fibrosis by SWE was detected in about 20% of patients taking MTX with RA, and was associated with only high BMI and serum AST levels, but not MTX cumulative dose and duration.

Disclosure: T. Y. Kim, None; S. Y. Bang, None; J. H. Sohn, None; H. S. Lee, None.

Preliminary Results From a Controlled Study Assessing the Humoral Immune Response to Vaccines in Rheumatoid Arthritis Patients Treated with Tocilizumab. CO Bingham III, Warren C. Rizzo, Micki Klearman, Azra Hassanali, Ruchi Upmanyu, and Alan J. Kivitz. Johns Hopkins University, Baltimore, MD, Advanced Arthritis Care & Research, Scottsdale, AZ, Genentech Inc, South San Francisco, CA, Genentech Inc, San Francisco, CA, Roche, Welwyn Garden City, United Kingdom, Allona Center for Clinical Research, Duncansville, PA

Background/Purpose: Tocilizumab (TCZ) is an IL-6–receptor inhibitor for treatment of rheumatoid arthritis (RA) patients (pts). Because TCZ may impact how IL-6 modulates T-cell activation and regulates B-cell differentiation, response to vaccination in TCZ-treated pts is of interest. VISARA is the first randomized controlled study of the effects of TCZ on response to 23-valent pneumococcal polysaccharide vaccine (23VPVV) and tetanus toxoid vaccine (TTV) in RA pts on stable MTX. Preliminary analysis of study endpoints and post hoc analyses assessing impact of concomitant oral corticosteroids (OCS) are presented.

Methods: RA pts with inadequate response/intolerance to ≥1 anti-TNF agent were stratified by age and randomly assigned (2:1) to TCZ 8 mg/kg IV every 4 wks + MTX (TCZ) or MTX only (MTX). Baseline (BL) serology samples were collected 3 wks after the first infusion, just before 23VPVV and TTV vaccination. Anti-pneumococcal and anti-tetanus antibody titers were evaluated at wk 8, after which all pts received TCZ+MTX for 12 more wks. Endpoints were proportion of pts with positive response (2-fold or >1 mg/L increase in serum antibody titers) to ≥6 of 12 23VPVV serotypes (primary) and proportion with positive response (4-fold or ≥0.2 mg/L increase in serum antibody titers) to TTV (secondary) at wk 8 (5 wks postvaccination).

Results: Data are available for 74/91 enrolled pts and presented for 61 pts who met per-protocol criteria (ie, received ≥1 dose of study medication and both vaccines, had available BL and 8-wk titer samples and no protocol violations). At wk 8, 53.7% of TCZ+MTX and 65% of MTX pts responded to ≥6 of 12 23VPVV serotypes, a difference of 11.3% (not statistically significant at 95% CI level [CI: –19.5%, 33.6%]). Two TCZ pts had nonprotective BL antibody titers (ie, <0.1 IU/mL); both achieved protective levels by wk 8. In pts taking OCS, the mean BL OCS dose was slightly higher in the responder than in the nonresponder MTX group, whereas the doses were similar in both TCZ+MTX groups (data not shown). Safety of TCZ was consistent with previous reports in RA pts.

Conclusion: Based on the 95% CI for the difference in proportions of responders, TCZ does not appear to significantly attenuate responsiveness to 23VPVV or TTV compared with MTX. However, given the small study sample size and the short duration of TCZ treatment before vaccination, in line with current recommendations, pts should, if possible, be up to date with required immunizations before initiating TCZ to maximize the vaccine response.

Disclosure: C. Bingham III, Genentech, Roche Pharmaceuticals, 5; W. C. Rizzo, Advanced Arthritis Care, 2, UCB, Savient, 5, Amgen, Takeda, UCBL Ruech Pharmaceuticals, Abbott, 8; M. Klearman, Genentech and Biogen IDEC Inc., 3; A. Hassanali, Genentech and Biogen IDEC Inc., 3; R. Upmanyu, Roche Pharmaceuticals, 3, Roche Pharmaceuticals, 1; A. J. Kivitz, Roche Pharmaceuticals, 8.

Reduction of Inflammation with Abatacept and Tocilizumab Results in Lower N-Terminal Pro Brain Natriuretic Peptide Levels in Patients with Rheumatoid Arthritis: Results From Prospective Cohort Studies. Inge A.M. van den Oever and Mike T. Nurstrom. Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands

Background/Purpose: Rheumatoid arthritis (RA) patients are at increased risk of heart failure (HF). The chronic inflammatory state in RA is associated with increased levels of N-terminal pro-brain natriuretic peptide (NT-proBNP), a biomarker for HF. Recently, a study demonstrated that NT-proBNP levels in RA patients decreased under TNF-blocking therapy. It is unknown whether this is also observed in biologics with other mode of actions. We evaluated the effects of abatacept and tocilizumab therapy on NT-proBNP levels.
Methods: In 34 RA consecutive patients starting with abatacept (10 mg/kg every 4 weeks) and 14 RA consecutive patients starting with tocilizumab (8 mg/kg every 4 weeks), disease activity parameters and serum samples were collected at baseline and after 12 weeks of therapy. Clinical response was assessed using EULAR response criteria. Responding patients comprised both good and moderate EULAR responders. NT-proBNP levels were measured by the Elecsys 2010 electrochemiluminescence method (Roche diagnostics). For statistical analyses t-tests, Mann-Whitney U tests and linear regression were used.

Results: NT-proBNP levels did not change significantly after 12 weeks (p=0.6) and there were no significant differences in NT-proBNP levels at baseline or after 12 weeks of treatment between the abatacept and tocilizumab group (p=0.16 and p=0.3, respectively). 34 patients (71%) were EULAR responders, 6 (12% good, 28+88% moderate) and 14 patients (29%) were non-responders. Baseline DAS28, CRP and BSE were higher, though not significantly, in responders compared to non-responders (table). Baseline NT-proBNP levels were higher in responders versus non-responders (p=0.044). Change in NT-proBNP levels after 12 weeks of treatment was significantly different between responders and non-responders (p=0.002), with decreasing NT-proBNP levels in responders and increasing levels in non-responders.

Table 1. RA-related factors and NT-proBNP levels at baseline and after 12 weeks of treatment

<table>
<thead>
<tr>
<th></th>
<th>Baseline 12 weeks</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT-proBNP (pg/ml)</td>
<td>7.5 (1.8–19.2)</td>
<td></td>
</tr>
<tr>
<td>Responders</td>
<td>8.1 (4.0–23.4)</td>
<td>0.013</td>
</tr>
<tr>
<td>non-responders</td>
<td>6.2 (2.9–8.5)</td>
<td>0.068</td>
</tr>
<tr>
<td>CRP (mg/l)</td>
<td>16.5 (2.8–42.5)</td>
<td>0.008</td>
</tr>
<tr>
<td>Responders</td>
<td>23.0 (4.3–44.8)</td>
<td>0.001</td>
</tr>
<tr>
<td>non-responders</td>
<td>7.5 (1.3–19.5)</td>
<td>0.760</td>
</tr>
<tr>
<td>ESR (mm/h)</td>
<td>37 (21–60)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Responders</td>
<td>39 (27–63)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>non-responders</td>
<td>29 (10–50)</td>
<td>0.958</td>
</tr>
<tr>
<td>DAS28</td>
<td>5.72 (1.44)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Responders</td>
<td>5.96 (1.15)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>non-responders</td>
<td>5.12 (1.88)</td>
<td>0.390</td>
</tr>
</tbody>
</table>

mean (SD) or median (IQR)

Conclusions: There was a remarkable difference in the course of NT-proBNP levels between EULAR responders and non-responders, as responders started with higher baseline levels which decreased significantly under tocilizumab treatment, while in contrast the NT-proBNP levels of non-responding patients increased. These findings indicate favourable effects of abatacept and tocilizumab on cardiac function in RA patients responding to treatment and underscore the importance of tight control of systemic inflammation in order to decrease CV risk.

Disclosure: I. A. M. van den Oever, BMS, 8; M. T. Nurmohamed, None.

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Prospective Follow-up of Tocilizumab Treatment in 764 Patients with Refractory Rheumatoid Arthritis: Tolerance and Efficacy Data From the French Registry Regate (REGistry – RoActEMra). Jacques Morel1, Marie-Odile Duzanski1,2, Thomas Bardin2, Alain C. Cantagrel1, Bernard Combe3, Maxime Dougdas4, Rene-Marc Filip5, Jacques-Eric Gottenberg6, Xavier Mariette7, Martin Soubrier2, Olivier Vittecoq2, Thierry Schaeverbeke8 and Jean Sibilia9, 1CHU Clermont-Ferrand, Clermont-Ferrand, France, 2CHU Hautepierre, Strasbourg, France, 3Centre Hospitalier Universitaire de Toulouse, Toulouse, France, 4Paris-Descartes University Hospital, APHP, Cochin Hospital, Paris, France, 5Hôpital R Salengro CHRU, Lille Cedex, France, 6Strasbourg University Hospital, Strasbourg, France, 7Université Paris-Sud, Le Kremlin Bicêtre, France, 8CHU CLERMONT-FERRAND, Clermont-Ferrand, France, 9Rouen University Hospital & Inserm905, University of Rouen, Rouen Cedex, France, 10CHU de la Cavale Blanche, Brest Cedex, France, 11Groupe Hospitalier Pellegrin, Bordeaux, France, 12CHU Hautepierre, Strasbourg, France

Background/Purpose: To assess tolerance and safety of rheumatoid arthritis (RA) treatment by tocilizumab (TCZ) in real life.

Methods: The French Society of Rheumatology and the Club Rheumatism and Inflammation set up the REGATE registry to prospectively collect, every 6 months for 5 years, data from 1500 patients treated with TCZ for refractory rheumatoid arthritis.

Results: From January 1st 2011 to April 2nd 2012, RA patients treated by TCZ initiated after January 1st 2010 have been prospectively included from 76 French centres in the REGATE registry. Among the 764 included patients (women: 80.1%, mean age 57.2±13.4 years, mean disease duration: 14.1 years (95.7), mean number of prior DMARD: 2.6 (±1.6), 76.3% RI-positive, 77.9% ACPA positive). 5.4% of patients had a history of cancer and 6.15% of severe infection, 19.1% of cardiovascular events and 24.2% of dyslipidemia before TCZ. 16.2% had not received any anti-TNF prior to TCZ and the mean number of biologics before TCZ was 2.1±1.5. The last biologic prescribed before initiation of TCZ was an anti-TNF for 39.1% of patients, rituximab for 17.7%, abatacept for 22.2% and others (kineret, ocrelizumab) for 1%. The median time between the last dose of the previous biologic and the first infusion of TCZ was 1.83 months (0–120).

Before TCZ, mean DAS28 was 5.18±1.3. 68.7% of the patients received corticosteroids with a mean dose of 12.93±41.4 mg/day. 38.3% of patients were treated with TCZ as monotherapy, and 61.7% with a concomitant DMARD mainly methotrexate (83%). After 1.3 years, the drug was stopped for 79 patients: 39 of them (51.9%) for non response and in 33 of them (44%) for safety reasons. 440 patients have already stopped the drug: 39 patients (51.9%) for non response and in 33 of them (44%) for safety reasons. 440 patients have already stopped the drug: 39 patients (51.9%) for non response and in 33 of them (44%) for safety reasons.

Conclusion: These first and preliminary results of the REGATE registry show that a high proportion of patients treated with TCZ was previously treated by anti-TNF (87%) even though it can be prescribed as a first line biologic. In addition, TCZ is not infrequently prescribed in previous treated by anti-TNF (87%) even though it can be prescribed as a first line biologic. In addition, TCZ is not infrequently prescribed in monotherapy in clinical practice (38%). Severe infections are in the higher range observed with biologics but deserve to be confirmed after longer exposure duration.

Disclosure: J. Morel, Roche CHUGAI, 5, Roche Pharmaceuticales, 2, Bristol-Myers Squibb, 5, UCB, 5, Pfizer Inc, 2, Pfizer Inc, 2, Abbott Laboratories, 5, Merck Pharmaceuticals, 5, Amgen, 5, M. O. Duzanski, None; T. Bardin, None; A. G. Cantagrel, Chugai, BMS, Roche, UCB, Pfizer, 5, UCB, Pfizer, 2, B. Combe, None; M. Dougdas, None; R. M. Filip, None; J. E. Gottenberg, None; X. Mariette, None; M. Soubrier, None; O. Vittecoq, None; A. Sarau, None; T. Schaeverbeke, None; J. Sibilia, None.
**Background/Purpose:** There is accumulating evidence that rheumatoid arthritis (RA) should be considered as prothrombotic state, explaining the increased risk of thromboembolic events. Suppressing inflammation could reduce this hypercoagulability. COBRA, the combination of step-down prednisolone, methotrexate and sulfasalazine (SSZ) is an effective ant thrombotic therapy. However, glucocorticoids have been identified as risk factor for the development of thromboembolism. In this study we evaluated the course of haemostatic markers in RA patients during strong anti-inflammatory therapy and the dose-dependent effect of prednisolone on coagulation and fibrinolysis.

**Methods:** 22 patients diagnosed with early RA, were randomised to either COBRA therapy or an attenuated form (COBRA-light) with halved initial prednisolone dose and no SSZ. At baseline and after 1, 4 and 26 weeks of treatment, 10 ml of citrated blood was collected for measurement of prothrombin time (PT), activated partial thromboplastin time (aPTT) and five haemostatic markers: prothrombin fragment 1+2 (F1+2), factor VIII (FVIII), von Willebrand factor (vWF), plasminogen activator inhibitor (PAI-1) and D-dimer. For statistical analyses t-tests and linear regression were used.

**Results:** Baseline characteristics were not significantly different between the 2 groups (each 11 patients). DAS44, CRP and ESR decreased significantly after 26 weeks (p<0.001). aPTT, D-dimer and F1+2 decreased during treatment in all patients (table). There was a significant positive association between decrease in CRP and BSE with D-dimer and decrease in CRP, BSE and DAS44 with F1+2 at all time points. There was no difference in the markers between the two groups, except for a stronger decrease in aPTT after 2 weeks (p=0.03) in the COBRA group. This difference was no longer seen at 4 weeks.

**Conclusion:** Overall, both COBRA and COBRA-light therapy induced an improvement of inflammatory and procoagulant factors in RA. Prednisolone could have attenuated this effect, since the coagulation factors FVIII, vWF increased during the first weeks, when doses of prednisolone were highest. However, there were no remarkable differences in the haemostatic markers between the two groups, indicating that doses higher than 30 mg of prednisolone have no attributable effect on the procoagulant state in RA.

**Disclosure:** I. A. M. van den Oever, None; D. F. J. Stuijiver, None; D. van den Uyl, None; B. J. F. van den Oever, None; M. M. ter Wee, None; W. F. Lems, None; D. van Schaardenburg, None; J. C. M. Meijers, None; V. E. A. Gerdes, None; M. T. Nurmoohamed, MBS, MSD, Roche, Abbott, Pfizer and UCB, 5, MBS, MSD, Roche, Abbott, Pfizer and UCB, 8.

| Table. Change in haemostatic factors in all 22 RA patients |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | baseline        | 2 weeks         | 4 weeks         | 26 weeks        |
| DAS44           | 3.9 (0.6)       | 1.6 (0.9)**     |                  |                 |
| ESR (mm/h)      | 23 (12-43)      | 4 (3-7)**       |                  |                 |
| CRP (mg/L)      | 15.0 (5.9-29)   | 2.5 (2.5-7.1)** | 2.5 (2.5-7.1)** | 2.5 (2.5-7.1)** |
| aPTT (sec)      | 29.9 (25.3-34.9)| 26.2 (21.5-31.4)** | 26.8 (25.5-29.9)** | 27.9 (26.6-30.4)** |
| PT (sec)        | 11.2 (0.4)      | 11.3 (0.5)      | 11.3 (0.5)      | 11.2 (0.5)      |
| FVIII (%)       | 142 (105-179)   | 152 (123-193)   | 127 (111-170)   |                  |
| D-dimer (FUE/L) | 1.18 (0.63-3.34)| 0.55 (0.29-2.6)** | 0.49 (0.26-8.4)** | 0.25 (0.21-0.79)** |
| CRP (mg/L)      | 13.0 (5.5-29.5) | 2.5 (2.5-7.1)** | 2.5 (2.5-7.1)** | 2.5 (2.5-7.1)** |
| vWF (%)         | 115 (87-149)    | 138 (94-189)*   | 101 (86-143)    |                  |

Values are mean (SD) or median (IQR) *p<0.05 and **p<0.001 change compared to baseline.
Methods: We retrospectively reviewed medical records of 144 RA patients who had been treated with combination of fixed dose of MTX and 20mg of LEF, and who had been followed up with regular laboratory evaluation for longer than 6 months. We evaluated the incidence of hepatitis (serum aminotransferases greater than two times the upper limit of normal) and/or neutropenia (absolute neutrophil count < 1500/μL) according to the treatment duration.

Results: Mean age of patients was 55.3 ± 9.6 (range, 34–77; male: female, 27:117). Mean duration of combination therapy of MTX and LEF was 17.8 ± 13 months (range, 1.6–59.5 months; median 14 months). Mean doses of MTX was 9.8 ± 1.5 mg per week (range, 7.5–15 mg/week). The overall incidence of hepatotoxicity was 19% (20/144). Of 144 patients, 14 (10%), 8 (6%), and 2 (1%) delayed onset of hepatotoxicity after 6, 12, and 24 months, respectively. Among patients with delayed onset of hepatotoxicity after 6 months, the mean duration of combination treatment was 14.5 ± 6.3 months (range, 8.3–26.0 months), and calculated cumulative doses of MTX and LEF, 628.7 ± 307.1 mg and 8.7 ± 6.0 g, respectively. The overall incidence of neutropenia was 6% (8/144). Of 144 patients, 7 (5%), 4 (3%), and 1 (1%) had delayed onset of neutropenia after 6, 12, and 24 months, respectively. Among patients with delayed onset of neutropenia after 6 months, mean duration of combination treatment was 18.0 ± 16.0 months (range, 6–52 months), and calculated cumulative doses of MTX and LEF, 774.0 ± 691.3 mg and 14.0 ± 10.9 g, respectively.

Conclusion: This study suggested that delayed onset of hepatotoxicity and/or neutropenia in patients with combination therapy of MTX and LEF was relatively common during 6–12 months of treatment. In addition, regular monitoring for such adverse events should be required for cumulative toxicity of long-term combination therapy.

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Meta-analysis of 5-Aminomimidazole-4-Carboxamido Ribonucleotide Transformylase (ATIC) 347C>G Polymorphism Affecting Methotrexate Efficacy and Toxicity in Rheumatoid Arthritis Patients. Fardina Malik1 and Prabha Ranganathan1. 1Alton Memorial Hospital, Alton, IL, 2Washington Univ School of Med, St. Louis, MO

Background/Purpose: Methotrexate (MTX) exerts its effect in part by inhibiting 5-aminomimidazole-4-carboxamido ribonucleotide transformylase (ATIC), a key enzyme in the purine biosynthetic pathway. Published data suggests an association between a non-synonymous single nucleotide polymorphism (SNP) in the ATIC gene (347C>G, Thr116Ser) with MTX efficacy and toxicity in patients with rheumatoid arthritis (RA); however this association has been inconsistent. The aim of this study was to investigate the association has been inconsistent. The aim of this study was to investigate the association of the ATIC 347C>G polymorphism in relation to MTX efficacy and toxicity in patients with RA by performing a meta-analysis.

Methods: Studies examining the association of the ATIC 347C>G polymorphism with MTX efficacy and toxicity in RA patients were systematically identified from the PubMed and Ovid Medline databases (from 1990 to May 31st 2012). Studies reporting genotypic or allelic distribution of ATIC 347C>G polymorphism in relation to MTX efficacy and/or toxicity were deemed eligible for the current analysis. Meta-analyses for both MTX efficacy and toxicity were separately performed to explore the composite effect of the ATIC 347C>G SNP on MTX efficacy and toxicity in patients with RA by performing a meta-analysis.

Results: Five studies with sufficient data were included in the meta-analysis of the ATIC 347C>G SNP’s association with MTX efficacy which represented 1100 RA patients. The meta-analysis did not demonstrate a significant association between the ATIC 347C>G polymorphism and MTX efficacy (Figure 1A). The pooled odds ratio (OR) using the fixed effects model was 1.194 (95% CI 0.915, 1.559; p = 0.193) with a trend towards between-study heterogeneity (p = 0.091) and using the random effects model was 1.168 (95% CI 0.786, 1.736; p = 0.441). For the meta-analysis of the ATIC 347C>G SNP’s association with MTX toxicity, five studies with sufficient data were included which represented 1055 patients. Meta-analysis using the fixed effects model demonstrated a significant association of the ATIC 347C>G SNP with MTX toxicity with an OR of 0.686 (95% CI 0.515, 0.915; p = 0.010) with no evidence of between-study heterogeneity (p = 0.245) (Figure 1B).

Conclusion: Our meta-analysis suggests that the ATIC 347C>G polymorphism may be a predictor of MTX toxicity in patients with RA, with the C allele being protective and the G allele conferring a higher risk for toxicity.

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Safety of Abatacept in Rheumatoid Arthritis with Chronic Hepatitis B VIRUS Infection. Melissa Padovan1, Elisabetta Lanciano2, Oscar Epis3, Alessandro Mathieu1, Giulia Ezra2, Leopoldo Gianfrotta2, Sarah Giangiacomo1 and Marcello Govoni1. 1Section of Rheumatology, Ferrara, Italy, 2Rheumatology Unit, Bari, Italy, 3Rheumatology Unit, Milano, Italy, 4Rheumatology Unit, Cagliari, Italy, 5Medical Clinics, Monza, Italy, 6Unit of Internal Medicine, Legnano, Italy

Background/Purpose: In patients with rheumatoid arthritis (RA) concomitant hepatitis B (HBV) represents a therapeutic challenge limiting, DMARD treatment options (conventional and biologics, especially anti-TNFa and rituximab) are limited. About abatacept there are unclear and scant data confined to isolated medical records review and anecdotal case reports. This observational multicenter retrospective study was planned to verify safety of abatacept in this particular setting in a group of Italian patients.

Methods: Six rheumatologic centers in different geographical areas of Italy were invited to participate in the study and provided data from patients with RA and positive HBV serology treated with abatacept in recent years. HBV serological markers, RA clinical and laboratory data were assessed by retrieving information from clinical documentation (hospital records, patient folders and clinical charts) provided by each participating centre and stored in a dedicated database. Follow-up data at 3 months intervals, up to 24 months, were analysed. The dose of Abatacept was given according to the standard guidelines, every two weeks for the first month and then monthly.

Results: 33 patients were included, 5 male and 28 female, mean disease duration 12 ± 5 yrs and baseline active disease (average DAS28 = 5.56 ± 1.5). 22 patients (66.6%) were RF positive and 19 (57%) ACPA positive. Prior biologics were tried unsuccessfully in 15 (2 biologics) and 5 patients (3 biologics) before starting abatacept. In combination with abatacept patients received methotrexate (18), leflunomide (4), sulfasalazine or hydroxicloroquine (1), corticosteroid alone (8). At baseline 27 patients were categorized as inactive carrier (one of these was also anti-HCV positive) and 4 patients as occult carriers (anti-core positive) for HBV. Liver function tests were normal and HBV-DNA titer was low or undetectable in all patients. Seven patients received antiviral prophylaxis, 5 with lamivudina e 1 with adefovir first and then tenofovir. In the follow-up assessment data were available in 14 patients ongoing at 24 months (DAS28 = 3.990 ± 1.12) and in 5 patients ongoing at 24 months (DAS28 = 2.10 ± 1.6) break point of follow-up. No patients experienced reactivation of hepatitis B; liver function tests remained normal and serologic HBV status remained the same as at baseline. Discontinuation of therapy was due to inefficacy (13 primary, 12 secondary), patient’s decision (2), low compliance (1), lost to follow-up (1) and adverse events (4) none of them HBV related. The high rate of withdrawal can be justified by the particular characteristics of the included patients, being long-standing refractory RA with an high rate of previous treatment failure.
Conclusion: Our study—though not designed to test efficacy—shows encouraging data about safety of abatacept in patients with concomitant HBV positive serology also in patients without any antiviral prophylaxis. More prospective data are needed to confirm these preliminary results.

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Is the Impact of Methotrexate On Mortality in Rheumatoid Arthritis Independent of Its Effect On Disease Activity? Dietmar MJ Krause1, Bernadette Gabriel2, Gertraud Herborn3 and Rolf Rau3. 1Internistische und Rheumazentrum, Ratingen, Germany, 2Private Practice, Gladbeck, Germany, 3Evangelisches Fachkrankenhaus, Ratingen, Germany

Background/Purpose: Methotrexate (MTX) is the anchor drug in the treatment of rheumatoid arthritis (RA). MTX shows effects on disease activity, radiologic progression and mortality. These three effects are thought to be associated with each other. Therefore, MTX-treatment is often stopped in case of insufficient improvement of disease activity. However, this association is incompletely understood.

Methods: We analysed data of one of the earliest MTX-cohorts in Europe (Evangelisches Fachkrankenhaus Ratingen). From 1980 to 1987 all patients starting treatment with MTX (n=271) were enrolled in a prospective observational study. One year after baseline, response to MTX-treatment was determined (improvement or no improvement of at least 20%). Nearly all patients continued MTX-treatment independent of this response (due to lack of alternative treatments). In 1995 and 2003, the follow-up of 250 patients could be determined. Cox regression was applied to estimate risks for increased mortality.

Results: Ten years after baseline, 88 patients were deceased, 64% of the patients alive were still on MTX-treatment. 59 patients died in the following eight years. A Cox model with age, gender, response to MTX-treatment after one year, number of swollen joints ten years after baseline and continuation of MTX-treatment as covariates showed independent positive effects of MTX-treatment on mortality (hazard ratio (HR): 0.63; 95% confidence interval (CI): 0.33–0.98; p=0.017). 59 patients died in the following eight years. A Cox model with age, gender, response to MTX-treatment after one year, number of swollen joints ten years after baseline and continuation of MTX-treatment as covariates showed independent positive effects of MTX-treatment on mortality (hazard ratio (HR): 0.63; 95% confidence interval (CI): 0.33–0.98; p=0.017).

Conclusion: Methotrexate (MTX) is the anchor drug in the treatment of rheumatoid arthritis (RA). MTX shows effects on disease activity, radiologic progression and mortality. These three effects are thought to be associated with each other. Therefore, MTX-treatment is often stopped in case of insufficient improvement of disease activity. However, this association is incompletely understood.

Disclosure: D. M. Krause, None; B. Gabriel, None; G. Herborn, None; R. Rau, None.

Six Months of an Attenuated Cobra Regimen (‘COBRA-light’) Is Clinically Noninferior to the Original Cobra Regimen: An Open-Label Randomized Trial in Early Rheumatoid Arthritis. Debby den Uyl1, Marielke M. ter Wee1, Maarten Boers2, Alexandre Voskuyl3, P.J.S.M. Kerstens3, Mike T. Nurmohamed2, Hennie G. Raterman1, D. van Schaardenburg2, N. van Dillen2, B.A.C. Dijkmans1 and W.F. Lems3. 1VU University Medical Center, Amsterdam, Netherlands, 2Reade; Jan van Breenen Research Institute, Amsterdam, Netherlands, 3Jan van Bremen Research Institute | Reade | Jan van Bremen Research Institute, Amsterdam, Netherlands

Background/Purpose: Early, intensive treatment of rheumatoid arthritis (RA) with combination therapy (COBRA therapy) considerably lowers disease activity and suppresses radiologic progression. Although proven to be very effective, uptake of COBRA therapy among rheumatologists has been suboptimal, for reasons including fear of possible side-effects. A modified schedule of the COBRA therapy with a lower dose of prednisone (‘COBRA-light’), might be equally effective and lessen concerns about side-effects. The purpose of this study was to investigate whether COBRA-light therapy is non-inferior to COBRA-theraoy in patients with early, active RA. Trial duration: one year.

Methods: 164 patients with early, active RA were randomised to either COBRA therapy (MTX 7.5 mg/week, SSZ 2 g/day and prednisone 60 mg/d, tapered to 7.5 mg/day) (n=81) or COBRA-light therapy (MTX 25 mg/week and 30 mg prednisone, tapered to 7.5 mg/day) (n=83). Primary treatment goal was minimal disease activity, defined as DAS44 < 1.6. After 3 months treatment, MTX dose could be increased up to 25mg/week, when DAS44 remained above 1.6. A difference in change of DAS44 > 0.5 between the groups after 6 months was considered clinically relevant, and set as the boundary of non-inferiority. Patients, physicians and assessors were aware of treatment allocation as this trial is an open label trial.

Results: At baseline, patients had moderately active disease: COBRA, mean (SD) DAS44 4.13 (0.81); COBRA-light, 3.95 (0.90). Two patients (COBRA-light arm) did not initiate treatment and two patients dropped-out of the study due to adverse events (myocardial infarction in COBRA-arm and manic episode in COBRA-light arm). At 6 months DAS44 had significantly decreased in both groups: COBRA-, –2.50 (1.21); COBRA-light, –2.18 (1.10) (Table). The difference between the groups in DAS44 change was 0.32 (95% CI: –0.03;0.68; p=0.08), i.e. within the noninferiority boundary. Minimal disease activity (DAS28<1.6) was reached in almost half of patients in both groups (49% and 41% in COBRA and COBRA-light respectively). There were no significant differences between the treatment groups with respect to other measurements of disease activity including the EULAR and ACR response criteria and the HAQ-score.

Table 1. Outcome week 26

<table>
<thead>
<tr>
<th>COBRA (n=81)</th>
<th>COBRA-light (n=81)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ DAS44*</td>
<td>–2.50 (1.21)</td>
<td>0.05</td>
</tr>
<tr>
<td>Absolute DAS44</td>
<td>1.63 (0.96)</td>
<td>1.67 (1.14)</td>
</tr>
<tr>
<td>Minimal disease activity (DAS44&lt;1.6)</td>
<td>49%</td>
<td>41%</td>
</tr>
<tr>
<td>Δ HAQ</td>
<td>–0.8 (0.6)</td>
<td>0.08</td>
</tr>
<tr>
<td>Δ Tender joints</td>
<td>–14 (11)</td>
<td>–13 (11)</td>
</tr>
<tr>
<td>Δ Swollen joints</td>
<td>–11 (6)</td>
<td>–10 (6)</td>
</tr>
<tr>
<td>Δ ESR, mm/h</td>
<td>–21.5 (37; –8)</td>
<td>–13.5 (34; –4)</td>
</tr>
<tr>
<td>Δ CRP mg/l</td>
<td>–9.5 (25; –1)</td>
<td>–8.5 (29; –1)</td>
</tr>
<tr>
<td>Δ Patient’s global assessment disease activity (0–100%)</td>
<td>–34 (59; –7)</td>
<td>–41 (65; –7)</td>
</tr>
<tr>
<td>Δ Physician’s global assessment disease activity, (0–100%)</td>
<td>–36 (59; –9)</td>
<td>–31 (54; –10)</td>
</tr>
<tr>
<td>ACR 20 response</td>
<td>72%</td>
<td>72%</td>
</tr>
<tr>
<td>ACR 50 response</td>
<td>56%</td>
<td>62%</td>
</tr>
<tr>
<td>ACR 70 response</td>
<td>37%</td>
<td>49%</td>
</tr>
<tr>
<td>EULAR good response</td>
<td>75%</td>
<td>65%</td>
</tr>
<tr>
<td>EULAR non-response</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>ACR/EULAR remission (Boolean)</td>
<td>15%</td>
<td>24%</td>
</tr>
<tr>
<td>Intra-articular injections, n (%)</td>
<td>0%</td>
<td>4%</td>
</tr>
</tbody>
</table>

* Δ: delta, difference between 0 and 26 weeks

Conclusion: Results at 6 months suggest that COBRA-light therapy is non-inferior to standard COBRA therapy: both strategies effectively lower disease activity in early, active RA patients. The clinical and radiological effects at one year are pending.

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Improved Radiological Outcome of Rheumatoid Arthritis: Early Treatment with methotrexate might be a key Prognostic Factor. Christoph Fiehn1, Elisabeth Belke-Voss1, Dietmar Krause2, Siegfried Wassenberg2 and Rolf Rau1. 1ACURA Centre for Rheumatic Diseases, Baden-Baden, Germany, 2Dept. for Medical Informatics, Biometry and Epidemiology, Ruhr University, Bochum, Germany, 3Evangelisches Fachkrankenhaus Ratingen, Rheumazentrum, Ratingen, Germany, 4Düsseldorf, Germany

Background/Purpose: To compare the rate of radiological progression in patients with rheumatoid arthritis (RA) diagnosed in the 1980s with those of the late 1990s until 2005 and to evaluate key factors for differences in progression.

Methods: 92 RA patients which were firstly seen in our clinic from 1997 to 2005 and which baseline and at least one follow up radiograph of hands and feet were available were retrospectively identified. As a control group, 89 RA patients from 1986 to 1990 were matched for the criteria disease duration, age and number of x-ray controls. In both groups patients had a disease...
duration of less than 5 years at first consultation (mean: 22 ±17 months). Radiologic damage was measured by the Ratingen score (RS).

Results: The baseline RS was significantly lower in the 1997–2005 group compared to the 1986–1990 group (mean 3.8 ± 8.7 vs. 7.7 ± 13.0 respectively, p < 0.0001). This was also the case in the patients firstly seen before the approval of TNF-Inhibitors in 2000 (n = 29, mean baseline RS 1997–2000: 2.7 ± 4.9; p < 0.001 in comparison to 1986–1990). Moreover, the 1997–2005 group showed significantly less radiologic progression than the 1986–1990 group during follow-up (ΔRS/year of 0.95 ± 2.19 vs. 5.69 ± 8.43; p < 0.0001). In the later group more patients (73% vs. 28%; p = 0.0001) received methotrexate (MTX), mainly early in the course of the disease. In contrast, the overall rate of DMARD treatment was not significantly different in both groups. Twenty one (23%) of the patients in the later group received biologic drugs, in the majority TNF-Inhibitors. Multivariate analysis showed that early start of MTX (before or directly after first consultation) was a significant predictor of low radiographic progression (p < 0.005), as were low ESR at baseline and belonging to the later group. In contrast, neither treatment with glucocorticoids or biologic drugs nor the overall rate of MTX-use were predictive for a better outcome.

Conclusion: Radiologic damage is markedly diminished in RA patients seen since the late 1990s. Early treatment with MTX may be the key factor for this improved prognosis. However, due to the retrospective design of the study, a bias cannot be completely excluded.

Disclosure: C. Fiehn, None; E. Belke-Voss, None; D. Krause, None; S. Wassenberg, None; R. Rau, None.

631 Impact of Tumour Necrosis Factor Inhibitor Treatment On Hand Bone Loss in Rheumatoid Arthritis Patients Treated in Clinical Practice. Results From The Nationwide Danish Danbio Registry. Lykke Midtbøll Ørnberg1, Mikkel Østergaard2, Pernille Bøyesen1, Trine David Jensen1, Anja Thomsen1, Ulrik Tar1, Vibeke Stevensen Ringsdal3, Annette Schlemmer1, Niels Graudal1, Anne Rødgaard Andersen4, Jakob Espesen1, Gina Kollerup1, Torben Grube Christensen2, Randi Pelck1, Bente Glimborg1, Ole Rintek Madsen1, Dorte Venderlo Jensen1, Ole Majgaard4 and Merete L. Hetland2.

1 DANBIO, On behalf of Depts of Rheumatology, North, South, Central, Zealand and Capital Region, Copenhagen, Denmark, 2 Diakonhjemmet Hospital, Olso, Norway, 3 Dept. of Endocrinology, Hvidovre Hospital, Copenhagen, Denmark, 4 Copenhagen University Hospital, Glostrup Hospital, Copenhagen, Denmark

Background/Purpose: Rheumatoid arthritis (RA) is characterised by progressive joint destruction and periarticular bone loss. In RA patients with insufficient response to Disease-Modifying Anti-rheumatic drugs (DMARDs) treated in clinical practice tumour necrosis factor inhibitors (TNFi) retard the joint damage(1), but their impact on hand bone loss and predictors thereof are not known. The aim of this study was to compare hand bone changes during treatment with Disease-Modifying Anti-rheumatic drugs (DMARDs) and subsequent treatment with TNFi in RA patients in clinical practice, and investigate the association between radiographic progression and hand bone loss. Furthermore, to identify predictors of hand bone loss during TNFi treatment in clinical practice.

Methods: X-rays of hands were obtained 2 yrs before start of TNFi (prebaseline), at the start of TNFi (prebaseline) and 2 yrs after follow-up. Clinical data from the DANBIO registry and patient files were collected. Hand x-rays were scored blinded to chronology according to the Sharp/van der Heijde method. Hand bone mineral density (BMD) was estimated with Digital X-ray Densitometry (DXR), a computerised method to measure cortical bone thickness of the 2nd–4th metacarpal. Annual (absolute and relative) hand BMD loss and radiographic progression rates during DMARD and TNFi treatment were calculated. Potential predictive baseline variables were investigated with univariate regression and significant variables included in a multiple linear regression analysis with annual BMD loss during TNFi treatment as the dependent variable.

Results: 136 RA patients (85% women, 71% rheumatoid factor positive, age 55 (23–84) years (median (range)) had three x-rays suitable for DXR. Pre-baseline 28 joint disease activity score (DAS28) was 4.3 (1.6–6.9). At baseline DAS28 was 5.3 (4.9–8.2) and infliximab (36%), etanercept (13%), or adalimumab (34%) was started. At followup, 39% were on initial TNFi, 27% had switched to another TNFi and 14% had withdrawn. DAS28 was 3.1 (1.4–7.7). Data on BMD loss and radiographic progression are shown in Table 1. Patients with radiographic progression (change in Total Sharp Score >0) had higher BMD loss than patients without radiographic progression in both the DMARD (p = 0.94 mg/cm² (median) vs. 0.34, p = 0.004, Wilcoxon) and TNFi period (p = 0.74 vs. 0.34, p = 0.004, Wilcoxon). Independent predictors of BMD loss during the TNFi period were: higher age (0.2mg/cm²/year increase) and 28 swollen joint count (SJC) (–0.4mg/cm²/joint increase).

Disclosure: Y. Urata, None; Y. Nakamura, None; K. I. Furukawa, None.

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Conclusion: In 136 established RA patients TNFi treatment reduced BMD loss and radiographic progression. High age and SJC predicted BMD loss were moderately correlated.

References

1Ornbjerg L. Ann Rheum Dis Published Online First: 24 April 2012. doi: 10.1136/annrheumdis-2012–201319

Disclosure: L. M. Ornbjerg, MSD, 8; M. Østergaard, Abbott Laboratories, 2; Abbott Laboratories, 5; Abbott Laboratories, 8; Centocor, Inc., 5; Merck Pharmaceuticals, 5; Merck Pharmaceuticals, 8; Mundipharma, 8; Novo, 8; Pfizer Inc, 5; Pfizer Inc, 8, Roche Pharmaceuticals, 5, UCB, 5, UCB, 8; Roche Pharmaceuticals, 5; Roche Pharmaceuticals, 8, MSD, 8; W. Bohne, None; D. Dencker, None; H. M. Lindegaard, Roche, MSD, 8; U. E. Poulsen, None; A. Hansen, MSD, 5; V. S. Ringsdal, None; A. Schlemmer, MSD, 5; N. Graudal, None; A. R. Andersen, None; J. Espejesen, None; G. Kollerup, None; T. G. Christensen, None; R. Pelck, None; B. Glintborg, None; O. Ritik Madsen, Abbott Laboratories, 5; MSD, 5; Pfizer Inc, 5; BMS, 5; UCB, 5; Abbott Laboratories, 6, MSD, 6; Pfizer Inc, 6, BMS, 6, MSD, 8; D. V. Jensen, None; O. Maigaard, None; M. L. Heitland, Roche Pharmaceuticals, 5; Pfizer Inc, 8, MSD, 8; BMS, 8; Abbott Laboratories, 8, UCB, 8.

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Response to Etanercept, but Not Infliximab or Adalimumab, Is Inversely Associated with Body Mass Index

James R. Maxwell1, Darren Plant2, Anne Barton3, Kimme L. Hyrich3, Ann W. Morgan4, John Isaacs5 and Anthony G. Wilson6. 1University of Sheffield, Sheffield, United Kingdom, 2University of Manchester, Manchester, United Kingdom, 3Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester Academy of Health Sciences, Manchester, United Kingdom, 4NIHR-Leeds Musculoskeletal Biomedical Research Unit and Leeds Institute of Molecular Medicine, University of Leeds, Leeds, United Kingdom, 5Newcastle University, Newcastle upon Tyne, United Kingdom, 6Section of Musculoskeletal Sciences, University of Sheffield, Sheffield, United Kingdom

Background/ Purpose: Recent studies have demonstrated inverse association between BMI and radiographic severity in patients with Rheumatoid Arthritis (RA). There is also preliminary evidence that body mass index (BMI) may influence response to anti-TNF treatment. We hypothesized that BMI may affect response to the three most commonly used anti-TNF agents. The aim of this study was to determine if BMI is associated with response to individual anti-TNF agents in RA patients.

Methods: 2,160 patients were included, of whom 726 were treated with Infliximab, 737 Etanercept and 697 Adalimumab. Linear regression was used to investigate the influence of BMI, recorded at baseline on the change in DAS28 between baseline and 6 months of treatment, adjusted for gender, DMARD treatment, smoking, baseline DAS28 and HAQ score. Similar models were constructed to examine change in ESR and CRP. The proportion of patients achieving EULAR improvement criteria according to stratified BMI was compared using the Chi squared test. Analyses were performed separately according to individual anti-TNF agents.

Results: Mean disease duration was 13.7 years. BMI was not associated with change in DAS between baseline and 6 months and there was no statistical difference in the proportion of patients achieving EULAR response criteria according to BMI for any of the medications. For patients treated with Etanercept, but not Adalimumab or Infliximab, BMI was inversely associated with change in both ESR and CRP (p<0.003, and p<0.0001 respectively).

Conclusion: Change in inflammatory activity in response to Etanercept, but not Infliximab or Adalimumab, is inversely associated with BMI. Response to Infliximab has been reported to be reported to be inversely related to higher BMI in a study of 89 patients however our much larger study did not replicate this finding. Our data suggest that higher doses of Etanercept may be required in RA patient with high BMI. Studies are required to determine if lower doses of this agent could be used in patients with lower BMI.

Disclosure: J. R. Maxwell, None; D. Plant, None; A. Barton, None; K. L. Hyrich, None; A. W. Morgan, None; J. Isaacs, None; A. G. Wilson, None.

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Risk Factors for Radiographic Progression During TNF-Inhibitor Treatment in 932 Rheumatoid Arthritis Patients Treated in Clinical Practice: Results From the Nationwide Danish Danbio Registry

Lykke Midtbøll Ørnbjerg1, Mikkelse Østergaard1, PernilleBojesen2, ArnaThörnman3; Ulrik Tarp1, Wolfgang Bohme1, Ditte Dencker1, Hanne M. Lindegaard1, UllaEngling Poulsen1, Annette Hansen1, Vibeke Stevenus Ringsdal1, Annette Schlemmer1, Niels Graudal1, Anne Røgaard Andersen1, Jakob Espelesen1, Gina Kollerup1, Torben Grube Christensen1, Randi Pelck1, Bente Gilitborg1, Ole Rintek Madsen1, Dorte Vendelbo Jensen1; Ole Maigaard1 and Merete L. Heitland2. 1DANBIO, On behalf of Depts of Rheumatology, North, South, Central, Zealand and Capital Region, Copenhagen, Denmark, 2Diakonhjemmet Hospital, Oslo, Norway, 3Copenhagen University and Glostrup Hospital, Copenhagen, Denmark

Background/ Purpose: Despite treatment with tumour necrosis factor inhibitors (TNFi) some rheumatoid arthritis (RA) patients progress radiographically in randomised controlled trials and observational cohorts (1). Risk factors for radiographic progression during TNFi treatment in clinical practice have not been investigated. The aim of this study was to identify baseline risk factors for radiographic progression during 2 years follow-up of TNFi-inhibitor treated RA patients in clinical practice.

Methods: X-rays of hands and wrists obtained at the start of TNFi (baseline) and approximately 2 years after follow-up were collected from 16 Danish departments, and linked with clinical data from the DANBIO registry. X-rays were blinded to chronology and scored according to the Sharp/van der Heijde method. Potential predictive baseline variables (28-joint Disease Activity Score(DAS28), C-reactive protein(CRP), 28 Swollen Joint Count(SJC), 28 Tender Joint Count(TJC), Health Assessment Questionnaire-HAQ), Total Sharp Score (TSS), age, gender, IgM Rheumatoid Factor (IgM-RF), disease duration, number of previous Disease-Modifying Anti-Rheumatic Drugs (DMARDS), concomitant methotrexate (MTX), concomitant prednisolone, type of TNFi drug) were investigated with univariate regression and significant variables (p < 0.05) included in a logistic regression analysis with +/- radiographic progression (change in TSS = 0) as dependent variable.

Results: 932 patients (75% women, 79% IgM-RF positive, age 57(19–88) years (median(range)); disease duration 6(1–70) years), DAS28 5.4(4.6–6.1) (median(inter-quartile range(IQR)), TSS 30(38) (mean(SD)) 14(2–44)(median(IQR))) had available X-rays. At baseline 59% of patients started treatment with infliximab, 18% with etanercept and 23% with adalimumab. 15% of patients received TNFi monotherapy, 76% combination therapy with MTX and 9% with other DMARDS. At follow-up (median 526, IQR 392–735days), 59% were treated with the initial TNFi, 29% had switched to another TNFi and 12% had withdrawn from TNFi.

Yearly change in TSS was 0.6(2.4) units (median(SD)), 28 TSS 0.7(2.4)(median(IQR)) included in a logistic regression analysis with +/- radiographic progression (change in TSS = 0) as dependent variable.

Conclusion: Change in inflammatory activity in response to Etanercept, but not Infliximab or Adalimumab, is inversely associated with BMI. Response to Infliximab has been reported to be reported to be inversely related to higher BMI in a study of 89 patients however our much larger study did not replicate this finding. Our data suggest that higher doses of Etanercept may be required in RA patient with high BMI. Studies are required to determine if lower doses of this agent could be used in patients with lower BMI.

Disclosure: J. R. Maxwell, None; D. Plant, None; A. Barton, None; K. L. Hyrich, None; A. W. Morgan, None; J. Isaacs, None; A. G. Wilson, None.

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Background/Purpose: Clinical remission or low disease activity are the main goals of rheumatoid arthritis (RA) treatment and European League Against Rheumatism guidelines recommend switching treatment after 3–6 months in patients who do not achieve these targets. Despite this, in Europe the majority of patients have moderate disease activity and many of them remain on methotrexate (MTX) which may lead to disease progression and functional deterioration. Several risk matrix models have been already developed but always include a patient population with mostly severe RA and never in subjects with a stable moderate disease state. The objective of this study was to identify (a combination of) factors contributing to the risk of radiographic progression (RP) among moderate RA subjects despite MTX treatment.

Methods: Subjects from the MTX arm of the TEMPO trial1 with sustained moderate RA (defined as ≥3 ≤50 disease activity score in 28 joints ≥5.1 during the last 6 months of the first year) were analyzed for radiographic progression after 2 and 3 years. Univariate logistic regression was performed to identify baseline predictors of RP. Predictor variables with p < 0.10 were selected for stepwise multivariate analysis. Receiver-Operating Characteristic (ROC) analysis was used to evaluate the performance of the final model to predict disease progression; the area under the ROC curve (AUC) was calculated as a measure of accuracy.

Results: During the last 6 months of the first year, 96 subjects had moderate RA, out of 187 patients that started MTX. Of these subjects, RP (change from baseline predictors of mTSS change ≥3.0 after 2 and 3 years (p = 0.05 for both models, 0.73 for both models, indicating a fair test of prediction.

Table. Baseline predictors of mTSS change ≥3.0 in subjects with moderate RA

<table>
<thead>
<tr>
<th>Univariate analysis Baseline Characteristic</th>
<th>At 2 years Odds ratio (95% CI) p value</th>
<th>At 3 years Odds ratio (95% CI) p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESR (mm/hour)</td>
<td>1.03 (1.01, 1.04) 0.005</td>
<td>1.03 (1.01, 1.05) 0.002</td>
</tr>
<tr>
<td>RF positive, Yes/No</td>
<td>5.68 (1.56, 20.73) 0.009</td>
<td>4.78 (1.63, 13.96) 0.004</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>1.02 (1.01, 1.04) 0.013</td>
<td>1.03 (1.01, 1.04) 0.008</td>
</tr>
<tr>
<td>Age</td>
<td>0.98 (0.95, 1.02) 0.295</td>
<td>0.98 (0.94, 1.01) 0.141</td>
</tr>
<tr>
<td>Gender, Female/Male</td>
<td>0.58 (0.19, 1.78) 0.341</td>
<td>0.70 (0.24, 2.05) 0.516</td>
</tr>
<tr>
<td>Duration of disease, y</td>
<td>0.97 (0.88, 1.05) 0.427</td>
<td>0.95 (0.87, 1.03) 0.193</td>
</tr>
<tr>
<td>Total swollen joints</td>
<td>0.99 (0.94, 1.03) 0.539</td>
<td>1.01 (0.96, 1.05) 0.500</td>
</tr>
<tr>
<td>Erosion score</td>
<td>1.00 (0.99, 1.02) 0.717</td>
<td>1.01 (0.99, 1.02) 0.461</td>
</tr>
<tr>
<td>Total tender joints</td>
<td>1.00 (0.96, 1.03) 0.815</td>
<td>1.01 (0.98, 1.04) 0.648</td>
</tr>
<tr>
<td>mTSS</td>
<td>1.00 (0.99, 1.01) 0.818</td>
<td>1.00 (1.00, 1.01) 0.391</td>
</tr>
<tr>
<td>EROA</td>
<td>0.97 (0.57, 1.64) 0.981</td>
<td>0.99 (0.61, 1.62) 0.971</td>
</tr>
<tr>
<td>Multivariate analysis*</td>
<td>1.02 (1.00, 1.04) 0.039</td>
<td>1.02 (1.00, 1.04) 0.017</td>
</tr>
<tr>
<td>RF positive, Yes/No</td>
<td>3.89 (1.01, 14.96) 0.048</td>
<td>3.14 (1.00, 9.83) 0.049</td>
</tr>
</tbody>
</table>

Conclusions: Subjects with sustained moderate RA despite treatment with MTX are at risk of disease progression. Both ESR and RF positivity at baseline were strongly predictive of radiographic progression in these subjects.

References
RABBIT is supported by unconditional grants from Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

Disclosure: K. Gerhold, None; A. Richter, None; M. Schneider, None; H. J. Bergerhausen, None; W. Demary, None; A. Liefhaver, None; J. Listing, Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

A. Zink, Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

A. Strangfeld, Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

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Efficacy of Methotrexate (MTX) According to Anti-Citrullinated Protein Antibody (ACPA) Status in an Early Inflammatory Arthritis Cohort

Sarah C. Horton, David Pickles, Paul Emery, Maya H. Buch and Jane E. Freemston. University of Leeds, Leeds, United Kingdom

Background/Purpose: Data suggests patients with early, ACPA negative, rheumatoid arthritis (RA) and undifferentiated arthritis (UA) are less likely to achieve remission with MTX at 4 months in comparison to ACPA positive patients [1]. In patients with probable RA, MTX only delayed progression to RA in ACPA positive patients [2]. The objective was to determine whether response to MTX differs according to ACPA status in an early inflammatory arthritis cohort.

Methods: Patients with UA or RA (2010 ACR/EULAR criteria) initiated on MTX as first-line DMDAR up to December 2011 were identified from the Inflammatory Arthritis disease COnsortium (IACON) registry in Leeds. Outcome measures at 6 months were remission (DAS28-ESR<2.6) and EULAR response. Outcomes were analysed where complete response data-sets were available using last observations carried forward for patients who stopped MTX or escalated to combination DMDAR therapy prior to 6 months. Logistic regression was used to compare the rate of DAS28 remission and EULAR good response at 6 months, adjusting for DAS28 at baseline.

Results: Of 78 patients commencing MTX monotherapy, 51 of 53 ACPA positive and 14 of 25 ACPA negative patients fulfilled 2010 RA criteria. Radiographic erosions were present in 63/5 (24%) ACPA negative and 11/53 (21%) ACPA positive patients. Table 1 displays baseline characteristics according to 2010 RA criteria and ACPA status. Over 6 months methotrexate was continued as monotherapy in 49 patients: alternative DMDARs were added (n=25), cessation (n=1), enrolment in clinical trial (n=1), death (n=1) and loss to follow-up (n=2). Patients escalating to combination DMDAR therapy did so at a median time of 3 months on a median (IQR) weekly dose of MTX of 20 mg (20–25mg). This was similar to the weekly dose of MTX at 6 months in patients continuing monotherapy (median IQR 15 to 25).

Data were complete for analysis of response in 60 patients (Table 2). Rate of remission was higher in ACPA positive patients; odds ratio(OR) 8.9, 95% confidence interval (CI) 2.0 to 40. There was a trend towards a superior rate of EULAR good response in ACPA positive patients at 6 months (OR 2.1, 95% CI 0.6 to 7.7).

Table 1. Baseline Characteristics

<table>
<thead>
<tr>
<th>RA (2010 criteria)</th>
<th>UA</th>
<th>ACPA+</th>
<th>n=51</th>
<th>ACPA–</th>
<th>n=51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SEM)</td>
<td>53 (2)</td>
<td>60 (5)</td>
<td>59 (15)</td>
<td>44 (5)</td>
<td></td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>36 (71)</td>
<td>8 (57)</td>
<td>1 (50)</td>
<td>9 (62)</td>
<td></td>
</tr>
<tr>
<td>Shared epitope, n positive/n tested (%)</td>
<td>20 (22) (91)</td>
<td>4 (6) (67)</td>
<td>Not recorded</td>
<td>8 (9) (99)</td>
<td></td>
</tr>
<tr>
<td>RF positive, n (%)</td>
<td>44 (86)</td>
<td>5 (12)</td>
<td>1 (50)</td>
<td>1 (9)</td>
<td></td>
</tr>
<tr>
<td>Symptom duration, median (IQR), wks</td>
<td>33 (17–77)</td>
<td>32 (11–62)</td>
<td>6,77</td>
<td>28 (25–91)</td>
<td></td>
</tr>
<tr>
<td>Erosions, n (%)</td>
<td>11 (22)</td>
<td>6 (43)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Joint involvement (M=medium, L=large, S=small joints)</td>
<td>0</td>
<td>0</td>
<td>1 (50)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1 joint</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2–10 joints</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>&gt;10 joints</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Response at 6 months

<table>
<thead>
<tr>
<th>ACPA Status</th>
<th>DAS28 Remission Rate, baseline</th>
<th>6-month DAS28, median (IQR)</th>
<th>Response Rate, median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>95% CI 0.6 to 7.7</td>
<td>0.5 to 1.3</td>
<td>0.5 to 1.3</td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td>0.5 to 1.3</td>
<td>0.5 to 1.3</td>
</tr>
</tbody>
</table>

Conclusions: Patients treated with bDMARDs had a worse disease state due to disease activity and functional capacity at enrollment, compared to patients on sDMARDs, which reflects treatment choices in daily care. All bDMARDs improved patients HRQoL beyond control of disease activity and physical function. Benefit of treatment with bDMARDs was particularly noticeable in the mental health subscales of the SF-36.

Disclosure: K. Gerhold, None; A. Richter, None; M. Schneider, None; H. J. Bergerhausen, None; W. Demary, None; A. Liefhaver, None; J. Listing, Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

A. Zink, Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

A. Strangfeld, Abbott, Amgen/Biovitrum, Bristol Myers Squibb, MSD SHARP & DOHME, Pfizer, Roche, and UCB.

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Background/Purpose: Quality of life in rheumatoid arthritis (RA) patients can be improved by reducing the common symptom of fatigue caused by disease related factors such as pain and inflammation. Recent studies indicate that glucocorticoid treatment improves patient reported fatigue (Westoff et al., 2011). Chronotherapy with a modified (delayed) release prednisone tablet may also improve these symptoms. NP01 (Horizon Pharma, Deerfield IL) is a proprietary MR formulation of prednisone that results in a 4 hour delay in traditional pharmacokinetic parameters of prednisone. This formulation capitalizes on known cytokine and endogenous biologic rhythms. Here we report fatigue scores from the Circadian Administration of Prednisone in Rheumatoid Arthritis-2 (CAPRA-2) study which evaluated patients with active RA on stable disease-modifying antirheumatic drugs (DMARDs) given MR prednisone or placebo.

Methods: The study was a 12-week, double-blind, placebo-controlled study that randomized 350 RA patients to either 5 mg MR prednisone (n=231) or placebo (n=119) taken once daily at bedtime (eg, 10pm) in addition to their standard DMARD treatment (Buttgereit et al., 2012). The primary endpoint was the proportion of patients achieving ACR20 response after 12 weeks. A secondary objective was to compare treatment with 5 mg MR prednisone and placebo in the change from baseline on the Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F) questionnaire. This 13 item questionnaire assesses the effect of fatigue on daily activity and function on a 5-point scale. Differences greater than 1 suggest a clinically important difference [MCID]: 3–4; Cella et al, 2005). At Week 12, the LSM change from baseline was statistically significantly greater for 5 mg MR prednisone than for placebo (LSM difference=2.24 [95% CI: 0.76, 3.72], p-value=0.0032) (Table 1). Similar results occurred for observed case data. These findings were consistent with improvement in ACR20 score.

References


Conclusion: Rate of remission was higher in ACPA positive vs ACPA negative patients, and there was a trend towards superior rate of eular response. Escalation of therapy was comparable between the groups. This data suggests that seronegative patients may be less responsive to MTX and may require a different treatment regimen.
Table 1. FACIT-F Fatigue Score at Each Visit (mITT Population, BOCF)

<table>
<thead>
<tr>
<th>Visit</th>
<th>FACIT-F Fatigue Score</th>
<th>5 mg MR-Prevalence</th>
<th>Placebo</th>
<th>5 mg MR-Prevalence vs. Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>n 231</td>
<td>119</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>28.81 (10.443)</td>
<td>28.73 (10.725)</td>
<td></td>
</tr>
<tr>
<td>Week 12</td>
<td>n 231</td>
<td>119</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>32.54 (10.893)</td>
<td>30.23 (10.465)</td>
<td></td>
</tr>
<tr>
<td>Absolute Change from Baseline to Week 12</td>
<td>LSM</td>
<td>3.83 (1)</td>
<td>1.59 (1)</td>
<td></td>
</tr>
</tbody>
</table>

Note: LSMs are from an analysis of covariance (ANCOVA) model with baseline results, treatment, and geographic region as factors. Model effects were from the Type III estimates.

Conclusion: Patients treated with 5 mg MR prednisone had significant improvement in FACIT-F scores compared with placebo, indicating a reduction in fatigue and improvement in an important aspect of quality of life. Chiropraxis with a MR prednisone formulation improves ACR scores and provides a potential new treatment option for patients with RA that can also improve symptoms of fatigue.


Impact of Etanercept-Methotrexate Therapy On Patient-Reported Outcomes in Rheumatoid Arthritis Patients with up to 12 Months of Symptoms

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Table 1. Effects of ETN50/MTX on PROs in Early RA Patients in Period 1 of the PRIZE Study (N = 306)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline Mean (SD)</th>
<th>Final on Therapy Mean (SD)</th>
<th>Δ from Baseline Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAQ Disability Index</td>
<td>3.1 (0.7)</td>
<td>0.5 (0.6)</td>
<td>−0.8* (0.7)</td>
</tr>
<tr>
<td>EQ-SD Utility Score</td>
<td>0.5 (0.3)</td>
<td>0.8 (0.3)</td>
<td>0.3* (0.3)</td>
</tr>
<tr>
<td>EQ-SD VAS</td>
<td>50.9 (22.6)</td>
<td>77.2 (24.1)</td>
<td>27.4* (28.1)</td>
</tr>
<tr>
<td>SF-36 Physical Component Score</td>
<td>33.6 (6.0)</td>
<td>45.5 (6.7)</td>
<td>11.9* (9.6)</td>
</tr>
<tr>
<td>SF-36 Mental Component Score</td>
<td>42.9 (10.9)</td>
<td>50.6 (9.3)</td>
<td>7.7* (10.6)</td>
</tr>
<tr>
<td>FACT-Fatigue</td>
<td>29.1 (12.6)</td>
<td>39.9 (11.4)</td>
<td>10.9* (12.2)</td>
</tr>
<tr>
<td>RA-WIS</td>
<td>13.5 (6.1)</td>
<td>4.8 (6.5)</td>
<td>−8.9* (6.6)</td>
</tr>
<tr>
<td>WPAI:RA, % activity impairment due to RA</td>
<td>57.2 (24.3)</td>
<td>21.5 (25.5)</td>
<td>−36.4* (29.4)</td>
</tr>
</tbody>
</table>

Note: Final on therapy visit and Δ values are for observed cases.

Conclusion: Combination therapy with ETN50/MTX for 52 wks in patients with <12 mo of symptomatic, active RA resulted in significant, clinically important improvements in measures of physical function, including normal HAQ (66.6% of patients), HR-QoL, fatigue, and work productivity. These outcomes are consistent with those reported in prior studies in patients with more established disease.

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Background/Project: To prevent disease progression, treat-to-target recommendations for rheumatoid arthritis (RA) include the evaluation and adjustment of drug therapy at least every 3 months until a target level of remission or low disease activity is achieved. It is well established that anti-tumor necrosis factor (TNF) treatment modifies associations between disease activity and radiographic progression over periods of 1–2 years. We aimed to assess whether TNF inhibition modifies this association over the initial 3–6 months of treatment for early RA.

Methods: Methotrexate (MTX)-naive early RA patients randomized to double-blind treatment with adalimumab (ADA) + MTX combination therapy vs. MTX monotherapy were drawn from the Phase III PREMIER clinical trial. Associations between week 12 disease activity, assessed using DAS28-CRP4, and changes in modified total sharp score (mTSS) from baseline to week 26 were compared between the ADA+MTX and MTX arms using generalized additive regression. mTSS progression was modeled as an absolute score change and as a worsening of ≥5 units. Models were fit with and without adjustment for baseline mTSS, DAS28, numbers of tender and swollen joints, and RA duration, and Δ mTSS was compared between the ADA+MTX and MTX arms.

Results: A total of 219 MTX-treated patients and 241 ADA+MTX-treated patients were included in the investigation. The mean age was 52 years, 73% were female, and the average RA duration was 9 months. In the
Conclusion: Early RA patients achieving a given disease activity level by week 12 with ADA+MTX experience less radiographic progression by week 26 than those achieving the same disease activity level with MTX alone. This could reflect the slower onset of response to MTX and/or a separate structure-protective effect for anti-TNF treatment. These aspects should be considered when setting disease activity targets with the goal of limiting radiographic progression.

References


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Characteristic of the Japanese Patients with Rheumatoid Arthritis (RA) of Rapid Radiographic Progression (RRP) Treated with Synthetic Disease Modifying Anti-Rheumatic Drugs (DMARDs) in Daily Practice: A Large-Scale Prospective Longitudinal Cohort Study (the 1st report of Apple Survey). Akimoto Okada1, Atsushi Kawakami1, Takaaki Fukuda1, Toshihiko Hidaka1, Tomonori Ishii2, Yukitaka Ueki3, Takao Kodera6, Munetoshi Nakashima3, Yuichi Takahashi5, Seiyo Honda1, Yoshiro Horai5, Tomohiro Koga5, Ryu Watanabe4, Hiroshi Okuno4, and Katsumi Eguchi5.

Background/Purpose: Rapid radiographic progression (RRP) is a key indicator of poor prognosis in rheumatoid arthritis (RA) patients captured in daily practice. In 20 related-centers of the Nagasaki University and Tohoku University in Japan we are conducting a large-scale prospective study (Apple Survey) to investigate extent of radiographic progression. We have tried to assess the extent of rapid radiographic progression (RRP) in synthetic disease modifying anti-rheumatic drugs (DMARDs)-treated RA patients.

Methods: We have selected the RA patients treated not by biologic DMARDs but by synthetic DMARDs for 1 year. One hundred fifty-three out of the 964 patients registered between May 09 and March 12 had evaluable data at present. Patients gave their informed consent to be subjected to the protocol that was approved by the Institutional Review Board of Nagasaki University, Tohoku University and related centers. DAS28-ESR was assessed every 3 months. Radiographs of the hands and feet were taken every 6 months. The images were scored by trained readers through modified total Sharp score (mTSS). RRP was defined as yearly progression of mTSS >3.0. We have examined what variables are associated with the development of RRP at 1 year.

Results: Ten variables including gender, disease duration at baseline, age, CRP at baseline (mg/dl), presence of autoantibodies (RF or anti-CCP Abs), DAS28-ESR at baseline, time-integrated DAS28-ESR during 1 year, mTSS at baseline, HAQ at baseline and the use of MTX or non-MTX DMARDs were evaluated through univariate and logistic regression analysis to explore the development of RRP at 1 year. RRP was found in 17 out of 153 patients (11.1%). Logistic regression analysis has found that short disease duration (p = 0.0061), younger age (p = 0.038), high time-integrated DAS28-ESR (p = 0.015) and high mTSS at baseline (p = 0.035) are independent variables to predict the development of RRP. There were the trend of presence of autoantibodies (p = 0.074) and non-MTX DMARDs use (p = 0.054) toward RRP at 1 year.

Conclusion: Our results have revealed the characteristic of synthetic DMARDs-treated Japanese RA patients who develop RRP. The treat-to-target strategy is particularly recommended in these patients.

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Treat-to-Target Strategy Aiming At Achievement of Structural and Functional Remission in Patients with Active Elderly-Onset Rheumatoid Arthritis. Takahiko Sugihara1, Tatsuro Ishizaki2, Tadashi Hosoya3, Shoko Iga4, Waka Yokoyama5, Fumio Hirano6, Nobuyuki Miyasaka7 and Masayoshi Harigai8. 1. Tokyo Metropolitan Geriatric Hospital, Tokyo, Japan, 2. Tokyo Metropolitan Institute of Gerontology, Tokyo, Japan, 3. Tokyo Medical and Dental University, Tokyo, Japan

Background/Purpose: Treat-to-target is the consensus treatment strategy for patients with rheumatoid arthritis (RA), but supporting evidence for treatment-to-target strategy in elderly patients in clinical practice is insufficient. The objective of this study was to evaluate structural damage and physical disability of patients who developed RA at ≥60 y/o (elderly onset RA, EORA) and were treated aiming at low disease activity (LDA) in Choju registry of rheumatoid arthritis on non-biologic and biologic disease-modifying antirheumatic drugs (DMARDs) for elderly patients in Japan (CRANE), a prospective, monocentric registry.

Methods: Of 150 Japanese elderly (≥60 years) patients with RA enrolled in the CRANE, we identified 106 methotrexate-naïve EORA patients with moderate to severe disease activity (disease activity score 28 joints (DAS28) ≥3.2) and disease duration ≤3 years at the enrollment. We analyzed data from 84 patients who completed 12-month follow-up in this study. The treatment was adjusted every 3 months aiming at LDA (DAS28 <3.2). We started treatment with non-biologic DMARD monotherapy (methotrexate (MTX), tacrolimus, salazosulfapyridine, or bucillamine), followed by TNF inhibitors, then tocilizumab or abatacept. The co-primary outcomes were DAS28, ACR20, ACR50, ACR70, partial sharp score (TSS) and Health Assessment Questionnaire-Disability Index (HAQ-DI) at week52.

Results: Baseline characteristics of the 84 patients were as follows: mean age, 75.3 y/o; mean disease duration, 0.92 years; mean DAS 28, 6.33; mean HAQ, 1.23; anti-CCP antibody positive, 66.3%. Rates for comorbidity of the patients were 33.8% for chronic lung diseases, 12.8% for cardiovascular diseases and 0.15% for diabetes mellitus. At week 12, 77.6% and 14.1% of the patients were receiving MTX at 7.3 ±1.8 mg/week and tacrolimus, respectively. At weeks 24 and 52, 16.9% and 33.3% of the patients were treated with TNF inhibitors. LDA and functional remission (HAQ-DI ≤0.5) were
achieved in 29.1% and 42.6% of the patients at week 24, respectively, and in 45.9% and 58.1% at week 52, respectively. Structural remission (ΔTSS/year ≤ 0.5) were observed in 39.3% and rapid radiographic progression (RRA,TASS/year > 3) in 32.6% of the patients. Triple (clinical, structural and functional) remission at week 52 was observed in 8.3% of the patients. Mean DAS28 at weeks 0, 12 and 24 and mean HAQ-DI at week 52 was significantly higher in the patients with RRP compared to those without RRP. The multiple linear regression model involving the area under the curve (AUC) of DAS28 (accumulated DAS28) between week 0 and week 12, as well as age, sex, anti-CCP antibody status, HAQ-DI, and presence of bony erosions at week 0, predicted RRP at week 52 well with the C statistic of 0.897 for 0–6 months, and 0.834 for 0–12 months.

Conclusion: Achieving LDA, structural remission and functional remission in daily clinical practice using non-biologic and biologic DMARDs in EORA patients were realistic goals. Rapid achievement and sustained maintenance of clinical remission is indispensable to prevent RRP in the patients with EORA.

Disclosure: T. Sugihara, Takeda Pharmaceutical Co. Ltd, 2, T. Ishizaki, None; T. Hosoya, None; S. Iga, None; W. Yokoyama, None; F. Hirano, None; N. Miyasaka, None; M. Harigai, None.

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TRAF1/C5 Locus Is Associated with Response to Anti-Tumor Necrosis Factor Therapy in Patients with Rheumatoid Arthritis. Helena Canhão1, Ana M. Rodrigues2, Maria José Santos3, Diana Carmona-Fernandes4, Bruno Bruhat5, Fabiana Rocha5, Jose canas Silva5, Joaquin Portela Pereira5, Jose Alberto Pereira Silva5, Jose Antonio Costa6, Domingos Araujo6, Candida Silva6, Helena Santos11, Catia Duarte12, Fernando Pimentel-Santos5, Jaime C. Branco5, Robert M. Plenge5, Daniel H. Solomon6, Joao E. Fonseca7, and Elizabeth W. Karlson8. 1Instituto de Medicina Molecular, Lisbon, Portugal, 2Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal, 3Hospital Garcia de Orta, E.P.E., Almada, Portugal, 4Instituto Medicina Molecular, Lisboa, Portugal, 5Hospital de Santo Espirito da Ilha Terceira, Ilha Terceira, Portugal, 6B Brigham and Women’s Hospital, Boston, MA, 7Karolinska Institute, Stockholm, Sweden, 8University of Leeds, Leeds, United Kingdom.

Background/Purpose: We evaluated 383 RA patients for associations between RA risk alleles specifically selected for their relevance on RA biologic pathways and the response to anti-TNF treatment in a Southern European population using a nationwide register.

Methods: We evaluated 383 RA patients for associations between anti-TNF treatment response, assessed by an absolute change in DAS28 at six months as the primary outcome, and single nucleotide polymorphisms (SNP) from TRAF1/C5, TNFAIP3, REL, PADI4, PTPN22 and PTPRC loci and HLA-DRB1*04 high-resolution genotyping. We also studied the same association taking the proportion of EULAR good responders and non responders at six months as the outcome. Univariate and multivariate linear and logistic regression analyses were performed, adjusting for clinical variables known to influence treatment response.

Results: Our study sample included 383 Caucasian individuals with RA, 89.5% were women. 26% were seropositive. At six months, 119 (31.1%) patients were classified as good responders, 175 (45.7%) as moderate responders and 89 (23.2%) as non-responders according to the EULAR response criteria.

The minor allele (G), which is the risk allele for RA susceptibility, rs3761847 SNP in the TRAF1/C5 region was associated with a poor anti-TNF treatment response either in linear (coefficient = −0.24; 95% confidence interval (CI) = −0.43, −0.06; p-value 0.009) and in logistic univariate (odds ratio (OR) 0.61; CI 0.41, 0.92; p-value 0.018) and multivariate regression analyses. P-value of 0.009 for linear models either univariate and multivariate was very close to the level of significance set to 0.0083 after Bonferroni correction to multiple comparisons (Table 1).

Table 1. Association of the rs3761847 single nucleotide polymorphism of TRAF1/C5 locus with the response to anti-TNF treatment

<table>
<thead>
<tr>
<th>SNP</th>
<th>Change in DAS</th>
<th>Absolute change in DAS n=383</th>
<th>Logarithmic regression models</th>
<th>Absolute change in DAS n=383</th>
<th>EULAR good response vs non-respondent n=208 (good=119, non=89)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Linear regression models</td>
<td>Logistic regression models</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Univariate Multivariate</td>
<td>Univariate Multivariate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coef. −0.24</td>
<td>Coef. −0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rs3761847 G</td>
<td>1.95 (1.26)</td>
<td>1.82 (1.31)</td>
<td>CI −0.43, −0.06</td>
<td>CI −0.40, −0.06</td>
<td>P 0.009</td>
</tr>
<tr>
<td>rs3761847 G</td>
<td>1.38 (1.19)</td>
<td></td>
<td></td>
<td></td>
<td>P 0.009</td>
</tr>
</tbody>
</table>

No significant associations were observed between HLA-DRB1 or the other allele variants with the response to anti-TNF treatment.

Conclusion: The rs3761847 TRAF1/C5 RA risk locus influenced the anti-TNF treatment response in the Southern European population assessed in this study. Additional studies in other populations are necessary to confirm the relevance of this finding.

Disclosure: H. Canhão, None; A. M. Rodrigues, None; M. J. Santos, None; D. Carmona-Fernandes, None; B. Bruhat, None; R. M. Plenge, None; D. H. Solomon, None; J. E. Fonseca, None; E. W. Karlson, None.

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Patient-Reported Outcomes in Early Rheumatoid Arthritis Patients Failing to Achieve Stable Low Disease Activity: Comparing Addition of Adalimumab to Methotrexate Monotherapy with Maintenance On Adalimumab Plus Methotrexate. Arthur Kavanaugh1, Ronald F. van Vollenhoven2, Paul Emery2, James W. Shaw3, Mary A. Cifal4, Stefan Florentius5 and Jose S. Smolen6. 1UCSD School of Medicine, La Jolla, CA, 2Karolinska Institute, Stockholm, Sweden, 3University of Leeds, Leeds, United Kingdom, 4Abbott Laboratories, Abbott Park, IL, 5Abbott, Rungis, France, 6Medical University of Vienna and Hietzing Hospital, Vienna, Austria.

Background/Purpose: Treat-to-target guidelines for rheumatoid arthritis (RA) suggest adjusting therapy every 3–6 months for pts who fail to achieve a disease activity target. However, pts treated with adalimumab (ADA) plus methotrexate (MTX) can exhibit a delayed clinical response without radiographic damage. Data from the Optimal Protocol for Treatment Initiation with Adalimumab (OPTIMA) trial were used to evaluate differences in patient-reported outcomes (PROs) between pts maintained on ADA+MTX after failing to achieve a stable treatment target on that regimen compared to those treated with ADA+MTX after failing to respond to MTX monotherapy.

Methods: MTX-naive pts ≥18 years of age with RA <1 year and active disease were randomized to ADA+MTX (N=515) or placebo (PBO) plus MTX (N=517) for 26 wks (Period 1). Those who failed to achieve stable low disease activity (LDA) (DAS2832 <3.2 at wks 22 and 26) were offered open-label (OL) ADA+MTX for an additional 52 wks (Period 2). Pts completed the Work Productivity and Activity Impairment (WPAI) questionnaire, Health Assessment Questionnaire Disability Index (HAQ-DI), Functional Assessment of Chronic Illness Therapy Fatigue (FACT-F) subscale, Patient Acceptable Symptom State (PASS) classifier, and other PRO measures at wk 0 (baseline) and subsequent time points.

Results: At the end of Period 1, 259/466 (56%) ADA+MTX pts failed to achieve stable LDA (OL ADA carry-on arm) compared with 348/460 (76%) PBO+MTX pts (rescue ADA arm). Baseline characteristics for the OL ADA carry-on arm and rescue ADA arm were comparable, though pts in the former were less likely to be employed (46.8% vs. 55.7%, P=0.029) and were more fatigued (mean FACT-F score: 23.6 vs. 25.8, P=0.022) than pts in the latter. Between wks 0 and 26, pts in the OL ADA carry-on arm had significantly greater improvements in physical functioning (mean HAQ-DI score change: −0.7 vs. −0.6, P=0.001), activity impairment (mean WPAI activity impairment score change: −24.6% vs. −18.3%, P=0.002), and health satisfaction (change in percent in PASS: 39.6% vs. 27.2%, P<0.001) than pts in the rescue ADA arm. Compared with pts in the OL ADA carry-on arm, pts in the
rescue ADA arm experienced significantly greater improvements in most PROs throughout Period 2. However, differences between the groups in improvements at wk 78 relative to wk 0 were statistically non-significant.

Mean Changes in PROs Relative to Wk 0 (Differences in Mean Changes Relative to Wk 26)

<table>
<thead>
<tr>
<th>PRO</th>
<th>MCID</th>
<th>Treatment Arm Wk 26</th>
<th>Wk 52</th>
<th>Wk 78</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPAI [range: 0–100]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absenteeism</td>
<td>7</td>
<td>OL ADA carry on</td>
<td>–11.9</td>
<td>–16.7</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Rescue-ADA</td>
<td>–11.9</td>
<td>–19.2 (2.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA carry on 8.7</td>
<td>10.7</td>
<td>11.1</td>
</tr>
<tr>
<td>Productivity</td>
<td>7</td>
<td>OL ADA carry on</td>
<td>–17.9</td>
<td>–24.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>–17.9</td>
<td>–26.9 (4.0***)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA carry on</td>
<td>–18.3</td>
<td>–26.7</td>
</tr>
<tr>
<td>Overall work impairment</td>
<td>7</td>
<td>OL ADA carry on</td>
<td>–18.3</td>
<td>–33.4 (7.5***)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>–17.5</td>
<td>–32.1 (7.4***)</td>
</tr>
<tr>
<td>Activity impairment</td>
<td>7</td>
<td>OL ADA carry on</td>
<td>–18.3</td>
<td>–32.1 (7.4***)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>–17.5</td>
<td>–33.4 (7.5***)</td>
</tr>
<tr>
<td>WIS [range: 0–23]</td>
<td>NE</td>
<td>OL ADA carry on</td>
<td>–4.3</td>
<td>–5.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>–3.8</td>
<td>–7.0 (2.6***)</td>
</tr>
<tr>
<td>HAQ-DI [range: 0–3]</td>
<td>OL ADA carry on</td>
<td>0.22</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>0.6*</td>
<td>–0.9 (-0.2***)</td>
</tr>
<tr>
<td>FACIT-F [range: 0–52]</td>
<td>3–4</td>
<td>OL ADA carry on</td>
<td>8.7</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>7.8</td>
<td>10.9 (1.1)</td>
</tr>
<tr>
<td>PASS [range: 0–100]</td>
<td>NA</td>
<td>OL ADA carry on</td>
<td>39.8</td>
<td>48.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rescue-ADA</td>
<td>27.2*</td>
<td>40.2 (12.2***)</td>
</tr>
</tbody>
</table>

Notes: The FACIT-F and PASS were scored so that higher values indicated less fatigue and more satisfaction, respectively. Other outcomes were scored so that higher values indicated worse functioning or work productivity. Differences between groups in outcome trajectories were modeled using generalized estimating equations. Missing data were accounted for using multiple imputation. The MCID is the smallest change in measurement that signifies an important improvement or worsening.

Abbreviations: PRO, patient-reported outcome; MCID, minimum clinically important difference; OL, open label; ADA, adalimumab; WPAI, Work Productivity and Activity Impairment questionnaire; WIS, Work Instability Scale; HAQ-DI, Health Assessment Questionnaire Disability Index; FACIT-F, Functional Assessment of Chronic Illness Therapy Fatigue subscale; PASS, Patient Acceptable Symptom State; NE, not established; NA, not applicable. *P < 0.05; mean change relative to wk 0 different from OL ADA carry-on arm. **P < 0.01; mean change relative to wk 0 different from OL ADA carry-on arm.

Conclusion: The results of this study suggest that sustained treatment with ADA+MTX in the absence of an initial clinical response can yield substantial benefits beyond the inhibition of radiographic progression. In addition, for patients not achieving stable LDA with MTX alone, the introduction of ADA after six months of treatment allows for significant improvements in work productivity and other PROs.

Reference


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Prevalence of Biologic Utilization Over Calendar Time Among Medicare Beneficiaries with Rheumatoid Arthritis

Methods: Using data from the 100% sample of U.S. Medicare beneficiaries with RA (≥2 RA diagnoses from rheumatologist visit occurring between 7 and 365 days apart), we identified eligible RA patients with continuous Part A, B, and D coverage for each 3 months interval from July 1st, 2006 to December 31st, 2009; those who had at least one filled prescription or infusion during the 3 months were categorized as users. Among beneficiaries who initiated a biologic after at least 12 months without exposure to any biologic, we performed logistic regression to examine factors associated with the choice of an injection versus an infusion biologic, including demographics, concomitant glucocorticoids and non-biologic DMARDs, calendar year, physician preference, and receiving subsidy for Medicare part B premium from state of residence. Physician preference was measured by the percentage of patients treated with infusion biologics out of all patients treated with biologics in the preceding 6 months by each physician, grouped into quartiles.

Results: From 2006 to 2009, approximately 27% of all U.S. Medicare beneficiaries with RA treated by rheumatologists received biologics. The prevalence of infliximab use declined from 14.9% in the 3rd quarter of 2006 to 12.2% in the 4th quarter of 2009. In contrast, the prevalence of abatacept increased from 1.1% to 4.9% during this time. We did not observe an increase in the use of self-injectable biologics (Figure 1). After adjusting for covariates, we found that stronger physician preference for infusion biologic was associated with increased odds of infusion biologic use (odds ratio comparing highest quartile to the lowest quartile, 8.9; 95% CI, 8.0–10.0) and receiving subsidized Medicare coverage was associated with increased injection biologic use (odds ratio, 2.8; 95% CI, 2.6–3.9).

Figure 1. Prevalence of Biologics among Medicare Beneficiaries with Rheumatoid Arthritis

Conclusion: The prevalence of injection and infusion biologics remained stable from 2006 to 2009. The choice of infusion versus injection biologics appeared to be strongly driven by patients’ financial considerations and physicians’ preferences.

Disclosure: J. Zhang, None; F. Xie, None; E. S. DeZell, Amgen, 2; L. Chen, None; J. Lewis, Centocor, Inc., 2; Abbott Laboratories, Amgen, 5; K. Haynes, Astra Zeneca, BMS, 2; K. G. Saag, AHRQ, NHI/NIAMS, 2; Amgen;Abbott;Ardeaa: Lilly/Merck;Novartis/Regeneron/Savient, URL, 5; NOF, ACR, 6; J. Curtis, Roche/Genentech, UCB= Centocor, Corona,Angen, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech,UCB, Centocor, CORRONA, Amgen, Pfizer, BMS, Crescendo, Abbott, 5.

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Cell Phone Based Automated Monitoring of Patients with Early Rheumatoid Arthritis

Methods: Using data from the 100% sample of U.S. Medicare beneficiaries with RA (≥2 RA diagnoses from rheumatologist visit occurring between 7 and 365 days apart), we identified eligible RA patients with continuous Part A, B, and D coverage for each 3 months interval from July 1st, 2006 to December 31st, 2009; those who had at least one filled prescription or infusion during the 3 months were categorized as users. Among beneficiaries who initiated a biologic after at least 12 months without exposure to any biologic, we performed logistic regression to examine factors associated with the choice of an injection versus an infusion biologic, including demographics, concomitant glucocorticoids and non-biologic DMARDs, calendar year, physician preference, and receiving subsidy for Medicare part B premium from state of residence. Physician preference was measured by the percentage of patients treated with infusion biologics out of all patients treated with biologics in the preceding 6 months by each physician, grouped into quartiles.

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The patients’ answers are recorded in SandRA database and automatically analyzed. If an answer does not indicate problems, patient receives an automatic SMS response of the answer being recorded. If an answer indicates problems, i.e., patient has not used the treatment, has experienced adverse events, or RA has not improved at the pace defined, the patient receives an SMS: “Your nurse will call you within 2 working days”. At the same time, the nurse receives an e-mail about the patient’s problem. If the problem cannot be solved on the phone, the patient is advised to visit the clinic for treatment adjustment.

Results: We analyzed 137 consecutive patients registered in SandRA. The patients’ regular doctor appointments were scheduled at 3 and 6 months. The patients’ answers are recorded in SandRA database and automatically analyzed. If an answer does not indicate problems, patient receives an automatic SMS response of the answer being recorded. If an answer indicates problems, i.e., patient has not used the treatment, has experienced adverse events, or RA has not improved at the pace defined, the patient receives an SMS: “Your nurse will call you within 2 working days”. At the same time, the nurse receives an e-mail about the patient’s problem. If the problem cannot be solved on the phone, the patient is advised to visit the clinic for treatment adjustment.

Background/Purpose: Focus on early aggressive treatment in patients with rheumatoid arthritis (RA) has increased during the past decade. There is evidence for the efficacy of prednisolone as bridging therapy awaiting the therapeutic effect of DMARDs as well as evidence for a disease-modifying effect of glucocorticoids. Our objective was to investigate pattern in prednisolone use in RA patients in the past decade. Most patients achieved the treatment target, i.e., their PGAs were under the alarm line (panel A). SandRA picked out 34%, 31%, 29%, and 31% of the patients at 6, 10, 18, and 22 weeks for assessment before regular appointments (panel B).

Conclusion: A novel automated cell phone based monitoring system may provide a feasible method to achieve treatment target in patients with early RA.

Disclosure: K. Puodakka, None; T. Sokka, None; H. Kautiainen, None.

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Strategies for Use of Prednisolone in Rheumatoid Arthritis Have Changed Over the Past Decade: Data From the NOR-DMARD Register. Ann-Birgittte Aga, Elisabeth Lie, Till Uhlig, Tore K. Kvien and Espen A. Haavardsholm, Diakonhjemmet Hospital, Oslo, Norway

Results:

Proportion of patients on prednisolone [% (n)]

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>MTX mono (n=1866)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline [% (n)]</td>
<td>49.0 (722)</td>
<td>44.7 (207)</td>
<td>45.9 (161)</td>
<td>62.3 (225)</td>
</tr>
<tr>
<td>6 month [% (n)]</td>
<td>32.5 (114)</td>
<td>29.4 (136)</td>
<td>30.2 (119)</td>
<td>35.2 (126)</td>
</tr>
<tr>
<td>MTX+n (n=707)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline [% (n)]</td>
<td>56.5 (48)</td>
<td>51.1 (48)</td>
<td>48.3 (49)</td>
<td>49.4 (79)</td>
</tr>
<tr>
<td>6 month [% (n)]</td>
<td>35.3 (30)</td>
<td>26.1 (48)</td>
<td>28.4 (40)</td>
<td>28.8 (46)</td>
</tr>
</tbody>
</table>

MTX mono vs. MTX+n from diagnosis: 9.1 (9.3) years. In patients starting MTX mono the proportion of patients using prednisolone at baseline increased over the years, while the proportion still using prednisolone at 6 months decreased (table). The differences between the first and the last period were statistically significant, but the effect of time was not linear. The TNFi+MTX group the proportion of patients using prednisolone at baseline was stable during the decade, but the proportion at 6 months was significantly lower in the last vs. the first time period. The mean doses of prednisolone were stable throughout the decade in both groups. Proportions of patients reaching 6-month DAS28 remission increased gradually over the years in both groups (table).

Conclusion: A higher proportion of RA patients used prednisolone when starting MTX in the recent years, and an increasing proportion of patients tapered and discontinued prednisolone. The observed increases in DAS28 remission rates likely reflects the implementation of modern DMARD treatment strategies including treatment earlier in the disease course and at lower levels of disease activity, but the changes in the use of prednisolone may be a contributing factor.

Disclosure: A. B. Aga, None; E. Lie, Roche Pharmaceuticals, 5, Pfizer Inc, 8; T. Uhlig, None; T. K. Kvien, Abbott Immunology Pharmaceuticals, 8, AstraZeneca, 8, Merck Pharmaceuticals, 8, NiCoX, S.A., 8, Pfizer Inc, 8, Roche Pharmaceuticals, 8, UCB, 8, BMS, 5, Abbott Immunology Pharmaceuticals, 5, Merck Pharmaceuticals, 5, NiCoX, S.A., 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5, UCB, 5; E. A. Haavardsholm, None.

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Use and Long Term Use of Complementary and Alternative Medicine in Rheumatoid Arthritis Patients. Peri H. Pepmueller1, Ramzy Jandali1, Anu Sharma2, Shannon Grant3 and Katherine C. Saunders4. 1Saint Louis University, MO, 2Center for Rheumatic Diseases, Bethesda, MD, 3Axio Research LLC, Seattle, WA, 4CORRONA, Inc., Southborough, MA

Background/Purpose: Studies have identified widespread use of complementary and alternative medicine (CAM), particularly in patients with rheumatic disease. Most have reported results over short time frames, i.e. “used in last year” or “ever use”; few have evaluated long-term (LT) use of CAM. In addition, studies have often looked at all patients in a rheumatology clinic rather than those with rheumatoid arthritis (RA) only. The purpose of this study was to quantify the frequency of ever and LT use of CAM in patients with RA and to identify characteristics associated with ever and LT CAM use.

Methods: Data from RA patients participating in the Consortium of Rheumatology Researchers of North America (CORRONA) registry, an independent prospective observational cohort with >30,000 RA patients enrolled from over 100 academic and private practices across the US, were examined. Patients provided data regarding the use of glucosamine/chondroitin, fish oil, borage seed oil, evening primrose oil, and flax seed oil at clinic visits. Other CAM use such as acupuncture, massage, or yoga was not collected. Patients with at least two years of follow-up and at least three visits were included in the analysis. Primary outcome was any CAM use within 2 years of first visit. LT use was defined as use of the same CAM at 2 consecutive visits or all visits in one year. Logistic regression was used to calculate odds ratios (ORs) of CAM use (ever or LT) by patient demographic, disease characteristics, and medication history.

Results: 11,970 patients were included in the analysis; 35.2% reported any CAM use, but only 10.8% reported LT use (p<0.0001). Fish oil was the most common CAM reported (27.3%). Without adjusting for other factors, patient demographics, medication history, and lower disease activity [Disease Activity Score (DAS28), tender/swollen joint count, modified Health Assessment Questionnaire (mHAQ), Clinical Disease Activity Index (CDAI), physician/patient assessments] were associated with ever and LT CAM use (Table 1). Separate multivariate models for ever and LT CAM use had the listed predictors in common (Table 1).
receiving a TNF as monotherapy (i.e. never received nbDMARD during prior biologic use. Patients were followed from aTNF initiation until discontinuation of a TNF or plan enrollment. The proportion of patients receiving a TNF as monotherapy (i.e. never received nbDMARD during aTNF follow-up) was determined; nbDMARDs included methotrexate (MTX), leflunomide, sulfasalazine, hydroxychloroquine, cyclophosphamide, gold salts, azathioprine, cyclosporine, and d-penicillamine. In patients receiving combination therapy (i.e. received nbDMARD at any time during aTNF follow-up), adherence to nbDMARDs was defined as the percent of days that patients received any nbDMARD while they were receiving the aTNF agent. Thus, 100% adherence indicates that the patient was on some nbDMARD 100% of the time during their aTNF follow-up based on filled prescriptions. Adherence with MTX was also assessed separately.

Results: Of 7,074 biologic-naive RA patients initiating an aTNF, 27% received it as monotherapy and 73% in combination with nbDMARDs. Of 2,690 aTNF patients previously exposed to biologics, 31% received monotherapy and 69% in combination with nbDMARDs. Only 42% of patients receiving aTNF monotherapy vs. 89% of combination therapy patients had filled a nbDMARD prescription during the 6 months prior to initiating the aTNF agent. Among biologic-naive patients who received combination therapy, patients 52% of patients adhered with nbDMARD therapy less than 80% of the time while receiving aTNFs; 32% of the patients had less than 60% adherence. Of biologic-naive patients who received aTNF combination therapy with methotrexate, 56% had less than 80% adherence with MTX and 35% had less than 60% adherence with MTX while receiving an aTNF. Results were similar for aTNF patients previously exposed to biologics. Adherence calculated here based on claims data may be an overestimate because we do not know if patients consumed the filled prescriptions.

Conclusion: This study found that up to 31% of patients receiving an aTNF agent for RA in the real-world received it as monotherapy, and a substantial proportion of those receiving combination therapy had less than 60% adherence with nbDMARDs. Some of these patients may have sub-optimal outcomes, as suggested by evidence that RA patients receiving aTNFs in combination with nbDMARDs have better response.

Disclosure: N. M. Engel-Nitz, None; S. Ogale, Genentech Inc., 3; M. Kulakodlu, None.

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Persistency and Predictors of Persistency of Adalimumab Among Rheumatoid Arthritis (RA) Patients in a US Registry. Allan Gibofsky1, Katherin C. Saunders2, Arijit Ganguli3, Mary Cifaldi4, Shannon Grant4, Jerry Clewell5, Nefluor Mozaffarian5, James Shaw5, Reva McCaskill5, George W. Reed6 and Jeffrey D. Greenberg6. 1Hospital for Special Surgery, New York, NY, 2CORRONA, Inc., Southborough, MA, 3Abbott Laboratories, Abbott Park, IL, 4Axio Research LLC, Seattle, WA, 5Abbott Park, IL, 6University of Massachusetts Medical School, Worcester, MA, 7NYU Hospital for Joint Diseases, New York, NY

Background/Purpose: There are limited observational data to guide physician decision-making when choosing to begin a patient on a new biologic treatment. Understanding real-world trends in persistency on therapy and factors related to persistency would aid in this process. We sought to identify predictors of persistency on adalimumab (time to discontinuation and change in treatment) in a large US registry of RA patients.

Methods: The CORRONA registry is a large, multicenter, longitudinal database of RA patients enrolled from > 90 academic and private practices across the USA. RA patients enrolled in CORRONA between March 2002 and September 2011 who initiated adalimumab and had at least one follow-up visit post-initiation were included in this analysis. Discontinuation of adalimumab and treatment change were modeled separately. Discontinuation was defined as stoppage of adalimumab for any duration, while treatment change included discontinuation of adalimumab, change in adalimumab dose/frequency, or adding/discontinuing a DMARD. Kaplan-Meier curves were used to estimate persistency quartiles. Associations between patient characteristics and persistency were estimated using univariate and multivariate proportional hazards (PH) regression models.

Results: 1639 patients initiated adalimumab and had at least one follow-up visit, 1603/1639 patients discontinued adalimumab, with a Kaplan-Meier estimate of median days to discontinuation of 632 (95% CI: 564.5–717). A multivariable model showed risk of discontinuation was associated with prior use of another biologic, number of swollen joints, duration of RA and prednisone use at initiation (Table 1). 1358/1639 patients experienced some treatment change. Median days to treatment change was 276 (95% CI: 258–298). Likelihood of treatment change increased with prior use of biologics, number of swollen joints and prednisone use at initiation; it defined as stoppage of adalimumab for any duration, while treatment change included discontinuation of adalimumab, change in adalimumab dose/frequency, or adding/discontinuing a DMARD. Kaplan-Meier curves were used to estimate persistency quartiles. Associations between patient characteristics and persistency were estimated using univariate and multivariate proportional hazards (PH) regression models.

Table 1. Patient characteristics at first visit associated CAM use

<table>
<thead>
<tr>
<th>Table 1. Patient characteristics at first visit associated CAM use</th>
<th>OR No Adjustment</th>
<th>OR (95% CI)</th>
<th>With Adjustment (^\dagger)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>Ever CAM</td>
<td>LT CAM</td>
<td>Ever CAM</td>
</tr>
<tr>
<td>Older age</td>
<td>1.005</td>
<td>1.006*</td>
<td>N</td>
</tr>
<tr>
<td>White</td>
<td>1.160</td>
<td>1.152 &amp; 1.25 (1.09 – 1.45)*</td>
<td>N</td>
</tr>
<tr>
<td>Current smoker</td>
<td>0.61*</td>
<td>0.556 * 0.70 (0.62 – 0.79)*</td>
<td>0.71 (0.57 – 0.87)*</td>
</tr>
<tr>
<td>Education: high school or less vs any college</td>
<td>0.64*</td>
<td>0.523 * 0.69 (0.63 – 0.75)*</td>
<td>0.58 (0.31 – 0.67)*</td>
</tr>
<tr>
<td>Married – vs windowed</td>
<td>0.732</td>
<td>0.651* 0.72 (0.62 – 0.83)*</td>
<td>0.66 (0.52 – 0.84)*</td>
</tr>
<tr>
<td>Region – Western vs Midwest</td>
<td>1.96*</td>
<td>2.269* 1.49 (1.29 – 1.72)*</td>
<td>1.67 (1.36 – 2.03)*</td>
</tr>
<tr>
<td>Northeast vs Midwest</td>
<td>0.817*</td>
<td>0.847* 0.83 (0.74–0.93)*</td>
<td>0.83 (0.71–1.02)*</td>
</tr>
<tr>
<td>South vs Midwest</td>
<td>1.12*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time work vs full-time</td>
<td>1.159</td>
<td>1.244* 1.17 (1.02 – 1.35)*</td>
<td>1.33 (1.08 – 1.64)*</td>
</tr>
<tr>
<td>More frequent visits (8+ vs 5 visits)</td>
<td>1.542*</td>
<td>2.024* 1.83 (1.53 – 2.19)*</td>
<td>2.63 (1.98 – 3.50)*</td>
</tr>
<tr>
<td>First visit in 2006 or later</td>
<td>2.014*</td>
<td>2.450* 1.83 (1.67 – 2.00)*</td>
<td>2.21 (1.90 – 2.56)*</td>
</tr>
<tr>
<td>Disease characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of RA (years)</td>
<td>0.995*</td>
<td>0.994*</td>
<td>N</td>
</tr>
<tr>
<td>Older at RA onset (yes/years)</td>
<td>1.007*</td>
<td>1.008* 1.01 (1.01 – 1.02)*</td>
<td>1.01 (1.01 – 1.02)*</td>
</tr>
<tr>
<td>Deformities present</td>
<td>0.900</td>
<td>0.903</td>
<td>N</td>
</tr>
<tr>
<td>Disease activity</td>
<td>1.22 (1.06 – 1.41)*</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>DAS 28</td>
<td>0.932*</td>
<td>0.873*</td>
<td>N</td>
</tr>
<tr>
<td>CDAI</td>
<td>0.948</td>
<td>0.990*</td>
<td>N</td>
</tr>
<tr>
<td>Number of swollen joints</td>
<td>0.990</td>
<td>0.992*</td>
<td>N</td>
</tr>
<tr>
<td>Number of tender joints</td>
<td>0.995</td>
<td>0.981*</td>
<td>N</td>
</tr>
<tr>
<td>mHAQ</td>
<td>0.898*</td>
<td>0.784*</td>
<td>N</td>
</tr>
<tr>
<td>Physician assessed disease activity (scale 1–100)</td>
<td>0.997*</td>
<td>0.994*</td>
<td>N</td>
</tr>
<tr>
<td>Patient assessed disease activity (scale 0–100)</td>
<td>0.997*</td>
<td>0.994*</td>
<td>N</td>
</tr>
<tr>
<td>Medical History</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSAID use</td>
<td>1.274*</td>
<td>1.418* 1.31 (1.20 – 1.43)*</td>
<td>1.49 (1.29 – 1.72)*</td>
</tr>
<tr>
<td>Exposure to 3+ DMARDs vs 0</td>
<td>1.293*</td>
<td>1.531 1.30 (1.13 – 1.49)*</td>
<td>N</td>
</tr>
<tr>
<td>Patient report anxiety/ depression</td>
<td>1.188*</td>
<td>1.101 1.19 (1.09 – 1.31)*</td>
<td>N</td>
</tr>
</tbody>
</table>

\(^\dagger\)Multivariate models built separately for ever and LT CAM using stepwise logistic regression.

\(^\ddagger\)p <0.0001, \#p <0.05

N = not included in model

Conclusion: The results show significant differences in patient characteristics between CAM users and non-users, but clinical characteristics are similar suggesting that patient characteristics rather than disease severity are the driving force behind CAM use. CAM use with first visits after 2006 suggests that CAM use is increasing. Although “ever use” of CAM was 35.2%, the LT use was significantly lower, 10.8%, implying that patients may try complementary therapy, but few continue.

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S165
TJC, SJC, swollen joint count

*time varying association. HR estimates initial risk association; association decreases over time.
+time varying association. HR estimates initial risk association; association increases over time.

Conclusion: In the CORRONA registry, persistence on adalimumab was inversely correlated with factors suggestive of high disease severity. Patients using concurrent MTX with adalimumab at initiation were less likely to experience a change in their treatment compared to non-MTX users.

Disclosure: A. Gibofsky, Abbott Laboratories, 1, Amgen, 1, Bristol-Myers Squibb, 1, GliaxSmithKline, 1, Johnson & Johnson, 1, Pfizer Inc, 1, Abbott Laboratories, 5, Amgen, 5, Genentech/Roche, 5, Pfizer Inc, 5, Abbott Laboratories, 8, Amgen, 8, Genentech/Roche, 8, Pfizer Inc, 8; K. C. Saunders, Corrona, 3; G. Reed, Corrona, 3; A. Ganguli, Corrona, 1, Amgen, 1, BMS, 1, Genentech/Roche, 1, Pfizer, 1; J. M. Kremer, Corrona, 1, Genentech, 1, Pfizer, 1, UCB, 1, Janssen, 1, AbbVie, 1, BMS, 1, Genentech, 1, Pfizer, 1, UCB, 1, Janssen, 1, Abbott Laboratories, 1; A. M. Berg, Abbott Laboratories, 1; K. M. Haraoui, Abbott Laboratories, 1; J. Clewell, Abbott Laboratories, 1; A. G. Dooten, Abbott Laboratories, 1, Abbott Laboratories, 1; M. Cifaldi, Abbott Laboratories, 1; A. Doria, Abbott Laboratories, 1; S. Grant, Axxo Research, LLC, 1; C. Burns, Abbott Laboratories, 1; N. Mozaffarian, Abbott Laboratories, 1, Abbott Laboratories, 1; J. Shaw, Abbott Laboratories, 1, Abbott Laboratories, 1; R. McCaskill, Abbott Laboratories, 1; G. W. Reed, Corrona, 2; University of Massachusetts School Medical, 3, Corrona, 3, Harvard Medical School, 5, J. D. Greenberg, Corrona, 4, AstraZeneca, Novartis, Pfizer, 5.

380 DMARD and Biologic Use During Pregnancy Among Rheumatoid and Psoriatic Arthritis Patients in the Corrona Registry. John J. Cush1, George Reed2, Katherine C. Saunders3, Joel M. Kremer4, Jeffrey D. Greenberg5, and Arthur Kavanaugh6. Baylor Research Institute, Dallas, TX, 1Baylor Research Institute, Dallas, TX, 2Hospital for Special Surgery, New York, NY, 3Albany Medical College, Albany, NY, 4NYU Hospital for Joint Diseases, New York, NY, 5UCSD School of Medicine, La Jolla, CA

Background/Purpose: CORRONA is a nationwide longitudinal disease-based registry that includes 32875 rheumatoid (RA) and 5462 psoriatic arthritis (PsA) patients. We sought to ascertain the frequency of pregnancy among 5377 women of childbearing age within the CORRONA registry and assess the impact of pregnancy on disease activity and medication use.

Methods: Females aged 18–45 diagnosed as RA or PsA with >12 mos follow-up were included. A preconception (PRE) visit < 12 mos of a self-reported pregnancy (PREG) was required. Disease activity and therapy were assessed at PRE and PREG visits and included CDAI, GAS, mHAQ, TJC, SJC and the % off all DMARDs or biologics (DMARD-free). We tallied pregnancies (221 pts) were identified, 147 pregnancies (130 RA, 17 PsA) were found for a frequency of 2.2%. Mean age was 32.4 yrs and disease duration 7.3 yrs. Time span from PRE to PREG was 4.9 mos (RA) and 6.3 mos (PsA). Overall drug use and disease activity was less than that seen in nonpregnant CORRONA patients (data not shown). At the PRE visit TNFi were most often used (54%) with surprisingly less MTX (16%), oBiologic (4%), Pred (23%), NSAIDs (34%) use (Table). At PRE 69% were in CDAI remission or LDAS. PREG impact was modest with median change from PRE–PREG being zero for 8/10 activity measures. Joint counts improved in 31% and flared in 27% during PREG, with 36% having a 1–2 increase in joint count. From the PRE to PREG, only 13% of 101 low activity pts worsened to high activity. Conversely, 43% of those with high activity improved to low activity during PREG. MTX and NB-DMARD decreased with PREG, yet some continued MTX (4%) or NB-DMARD (21%) at PREG. Biologic use was halved from 5% (PRE) to 29% (PREG) and DMARD-free rose from 28% to 61% during PREG. 61 patients were biologic free at PRE and only 2 (3.3%) started biologics during PREG. Conversely of 80 PRE patients who took TNFi, 42 (53%) stopped TNFi during PREG.

Comparison of Therapies and Activity Pre- and during Pregnancy (n=147)

<table>
<thead>
<tr>
<th>Therapy</th>
<th>PRE</th>
<th>PREG</th>
</tr>
</thead>
<tbody>
<tr>
<td>JTC</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>SJC</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td>CDAI</td>
<td>7.8</td>
<td>7.7</td>
</tr>
<tr>
<td>GAS</td>
<td>5.9</td>
<td>6.0</td>
</tr>
<tr>
<td>Low Activity %</td>
<td>68.9</td>
<td>59.9</td>
</tr>
<tr>
<td>High Activity %</td>
<td>31.3</td>
<td>17.8</td>
</tr>
<tr>
<td>mHAQ</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>ESR mm/hr</td>
<td>20.5</td>
<td>22.4</td>
</tr>
<tr>
<td>MTX %</td>
<td>15.7</td>
<td>4.1</td>
</tr>
<tr>
<td>NB DMARD%</td>
<td>40.1</td>
<td>21.1</td>
</tr>
<tr>
<td>TNFi %</td>
<td>54.4</td>
<td>27.2</td>
</tr>
<tr>
<td>Other Biologics</td>
<td>4.1</td>
<td>2.0</td>
</tr>
<tr>
<td>DMARD Free %</td>
<td>27.9</td>
<td>61.2</td>
</tr>
<tr>
<td>Prednisone %</td>
<td>23.1</td>
<td>12.2</td>
</tr>
<tr>
<td>NSAID %</td>
<td>34.0</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Conclusion: TNFi were most frequently used in those apparently planning to become pregnant and also during PREG. RA and PsA patients who become pregnant are likely to have low level disease activity and less commonly MTX, NB-DMARD, Pred or NSAIDs. While the literature suggests up to 80% of RA patients improve during PREG, this large CORRONA cohort showed less disease activity change with 12% moving from low to high activity and only 43% moving from high to low activity during PREG.

Disclosure: J. J. Cush, Genentech, Pfizer, UCB, Celgene, Amgen, Novartis, CORRONA, NIH, 2; Jensen, Savient; Pfizer, BMS, Amgen, Genentech, Abbott, UCB, 5; G. Reed, Genentech, Pfizer, UCB, 5; Corrona, 5; Corrona, 2; K. C. Saunders, Corrona, 3; J. M. Kremer, Corrona, 1; Bristol-Myers Squibb, Genentech, Pfizer, HGS, UCB, 2; Corrona, 4; Abbott, Amgen, Genentech, Pfizer, 5; Abbott, Amgen, BMS, 8; J. D. Greenberg, Corrona, 4; AstraZeneca, Novartis, Pfizer, 5; A. Kavanagh, Amgen, Abbott, BMS, Celgene, Roche, UCB, Janssen, Pfizer, 2.

381 DAS Does Not Predict Increasing Treatment in Early Rheumatoid Arthritis: Results From the CATCH Study. Lonnie Pyne1, Vivian Bykerk2, Carol A. Hitchen1, Edward Keystone3, J. Carter Thorne3, Boulou Harauz4, Ashley Bonner1, Janet E. Pope1 and CATCH Investigators1. 1Western University, London, ON, 2Hospital for Special Surgery, New York, NY, 3University of Manitoba, Winnipeg, MB, 4University of Toronto, ON, 5Southlake Regional Health Centre, Newmarket, ON, 6Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Montreal, QC, 7McMaster University, Hamilton, ON, 8Western University of Canada, St. Joseph’s Health Care, London, ON, 9Toronto, ON.

Background/ Purpose: The disease activity score (DAS) was developed in RA to guide therapy. Its utility in practice for early rheumatoid arthritis (ERA) has not been fully studied. The aim was to determine factors most strongly associated with an increase in therapy in ERA at 3 and 6 months.

Methods: Data were collected from Canadian Early Arthritis Cohort (CATCH) patients who were included if they had >2 visits in baseline and 6 months data. A regression analysis determined factors associated with treatment intensification.

Results: Of the 1,145 ERA patients, 790 met inclusion criteria. Mean age was 53.4 (SD 14.7), disease duration 6.1 months (SD 2.8), 75% were female, baseline DAS28 was 4.7 (SD 1.8) and 2.9 (SD 1.8) at 6 months. Factors most strongly associated with intensifying treatment in univariate analyses were MD global (assessment) (OR = 7.8 at 3 months and OR = 7.4 at 6 months, P < 0.0005) and SJC (OR = 4.7 and OR = 7.3 at 3 and 6 months, P < 0.0005). DAS did not affect treatment intensification as strongly in univariate analyses (OR = 3.0 at 3 months and OR = 4.6 at 6 months, P < 0.0005). In the logistic regression model only MD global was consistently associated with treatment intensification (OR = 1.5 and OR = 1.2 at 3 and 6 months respectively, P < 0.0005). DAS28 was not a consistent predictor of treatment intensification (OR = 1.0, P = 0.987 at 3 months and OR = 1.2 P = 0.023 at 6 months). If adjusting for multiple comparisons, only MD global was significant at both 3
and 6 months. When treatment was intensified; only 2% of physicians listed DAS28 as a reason for the treatment change, compared to 52%, 50% and 24% for SJC, TJC and MD global respectively. For the same SJC, larger joint involvement was more likely to influence treatment than small joint involvement at 3 months (OR = 1.4, P = 0.027). At 3 (but not 6) months for the same joint count, larger joint involvement was more associated with increasing therapy (P = 0.027).

Table 1. Summary of variables in logistic regression model of increase therapy (strict definition) at 3 and 6 months. Model had a percent correct classification of 76.2% and P-value < 0.0005 at 3 months and 79.3% and P-value < 0.0005 at 6 months

<table>
<thead>
<tr>
<th>Age</th>
<th>TJC</th>
<th>SJC</th>
<th>ESR</th>
<th>CRP</th>
<th>Patient Global Assessment</th>
<th>HAQ-DI</th>
<th>Pain</th>
<th>Today</th>
<th>MD Global Assessment</th>
<th>DAS28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp(B) (95% C.I.) 3 months</td>
<td>0.999 (0.995, 1.003)</td>
<td>1.015 (1.012, 1.018)</td>
<td>1.017 (1.015, 1.020)</td>
<td>1.024 (1.021, 1.026)</td>
<td>1.012 (1.010, 1.015)</td>
<td>0.541 (0.535, 0.547)</td>
<td>1.116 (1.113, 1.119)</td>
<td>1.460 (1.457, 1.463)</td>
<td>0.999 (0.995, 1.003)</td>
<td></td>
</tr>
<tr>
<td>P-Value</td>
<td>0.273</td>
<td>0.037</td>
<td>0.162</td>
<td>0.029</td>
<td>0.009</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Exp(B) (95% C.I.) 6 months</td>
<td>0.996 (0.991, 1.001)</td>
<td>0.961 (0.954, 0.968)</td>
<td>0.987 (0.984, 0.990)</td>
<td>0.997 (0.995, 1.000)</td>
<td>1.015 (1.013, 1.017)</td>
<td>0.530 (0.525, 0.535)</td>
<td>1.221 (1.217, 1.224)</td>
<td>1.620 (1.617, 1.623)</td>
<td>0.989 (0.985, 0.993)</td>
<td></td>
</tr>
<tr>
<td>P-Value</td>
<td>0.089</td>
<td>0.010</td>
<td>0.033</td>
<td>0.010</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Physician global assessment was independently associated with an increase in treatment at 3 and 6 months in ERA, whereas DAS28 was only significant at 6 months. SJC was also strongly related to treatment intensification at 6 months. Physicians rarely stated that DAS28 was the reason for increasing treatment and the data demonstrate that MD global assessment (which is not part of the DAS) is the main reason for treatment intensification in ERA.

Disclosure: L. Pyne, None; V. P. Bykerk, Amgen, 2, Pfizer Inc, 2, Hoffmann-La Roche, Inc., 2, United Chemicals of Belgium (UCB) Canada Inc., 2, Bristol-Myers Squibb, 2, Abbott Laboratories, 2, Janssen Inc. (a wholly owned subsidiary of Johnson & Johnson Inc.), 2; C. A. Hitchon, Amgen, 2, Pfizer Inc, 2, Hoffmann-La Roche, Inc., 2, United Chemicals of Belgium (UCB) Canada Inc., 2, Bristol-Myers Squibb, 2, Abbott Laboratories, 2, Janssen Inc. (a wholly owned subsidiary of Johnson & Johnson Inc.), 2; E. Keystone, Amgen, 2, Pfizer Inc, 2, Hoffmann-La Roche, Inc., 2, United Chemicals of Belgium (UCB) Canada Inc., 2, Bristol-Myers Squibb, 2, Abbott Laboratories, 2, Janssen Inc. (a wholly owned subsidiary of Johnson & Johnson Inc.), 2; J. C. Thorne, Amgen, 2, Pfizer Inc, 2, Hoffmann-La Roche, Inc., 2, United Chemicals of Belgium (UCB) Canada Inc., 2, Bristol-Myers Squibb, 2, Abbott Laboratories, 2, Janssen Inc., 2; B. Harauzl, Amgen, 2, Pfizer Inc, 2, Hoffmann-La Roche, Inc., 2, United Chemicals of Belgium (UCB) Canada Inc., 2, Bristol-Myers Squibb, 2, Abbott Laboratories, 2, Janssen Inc., 2; A. Bonner, None; J. E. Pope, A. T. Hitchon, None; L. Pyne, None; J. C. Thorne, None; A. A. E. Bonner, None; J. E. Pope, None; A. T. Hitchon, None.

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Does Biased Risk Perception Explain the Underuse of Disease Modifying Anti-Rheumatic Drugs? Richard W. Martin1, Andrew J. Head2, James D. Birmingham1 and Aaron T. Eggebeen3 1Michigan State University College of Human Medicine, Grand Rapids, MI, College of Human Medicine, Michigan State University, Grand Rapids, MI

Background/Purpose: The prescription of a Disease Modifying Anti-rheumatic Drugs (DMARD) for patients with rheumatoid arthritis (RA) is considered a standard of effective care. However a recent study of Medicare managed care enrollees, only 63% received a DMARD. The explanation for underutilization is not fully known. In a sample of 144 patients, Constantine et al found compared to white adults with RA, African American patients assigned greater importance to the risks of treatment over the likelihood for benefit. The purpose of our study was to evaluate the determinants of risk perception (RP) in a large cohort of community RA patients and predictors of their willingness to take a proposed DMARD (DMARD willingness).

Methods: A single center, cross-sectional mail survey of RA patients in a community rheumatology practice. Patient characteristics including health literacy screening index (HL), depression, RA duration, DMARD experience including bother from current DMARD side effects, satisfaction with RA control, Decision Regret Scale, TNFi knowledge, happiness, HAQ2, and CDAI were collected. Patients were presented a hypothetical decision scenario where they were asked to consider switching DMARDs. They evaluated how risky the proposed medication was and how likely they would be to take it. Predictors of RP and DMARD willingness were identified with hierarchical linear regression modeling.

Results: The completed sample included 1009 RA patients. The overall survey response rate was 71%. Patient characteristics: age 61.6 years (range 18–93), 75% female, minority 6.5%, low or marginal health literacy 8.8%, depression 15.0%, duration RA 13.1 years (range 0.5–68). A regression model evaluating predictors of RP demonstrated a R2 = 31.5. The standardized regression coefficients show the strongest predictor of RP was HAQ2 disability (B = 152), followed by HL (B = -1.49), and current or past experience of DMARD related bother (B = -1.46). Age, TNFi knowledge, happiness and depression, and other demographics did not significantly add to the predictive power of the model. A second model of predictors of DMARD willingness had a R2 = 12.7%. The standardized regression coefficients show the strongest predictors of DMARD willingness were satisfaction with RA (B = -1.67) and regret related to their previous DMARD choice (B = -1.60), and HL (B = 1.49). Age and other demographic characteristics, extent of past RA and general DMARD related experience, happiness and depression did not significantly add to the predictive power of the model.

Conclusion: RP was influenced by negative RA disease and treatment experience, while DMARD willingness was affected by perceived disease control. Health literacy, independent of low educational achievement or another demographic, was a predictor of both RP and DMARD willingness. When proposing to initiate a new DMARD, clinicians must be alert for cognitive impairment whether derived from educational, language, age related decline in information processing that could affect patient decision making. Time pressures increase cognitive load, which might justly extend the time of deliberation beyond the constraints of the office visit by using decision aids.

Disclosure: R. W. Martin, None; A. J. Head, None; J. D. Birmingham, None; A. T. Eggebeen, None.

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Background/Purpose: We compared patient (pt) characteristics, for initiating, tapering and DC of TNFi/MTX combination therapy (CT), among RA pts seen during 02–04 vs. 07–09 to detect changes in practice.

Methods: In the Consortium of Rheumatology Researchers of North America (CORRONA), a rheumatologist arthritis (RA) registry, the relationship between maximum CDAI (Clinical Disease Activity Index) and the use of CT during the 2 time intervals was compared using all RA pts in CORRONA and those with >= 2 yrs of follow-up (fu) (N = 4955; N = 6847). DCing/tapering MTX, TNFi, or both reasons for DCing were compared among the subset who initiated CT (n = 315; n = 697 respectively).

Results: Among pts receiving CT, age, gender and patterns of adding TNFi to MTX vs. MTX to TNFi were similar in the 2 time periods; The mean CDAI at CT initiation (for all pts and pts with >= 2 yr fu) was lower in 07–09 (18.6 and 18.3 vs. 14.6 and 14.0, p < 0.001). 35% of all pts starting CT were on prednisone at initiation during the 02–04 interval vs. 30.4% during 07–09, p = 0.084. Among all RA pts with 2 yrs of fu a higher percentage of patients initiated CT in 07–09 than 02–04 in each maximum CDAI category. Although MTX DCing rates were similar between the 2 time periods, tapering was more frequent in the 07–09 (51%) vs 02–04 cohort (38.8%), p = 0.029. DCing (or switching) the TNFi occurred among 37% of pts initiating CT during 07–09 vs. 31.7% (02–04) p = 0.105. Baseline CDAI did not predict DC patterns. The mean CDAI at time of DC was higher in the 02–04 cohort for MTX, TNFi or both with overall mean CDAIs (02–04 vs. 07–09) at the time of DC of CT of 19.4 vs. 13.2 p < 0.001. The mean CDAI at time of DC of prednisone, was similar between the two time periods (15.2 vs. 15.0) p = NS.

Physician-recorded reasons for DCing MTX or TNFi were consistent across time intervals.
RA pts with 2 y F/U after a visit in

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002–2004</td>
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<td>2007–2009</td>
<td>6847</td>
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</table>

<table>
<thead>
<tr>
<th>% of pts with a max CDAI during the 2 y F/U who did not receive CT anytime during the 2yr.</th>
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</thead>
<tbody>
<tr>
<td>Max CDAI 10–22</td>
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<td>Max CDAI &gt;22</td>
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<table>
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<tr>
<th>% of pts DC ing CT during 2 yrs F/U p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC only MTX (continuing TNFi)</td>
</tr>
<tr>
<td>DC only TNFi (continuing MTX)</td>
</tr>
<tr>
<td>both MTX + TNFi</td>
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<td>DC Prednisone</td>
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</table>

<table>
<thead>
<tr>
<th>CDAI (SD) at time of DC of RA pts p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTX only</td>
</tr>
<tr>
<td>TNFi only</td>
</tr>
<tr>
<td>both MTX + TNFi</td>
</tr>
<tr>
<td>DC</td>
</tr>
</tbody>
</table>

Conclusion: We found lower CDAIs among those initiating CT between 07–09 and lower CDAIs among those weaning or stopping CT in 2 yrs of F/U, perhaps reflecting stricter definition and implementation of aggressive treatment goals in the later time periods.

Disclosure: D. Wenkert, Amgen, 1, Amgen, 3; S. Grant, Axio Research LLC, 3; D. H. Collier, Amgen Inc., 1, Amgen Inc., 3; A. S. Koenig, Pfizer Inc, 3, Pfizer Inc, 1; M. Kremer, Bristol-Myers Squibb, Genentech, Pfizer, UCSF, HGS, 2, Amgen, Abbott, Genentech, Pfizer, 5, Amgen, Abbott, BMS, 8, Corrona, 4.

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Treating Rheumatoid Arthritis to Target: A Canadian Patient Survey.
Boulos Harouï1, William G. Bensen2, J. Carter Thorne3, John P. Wade4, Melissa Deamude5, Jane M. Prince6 and Jean Legare7. 1Institut de Rhumatologie de Montréal, Montreal, QC, 2St. Joseph’s Hospital and McMaster University, Hamilton, ON, Hamilton, ON, 3Southlake Regional Health Centre, Newmarket, ON, 4University of British Columbia, Vancouver, BC, 5Dr. William G. Bensen Medicine Professional Corporation, Hamilton, ON, 6Vancouver Coastal Health, Vancouver, BC, 7Arthritis Alliance of Canada, Montreal, QC

Background/Purpose: Recently, many countries, including Canada, evaluated rheumatologists’ acceptance and agreement with a set of 10 Treat to Target (T2T) recommendations for rheumatoid arthritis (RA), developed by an international task force.1 In this study, the Canadian T2T steering committee evaluated how Canadian patients with RA perceive these recommendations. To assess the current state of RA management in Canada from a patient perspective and to assess whether, and to what extent, Canadians with RA agree with the T2T recommendations among Canadian patients.

Methods: A questionnaire was sent by post to all consultant rheumatologists in England under ‘Freedom of Information act (FOI)’ to 131 NHS trusts. Questions were aimed to enquire about the initial steroid regime used by consultant rheumatologists in adult cases (≥18 yrs) of confirmed RA. The responses were received back by post and analysed.

Results: Total response received were 130 (92.2% response rate), with 82.4% agreeing on the early routine use of steroids in their practice. 53.6% used the Oral route, 48% used the intramuscular (IM) route and 45.6% of Consultants used the intra-articular route (either alone or in combination with other routes).

For those who used oral Prednisolone, the initial starting dose varied from 60mg (6.3%) to 7.5 mg (11.1%) responses per day with the majority using an initial dose of 15 mg (25.3%) or 20mg (23.8%) daily.

The duration of oral steroid use varied from 1 month (4.2%) to 2 years (4.2%) with the majority being for 4–6 months (72.3%).

The dose of IM Depomedrone was 40mg - 160 mg, with majority using 120 mg (86.2%), for a total duration that again varied from 2 months to 2 years, with the majority being 6 months (52.2%).

The dose of intraarticular injection for large joint also varied from 20 mg to 60 mg of Depomedrone with 40 mg used by majority (92%) of rheumatologist.

Conclusion: Majority of Rheumatologist use steroids for initial treatment of early Rheumatoid Arthritis. There is a wide variability in the use of steroids including its route, dose and duration of use. There is therefore an urgent need of scientifically proved guidelines on their initial use.

Disclosure: A. Bharadwaj, None; C. Alves, None.

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Costs of Tumor Necrosis Factor Blockers Per Treated Rheumatoid Arthritis Patient Using Real-World Drug Data in a US Managed Care Population.
Vernon F. Schabert1, Crystal Watson1, George Joseph1, Paige Iversen1, Chakkarin Burudpakdee2 and David J. Harrison2. 1IMS Health, Alexandria, VA, 2Amgen Inc., Thousand Oaks, CA

Background/Purpose: Etanercept (ETN), adalimumab (ADA), and infliximab (INF) are FDA-approved tumor necrosis factor (TNF)-blocker treatments for moderate to severe rheumatoid arthritis (RA) and are commonly used first-line biologics. These agents have differing modes of
administration and dose ranges. It is important to understand the true cost of treatment with these agents including the effects of real-world dosing data, gaps in therapy, varying persistence, and switching. This study describes the annual TNF-blocker costs for patients treated with ETN, ADA, and INF, using data from a US managed care population.

**Methods:** The IMS LifeLink™ Health Plan Claims database was used to identify RA patients (18–64 years) with ≥ 1 claim for ETN, ADA, or INF between February 1, 2008 and July 5, 2010. Their first TNF-blocker claim after ≥ 6 months of continuous enrollment defined their index claim and medication. Patients were classified as “new” if they did not have a claim for the same agent in the previous 6 months (pre-index period) or “continuing” if they did. Patients were followed for 1 year after their index claim. Patients were excluded if they had a diagnosis in their pre-index period of psoriasis, psoriatic arthritis, ankylosing spondylitis, Crohn’s disease, ulcerative colitis, or juvenile idiopathic arthritis. Total annual TNF-blocker dose was computed and costs were calculated using the March 2012 wholesale acquisition costs and Medicare Physician Fee Schedule for TNF-blocker related administrations. For patients who switched agents in the first year, costs of other TNF-blockers used were attributed to the patients’ index medication.

**Results:** Overall, 16,280 patients with RA (7,754 [47.6%] ETN, 4,834 [29.7%] ADA, 3,692 [22.7%] INF) were identified. Mean age was 50.3 years and 76.5% were female. Overall, patient characteristics were similar. INF was more commonly given by a rheumatologist (63.3% vs 57.3% ADA and 53.3% ETN) and less likely to be a new agent (28.4% vs 39.1% ADA and 33.7% ETN). The majority of patients had commercial insurance (83.0%-86.0%) and the majority of plans were preferred provider organizations (65.0%-70.0%). The overall 1-year TNF-blocker cost per RA patient was lowest for patients on ETN ($16,787), followed by ADA ($19,308) then INF ($22,939). For patients new to TNF-blockers, 1-year cost per treated patient was $15,828 for ETN, $17,250 for ADA, and $19,397 for INF; 1-year cost per continuing patient was $17,275 for ETN, $20,626 for ADA, and $24,345 for INF.

**Conclusion:** Across new and continuing RA patients, ETN was the most frequently prescribed TNF-blocker and had the lowest cost per treated patient as observed in real-world drug utilization data.

**Disclosure:** V. F. Schabert, IMS Health, 3; C. Watson, Amgen Inc., 1; G. Joseph, Amgen Inc., 1, Amgen Inc., 3; P. Iversen, IMS Health, 3; C. Burudpakde, IMS Health, 3; D. J. Harrison, Amgen Inc., 1, Amgen Inc., 3.

### 387 Medication Choices and Medication Survival in a National Multicentre Community Based Rheumatoid Arthritis Cohort

**Methods:** To study the retention rate of the anti-TNF biologics in the treatment of rheumatic diseases and the associated factors for drug withdrawal.

**Results:** From 2005 to 2012, 1335 courses of anti-TNF biological agents in 991 patients with rheumatic diseases were used. There were 553 women and 438 men (mean age 49 ± 13.9 years and duration of disease 7.4 ± 6.6 years). Underlying rheumatic diseases were: rheumatoid arthritis (RA) (50%), spondyloarthropathy (SpA) (37%), psoriatic arthritis (PsA) (11%) and others. Combined Medication Practice, Sydney, Australia, 2McCloud Consulting Group, Sydney, Australia, 3Roche Products Pty Limited, Sydney, Australia, 4Menzies Research Institute Tasmania, Hobart, Australia, 5Melbourne, Australia

**Background/Purpose:** A sizeable body of high-quality research underpins our knowledge of the efficacy of various RA therapies. Outside the controlled environment of these clinical trials, however, in real world practice many additional factors may influence the use of DMARD/bDMARDs. There is little knowledge of whether the trial evidence is being implemented in real world settings, or whether the trial efficacy and safety translates into clinical effectiveness.

**Methods:** Point of care clinical software has been used to collect data since 2009 from 20 participating Australian rheumatology treatment centres. Patients with a rheumatologist’s diagnosis of RA were identified. Medication changes were analysed in 9 prespecified categories to permit the construction of population treatment algorithms. Medication survival was assessed using Kaplan Meier plots. The change in disease activity following a medication change was also assessed.

**Results:** RA patients numbered 9570, with 73% female, mean age 62, and median disease duration 7 years. Any DMARD was used in 87% overall, and 30% had used a biological DMARD. The DMARD/bDMARD usage above 1% in the cohort included methotrexate 71%, Hydroxychloroquine 25%, Leflunomide 24%, Sulphasalazine 17%, Etanercept 12%, Adalimumab 11%, Tocilizumab 5%, Abatacept 3%, Golimumab 3%, Rituximab 2.5%, and Certolizumab 2%. Median DMARD survival ranged from 49 to 231 months for the most common DMARDs and from 9 to 49 months for the most common biologic DMARDs. A tree diagram representing the observed treatment changes was constructed. Of the 2256 patients whose first RA medication was monotherapy Methotrexate and who required a change, 31% changed to greater than 1 conventional DMARD, 29% added Leflunomide, 17% added a bDMARD, and 16% ceased therapy. Of the 466 patients whose first change in RA medication was to Methotrexate plus Leflunomide and required a second change, 46% returned to monotherapy Methotrexate, 18% changed or added another conventional DMARD, 20% changed to monotherapy DMARD other than methotrexate, and 28% added a bDMARD.

**Conclusion:** Australian rheumatologists are making frequent changes in medications in their RA patients and appear to be implementing best evidence guidelines. Australian regulatory requirements for utilizing subsidised biological therapy may also be affecting choices. The most commonly observed treatment algorithm in patients who required therapeutic escalation had patients starting with DMARD monotherapy followed by DMARD combination therapy followed by bDMARD combined with DMARD combination therapy. Shorter median survival of biologic therapies than traditional therapies may reflect the more refractory nature of the patients who are selected for these therapies. Analysis of the effect of a medication switch on disease activity will be of interest in this cohort.

**Disclosure:** L. Roberts, None; K. Tynns, None; J. P. de Jager, None; G. O. Littlejohn, None; H. Griffiths, None; D. Nicholls, None; P. Bird, None; J. Hill, None; P. McCloud, None; J. C. Scott, Roche Pharmaceuticals, 3; J. Zochling, None;
p=0.001) and rheumatoid arthritis (vs other diagnoses; HR 1.47 [1.13–1.93]; p=0.005) was independent predictors for drug withdrawal due to inefficacy or serious adverse events after adjustment for age, sex and disease duration.

Conclusion: Our Registry data reveals that IFX is associated with a significantly higher withdrawal rate for both loss of efficacy over time and the development of serious adverse events, in particular tuberculosis.

Disclosure: C. C. Mok, None; C. Kwan, None; H. Chan, None; K. L. Lee, None; L. S. Tam, None.

Background/Purpose: The current treatment paradigm in RA is to attempt to decrease concomitant use of oral glucocorticoids (OGC). This study examined the OGC-sparing effects of Rituximab in U.S. RA patients who had switched from an anti-TNF therapy.

Methods: Retrospective cohort study using a large U.S. administrative claims database. Patients selected for study were adults aged ≥18 years who had been diagnosed with RA between 1/1/2004-3/31/2011 had initiated Rituximab treatment after treatment with anti-TNF therapy between 3/1/2006-3/31/2011, and had OGC use within 30 days prior to Rituximab initiation. Rituximab ‘exposure periods’ were constructed using Rituximab infusion dates and the recommended administration frequency schedule, equaling the duration of time from initiating Rituximab until the first occurrence of 1) switch to a different biologic disease modifying antirheumatic drug (BDMARD); 2) 90-day gap in treatment with Rituximab; 3) disenrollment from health insurance, 4) reaching 3/31/2011, or 5) reaching a maximum study follow-up of 36 months. Patients were excluded if within the 12-month period prior to Rituximab initiation they had been diagnosed with a non-RA indication for any BDMARD.

During the Rituximab exposure periods the study outcomes, proportion of patients using OGCs, were measured in sequential 90-day intervals, the first of which commenced as of Rituximab initiation. A multilevel random coefficient model was used to test for statistically significant OGC-sparing effects over time.

Results: A total of 952 Rituximab exposure periods from 938 unique patients were included for study; average age 54.7 years, 79.2% female. Table displays the study results. The proportion of patients using OGCs decreased over time, with slight non-monotonic fluctuations, from 80.6% of patients in months 1–3 to 54.1% of patients remaining on therapy in months 34–36. The mean OGC dose also decreased over time, again with slight non-monotonic fluctuations, from 5.7 mg among patients in months 1–3 to 3.2 mg among patients remaining on therapy in months 34–36. The decreases in the proportion of patients using OGCs (P<0.0001) and the average OGC dose (P<0.0001) were both statistically significant. In sensitivity analysis subset to only patients remaining on therapy through months 34–36, the OGC use patterns were similar to those from among overall sample.

Table. OGC use over time since Rituximab initiation

<table>
<thead>
<tr>
<th>Month range</th>
<th>Sample N</th>
<th>% using OGCs</th>
<th>Mean OGC dose*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–3</td>
<td>952</td>
<td>80.6%</td>
<td>5.7</td>
</tr>
<tr>
<td>4–6</td>
<td>864</td>
<td>79.3%</td>
<td>5.5</td>
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<td>7–9</td>
<td>715</td>
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<td>10–12</td>
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<td>13–15</td>
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<td>34–36</td>
<td>74</td>
<td>54.1%</td>
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</table>

*Average daily dose, expressed in prednisone equivalent (mg), calculated among all patients

Conclusion: In this study, statistically significant OGC-sparing effects were observed in RA patients who had switched to Rituximab after treatment with anti-TNF therapy. The clinical implications of such OGC-sparing effects warrant further investigation.

Disclosure: S. Johnston, Truven Health Analytics, 3; T. Kanath, Genentech, Inc, 3; N. Shi, Truven Health Analytics, 3; R. Fowler, Truven Health Analytics, 3; B. C. Chu, Truven Health Analytics, 3; W. Reiss, Genentech, 3.

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Performance of Criteria for Remission in a Long-Term Observational Study of Patients with Early Rheumatoid Arthritis. Bjorn Svensson1, Maria LE Andersson2, Sidona-Valentina Bala1, Kristina Forslin3 and Ingäld Hafström4. 1Lund University, Lund, Sweden, 2R&D Center, Spenshult Hospital, Oskarström, Sweden, 3Helsingborgs Lasaret and Lund University Hospital, Helsingborg, Sweden, 4Karolinska University Hospital, Stockholm, Sweden

Background/Purpose: Remission is widely accepted as the goal of treatment in RA and has to be sustained to keep joint damage at a minimum (Smolen et al 2010). The DAS28<2.6 remission criteria is widely used but criticized for allowing remission to be present in spite of several swollen or tender joints. The recently proposed Boolean ACR/EULAR remission criteria are more stringent and do not have this bias but their utility in long-term observational studies needs to be evaluated. The present study addresses the performance of these criteria over 8 years in an observational study of patients with early RA.

Methods: 839 patients, included in 1992–1999, within one year from disease onset in the BARFOT observational study were followed for 8 years. The following remission criteria (RCR) were applied: The DAS28 RCR (DAS28<2.6) and the ACR/EULAR RCR (≤1 swollen joint, ≤1 tender joint, CRP ≤1 mg/dl and patient global assessment ≤1 (0–10 scale). Sustained remission was defined as remission at all four visits at 1, 2, 3 and 8 years. Radiographic joint damage was assessed by the Sharp van der Heijde method (SHS).

Results: Sustained remission was present in 79 patients (14%) by the DAS28 RCR and 16 (3%) by the ACR/EU RCR. In patients in sustained remission by the DAS28 RCR, radiological progression (RP) with SHS of >0 occurred in 31, 45, 57 and 65% and by the ACR/EU RCR in 21, 46, 46 and 62% at 1, 2, 5 and 8 years, respectively. The likelihood ratios for the ability of sustained remission by the the DAS28 criteria and the ACR/EU criteria, respectively, to identify patients with favorable radiographic outcome from baseline to 8 years was 2.2 vs 1.9 for a change in SHS of ≥0 (minimal RP), 1.5 vs 1.4 for a change of <5 (clinically relevant change) and 1.4 vs 1.3 for a change of <3 (<1 point per year). A small number of patients in sustained remission by DAS28 RCR had at some point in time more than one swollen or tender joint. More than one joint was found in 11 of 315 assessments (3.5%) of tender joint count (max 5 in one case) and in 28 of 315 assessments (9%) of swollen joint count (max. 6 in one case).

Conclusion: The new ACR/EU criteria appear too stringent to be feasible in long-term observational studies. Only a very small number of patients were identified and the ability to predict favorable radiographic outcome was not significantly superior. Sustained remission by the DAS28 criteria was more than four times as frequent and the frequency of possible false remissions was very low. Therefore, awaiting further development, the DAS28 remission criterion could be preferred in long-term observational studies.

Disclosure: B. Svensson, None; M. L. Andersson, None; S. V. Bala, None; K. Forslin, None; I. Hafström, None.

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DAS28 Is Not a Sufficient Disease Activity Measure for Obese Rheumatoid Arthritis Patients - Don’t Leave the Feet Behind. Vikram Garg1, Paul Maranian1, Mihaela B. Taylor1, Harold E. Paulus2, David Elashoff1, and Veena K. Ranganath3. 1UCAL David Geffen School of Medicine, VA Greater Los Angeles Healthcare System, Los Angeles, CA, 2UCLA Medical School, Los Angeles, CA, 3University of California Los Angeles Los Angeles, Los Angeles, CA, 4University of California, Los Angeles, Los Angeles, CA, 5University of California, Los Angeles, Western Consortium of Practicing Rheumatologists, Los Angeles, CA

Background/Purpose: Current literature suggests that obesity impacts disease activity in rheumatoid arthritis (RA) and the incidence of obesity is on
the rise. The objective of this study was to evaluate how obesity (BMI≥30) affects different composite disease activity measures in RA, specifically evaluating differences between 28 vs 44 joint counts measures.

Methods: We examined a long-term prospective observational cohort of early poor prognosis seropositive RA patients (within 15 months of symptom onset) from the Western Consortium of Practicing Rheumatologists. Patients included had a diagnosis of RA according to the ACR 1987 criteria, DMARD-naive, positive rheumatoid factor, ≥6 SJC, and ≥9 TJC. BMI was categorized above and below 30. The following baseline characteristics were collected: age, gender, BMI, disease duration, CCP status, prednisone use, sharp scores, and radiographic evidence of osteoarthritus (OA). Components needed to calculate DAS44/ESR-4 item, DAS28/ESR-4 item, and CDAI were also collected at baseline. Patients completed a comprehensive questionnaire at study entry including: demographics, health, medication, pain visual analog scale (VAS), patient global VAS, and the Health Assessment Questionnaire-Disability Index (HAQ-DI).

Results: Significant difference between obese and non-obese patients were observed for baseline swelling of MCP, knees, ankles, and MTP joints, tender ankle joints, HAQ-DI and MD global. Consequently, DAS44/ESR-4 item was significantly higher in the obese early RA patients, but DAS28/ESR4 item and CDAI were not significantly different. Other baseline measures were not different.

Table 1. Baseline Values

<table>
<thead>
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<th>BMI 20–30 (N=184)</th>
<th>BMI &gt;30 (N=64)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
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<td>Age</td>
<td>51.4 (13.1)</td>
<td>51.6 (11.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Female</td>
<td>75.5%</td>
<td>78.1%</td>
<td>NS</td>
</tr>
<tr>
<td>Duration</td>
<td>81.6 (8.8)</td>
<td>65.7 (5.6)</td>
<td>NS</td>
</tr>
<tr>
<td>On MTX</td>
<td>54.4%</td>
<td>59%</td>
<td>NS</td>
</tr>
<tr>
<td>Nodules</td>
<td>0.18 (0.5)</td>
<td>0.08 (0.3)</td>
<td>NS</td>
</tr>
<tr>
<td>OA present</td>
<td>36.6%</td>
<td>37%</td>
<td>NS</td>
</tr>
<tr>
<td>ESR</td>
<td>40 (24.7)</td>
<td>42.7 (25.3)</td>
<td>NS</td>
</tr>
<tr>
<td>CRP</td>
<td>2.9 (6.9)</td>
<td>3.5 (4.1)</td>
<td>NS</td>
</tr>
<tr>
<td>On Pred</td>
<td>46.2%</td>
<td>45.9%</td>
<td>NS</td>
</tr>
<tr>
<td>CDAI</td>
<td>36.1 (14.4)</td>
<td>40.8 (16.3)</td>
<td>NS</td>
</tr>
<tr>
<td>HAQ-DI</td>
<td>1.1 (0.7)</td>
<td>1.4 (0.7)</td>
<td>0.005</td>
</tr>
<tr>
<td>das44esr4</td>
<td>4.6 (1.2)</td>
<td>5.1 (1.3)</td>
<td>0.01</td>
</tr>
<tr>
<td>das28esr4</td>
<td>6.1 (1.1)</td>
<td>6.4 (1.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Pt global</td>
<td>54.5 (27.7)</td>
<td>57.9 (25.7)</td>
<td>NS</td>
</tr>
<tr>
<td>MD global</td>
<td>48.1 (21)</td>
<td>55.1 (20.3)</td>
<td>0.03</td>
</tr>
<tr>
<td>Tender28</td>
<td>13.5 (7.1)</td>
<td>14.5 (8.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Tender44</td>
<td>20 (9.5)</td>
<td>21.7 (11.52)</td>
<td>NS</td>
</tr>
<tr>
<td>LE tender</td>
<td>6.9 (4.3)</td>
<td>7.2 (4.6)</td>
<td>NS</td>
</tr>
<tr>
<td>UE tender</td>
<td>13.2 (6.9)</td>
<td>14.4 (7.9)</td>
<td>NS</td>
</tr>
<tr>
<td>Ankle tender</td>
<td>0.9 (0.9)</td>
<td>1.3 (0.9)</td>
<td>0.004</td>
</tr>
<tr>
<td>Swell28</td>
<td>12.5 (6.6)</td>
<td>14.9 (7.3)</td>
<td>0.04</td>
</tr>
<tr>
<td>Swell44</td>
<td>17.4 (8.6)</td>
<td>22.2 (10.6)</td>
<td>0.003</td>
</tr>
<tr>
<td>LE swollen</td>
<td>5.5 (4.2)</td>
<td>8.4 (9.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>UE swollen</td>
<td>11.6 (6.2)</td>
<td>14.4 (7.7)</td>
<td>0.008</td>
</tr>
<tr>
<td>MCP swollen</td>
<td>4.8 (3.2)</td>
<td>6.2 (3.3)</td>
<td>0.004</td>
</tr>
<tr>
<td>Knee swollen</td>
<td>0.8 (0.9)</td>
<td>1.2 (0.9)</td>
<td>0.001</td>
</tr>
<tr>
<td>Ankle swollen</td>
<td>0.8 (0.9)</td>
<td>1.4 (0.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MTP swollen</td>
<td>4 (3.7)</td>
<td>5.5 (4.1)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Conclusion: Our results suggest that in obese RA patients, swelling of the LE weight bearing joints may impact composite disease activity measures. DAS44/ESR-4 item (considered a gold standard measure) was significantly different between obese and non-obese RA patients, while the DAS28/ESR4 item and CDAI were not. Several studies that examined the relationship between BMI and disease activity (Sahebari et al 2011, Klassen et al 2011, Baker et al 2011), used DAS28 as their measure of disease activity. Our findings suggest that weight bearing joints should be included when assessing RA disease activity in obese patients, and future studies are needed to validate these results.

Disclosure: V. Garg, None; P. Maranian, None; M. B. Taylor, None; H. E. Paulus, None; D. Elashoff, None; V. K. Ranganath, None.

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Analysis of Factors Impact On Patient Global Assessment in Daily Practice Based On Observational Cohort IORRA (Institute of Rheumatology, Rheumatoid Arthritis), Yasushi Inoue, Eicchi Tanaka, Ayako Nakajima, Eiichi Inoue, Akihiko Kobayashi, Daisuke Hoshi, Naoki Sugimoto, Kumi Shidara, Yohei Seto, Atsuo Taniguchi, Shigeki Momohara and Hisashi Yamanaka. Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan

Background/ Purpose: Patient global assessment (PGA) is an element of the new CReumaEULAR remission criteria for rheumatoid arthritis (RA). This definition has been reported to be better predict structural or functional outcomes than DAS28, and we have also reported the importance of maintaining stringent remission to avoid progressive functional damage (ACR 2011 #332). Boolean-based remission for clinical trials (Boolean trials) consists of 4 components: (tender [TJC28] and swollen joint counts [SJC28] as assessed by 28 joints, C-reactive protein [mg/dL], and PGA (0–10 scale) values being <1). In most patients, whether Boolean trials remission is achieved or not depends on PGA. It is therefore necessary to reveal what factors are significantly associated with PGA.

Methods: The Institute of Rheumatology, Rheumatoid Arthritis (IORRA), is a hospital-based large observational cohort of RA patients. Clinical information and laboratory data have been collected biannually since 2000. Pain, PGA, and physician global assessment (PtGA) scores were rated using a Visual Analogue Scale (0–10 cm). The validated Japanese versions of Health Assessment Questionnaire (J-HAQ) scores and European Quality of life 5 Dimensions (EQ-5D) ratings were used to evaluate physical function and quality of life (QOL), respectively. The subjects in this study were RA patients who participated in the IORRA survey during April 2011. Correlations between PtGA score and clinical parameters, including medications and pain VAS, J-HAQ, PhGA, and EQ-5D were examined by Spearman’s correlation. Univariate and multivariate logistic regression models were used to evaluate the effect of clinical parameters on PtGA scores of >1 compared to PtGA scores of ≤1. Odds ratios (OR) with 95% confidence intervals (CI) were calculated using the JMP 9.0 software package.

Results: We analyzed 5,276 Japanese RA patients from whom all 4 components of Boolean trials were available. TJC28, SJC28, and CRP were satisfied in 78.3%, 72.8% and 84.4% of them, respectively. By contrast, only 31.3% of the patients fulfilled PGA scores of ≤1, but among them, Boolean trials remission was achieved in 76.9%. PGA was closely correlated with J-HAQ (r = 0.54), EQ-5D (r = 0.66) and pain VAS (r = 0.86). In multivariate analyses, significant factors associated with a PtGA score >1 were J-HAQ (OR = 1.96; 95% CI, 1.61–2.40; p<0.001), nonsteroidal anti-inflammatory drug (NSAID) use (OR = 1.40; 95% CI, 1.20–1.64; p<0.001), TJC28 (OR = 1.26; 95% CI, 1.17–1.36; p<0.001), SJC28 (OR = 1.11; 95% CI, 1.05–1.16; p<0.001), CRP (OR = 1.18; 95% CI, 1.06–1.33; p = 0.003), age (OR = 0.99; 95% CI, 0.98–0.99; p<0.001), and EQ-5D (OR = 0.001; 95% CI, 0.000–0.001; p<0.001).

Conclusion: In RA patients, a PtGA score of ≤1 was associated with not only joint involvements (TJC, SJC), inflammation (CRP), and physical dysfunction, but also impaired QOL, younger age, and NSAID use.

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validated patient reported outcome measures of disease activity. They have been shown to correlate highly with DAS28 and CDAI, PDA1 and PDA2.

We aim to develop and examine the performance of status and responder criteria, based on PDA1 and PDA2: low, moderate and high disease activities and European League Against Rheumatism (EULAR) good and moderate responses to treatment.

Methods: Data from 299 RA patients (originally used to develop PDAS) were analysed using receiver operator characteristic (ROC) curves to determine optimal cutpoints for PDA1 and PDA2 that correspond to DAS28 and CDAI defined criteria for remission, low, medium, and high disease activity. Data from 56 RA patients initiated on Disease Modifying Anti-Rheumatic Drugs (DMARDs) before and 6 months after treatment were used to determine optimal thresholds for PDA1 and PDA2 corresponding to EULAR good or moderate responses. Optimal cut-off points were obtained by maximising the average of sensitivity and specificity. Agreement with DAS28 and CDAI response criteria was assessed with kappas (κ) statistics.

Results: Table 1 shows criteria for PDA1- and PDA2-based remission, low, moderate and high disease activity. Key cutpoints for PDA1/PDA2 were, respectively, 3.5, 4.5, 4.8, and 3.8, 4.6, 5.0. Area under curve (AUC) for the ROC curves ranged from 0.89 to 0.95. Sensitivities ranged from 79% to 99%, and specificities from 61% to 89%. Moderate to good agreement with Speyer6, M. de Buck7, P.B. de Sonnaville8, B.A. Grillet9, Tom Huizinga1 and respectively. Again, these were comparable to the agreement between DAS28 and PDAS2. Corresponding agreements with CDAI were improved study.

Protein Antibody (ACPA) positive and negative RA and UA patients in the same group of patients (κ = 0.54). The criteria that correspond to EULAR moderate and good response were 0.4, 0.8 for PDA1 and 0.3, 1.2 for PDA2. Area under the ROC curve ranged from 0.88 to 0.93. Sensitivities ranged from 72% to 100% and specificities from 77% to 94%. Agreement of DAS28 response with PDA1 and PDA2 were κ = 0.46 and 0.38, respectively. Again, these were comparable to the agreement between DAS28 and CDAI in this patient group (κ = 0.55).

Table 1. Criteria of PDAS for Different Disease Statuses

<table>
<thead>
<tr>
<th>Remission</th>
<th>Low Disease Activity</th>
<th>Moderate Disease Activity</th>
<th>High Disease Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDA1</td>
<td>&lt;3.5</td>
<td>3.5–4</td>
<td>&gt;4.0</td>
</tr>
<tr>
<td>PDA2</td>
<td>&lt;3.8</td>
<td>3.8–4.5</td>
<td>&gt;4.5–5.0</td>
</tr>
</tbody>
</table>

Conclusion: We have established and validated criteria for defining high, medium, and low disease activity as well as remission, good and moderate response for PDA1 and PDA2. They have comparable agreement and performance to DAS criteria based on DAS28 and CDAI, and should facilitate the use of PDA1 and PDA2 in routine practice and research.

Disclosure: A. M. Leung, None; D. Farewell, None; C. S. Lau, Treat to Target Advisory Board in Asia (Abbott), 5, Asia Rheumatology Expert Advisory Council for Pfizer. 5, E. Choy, None. 349

Trends in Disease Activity, Response and Remission Rates in Rheumatoid Arthritis During the Last Decade: Results From the NOR-DMARD Register. Anna-Birgitte Aga, Elisabeth Lie, Karen M. Fagerli, Till Uhlig, Tore K. Kvien and Espen A. Haavardsholm. Diakonhjemmet Hospital, Oslo, Norway

Background/ Purpose: During the past decade there has been an increasing focus on early, aggressive treatment of patients with rheumatoid arthritis (RA), and combined with the availability of biologics this will likely lead to improved patient outcomes. Observational data reflect everyday clinical practice and can provide information about implementation of current treatment recommendations. Our objective was to investigate whether baseline disease activity levels and responses in patients with RA changed during the period 2001–2010.

Methods: Data for this study were provided by the NOR-DMARD Register. Adult patients with inflammatory arthropathies starting a new DMARD at five Norwegian rheumatology departments are consecutively included and followed longitudinally. These analyses focused on two groups of RA patients: Methotrexate (MTX) naive RA patients starting MTX monotherapy (MTX mono), and biologics naive RA patients starting TNF-inhibitor + MTX (TNFi+MTX). For the descriptive analyses each group was stratified into two-year intervals according to start date. Time trends in several baseline variables were assessed by linear regression analysis with time as the independent variable (continuous 1–10) and the respective baseline variables as dependent variables. CRP, ESR, joint counts and MHAQ were ln-

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The IMPROVED trial remission after one year is achieved in similar proportions of patients with early arthritis, regardless of ACPA status or classification. A low baseline DAS and achieving early remission after initial treatment with prednisone and methotrexate is predictive for achieving remission after one year. Of those not achieving early remission, ACPApos RA and, probably ACPAneg UA and RA patients, benefit more from a treatment strategy with adalimumab than of one with multiple DMARDs with low dose prednisone.

Disclosure: K. V. C. Wevers-de Boer, None; L. Heimans, None; K. Visser, None; A. A. Schouffoer, None; T. H. E. Molenaar, None; J. B. Harbers, None; C. Bijkerk, None; L. Speyer, None; M. de Buck, None; P. B. de Sonnaville, None; B. A. Grillet, None; T. Huizinga, None; C. F. Allaart, None.

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transformed for the linear regression analyses. EULAR good response and DAS28 remission were similarly assessed by logistic regression analysis.

**Results:** A total of 2573 patients were included: MTX mono n = 1866 (69.9 % female, 62 % RF+, mean (SD) age 56.0 (13.7) years, yrs, time from diagnosis 3.6 (7.7) yrs) and TNFi + MTX n = 707 (70.3 % female, 75 % RF+, mean (SD) age 52.1 (13.2) yrs, yrs, time from diagnosis 9.1 (9.3) yrs).

Significant time trends were found in both groups for baseline values of DAS28, 28-SJC and CRP (table). Significant time trends were also found for baseline disease duration, SDAI, MHAQ, 28-TJC, ESR, physician global, patient global and joint pain VAS (data not shown). Further, there was a trend towards increasing 6-month DAS28 remission rates over the years in both groups, whereas a gradual increase in the EULAR good response rate was only observed in patients starting MTX mono (table).

**Conclusion:** Mean baseline disease activity level for patients starting MTX treatment and for patients starting the first TNFi has decreased from 2001 to 2010 and moderate to high during the last decade. Mean disease duration also decreased significantly. These findings indicate that clinicians have implemented modern, more aggressive RA treatment strategies which will hopefully result in better long-term patient outcomes.

**Disclosure:** A. B. Aga 1, E. Lie, Roche Pharmaceuticals, 5, Pfizer Inc, 8, K. M. Fagerli, Abbott Immunology Pharmaceuticals, 8, Pfizer Inc, 8, Merck Pharmaceuticals, 8, Roche Pharmaceuticals, 8, T. Uhlig, Bristol-Myers Squibb, 5, Pfizer Inc, 5, Merck Pharmaceuticals, 5, T. K. Kvien, Abbott Immunology Pharmaceuticals, 8, AstraZeneca, 8, Merck Pharmaceuticals, 8, NiCox, S.A., 8, Pfizer Inc, 8, Roche Pharmaceuticals, 8, UCB, 8, BMS, 5, Abbott Immunology Pharmaceuticals, 5, Merck Pharmaceuticals, 5, NiCox, S.A., 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5, UCB, 5, E. A. Haavardsholm, None.

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Prevalence, Concordance and Predictors of Early and Sustained Remission Assessed by Various Indices in the French Early Arthritis Espoir Cohort. Cédric Lukas1, Ihsane Hmamouchi2, Xavier Le Loet3, Bruno Fauvert4 and Bernard Combe5.

**Conclusion:** Clinical remission is the best achievable state in patients with rheumatoid arthritis (RA). The definition of remission, however, is still under debate. The aim of this study was to assess the prevalence of remission during the initial follow-up of a cohort of patients with early inflammatory arthritis, to evaluate the concordance across different criteria sets in defining this state, and to look for predictive factors for early- and sustained remission.

**Methods:** Patients from the French ESPOIR cohort, who had arthritis involving at least 2 joints for between 6 weeks and 6 months, and had not received any specific therapy before their inclusion, were followed-up every 6 months. Treatment was collected, but no specific strategy was imposed. We analysed early remission (at 6 months follow-up) and sustained remission (remission state in both 6 months- and 1 year visits) in 3 different groups of patients: Patients who were diagnosed as having RA according to 2010 ACR/EULAR criteria, undifferentiated arthritis (UA) after 1 year of follow-up, and the entire cohort (ESPOIR). Remission was defined according to 2011 ACR/EULAR criteria, 28 Joint Disease Activity Score (DAS28<2.6), and Simplified Disease Activity Index (SDAI<3.3). Agreement across available criteria sets was evaluated by k-coefficient. Predictive factors for sustained remission at 1 year in RA patients were analyzed by logistic regression, with potential predictive factors tested from available clinical, biological and demographic data.

**Results:** 813 patients were included, mean age (SD) 48.1(12.6) years, 45.8% positive for rheumatoid factor (RF), 38.8% for anti-CCP test. Early remission rates in the RA/UA/ESPOIR groups were observed in respectively 29.2% (181/682), 51.4% (55/123) and 32.7% (239/813) of patients by DAS28: 15.7%, 29.1% and 18% by SDAI; and 11.2%, 29.1% and 12.8% by ACR/EULAR criteria. Agreement between classifications of remission by k-statistics was low for DAS28 vs ACR/EULAR (r = 0.44 [0.38–0.51]), high for SDAI vs ACR/EULAR (r = 0.78 [0.72-0.84]), and moderate for SDAI vs DAS28 (r = 0.54 [0.48–0.61]). Lower baseline disease activity scores (DAS28<5.1), non-menopausal status and younger age (<50 years) were the best predictive factors for sustained remission at 1 year, with consistent results across the 3 definitions of remission.

**Disclosure:** C. Lukas, None; I. Hmamouchi, None; X. Le Loet, None; B. Fauvert, None; B. Combe, None.

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Assessment of Global Disease Activity in Rheumatoid Arthritis Patients Monitored in the Measurement of Efficacy of Treatment in the Era of Rheumatology Database: The patient’s Versus the rheumatologist’s Opinion. E. Gvozdenovic1, R. Koevoets1, W. Wolterbeek1, Désirée van der Heijde1, T.W.J. Huizinga1, C.F. Allaart1 and Robert B. M. Landewe2.

**Conclusion:** Our study showed that the rate of early (6 months) and sustained remission at 1 year in a cohort of early inflammatory arthritis is dependent on the definition used, with a variable degree of agreement across criteria sets, but with consistent predictive factors of favourable outcome at 1 year in patients finally diagnosed with RA. Younger age, lower baseline DAS28 and non-menopausal status.

**Disclosure:** C. Lukas, None; I. Hmamouchi, None; X. Le Loet, None; B. Fauvert, None; B. Combe, None.

**Background:** Disagreement on disease activity between rheumatoid arthritis (RA) patients and rheumatologists may influence treatment decisions and compliance.

The aim is to compare the physician’s (PhGDA) and patient’s (PdGDA) assessment of global disease activity and to identify factors that might influence these differences over time, as well as factors that may influence the patients and the physicians score separately.

**Methods:** Anonymously data were used from 2118 Dutch patients included in the Measurement of efficacy of Treatment in the Era of Rheumatology (METEOR) database, a worldwide online tool for disease monitoring in RA. PhGDA and PfGDA were scored independently on a 100 mm visual analogue scale (VAS) with 0 and 100 as extremes. Intra-class correlation coefficients (ICC) were calculated as a measure of agreement and a Bland Altman plot was created to visualize the differences between PhGDA and PfGDA. Linear Mixed Model analysis was used to model the difference in PfGDA and PhGDA over time. Logistic repeated measures were used to model the difference in PfGDA and PhGDA (PfGDA≠PhGDA vs. PhGDA<PfGDA) over time. Gender, age, swollen joint count, tender joint count, VAS pain, disease duration and ESR were considered as possible determinants in both models.

**Results:** Mean (SD) age was 57 (13) years and 67% of the patients were female. Agreement between PfGDA and PhGDA was moderate (ICC: 0.57). Patients scored on average 11 units higher (worse) than PhGDA over time. The patient’s perception of pain (VAS) was positively associated with the PfGDA being worse long-term patient outcomes.
higher than PhGDA. Similarly, ESR and swollen joint counts were positively associated with a PhGDA being higher than a PtGDA (Table 1). Both PtGDA and PhGDA were independently associated with tender joint count, swollen joint count, disease duration, and pain (VAS) for pain.

Table 1. Clinical parameters associated to the difference between PtGDA and PhGDA as a binary dependent variable.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate β</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.16</td>
<td>0.15, 0.47</td>
<td>0.30</td>
</tr>
<tr>
<td>Age</td>
<td>-0.00</td>
<td>0.01, 0.02</td>
<td>0.46</td>
</tr>
<tr>
<td>Disease duration</td>
<td>-0.01</td>
<td>-0.02, 0.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>ESR</td>
<td>-0.29</td>
<td>-0.36, -0.21</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>SJC28</td>
<td>-0.04</td>
<td>-0.10, 0.02</td>
<td>0.22</td>
</tr>
<tr>
<td>TJC28</td>
<td>0.05</td>
<td>0.04, 0.06</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*PtGDA versus PhGDA

Conclusion: Subjects rate global disease activity consistently higher than their rheumatologists. Patients base their judgment primarily on the level of pain; while physicians use SJC and ESR to rate global disease activity.

Disclosure: E. Gvozdenovic, None; R. Koenevert, None; R. Wolterbeek, None; D. van der Heijde, None; T. W. J. Huizinga, None; C. F. Allaart, None; B. M. Landewe, None.

Basal Metabolic Rate As an Indicator of Rheumatoid Arthritis Disease Activity and Predictor of Remission. Heather Jones1, Annette Szumski2 and Andrew S. Koenig.1. Pfizer Inc, Collegeville, PA, 2Pfizer Inc., Collegeville, PA

Background/Purpose: The role of body mass index (BMI) in rheumatoid arthritis (RA) disease activity and response to treatment has been difficult to determine.1 As a measure of physiologic function, basal metabolic rate (BMR) may be a better indicator than BMI for clinical assessment and treatment response in RA patients. In this posthoc analysis, the relationship between BMR, BMI, disease activity and responses to etanercept (ETN)-methotrexate (MTX) treatment were assessed in subjects with moderately active RA in the PRESERVE trial.2

Methods: Subjects with DAS28 ≥3.2 and ≤5.1, despite stable doses of oral MTX received open-label ETN 50 mg once weekly (QW) plus MTX (titration to ≤25 mg/week through week 28) for 36 weeks (Period 1). Posthoc analyses of disease activity and treatment response by BMR and BMI categories at baseline and Week 36 of treatment were conducted in subjects who received ≥1 treatment dose and had Week-36 assessments. The Mifflin-St Jeor3 and revised Harris-Benedict4 formulas were used to calculate BMR. Adjusted mean DAS28 scores were calculated using ANCOVA with BMI categories and weight as predictors at baseline and using weight and baseline scores as predictors at Week 36. Similar analysis performed on BMI. Baseline correlates were used to determine overall associations between BMI/BMR and DAS28.

Results: Of 829 subjects analyzed, the proportions of patients with each category of BMR (Mifflin-St Jeor) were evenly distributed and half had a BMI in the low to normal range (table). At baseline, higher BMR was significantly associated with lower DAS28 scores after adjusting for weight (r = 0.127, p = 0.008), and lower BMI was associated with lower DAS28 scores (r = 0.124, p = 0.001). At week 36, higher BMR was significantly associated with lower DAS28 scores (r = 0.233, p < 0.001) and were also associated with a greater likelihood of remission (DAS28<2.6, p < 0.001). Similar results were seen using the revised Harris-Benedict formula. Higher BMI was significantly associated with higher week 36 DAS28 scores (p = 0.002) and with decreased likelihood of remission (p = 0.047).

Adjusted Mean DAS28 scores by Baseline BMR and BMI Category at Baseline and Week 36 of Treatment with ETN-MTX in Subjects With Moderate RA

Disclosure: H. Jones, Pfizer Inc; 3A. Szumski, Pfizer Inc; 3A. S. Koenig, Pfizer Inc; 1, Pfizer Inc; 3, Pfizer Inc; 3, Pfizer Inc; 3

Can Sustained Remission of Rheumatoid Arthritis Be Predicted? an Analysis From the Japanese National Database of Rheumatic Disease (NinJa). Yoichiro Haji1, Masurama Kishimoto1, Ryo Rokutanda2, Sachiko Ohde2, Guotam A. Deshpande3, Yuri Ohara1, Chuan Min1, Yasuharu Sayama1, Hisamori Shimizu1, Ken-ichi Yamaguchi1, Akira Takeda1, Yukio Matsui1, Masato Okada1 and Shigeto Tohma1. 1St. Luke’s International Hospital, Tokyo, Japan, 2St-Luke’s Life of Science Institute, Tokyo, Japan, 3Sagamihara National Hospital, Sagamihara City, Japan

Background/Purpose: Achievement of clinical remission in rheumatoid arthritis (RA) is now the goal of therapy to reduce joint damage and disability, and maintain or improve quality of life. Sustained remission is critical to attain these outcomes. Predictive factors for sustained remission of RA are not known. The purpose of this study is to identify prognostic factors of sustained remission and build a predictive model.

Methods: Data from RA patients registered in a nationwide Japanese cohort database (NinJa: National Database of Rheumatic Diseases by i-net in Japan) in 2009 and 2010 were used to evaluate baseline characteristics, treatment profiles, and the following clinical outcomes: tender joint count (TJC), swollen joint count (SJC), C-reactive protein (CRP), ESR, patient Visual analog scale (VAS), physician VAS, and Modified Health Assessment Questionnaire (MHAQ). All patients with SDAI remission in 2009 were divided based on whether remission was maintained in 2010. A multivariate Cox regression model was constructed for predictive factors and a prognostic prediction model was constructed. Bootstraping was used for internal model validation.

Results: Out of 4215 patients with RA in the 2009 cohort, 930 patients had SDAI remission, and 623 patients (67.0%) had sustained remission after 1 year. Compared to non-sustained remission group, duration of disease, SJC, CRP, ESR, patient VAS, physician VAS, and MHAQ were significantly lower in the sustained remission group (p < 0.05). Mean SDAI score in the sustained remission group was 1.45 ± 0.92 versus 2.08 ± 0.86 in the non-sustained remission group (p < 0.05). A prognostic prediction model with a total score of 6 points was constructed as follows: 2 points for MHAQ ≥1; 1 point each for SJC ≥1, ESR ≥20, patient VAS ≥0.5, and physician VAS ≥0.5. Area under the receiver operating characteristic (ROC) curve for this model was 68.8% (95% CI: 65.0–73.0%). Bootstrapped validation beta coefficients of predictors were identical to the original cohort data.

Conclusion: We found that duration of disease, SJC, CRP, ESR, patient VAS, physician VAS, and MHAQ are significantly lower in those with sustained remission after 1 year. A prediction model was successfully built and validated using clinically relevant parameters.

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High Patient Global Assessment Scores Associate with the Residual Disease Activity Unidentified by a 28-Joint Examination in Rheumatoid Arthritis Patients Approaching Clinical Remission. Yasushi Inoue, Eiichi Tanaka, Ayako Nakajima, Eisuke Inoue, Akiko Kobayashi, Daisuke Hoshi, Naoki Sugimoto, Kumi Shidara, Yohei Seto, Atsuhiro Iwaguuchi, Shigeki Momohara, and Hisashi Yamashita. Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan

Background/Purpose: Patient global assessment (PtGA) is a component of the new ACR/EULAR remission criteria for rheumatoid arthritis (RA). It has been reported that >50% of patients who satisfied the other 3 components failed to achieve remission due to their higher PtGA score. Certain problems related to the higher PtGA among such patients may have been hidden. However, it remains to be clarified whether RA patients with a PtGA score ≤1 would essentially differ from those with a score >1, and whether significant differences would be found when comparing patients with a PtGA score ≤1 to those with a slightly higher score.

Methods: The Institute of Rheumatology, Rheumatoid Arthritis (IORRA), is a hospital-based large observational cohort of RA patients. Clinical information and laboratory data have been collected biannually. PtGA scores were rated using a Visual Analogue Scale (0–10 cm). Swollen and tender joint counts were recorded by examination of 45 joints. Components of DAS28 were documented as TJC28 and SJC28, and the other joint involvements in this study were described as “TJC45-28” and “SJC45-28”. Thirteen validated Japanese versions of Health Assessment Questionnaire (J-HAQ) scores and the EuroQol 5 Dimensions (EQ-5D) ratings were used to evaluate physical function and quality of life (QOL), respectively. The subjects were 2,973 RA patients who participated in the IORRA survey in April 2011, and “fulfilled 3 other components” defined as TJC, SJC, and CRP being ≤1. Multivariate logistic regression analyses were performed to evaluate factors associated with PtGA in 2 models; model 1, patients with a PtGA >1 compared to those with a PtGA ≤1; model 2, patients with a PtGA >1 compared to those with a PtGA ≤1. Odds ratios (OR) with 95% confidence intervals (CI) were calculated using the JMP 9.0 software package.

Results: Among patients fulfilling the other 3 components, only 42.8% achieved Boolean trials remission. Multivariate analysis showed that, whether Boolean trials remission was achieved or not was independently associated with age (OR = 0.99; 95% CI, 0.98–0.99; p<0.001), SJC28 (OR = 1.10; 95% CI, 1.04–1.16; p<0.001), TJC28 (OR = 1.26; 95% CI, 1.17–1.37; p<0.001), J-HAQ (OR = 1.97; 95% CI, 1.62–2.41; p<0.001), EQ-5D (OR = 0.001; 95% CI, 0.000–0.001; p<0.001), and NSAID use (OR = 1.41; 95% CI, 1.20–1.65; p<0.001). Notably, “SJC45-28” was also strongly associated (OR = 1.18; 95% CI, 1.02–1.38; p<0.001) with achieving Boolean trials remission. When factors were analyzed in patients with a PtGA ≤2 (n = 538) compared to those with a PtGA >2, significant associations were similarly found in age, SJC28, TJC28, J-HAQ, EQ-5D, NSAID use, and “SJC45-28”, indicating that a slight increase of PtGA would reflect the hidden problems and residual disease activity.

Conclusion: Among patients fulfilling the other 3 components, high PtGA scores (>1), even if only slightly higher, were closely related to impaired QOL, physical dysfunction, joints involvement, and NSAID use. Furthermore, any joint involvement unidentified by a 28-joint examination significantly influenced PtGA in the IORRA cohort. In clinical practice, a rheumatologist must pay attention to the other joints when the PtGA score is >1.

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Can We Improve Outcomes in Early Rheumatoid Arthritis by Determining Best Practices? An Analysis of the Canadian Early Rheumatoid Arthritis Cohort (CATCH). Jamie Harris1, Vivian P. Bykerk2, Carol A. Hitchon3, Edward Keystone4, J. Carter Thorne5, Gilles Boire6, Boulou Harouet7, Glen S. Hazelett8, Ashley Bonner9, Janet E. Pope10, and CATCH Investigators10. 1Western University, London, ON, 2Hospital for Special Surgery, New York, NY, 3University of Manitoba, Winnipeg, MB, 4University of Toronto, Toronto, ON, 5Southlake Regional Health Centre, Newmarket, ON, 6CHUS - Sherbrooke University, Sherbrooke, QC, 7Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Montreal, QC, 8McMaster University, Hamilton, ON, 9Western University of Canada, St. Joseph’s Health Care, London, ON, 10Toronto, ON

Background/Purpose: The goal of ERA treatment is remission but many patients do not achieve this state due to patient factors and perhaps differences in treating physicians. Studying treatment variation can lead to adopting best practices. Our objective was to investigate whether site differences occur and have an effect on outcome in ERA, and if so, to determine whether site size and/or differences in treatment explain the variability.

Methods: Sites from the CATCH database that had >40 patients at 6 months after enrolment were studied. Included sites were randomly renumbered and assigned a letter with investigators blinded. Patient data was used to calculate remission by several definitions (DAS28 ≤ 2.6, SDAI ≤ 3.3, CDAI ≤ 2.8) and to determine treatment and treatment changes. Regression models included site as a variable and confounding baseline characteristics (HAQ, DAS28, serology, presence of erosions, cigarette smoking, age, gender, symptom duration, and SES) that had a p-value < 0.10 in univariate analyses.

Results: Of the 1138 baseline patients, 798 and 640 patients had data at 6 and 12 months respectively. Baseline descriptive statistics revealed that (mean (SD) or%): age 52(17) years; 72% female; 23% had erosions; 54% either were current or ever smokers; 37% anti-CCP positive; 51% RF positive; disease duration 18(203) days; HAQ 0.9(0.7); DAS28 4.5(1.4). Regression analyses showed that site is an important predictor for mean changes in DAS28 (p ≤ 0.000), increase in DAS28 (p ≤ 0.004), DAS28 remission (p ≤ 0.000), CDAI remission (p ≤ 0.000), and SDAI remission (p ≤ 0.022). Regression analyses including treatment showed that increases in medication was the strongest predictor of bad outcome (p < 0.05) and caused site to lessen some of its predictive ability.

Conclusion: The two largest sites had the biggest mean changes in DAS at 6 and 12 months. Site is a predictor for ERA outcome. The fastest and best indicator for low DAS/remission was initial treatment with combination therapy.
DMARDs and for 12 months the latter approach or initial treatment with parenteral methotrexate at 20–25 mg per week. We cannot say if an unmeasured factor accounted for better changes in DAS at the largest sites.


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Discordant Inflammatory Markers in Veterans with Rheumatoid Arthritis: Baseline Characteristics and Relationship with Disease Activity.

Rebecca Belsom1, Archana Jain1, Jeffrey Curtis1, Shuo Yang2, Ted R. Mikuls2, and Angela L. Peasgood1, 1University of Birmingham, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL, 3University of Alabama at Birmingham, Birmingham, AL, 4Birmingham VA Medical Center and University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Discrepancies between erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) elevations with clinical disease activity frequently occur in rheumatoid arthritis (RA) patients and may be due to comorbid factors other than RA disease activity. We hypothesize that common comorbidities such as current or prior tobacco use, congestive heart failure (CHF), coronary artery disease (CAD), and diabetes mellitus (DM) are associated with discrepancies in inflammatory marker elevations in RA patients.

Methods: We performed a cross-sectional analysis using data collected at the baseline visit in the Veterans Affairs Rheumatoid Arthritis (VARA) cohort. We obtained demographics and comorbidities (tobacco use, CHF, DM, CAD, sleep apnea, chronic obstructive pulmonary disease, malignancy, osteoarthritis, obesity) from linked Decision Support Services (DSS)-derived medical data. We used the following cutpoints to define normal laboratory values for ESR and CRP: 1) ESR for age over 50, 20/mm/hr for men and 30/mm/hr for women; age under 50, 15/mm/hr for both sexes 2) CRP of 0.8 mg/dL for both sexes. Concordant values were defined as both tests either being above or below these cutpoints. We analyzed the frequencies of comorbidities in patients with low disease activity by the clinical disease activity index (CDAI) ≤ 10 in relation to: 1) concordant vs. discordant elevations in inflammatory markers and 2) low or moderate/high disease activity by DAS28-ESR (<3.2 or ≥3.2) and DAS28-CRP (<2.67 or ≥2.67).

Finally, we documented the frequencies of comorbidities in patients who met all the current ACR/EULAR Boolean-based definition requirements and in those who met only the 3 clinical criteria but failed the CRP ≤ 1 criterion.

Results: We identified 1158 RA patients with baseline ESR and CRP values. There were 392 with concordantly normal, 368 with concordantly elevated, 205 with elevated ESR/normal CRP and 193 with elevated CRP/normal ESR at baseline. Patients in low disease activity by the CDAI were equally likely to have an elevated CRP and normal ESR as they were to have a normal CRP and elevated ESR, irrespective of comorbidities. Fewer than 10% of patients with a low CDAI had moderate-high disease activity by DAS28-CRP and DAS28-ESR. There were 157 patients who met all ACR/EULAR Boolean remission criteria and 35 who met all criteria except for CRP ≤ 1. Among tobacco users, 20% who would otherwise have met ACR/EULAR remission criteria did not due to a CRP > 1.

Conclusion: Common medical comorbidities are frequently associated with elevated ESR and/or CRP in patients with RA. ESR by itself or as part of the DAS28-ESR was as likely to be elevated and categorize patients in low disease activity as CRP by itself or as part of the DAS28-CRP. Despite potential concern that the presence of various comorbidities might significantly influence ESR and CRP and decrease the likelihood that patients meet current ACR/EULAR remission criteria, we did not observe strong evidence for this problem in veterans with RA.

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The Impact of Reaching Low Disease Activity in the First Year On Future Disability and Damage in Patients with Early Rheumatoid Arthritis.

Pooneh Akhavan1, George A. Tomlinson2, Paul R. Fortin3 and Claire Bombardier1, 1University of Toronto, Toronto, ON, 2Toronto General Hospital, Toronto, ON, 3Division of Rheumatology, Centre de recherche du centre hospitalier universitaire de Quebec, Faculte de medicine de L’universite Laval, Quebec City, QC

Background/Purpose: Remission has been proposed as the goal of treatment in patients with early rheumatoid arthritis (RA) by current clinical practice guidelines. Remission is ideal but rare and achieving a low disease activity state (LDA) may be a more realistic goal. The objective of this study was to assess the impact of LDAS at one year on patient function and x-ray progression.

Methods: We used data from The Study Of New Onset Rheumatoid Arthritis (SONORA), a North American prospective cohort of patients with early RA. Our analysis is based on 3 years of follow-up. The Simplified Disease Activity Index (SDAI) and patients’ function (HAQ-DI) were measured at baseline, years 1, 2 and 3. Hand x-ray was performed yearly up to year 2; a modified sharp score of ≥3.5 indicated important x-ray progression.

Multivariate linear regression analysis was performed to assess the impact of reaching LDA (yes/no) at year 1 on future HAQ. Logistic regression was used to assess the impact of reaching LDA at year 1 on x-ray progression (yes/no) at year 2. Both analyses were adjusted for potential clinical confounders. Missing data were imputed using Multiple Imputation.

Results: Baseline characteristics of 964 eligible patients included: mean (sd) age 53 (14.8), disease duration 5.3 (3.1) months, swollen joint count (SJC) 9.4(7.1), tender joint count (TJC) 10.1 (8.0), CRP 1.4 (1.5), SDAI 30.5 (16.6) and median (IQR) HAQ 1.0 (0.37–1.63) and modified Sharp score 3.0 (0.0–7.0). Year 1 LDA was achieved in 37% of patients and x-ray progressed in 17%. Year 1 LDA was strongly associated with lower HAQ at 3 years (p = 0.0003). Other predictors included higher baseline HAQ (p<0.001), older age (p = 0.002), higher joint space narrowing (JSN) score (p = 0.03) and gender (female) (p = 0.007) which were associated with higher HAQ. Complete case and imputed analyses showed similar results. Year 1 LDA was significantly associated with less x-Ray progression at year 2 (OR 0.68, 95% CI 0.47–0.98; p = 0.04) in the imputed case analysis (was not significant in complete case analysis). Baseline Sharp score (1.06, 1.01–1.12; 0.03), positive rheumatoid factor (1.98, 1.2–3.2; 0.01), positive anti-CCP (1.95, 1.13–3.4; 0.03), higher CRP 1.15 (1.01–1.30; 0.03) were also predictors of x-ray progression.

Conclusion: Reaching low disease activity is associated with improved long term outcomes in early RA. This provides strong supports for the current treat to target recommendations. An assessment of prognostic factors at baseline is essential and can help clinicians stratify patients and individualize RA treatment.

Reference:


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Remission is a Difficult Target in Clinical Practice When RA Disease Is Established.

Till Uhlig1, Elisabeth Lie1, Cecilie Kaufmann2, Erik Brandt2, Knut Mikkelsen3, Symwve Kalstad4 and Tore K. Kvien4, 1Diakonhjemmet Hospital, Oslo, Norway, 2Vestre Viken, Drammen, Norway, 3St. Olavs Hospital, Trondheim, Norway, 4Lillehammer Hospital for Rheumatic Diseases, Lillehammer, Norway, 5Tromsø, Norway

Background/Purpose: Clinical remission is the treatment target in rheumatoid arthritis (RA) and several composite indices are available for evaluation of remission and low disease activity (LDA) states. We currently have little information on how disease duration impacts remission and LDA...
rates in daily clinical practice. We examined how often clinical remission and LDA is achieved in clinical practice using existing definitions in RA patients with variable disease duration.

Methods: Data were retrieved from the NOR-DMARD register. For the present analyses we used data from all 4568 patients starting with a synthetic (n=3095) or biological (n=1473) DMARD with available a 3-month follow-up data, and also from 3262 patients with available 6 months follow-up data. Mean (SD) age was 54.7 (11.7) yrs, disease duration was 8.5 (7.9) yrs, 72.7% of patients were females.

Applied definitions for clinical remission included the Disease Activity Score based on 28 joint counts (DAS28) <2.6, the Simplified Disease Activity Index (SDAI) <3.3, the Clinical Disease Activity Index (CDAI) <2.8, Routine Assessment of Patient Index Data (RAPID3, range 0–10) <1, and the ACR/EULAR remission definition (A/E) with tender joint count, swollen joint count, patient global assessment (scale 0–10), and CRP (mg/dL) all <1. We also explored a practical remission definition of A/E without CRP (A/E PRAC), and low disease activity for DAS28 (<3.2), SDAI (<11), CDAI (<10) and RAPID3 (<2). The four investigated categories for disease duration were: <1 year, 1–6 years, 6–10 years, and >10 years.

Results: The table shows percentages for patients according to disease duration periods who met different remission and LDA definitions after 3 months and 6 months of DMARD treatment.

While the new A/E remission criteria were most stringent, for all remission indices the likelihood of remission after 3 and 6 months of DMARD treatment decreased with increasing RA disease duration (Chi square test p<0.01 for all comparisons for 3 and 6 months follow-up). Remission and low disease activity rates after 3 and 6 months were clearly best in patients with up to one year disease duration. Only 6–9 percent of patients with disease duration over 1 year achieved after 3–6 months DMARD treatment a state of remission according to the A/E criteria.

Conclusion: The target of remission varies in difficulty across different remission criteria and is less often achieved with increasing disease duration. These observations have implication for how treat-to-target can be managed in a realistic way in patients with established disease and may indicate that many patients with established disease will need an individualized target due to joint destruction, co-morbidities and other factors.

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Frequencies of Boolean and Index Based ACR-EULAR Remissions Differ Slightly Depending On the Method of Patient Global Assessment.

Paul Studenic, Josef S. Smolen and Daniel Aletaha. Medical University Vienna, Vienna, Austria

Background/Purpose: Two definitions of remission have been put forward by the ACR and EULAR: a Boolean based, requiring swollen and tender joint counts (SJC, TJC), C-reactive protein (CRP in mg/dl) and patient global assessment (PGA on a 0–10cm scale, VAS) to be ≤1; and an index based definition, requiring the simplified disease activity index (SDAI) to be ≤3.3. The patient global has been shown to be crucial in fulfilling the criteria (1). In many settings a numerical rating scale (NRS) is preferred instead of a VAS. Here, we investigated whether the use of a NRS-like assessment would lead to different remission frequencies compared to a VAS.

Methods: We obtained data of a random cross-sectional visit of RA outpatients from a longitudinal observational database. We used simulated (s)-NRS values, in which VAS values were rounded to the closest integer, for calculation of the SDAI. We compared proportions of patients in Boolean and/or SDAI remission between PGA by VAS and sNRS, evaluating their difference or agreement descriptively by Kappa and receiver operating curve analyses (ROC).

Results: We identified 922 RA patients (80% female, 56% rheumatoid factor (RF) positive, mean disease duration 8 years). In the main analysis, 12.8% of patients were in Boolean remission using sNRS versus 11.3% using VAS (see table).

All patients in Boolean remission using VAS also were in remission by sNRS. Boolean remission using VAS and sNRS had a high agreement (κ of 0.93). SDAI remission frequencies were higher than Boolean remission frequencies with a good agreement (table), and showed a κ of 0.94 for the comparison of VAS and sNRS. In sensitivity analyses, in which we rounded all VAS values either up to the next higher integer, or down to the next lower integer to obtain the sNRS, confirmed the main analysis (table).

Conclusion: As expected SDAI remission rates were somewhat higher than Boolean remission rates. This was consistent regardless of the method used to assess the patient global. While Boolean remission was about 15% more frequent using sNRS than VAS, SDAI remission was numerically lower with sNRS than VAS. Thus, using a SNAI instead of a VAS for PGA assessment seems to have little impact regarding the achievement of both SDAI and Boolean remission so that sNRS may be a valid tool for PGA assessment in the new remission criteria. However, this assumption will have to be tested using true rather than simulated NRS.


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βg-h3 Regulates the Inflammatory Arthritis by Mediating Selective Recruitment of Effector/Memory T Cells. Keum Hee Sa, Jin Hee Kang, Mahmudul Md Alam, Kyung Hwa Lee, Churl Hyun Im, Eon Jeong Nam, In San Kim and Young Mo Kang. Kyungpook National University School of Medicine, Daegu, South Korea

Background/Purpose: Transforming growth factor-beta inducible gene-3 (βg-h3) is abundantly expressed in synovial tissues of rheumatoid arthritis (RA) and has a regulatory role in growth, differentiation, adhesion, migration, and survival of cells. Previously, we found that βg-h3 regulates the adhesion and migration of T cells expressing a high level of α4β1 integrin. Therefore, we sought to investigate whether βg-h3 regulates the adhesion of specific T cell subsets selectively and whether it recruits T cells into arthritic tissues differentially according to expression of βg-h3 in a soluble form or in situ within synovial tissues.

Methods: T cells were isolated using negative selection kit with MACS T cell subsets were isolated with antibodies against CD4, CD45RO, and α5 integrin using FACS Aria™. Adhesion of T cell subsets was investigated on βg-h3-coated microtitre plates. βg-h3 overexpressing mice were generated
by the insertion of hS178ig-h3 transgene downstream of albumin promoter. β5β3 deficient mice were also prevented from deleting β5β3 gene using homologous recombination. Collagen antibody induced arthritis (CAIA) model was prepared. Recruitment of effector T cells was evaluated using in vivo homing assay.

Results: T cells isolated from SF of RA were mostly α5β1+1, while most of those from PB of controls were α5β1-1. Adhesion of SF T cells on the coated β5β3 was enhanced compared with normal or RA PB T cells, which was inhibited by the function blocking antibody against α5β3 integrin. RGD peptide, which also binds to αvβ3 integrin, did not block β5β3-mediated adhesion of T cells, while dIhafs-I, a fragment of the 4th fas-I domain of β5β3, blocked the adhesion in a dose-dependent manner. The proportion of CD45RO+ cells among T cells was increased in the PB and SF of RA compared to PB of controls. Most of the CD45RO+ T cells were α5β1+1 population, while almost all the CD45RO+ T cells were α5β1-1 population. β5β3-mediated adhesion were higher in the CD4+/CD45RO+α5β1+ T cells compared with CD4+/CD45RO+α5β1− T cells (0.40 ± 0.03 vs 0.19 ± 0.03 and 0.22 ± 0.02, respectively, P < 0.01). In β5β3-trasgenic CAIA mice, arthritis severity was efficiently ameliorated compared with control (P < 0.05) and tissue sections revealed a decreased number of infiltrating T cells. In β5β3 deficient mice, the severity of CAIA was significantly less severe compared to wild type C57BL/6J mice (P < 0.05), which was consistent with reduced histologic scores. To evaluate the role of β5β3 in T cell recruitment into synovial tissues, in vivo homing of T cells was assessed after adoptive transfer of CFSE-labeled effector T cells. Homing of effector T cells into joint tissue was significantly reduced in β5β3 deficient CAIA mice compared with that of wild type CAIA mice (P < 0.05).

Conclusion: The present data indicate that β5β3 may play a critical role in the regulation of inflammation by the selective recruitment of memory- T cells into the synovial tissues of RA through the interaction with α5β3 integrin. These results implicate a soluble β5β3-based therapeutic strategy for the treatment of inflammatory arthritis.

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The 50V IL4R SNP Is Associated with Increased Th17 Cell Frequency and Poor Clinical Outcome in Rheumatoid Arthritis. Jan Leipe1, Iryna Prots2, Markus A. Schramm1, Matthias Witt1, Axel P. Nigg1, Christiane S. Reinidl1, Claudia Dechant1, Mathias Grunke1, Hen-drik Schulze-Koops2 and Alla Skapenko1. 1University of Munich, Munich, Germany, 2Junior Research Group III, Interdisciplinary Center for Clinical Research Nikolaus-Fiebiger Center for Molecular Medicine, Erlangen

Background/Purpose: A single nucleotide polymorphism (SNP) in the IL4R gene (rs 1805010) has previously been associated with an aggressive destructive course of rheumatoid arthritis (RA). Patients homozygous for the V50 allele, which has been linked to diminished IL-4 signaling, is reported to be a candidate autoantigen in rheumatoid arthritis (RA), yet its specific biologic function remains unknown. Histologic analysis indicates that EN01 is expressed in fibroblast-like synoviocytes (FLS), monocytes, and endothelial cells in the synovium. In pro-inflammatory conditions, EN01 is translocated to the cell surface where it activates plasminogen. Its expression in monocytes mediates migration of the cells into inflamed lung tissues in animal models. Our aim was to investigate the role of surface-expressed EN01 in RA FLS, the key constituent of pannus in RA synovium.

Methods: FLS from RA synovial tissues were isolated and cultured in vitro. EN01 expression on the cell surface was assessed by confocal microscopy. Cell surface-expressed EN01 was treated with a mouse anti-human EN01-stimulating monoclonal antibody as well as an isotype control. Scratch test of cultured FLS and transwell experiments under platelet-derived growth factor (PDGF) were performed to assess FLS migration. Cytoskeletal rearrangement was analyzed after staining FLS with an anti-filagrin antibody. Fluor-4 fluorophore was used for calcium-flux assays directly on discs plated with FLS.

Results: Cell surface EN01 expression was low in (56 passages) cultured FLS under normal conditions. However, overnight TNF-α (as low as 0.1 ng/ml) treatment induced EN01 translocation to the cell surface, which peaked at 24 hours (figure). Stimulation of cell surface-expressed EN01 induced faster repopulation of FLS in the scratch test assay, and increased PDGF-induced transwell migration. Cytoplasmic actin filament rearrangement in FLS was markedly enhanced with EN01 stimulation. Moreover, EN01 stimulation induced a positive calcium flux response in FLS under intravital confocal microscopy.

Conclusion: Translocation of cytoplasmic EN01 to the cell surface in RA FLS is potentiated by TNF-α. Our results indicate that EN01 can contribute to migration of RA FLS, especially under the pro-inflammatory milieu as in the RA synovium.

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Pathway Analysis of Genome-Wide Association Studies on Rheumatoid Arthritis. Young Ho Lee1, Sung Jae Choi2, Jong Dae Ji3 and Gwan Gyu Song4. 1Korea University Medical Center, Seoul, South Korea, 2Korea Univ College of Med, Seoul

**Background/Purpose:** Genome-wide association studies (GWASs) have been successfully used to identify novel common genetic variants that contribute to susceptibility to complex diseases, but individual GWASs are limited in terms of identifying new loci. Thus, pathway-based analysis is required to identify further new loci that contribute to susceptibility to complex diseases. The aims of this study were to identify candidate causal single nucleotide polymorphisms (SNPs) and candidate causal mechanisms of rheumatoid arthritis (RA) and generate hypothesis for SNP to gene to pathway.

**Methods:** An meta-analysis dataset of RA GWASs was used that included 2,554,714 SNPs in 5,539 RA cases and 20,169 controls of European descent. ICSNPathway (Identify candidate Causal SNPs and Pathways) analysis was applied to meta-analysis results of the RA GWAS dataset.

**Results:** ICSNPathway analysis identified 49 candidate causal SNPs and 37 candidate causal pathways. The top 5 candidate causal SNPs, rs1063478 (p = 5.40E–09), rs375256 (p = 3.44E–09), rs365066 (p = 3.60E–30), rs2581 (p = 2.7E–25), and rs1059510 (p = 2.52E–06) were all at human leukocyte antigen (HLA) loci. These candidate causal SNPs and pathways provide 22 hypothetical biological mechanisms. The most strongly associated pathway concerned HLA: rs1063478 (nonsynonymous coding) to HLA-DMA to antigen processing and presentation of peptide antigen. ICSNPathway analysis identified two candidate causal non-HLA SNPs and ten candidate causal pathways, which provided two hypothetical biological mechanisms. First, rs2476001 (nonsynonymous coding [deleterious]) (p = 6.22E–71) to a protein tyrosine phosphatase nonreceptor 22 (PTPN22) and integrin αβ3. In both cases, a ternary complex, FGF1-FGFR-integrin-β3 plays a pivotal role in synoviocyte apoptosis, and its expression is regulated by the direct binding of FGF1 or IGF1 to integrin αβ3. This integrin-growth factor interaction may be a novel therapeutic target for RA.

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Early Growth Response-1 (EGR-1) Controls Synoviocyte Apoptosis, and Its Expression Is Regulated by the Direct Binding of Fibroblast Growth Factor Factor-1 (FGF1) or Insulin-Like Growth Factor-1 (IGF1) to Integrin αβ3. Shino Tanaka1, Jun Saegusa1, Seiji Kawano1, Yoshikazu Takada2, Shunichi Kumagai2 and Akio Morinobu3. 1Kobe University Graduate School of Medicine, Kobe, Japan, 2University of California, Davis, School of Medicine, Sacramento, CA, 3Shinko Hospital, Kobe, Japan

**Background/Purpose:** Growth factors such as fibroblast growth factor (FGF) and insulin-like growth factor (IGF) are of interest in the initiation and development of rheumatoid arthritis (RA) synovial hyperplasia, because of their potent mitogenic and angiogenic activities. The traditional understanding of FGF and IGF signaling has held that their binding to their respective receptor (i.e., the FGF receptor [FGFR] or the IGF receptor [IGFRI]) is sufficient to initiate proliferation, even though the mutant still binds FGFR; this is also true for IGF1. In both cases, a ternary complex, FGF1-FGFR-integrin αβ3, was formed. However, the mechanism underlying the cross-talk between growth-factor-receptor signaling and integrin signaling is unknown. Here we investigated how the growth factor-integrin αβ3 interaction is involved in growth-factor signaling in RA synoviocytes.

**Methods:** Several mutations were introduced at the interface of FGF1 or IGF1 with integrin αβ3, and integrin-binding-defective FGF1 and IGF1 mutants (FGF1R50E and IGF1R50E) were generated. RA synoviocytes were stimulated with FGF1 or FGF1R50E, and comprehensive gene-expression profiling was performed by eDNA microarray. Intracellular signaling in synoviocytes treated with FGF1, FGF1R50E, IGF1, and IGF1R50E was evaluated by real-time PCR and Western blot analyses. Synoviocytes transfected with scramble siRNA or early (EGR-1)-specific siRNA were treated with various apoptotic stimuli, and cell viability was measured by the WST-8 assay.

**Results:** The integrin-binding-defective mutants (FGF1R50E and IGF1R50E) showed a markedly reduced ability to induce the cell proliferation of RA synoviocytes. The cDNA microarray analysis showed significantly reduced EGR-1 mRNA expression in the FGF1R50E-treated synoviocytes. Furthermore, EGR-1 mRNA and protein were rapidly induced in RA synoviocytes in response to FGF1 or IGF1, but the EGR-1 expression was significantly impaired in FGF1R50E- or IGF1R50E-treated synoviocytes. In addition, the downregulation of EGR-1 by siRNA inhibited the apoptosis of synoviocytes treated with H2O2 or dexamethasone.

**Conclusion:** EGR-1 plays a pivotal role in synoviocyte apoptosis, and its expression is regulated by the direct binding of FGF1 or IGF1 to integrin αβ3. This integrin-growth factor interaction may be a novel therapeutic target for RA.

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Single Nucleotide Polymorphisms within the HLA-DRB1 Gene in Relation to Antibodies Against Citrullinated Peptides in Individuals Prior to the Development of Rheumatoid Arthritis. Lisbeth Arlestig1, Mikhail Brink2, Andrew E. Koch2, M. Asif Amin1, Phillip L. Campbell1, Christine M. Ha1 and Alisa E. Koch2,1. University of Michigan, Ann Arbor, MI, 1University of Michigan Medical School, Ann Arbor, MI

Background/Purpose: Multiplex analysis has demonstrated the presence of several antibodies against cyclic citrullinated peptides (ACPAs) preceding the development of rheumatoid arthritis (RA) by several years. Certain HLA-DRB1* alleles are strongly associated with RA.

To relate the presence of different ACPAs, in individuals before the onset of symptoms of RA, to single nucleotide polymorphisms (SNPs) within the HLA-DRB1 region in order to identify the SNPs most highly associated with the ACPAs analysed in the disease development.

Methods: The study group comprised 406 individuals, with 717 samples, who were identified before the onset of symptoms (median IQ9 7.4 (9.3) years), as donors to the Medical Biobank of Northern Sweden. A total of 976 population controls were identified from the Medical Biobank for analysis of antibodies against 10 different citrullinated peptides in plasma using a microarray system developed in collaboration with Phadia AB/Thermofisher, Uppsala, based on their ISAC platform. In a previous study the highest frequencies of antibodies were found for fibrinogen (Fib) B63–52, α-enolase (CEP-1), and filaggrin. Anti-CCP2 antibodies were analysed using ELISA (Euro-Diagnostics). Samples from the same individuals were genotyped with the Immunochip custom array according to Illumina protocols (SNP&SEQ Technology Platform, Uppsala, Sweden). 81 SNPs covering the HLA-DRB1* to DQA1* region were analysed. The Haploview software version 4.2 was used for haplotype and association analysis with a permutation test.

Results: Thirty-seven of the SNPs were associated with the pre-disease individuals compared with controls. After permutation test 22 of them and six haplotypes (7–16 SNPs) remained significantly associated. Anti-CEP-1 antibodies were associated with 15 SNPs although none remained significant after permutation. Anti-filaggrin antibodies were related to 4 SNPs, two of which were similar as for anti-CEP-1 (rs9271588 and rs9272363), none remained significant after permutation test. Anti-FibB63–52 antibodies were associated with 4 different SNPs compared with the other antibodies and none were significant after permutation test. Of the SNPs analysed 21 were associated with anti-CCP2 antibodies and two of them (rs9271588, rs9271850) and three haplotypes were significantly associated after a permutation test.

Conclusion: The presence of ACPAs is related to a number of SNPs within the HLA region albeit with somewhat different patterns between the various antibodies.

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First-Degree Relatives without Rheumatoid Arthritis Exhibit Reactivity to Multiple Anti-Citrusubilated Protein Antibodies in Association with Rheumatoid Arthritis-Related Clinical Characteristics: Studies of the Etiology of Rheumatoid Arthritis. Kendra A. Young1, Kevin D. Deane2, Lezlie A. Derber1, Jan M, Hughes-Austin3, Michael H. Weissman1, Jane H. Buckner2, Ted R. Mikuls3, James R. O’Dell2, Richard M. Keating2, Peter K. Gregersen4, V. Michael Holers2 and Jill M. Norris1, 1Colorado School of Public Health, Aurora, CO, 2University of Colorado School of Medicine, Aurora, CO, 3University of Colorado Anschutz Medical Campus, Aurora, CO, 4Colorado School of Public Health/University of Colorado Anschutz Medical Campus, Aurora, CO, 6Benaroya Research Institute at Virginia Mason, Seattle, WA, 7Omaha VA and University of Nebraska Medical Center, Omaha, NE, 8Univ of Nebraska Med Ctr, Omaha, NE, 9University of Chicago, Chicago, IL, 10Feinstein Institute Medical Research and North Shore-Long Island Jewish Health System, Manhasset, NY

Background/Purpose: Prior to diagnosis of rheumatoid arthritis (RA), there are increases in the number of citrullinated proteins that anti-citrullinated protein antibodies (ACPA) target, suggesting an expansion of autoimmunity in early RA development that, if fully understood, may provide insight into the earliest antigenic targets important in disease pathogenesis. Anti-CCP assays are currently the most widely used ACPA assessments; however, the specific epitopes recognized by these commercial assays are unknown, thereby limiting the ability to make inferences about the type and expansion of ACPA responses. Our objective was to utilize multiplex technology to examine ACPA reactivity to specific citrullinated proteins and peptides in the pre-diagnosis period of RA development by performing this analysis in first-degree relatives (FDRs) of RA probands, who do not have RA, but are at increased risk of future RA.

Methods: We selected 113 FDRs (Ab+) who had been positive at ≥1 research visit for any of 5 Ab: rheumatoid factor (RF) by nephelometry; RP by ELISA for isotypes IgM, IgG, or IgA; or anti-CCP2 and 100 FDRs (Ab−) who had never been autoantibody positive. A panel of 18 ACPA was measured using a bead-based assay in serum from 397 visits by these FDRs. Cut-offs for positivity for each ACPA were determined using receiver lactose bovine serum albumin (2’FL-BSA) was used as a standard. We previously showed that fult gene deficient mice in which KRN arthritis has been induced have less joint monocyte chemotactic protein (MCP)-1/CCL2 and interleukin (IL)-1β than wild type mice. Hence, we measured IL-1β and MCP-1/CCL2 in RA, OA and other inflammatory disease synovial fluids (SFs) by ELISA to determine if these cytokines have been modified. We also examined tumor necrosis factor (TNF)-α for fucosylation, as TNF-α is a key cytokine in RA pathogenesis. To determine whether fult was expressed by NL and RA synovial fibroblasts, real time polymerase chain reaction (RT-PCR) was performed. To block the expression of fult1, RA synovial fibroblasts were transfected with fult1 small interfering RNA (siRNA). After treatment with fult1 siRNA, RA synovial fibroblasts were stimulated with TNF-α for 1 hour. We then measured the expression of cytokines important in RA, MCP-1/CCL2, epithelial neutrophil-activating protein 7 (ENA-78)/ CXCL5 and vascular endothelial growth factor (VEGF) mRNA were measured by RT-PCR.

Results: Total α(1,2)-linked fucosylated proteins in RA ST were significantly higher compared to OA ST or NL ST [mean ± SEM 74 ± 21 ng/ml (n=5), 25 ± 4 ng/ml (n=7) and 29 ± 6 ng/ml (n=9), respectively, p<0.05]. Specifically, α(1,2)-linked fucosylated IL-1β and MCP-1/CCL2 in RA synovial fluids were 6 ± 2% of total fucosylated proteins (n=9) and 20 ± 4% of total fucosylated proteins (n=12), respectively. In addition, α(1,2)-linked fucosylated TNF-α in RA synovial fluids was significantly higher than in OA and other inflammatory disease synovial fluids [950 ± 220 pg/ml (n=22), 150 ± 90 pg/ml (n=13) and 30 ± 20 pg/ml (n=11), respectively, p<0.05]. We also found that fult1 messenger RNA (mRNA) in cultured RA synovial fibroblasts was significantly elevated compared to NL synovial fibroblasts (p<0.05). Additionally, RA synovial fibroblasts transfected with fult1 siRNA had significantly lower mRNA expression for MCP-1/CCL2, ENA-78/ CXCL5 and VEGF than did control siRNA transfected synovial fibroblasts.

Conclusion: These data show that α(1,2)-linked fucosylated proteins are upregulated in RA ST compared to other STs. We also show that fult1 in RA synovial cells is necessary for production of variety of cytokines. Targeting fult may be a novel way to alter joint cytokine production.

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operating characteristic (ROC) curves of data from 200 patients with established RA (1987 ACR criteria), and 98 blood-bank controls, where we found that positivity for ≥ 9 ACPAs had 67% sensitivity and 92% specificity for RA, comparable to the 70% sensitivity and >95% specificity for anti-CCP2. In FDRs, we examined reactivity to ACPA and associations between ACPA (number positive and positivity for ≥ 9 ACPA) and RA-related characteristics including positivity for RF (nephelometry or isotopic test), anti-CCP2 or tender joint examination. While we had too few anti-CCP2 positive FDRs to test (n=8), associations were examined with the high-risk autoantibody profile (i.e., anti-CCP2 and/or ≥2 RF isotypes), which was shown to be highly specific (>96%) for future RA.

Results: Both Ab− and Ab+ FDRs showed reactivity to multiple ACPA, although Ab+ FDRs were positive for a greater number of ACPA than Ab− FDRs (mean 3.1 ± 4.3 vs. 2.1 ± 2.8, p=0.04). Of the 8 anti-CCP2 positive FDRs, 5 were positive for at least 9 ACPA, and 4 were positive for 16 or more ACPA. 76% of anti-CCP2 negative FDRs were positive for ≤ 2 ACPA, and 10% were positive ≥9 ACPA. Being positive for a greater number of ACPA is associated with being positive for RF (OR=1.22, 95%CI 1.09–1.35), with the IgM (OR=1.17, 95% CI 1.00–1.3) and IgA (OR=1.14, 95% CI 1.02–1.28) RF isotypes, and for those positive for anti-CCP2 and/or ≥2 RF isotypes (OR=1.22, 95% CI 1.09–1.35). FDRs positive for at least 9 ACPA had significantly greater odds of having least one tender joint on exam (OR=1.35). FDRs positive for at least 9 ACPA had significantly greater odds of follow-up is needed to further assess these findings.

Discussion: H. Mitomi, None; H. Yamada, None; T. Nozaki Shihata, None; H. Ito, None; Y. Yamaski, None; S. Nomoto, None; A. Kusaba, None; H. Yamashita, None; S. Ozaki, None.

416 Dyslipidaemia in Early Rheumatoid Arthritis Patients Is Common and Not Influenced by Two Years of Effective DMARD Therapy. The OPERA Study. Torkell Ellingsen1, Kim Horslev-Petersen2, Merete L. Heltand1, Peter Junker3, Jan Podenphant3, Mikkel Ostergaard2 and Kristian Stengaard-Pedersen4. 1Regional Hospital, Silkeborg, Denmark, 2Southern University, Denmark, 3Copenhagen University and Glostrup Hospital, Copenhagen, Denmark, 4Odense University Hospital, Denmark, 5Copenhagen University Hospital at Glostrup, Denmark, 6Aarhus University Hospital, Denmark.

Background/Purpose: In a cohort of early (<6 month duration) treatment-naive rheumatoid arthritis (ERA) patients (the OPERA-study) (1) to measure lipid levels at baseline, year one and two. Further, to analyze for changes in lipid levels in relation to effective DMARD treatment during two years.

Methods: In 180 ERA patients total s-cholesterol, s-HDL, s-LDL, s-VLDL, s-triglyceride were measured by standardized techniques. All patients were treated with methotrexate (MTX) (20 mg/week) and trimetron-olone intravenously in any swollen joint for 2 years and in addition randomized to receive adalimumab (ADA) or placebo (PLA) during the first year. After year 1, ADA and PLA were withdrawn. If patients had DAS28 (CRP) >3.2 during year 2, sulphasalazine (SSZ) and hydroxychloroquine (HCQ) were added to MTX and if active disease persisted after withdrawal of ADA/PLA, replaced SSZ and HCQ in both treatment arms (1). Analysis was by ITT with last observation carried forward. Comparisons by Wilcoxon’s test.

Results: Baseline characteristics and disease activity were similar in the MTX+PLA and MTX+ADA groups: age 54 vs 56 years; women 69% vs 63%; disease duration 83 vs 84 days; anti-CCP positive 70% vs 60%; IgM-RF positive 74% vs 70%; DAS28 (CRP) median 5.6 (range3.8–7.3) vs. 5.5 (3.8–7.5) respectively. The treatment had an excellent effect on inflammation but no effect on the dyslipidaemias:

<table>
<thead>
<tr>
<th>DAS28 Lipid levels mmol/L</th>
<th>Baseline Median (range)</th>
<th>Year 1 Median (range)</th>
<th>Year 2 Median (range)</th>
<th>Baseline % abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>s-cholesterol</td>
<td>5.6 (3.3–8.6)</td>
<td>4.8 (2.2–7.8)</td>
<td>4.1 (0.7–7.7)</td>
<td>5.0 (0.7–8.4)</td>
</tr>
<tr>
<td>s-HDL</td>
<td>1.4 (0.7–2.7)</td>
<td>1.7 (0.8–3.6)</td>
<td>1.5 (0.7–2.8)</td>
<td>5.3 (1.3–8.4)</td>
</tr>
<tr>
<td>s-LDL</td>
<td>2.8 (0.8–6.1)</td>
<td>2.9 (0.9–6.1)</td>
<td>2.8 (0.8–5.9)</td>
<td>5.0 (0.8–6.3)</td>
</tr>
<tr>
<td>s-VLDL</td>
<td>0.6 (0.1–1.7)</td>
<td>0.5 (0.2–1.6)</td>
<td>0.5 (0.2–1.7)</td>
<td>5.0 (0.2–1.7)</td>
</tr>
<tr>
<td>s-triglyceride</td>
<td>1.3 (0.3–3.8)</td>
<td>0.9 (0.4–3.5)</td>
<td>1.1 (0.4–3.8)</td>
<td>3.4 (1.6–7.9)</td>
</tr>
<tr>
<td>s-Cholesterol/ s-HDL</td>
<td>2.3 (1.7–9.8)</td>
<td>3.2 (1.3–7.2)</td>
<td>3.2 (1.8–7.3)</td>
<td>3.2 (1.8–7.3)</td>
</tr>
</tbody>
</table>

No effect of the efficient DMARD treatment strategy was observed after one or two years in any of the treatment arms regarding the levels of total s-cholesterol, s-HDL, s-LDL, s-VLDL or s-triglyceride (p-levels between 0.07–0.97). At baseline more than half of the 180 ERA patients had abnormal lipid concentrations compared to the reference levels.

Conclusion: In a Danish cohort of ERA patients (OPERA study) more than half of the patients had abnormal serum lipid concentrations at the time of diagnosis. Two years of effective synovitis suppression with MTX and glucocorticoid intraarticular and addition of ADA or PLA during the first year did not influence the dyslipidaemias.

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References:

The Potential Role of PTPRD Gene Copy Number Variation in Susceptibility to Rheumatoid Arthritis. Seung Cheol Shim, Donghyuk Sheen, Mi Kyoung Lim and Hyo Park. Eulji University Hospital, Daejeon, South Korea

Background/Purpose: Since it is important to explore genetic variations associated with rheumatoid arthritis (RA), genome-wide association studies (GWAS) have led to the identification of RA genetic variants putatively associated with susceptibility. Recently, copy number variation (CNV) may also affect susceptibility to diseases, which have been already observed in diverse autoimmune diseases. Protein tyrosine phosphatase receptor D (PTPRD) is a member of the receptor-like PTP which expresses in the B cell lines and thymus and could be involved in the pathogenesis of autoimmune diseases. In this study, we investigated whether the variation of the PTPRD gene copy number related with susceptibility to RA.

Methods: To investigate whether the variation of the PTPRD gene copy number influence the pathogenesis to RA, blood samples and clinical records were obtained from 217 RA patients (184 females, 33 males) and 205 healthy controls. The genomic DNA of RA patients and healthy controls was extracted from leukocytes in peripheral blood using the Genomic DNA Extraction kit (iNtrON Biotechnology, Korea). To measuring the copy number of PTPRD gene, the quantitative real-time PCR (QPCR) was carried out using Mx3000P QPCR system (Stratagene, La Jolla, CA) and each sample for each gene was assayed in triplicate. Western blot was conducted to detect expression levels of PTPRD

Results: The copy number of PTPRD gene in RA patients was compared with that in healthy controls. The proportion of the individuals with <2 copy of PTPRD was significantly higher in patients than in controls, while that of the individuals with >2 copy was lower in patients than in controls. The average relative copy number of the PTPRD gene in RA patients (1.14, 95% CI (1.12–1.16)) was significantly lower than that in healthy controls (1.65, 95% CI (1.12–1.16)) was significantly lower than that in healthy controls (1.65, 95% CI (1.12–1.16), p = 0.0001) (Figure 1). Furthermore, we also investigated association between copy number of PTPRD and RA phenotype such as RF factor and anti-CCP levels, which showed no association between copy number of PTPRD and both RA phenotypes. Western blot showed the lower expression of PTPRD in patients with RA compared to control subjects (Figure 2).

Conclusion: This is the first evidence showing the association between low copy number of the PTPRD gene and susceptibility to RA, which may help understanding the pathogenesis of RA and other autoimmune disorders like affecting maturation and differentiation of T cell and B cells.

Disclosure: S. C. Shim, None; D. Sheen, None; M. K. Lim, None; H. Park, None.

Immediate Early Response Gene X-1 Is Over-Expressed and Regulates Apoptosis and Cytokine Production in Rheumatoid Arthritis Synovial Fibroblasts. Akio Morinobu1, Masaaki Fujita2, Shino Tanaka3, Jun Saegusa4 and Shinichi Kumagai5. 1Kobe university graduate school of medicine, Kobe 650-0017, Japan, 2Kobe University Graduate School of Medicine, Kobe, Japan, 3Rheumatology and Clinical Immunology, Kobe, Japan, 4Shinko hospital, Kobe, Japan

Background/Purpose: Histone deacetylase inhibitors (HDACi) are potential therapeutic drugs for the treatment of rheumatoid arthritis (RA). We found that an HDACi up-regulates the gene expression of immediate early response gene X-1 (IEX-1) in rheumatoid arthritis synovial fibroblasts (RA-SF). IEX-1 is regulated by various stress stimuli and involved in apoptosis and cell growth. Since the role of IEX-1 has never been examined in RA, we examined the expression and function of the molecule in RA-SF.

Methods: Synovial fibroblasts from RA and OA patients were cultured and used between 2–4 passages. Gene and protein expression was determined by qPCR and Western blotting, respectively. Apoptosis was determined by annexin V staining using a flow cytometer. To examine the function of IEX-1, IEX-1 was knocked down by siRNA or over-expressed with lipofection.

Results: (1) IEX-1 mRNA levels were higher in RA-SF than in OA-SF. LPS and TNFa up-regulated the IEX-1 mRNA expression in RA-SF. (2) Over-expression of IEX-1 induced apoptosis and promoted anti-Fas mAb-mediated apoptosis in RA-SF, while knockdown of IEX-1 protected RA-SF from anti-Fas mAb-mediated apoptosis. Also, over-expression of IEX-1 augmented anti-Fas mAb-induced caspase-8 activation, while knockdown of IEX-1 suppressed it. Thus, IEX-1 promotes anti-Fas mAb-induced apoptosis through up-regulating caspase-8 activity. (3) IEX-1 was up-regulated by TSA, an HDACi. Interestingly, apoptosis induced by TSA plus anti-Fas mAb in RA-SF was partially inhibited by knockdown of IEX-1, indicating that IEX-1-mediated apoptosis was mediated, at least in part, by the up-regulation of IEX-1. (3) When IEX-1 expression was down-regulated with siRNA, LPS-induced IL-6 production was decreased, showing that IEX-1 is also involved in cytokine production from RA-SF.

Conclusion: IEX-1 is over-expressed in RA-SF and further induced by TNFa. IEX-1 facilitates anti-Fas mAb-induced apoptosis by enhancing caspase activation, and regulates cytokine production. IEX-1 is likely to play an important role in RA pathogenesis.

Disclosure: A. Morinobu, None; M. Fujita, None; S. Tanaka, None; J. Saegusa, None; S. Kumagai, None.
Epigenome Analysis of Rheumatoid Arthritis Synovial Fibroblasts Revealed TBX5 As A Novel Transcription Factor in Chemokine Regulation. Emmanuel Karouzakis, Michellie Tenckmann, Renate E. Gay, Beat A. Michel, Steffen Gay and Michel Neidhart. Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland

Background/Purpose: Changes in DNA methylation and histone marks have been associated with diseases such as cancer, rheumatoid arthritis (RA) and systemic lupus erythematosus. Previously, we performed methylation immunoprecipitation (MeDIP) in combination with human promoter arrays and identified TBX5 as a differentially methylated gene in RA synovial fibroblasts (SF). Now, we want to further examine its role in the pathogenesis of RA and identify specific TBX5 gene targets.

Methods: Methylation immunoprecipitation assay was used to analyze DNA extracts from OASF (n=5) and RASF (n=7) cell cultures. Bisulfite sequencing was used to confirm the MeDIP results. Transient transfections were done in OASF cell cultures with a TBX5 overexpression vector. RNA and cDNA were prepared and used to hybridize an Affymetrix human microarray. The microarray expression array was confirmed by quantitative SYBR PCR in OASF cultures (n=7). DAVID bioinformatics software was used to functionally annotate the microarray data.

Results: The TBX5 gene was significantly more methylated in OA than RA, as shown by MeDIP assay (OASF 17±2.9 and RASF 5±3.5 fold enrichment, p<0.04, n=6). The MeDIP results were confirmed by bisulfite sequencing of the TBX5 promoter. TBX5 transcripts were significantly more expressed in RASF than OASF (RASF dCt: 16.0 ± 0.6; OASF dCt: 19.3 ± 0.3, p<0.005, n=8). In addition, Western blot showed that the TBX5 protein was expressed in RASF, but not in OASF. Overexpression of TBX5 in OASF revealed 640 genes commonly up regulated from 1.2 to 3-fold. Analysis of these genes by DAVID bioinformatics tool identified that the chemokines IL8, CXCL2 and CCL20 were common targets of TBX5 in OASF. The expression of chemokines was significantly upregulated in seven different OA cell cultures (IL8: 2 fold change ±0.9, CXCL2: 1.97 fold change ±0.9, CCL20: 2.7±0.8, p<0.05).

Conclusion: Promoter specific DNA demethylation and an open chromatin are responsible for the intrinsically up-regulated TBX5 expression in RASF. TBX5 may be a novel regulator of chemotaxis thereby associated with the ability of RASF to attract inflammatory cells to the synovium.

Disclosure: E. Karouzakis, IAR, IMI-BTCure, Novartis-Stiftung, 2; M. Tenckmann, Masterswitch-FP7, IMI-BTCure, IAR, 2; R. E. Gay, Masterswitch-FP7 and her institution, 2; B. A. Michel, his institution, 3; S. Gay, IAR and his institution, 2; M. Neidhart, his institution, 3.

420 Loss-of-Co-Homozygosity Mapping and Exome Sequencing of a Syrian Pedigree Identified the Candidate Causal Mutation Associated with Rheumatoid Arthritis. Yukinori Okada1, Namrata Gupta2, Daniel Mirel3, S. Gay, F. Mouassess, Daniel Aletaha2, S. Gay. 1Medical University of Vienna and Hietzing Hospital, Vienna, Austria, 2Medical University of Vienna, Vienna, Austria. Background/Purpose: Autoantibodies in general, and rheumatoid factor (RF) and anti-citrullinated peptide antibodies (ACPA) in particular, are a hallmark of RA. After their characterization, ACPA have been regarded as more specific than RF in relation to diagnostic and prognostic utility. However, these antibodies have often been unequivocally shared throughout the literature and most of them have come from observational studies, often from a single or few centers. While it has been known for long that RF+ patients have more active and severe disease than RF- ones, it is not clear if this effect is due to RF, ACPA or both in the light of the usually >80% overlap of RF and ACPA positivity and the above controversy. Here we compared the extent of disease activity in RF+ and/or ACPA+ patients to understand the impact of these autoantibodies on disease activity of RA.

Methods: We were kindly provided a large database of patient level data from an international multicenter clinical trial comparing methotrexate (MTX) and rituximab plus MTX in patients with early (~4 years) arthritis who had to be MTX-naive and fulfill a predefined level of active disease (~8 swollen and tender joints) and be RF+ or have erosive disease at entry (IMAGE trial)1. Core set variables as well as levels of RF (by nephelometry) and ACPA (by ELISA) were available from the database. For the purpose of this analysis, we focused on baseline data and pooled the patients of all three treatment groups. The following groups were formed four groups according to the presence/absence of RF and ACPA. We compared disease activity variables and indices (disease activity score, DAS28; simplified and clinical disease activity index, SDAI and CDAI) across these groups using the Kruskal Wallis test for overall assessment, and the Wilcoxon test for subsequent pairwise comparisons if appropriate. A main focus of the latter was the comparison of the RF+-ACPA+ and RF-/ACPA+ populations compared to each other.

Results: At baseline, disease activity was 6.9, 7.1, 7.1 and 6.6 by the DAS28 for RF-/ACPA- (n=64); RF+/ACPA+ (n=611); RF+/ACPA- (n=40); RF-/ACPA+ (n=29), respectively; and 47.8, 49.8, 53.1, 42.3 for the SDAI, significantly different among the four groups for both measures. The lowest values of disease activity measures were seen for the RF-/ACPA- population, and significantly lower than in the RF+/ACPA+ group (p=0.014 for DAS28, and p=0.004 for SDAI). Similar findings were made for CDAI, swollen and tender joint counts, while for ESR and CRP there was a numerical trend in this direction (not shown). Interestingly, patients positive for both RF and ACPA tended to have slightly lower disease activity than RF-/ACPA+ and higher than RF-/ACPA+ ones. Importantly, similar findings were made for the baseline values of each of the three trial arms when assessed individually (not shown).

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Conclusion: The data presented suggest that RF may contribute more strongly to disease activity than ACPA and, therefore, may have more direct pathogenetic implications. Confirmation of these findings in other trial databases would shed more light on this insight.

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Disclosure: J. S. Smolen, Abbott, BMS, MSD, Pfizer, Roche, UCB; 2, Abbott, Axygen, Asta-Zeneca, BMS, Celgene, Glaxo, Medimmune, MSD, Novo-Nordisk, Pfizer, Roche, Sandoz, UCB, 5, Mosby-Elsevier, 7; E. Aalasti, None; D. Aletaha, MSD, 2, Abbott, BMS, Grüenthal, MSD, Pfizer, Roche, UCB, 5.

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Antibodies to Citrulline From Rheumatoid Arthritis Patients Also Bind Homocitrulline. Mathias Scinocca, Radha Joseph, David A. Bell, Ewa Cairns and Lillian J. Barra. Schuchl School of Medicine and Dentistry, Western University, London, ON

Background/Purpose: Antibodies to citrullinated proteins/peptides (ACPAs) are specific for Rheumatoid Arthritis (RA). One of ACA’s targets is citrullinated fibrinogen (cifib) and it is found in inflamed synovium. Recently, it has been reported that antibodies to homocitrullinated proteins/peptides (AHPAs) also occur in RA. Citrulline and homocitrulline are structurally similar. Both can be generated during inflammation, but by different processes. ACPAs from RA patients, including those targeting citrulline, are arthritogenic. However, the role of AHPAs in RA is not known. The purpose of this study was to determine whether: 1) RA patients have antibodies to homocitrullinated fibrinogen (AHFA) and 2) ACPA and AHPA are cross-reactive.

Methods: Serum was obtained from patients who met ACR criteria for RA, Psoriatic Arthritis or Systemic Lupus Erythematosus and were compared to healthy controls. It was tested against the following antigens: fibrinogen (fib), cifib, homocitrullinated fibrinogen (homocifib), JED (a proprietary synthetic citrullinated peptide) and homocitrullinated JED (homoJED). Citrullination was done in vitro using peptidyl arginine deiminase enzyme (PAD2) [1]. Homocitrullination was done using potassium isocyanate. Both modifications were confirmed by mass spectrometry using ESI-MSMS and Mascot server analysis. Shared Epitope (SE) binding was predicted by a computer algorithm [2]. ACPA was purified by affinity chromatography using JED. Antibodies to the above antigens and cyclic citrullinated peptide 2 (CCP2) were detected by ELISA. Inhibition assays using fib and homocifib were conducted by ELISA.

Results: Mass spectrometry of modified fibrinogen revealed 5579 (70%) of arginines were citrullinated and 89103 (86%) of lysines were homocitrullinated. Approximately 25% of MHCI-binding peptides were both citrullinated and homocitrullinated. Five of these peptides were predicted to bind to the SE. The majority of RA patients were anti-CCP2 positive (89%) and 50% expressed AHFA. None of the normal controls and <5% of PsA and SLE were AHFA positive. All AHPA positive patients were also anti-CCP2 positive. Reactivity to homocitrullinated sites on fibrinogen was confirmed by inhibition assays. Affinity purified ACPA using a citrullinated peptide (JED) had reactivity to JED, anti-CCP2, as well as the homocitrullinated peptides, homoJED and homocifib.

Conclusion: Antibodies to homocitrullinated peptides/proteins are specific for RA. These antibodies bind citrullinated and homocitrullinated antigens, suggesting cross-reactivity and possible pathogenicity.


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Sputa Autoantibodies in Patients with Established Rheumatoid Arthritis and Subjects At-Risk for Future Clinically Apparent Disease. Van C. Willis1, M. Kristen Demoruelle1, Leszie A. Derber2, Catherine J. Chartier-Logan3, Mark Parish3, Isabel Pedraza4, Michael H. Weissman5, Jill M. Norris6, V. Michael Holers7 and Kevin D. Deane1. 1University of Colorado School of Medicine, Aurora, CO, 2Cedars Sinai Med Ctr, Los Angeles, CA, 3Cedars-Sinai Medical Center, Los Angeles, CA, 4Colorado School of Public Health, Aurora, CO

Background/Purpose: Elevations of rheumatoid arthritis (RA)-related autoantibodies (Abs) prior to the symptomatic onset of inflammatory arthritis (IA) suggest that autoimmunity in RA is initiated outside of the joints. Furthermore, emerging data suggest a potential site may be the lung, supported by the association of inhaled factors such as smoking with RA, our published findings that inflammatory airways abnormalities can precede the onset of symptomatic IA in RA, and known mechanisms for generation of autoimmunity in the lung such as bronchus-associated lymphatic tissue (BALT) (Rangel-Moreno et al 2006). Prior work suggests that comparison of sputa and sera can be used to identify lung generation of autoantibodies (Schiotz et al 1979); therefore, to investigate the role of the lung as a site of initial generation of RA-related autoimmunity, we tested RA-related Abs from sera and sputa from subjects with established RA and subjects at-risk for future RA due to a family history of RA.

Methods: Simultaneous collection of sera and induced sputa (5% nebulized saline) was performed in 17 healthy controls, 29 first-degree relatives (FDR) of RA probands without IA by clinical examination, and 12 subjects with early seropositive RA (1987 criteria; <1 year from diagnosis). Samples were tested for CCP2 (IgG3), CCP3.1 (IgG/IgA) and IgM, IgG and IgA rheumatoid factor (RFs) using commercial ELISAs. In sera, CCP positivity was set from kit standards, and RF positivity was determined as a level elevated in <5% of 491 blood donors. Sputa positivity for each Ab was determined using the control mean plus 2 standard deviations. Chi-squared testing was used to compare groups, and matched-pair analyses were used to compare the frequency of Ab positivity in sputa and sera.

Results: There were no significant differences in age, sex, smoking status or history of lung disease between Early RA and FDR subjects. All of the Early RA and 8/29 (28%) of FDR subjects were positive in their sera for at least 1 Ab. Overall, a greater proportion of Early RA subjects were positive for each Ab in their sera vs. sputa. However, 8 of the 21 seronegative FDRs were positive in their sputa for at least 1 Ab. Specifically, the assays that detected IgA were elevated in significantly more FDR subjects’ sputa than sera: CCP3.1 31% positive in sputa vs. 7% positive in sera, p=0.03; RF-IgA 14% vs. 0%, p=0.03.

Conclusion: Sputa elevations of RA-related Abs in seronegative FDRs without IA suggest that in some cases RA-related autoimmunity may be initially generated in the lung. Because sputum largely reflects airway responses, these findings also suggest that RA-related autoimmunity may be initially limited to the airways, and IgA predominant. However, the higher number of patients with RA sera vs. sputa Ab positivity also suggests that after the symptomatic onset of RA the generation of Abs occurs at other sites, leading to autoantibodies in the circulation instead of sputa. These findings show the utility of sputa testing to assess RA-related autoimmunity in the lung, as well as demonstrate a need for prospective studies of subjects at-risk for future RA to determine the role of immunologic responses in the lung in the earliest phases of RA development.

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Influence of Pregnancy On Disease Activity-Associated Genes in Rheumatoid Arthritis. Erik J. Peterson1, Shreyasee Amin2, Hatice Bilgic3, Emily Bacchler Gillespie4, Jane E. Salomon5, Ann M. Reed6, Weihua Guan7 and Daniel L. Mueller1. 1University of Minnesota Medical School, Minneapolis, MN, 2Mayo Clinic, Rochester, MN, 3Hospital for Special Surgery, New York, NY, 4University of Minnesota School of Public Health, Minneapolis, MN

Background/Purpose: Rheumatoid arthritis (RA) disease activity can often quiesce during pregnancy. Nevertheless, most women will experience a disease flare postpartum (PP). We hypothesized that changes in blood immune cell gene expression patterns during healthy pregnancy, which promote fetal tolerance in order to protect against fetal loss, will also be relevant in regulating RA disease activity.

Methods: Whole-blood gene expression profiles (15,050 expressed; p<0.05) from 19 pregnant RA subjects and 13 pregnant age-matched healthy controls were assayed at first trimester of pregnancy (T1), T2, T3, and PP using Illumina HumanHT-12 v3 and v4 BeadChip arrays. At identical time points, disease activity in RA women was assessed using the DAS28-PP. A Generalized Estimating Equations (GEE) approach was applied to model gene expression changes during pregnancy (T1-T3) and between pregnancy and PP, to take into account the correlation within samples. A version effect (v3 vs v4) was also included in the model.
Results: Within the CON samples, 581 blood cell genes demonstrated either a >20% change in mRNA expression between T1—T2 or T2—T3 of pregnancy, or a >20% change in expression between the average of T1—T3 and the PP period (BH q<0.05). Many of these genes mapped to Ingenuity Pathways associated with (p<0.01) hematopoietic system development and function (n=149 molecules), cell death (n=185), and immunological diseases (n=127). These 581 “pregnancy-related” genes were then selected for further study in the pregnant RA cohort. Of the 581 genes, 74 were found to be significantly associated with the DAS28-CRP score after correcting for multiple hypothesis tests (Bonferroni correction, p<8.6x10^-3), with 11 of these demonstrating a >20% change in mRNA expression for every 1 unit change in DAS28-CRP score either during pregnancy or in the PP period. For the 50 pregnancy-related genes whose expression fell PP in association with rising DAS28-CRP, 7 genes (CD247, CD5, CD6, FLT3LG, IL7R, RBM18, and TUBB) were functionally associated with autoimmune diseases by Ingenuity Pathways Analysis; likewise, of the 24 genes whose expression directly correlated with DAS28-CRP PP, 5 genes (IL1B, MD108, NCF4, PFKFB3, and SLC22A4) were associated with autoimmune diseases (p=0.0015).

Conclusion: Our experiments identify 74 RA disease activity-correlated blood cell genes whose expression is modulated during normal pregnancy. Insofar as these genes reflect alterations in immune cell reactivity normally associated with pregnancy and promotion of fetal tolerance, they may represent a window into processes and pathways with a capacity to regulate disease activity in RA patients. Pregnancy-modulated genes that fluctuate with RA disease activity may also have utility as disease activity biomarkers.

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425 Slug Is Induced by Benzo(a)pyrene and EGF Through PI3K/Akt/mTOR Pathway and Is Closely Involved in the Regulation of the Invasive Properties of FLS in Rheumatoid Arthritis. Jaejoon Lee1, Jiwon Hwang2, Chan Hong Jeon3, Joong Kyong Ahn4, Hoon Suk Cha1 and Eun-Mi Koh1.

1. Samsung Medical Center, Sunkyunkwan University School of Medicine, Seoul, South Korea; 2. Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea; 3. Soongchunhyang University College of Medicine, Bucheon, South Korea; 4. Kangbuk Samsung hospital, Sungkyunkwan University School of Medicine, Seoul, South Korea

Background/Purpose: Slug, a Snail family of zinc finger transcription factor, plays a critical role in tumor proliferation, invasion and metastasis. We have previously shown that Slug is overexpressed in RA synovial tissue and suppression of Slug facilitates apoptosis of RA FLS. However, the precise mechanism through which Slug is induced in RA FLS remains unclear. Since cigarette smoke is an important environmental risk factor for RA, we examined the role of RA disease susceptibility and severity. Benzo(a)pyrene (BaP) is a polycyclic aromatic hydrocarbon found in cigarette smoke. BaP can be metabolized to active compounds that induce the production of reactive oxygen species. The effect of BaP on Slug expression in RA FLS has not been studied thus far.

The present study was undertaken to investigate the biological effects of BaP on the expression of Slug, signaling pathway through which Slug is expressed, and the effect of BaP/Slug on the invasive properties of RA FLS.

Methods: Expression of Slug was measured by real-time PCR following stimulation of FLS with different concentrations of BaP, EGFR, H2O2, TGF-β, and TNF-α (n=7, each). Phosphorylation of the key enzymes in the signal transduction pathway was analyzed by Western blot. Inhibitors targeting the PI3K/Akt/mTOR pathway were used to confirm critical signaling pathway for Slug expression (n=7). An in vitro cell invasion assay was performed using RA FLS treated with Slug siRNA or with control siRNA (n=4).

Results: Slug expression was significantly increased following treatment with BaP (n=4, p=0.0014), EGFR (100ng/ml, p=0.027) and H2O2 (0.25mM, p=0.029), but not with TGF-β and TNF-α. Stimulation with BaP and EGF induced phosphorylation of Akt kinase activity, but no significant change was observed in ERK, JNK and p38 activity. Slug mRNA expression by BaP and EGF decreased significantly following treatment with PI3K/Akt/mTOR inhibitors (p=0.026, p=0.002, respectively). Slug siRNA treatment induced a significant down-regulation in the invasive function of FLS compared to those treated with control siRNA (p=0.029). In addition, stimulation with BaP increased invasive function of control siRNA-treated FLS (p=0.01), but no such change was observed in Slug siRNA-treated FLS.

Conclusion: Our data show that BaP, one of major toxic components in cigarette smoke, induce Slug expression in RA FLS through PI3K/Akt/mTOR pathway, and may regulate invasive properties of RA FLS. This mechanism may provide a novel explanation for the increased RA susceptibility and severe clinical phenotype in those who smoke.

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1. UCSD School of Medicine, La Jolla, CA, 2. UCSD School of Medicine, La Jolla, CA, 3. Chung-Ang University College of Medicine, Seoul, South Korea, 4. Jeju National University, Jeju, Korea, South Korea, 5. Univ of California-San Diego, La Jolla, CA

Background/Purpose: Wnt (wingless) pathway signaling has been implicated in patterning in embryogenesis and in adult wound healing and homeostasis. A canonical Wnt antagonist, Dickkopf-1 (DKK-1), has been described as an embryonic bone morphogen. DKK-1 expression is stimulated by TNF in inflammatory disease and is elevated in the sera of rheumatoid arthritis patients. This Wnt signaling antagonist has been linked to the depression osteoblast activity and bone loss. Here we examined a novel role for the pathogenic activity of this protein by virtue of its ability to activate JNK and increase migration of fibroblast-like synoviocytes (FLS).

Methods: Human and mouse FLS were cultured and the plates were scratched. Migration was measured by serial photography of a marked area and ImageJ quantification. Results were confirmed with an OriTM stopper assay, and cell entry into the central clearing was measured by calcein AM fluorescence. FLS were treated with DKK-1, R5Wnt5a, PDGF, SB216763 (a GSK3β inhibitor), SP600125 (a JNK inhibitor), and IWP-2 (a porcine inhibitor). In some cases, FLS were lysed for Western blot and qPCR analyses.

Results: Human and mouse FLS exhibited faster migration in the scratch wound assay and the stopper assay when stimulated with DKK-1 (50, 100 or 150ng/ml). DKK-1 increased percent wound closure from 31±4to 46±5 (p<0.04) for human and 41±4 to 58±18 (p<0.04) for mouse FLS. DKK-1-induced migration was inhibited by the JNK inhibitor SP600125. On the other hand, SB216763 and IWP-2 had minimal or no effect, indicating that it is independent of endogenously produced Wnt. DKK-1 stimulated JNK phosphorylation in FLS within 10 minutes, which was also not abrogated by IWP-2. To determine which JNK isoform is responsible, JNK1 null and JNK2 null mouse FLS were studied in the migration assays. Unexpectedly, DKK-1 treatment still induced the migration of JNK1 deficient, but not JNK2 deficient cells. In association with increased migration, DKK-1 treated FLS increased expression of MMP-1 (1.4 fold), MMP2 (1.4 fold) and MMP13 (1.6 fold). In contrast, MMP9 and MMP3 expression was decreased.

Conclusion: DKK-1 stimulates migration of FLS, which is associated with JNK phosphorylation and increased expression of selected metalloproteinases. DKK-1-induced migration was mediated by JNK1 signaling, suggesting that this pathway plays a critical role in synoviocyte migration and cartilage damage in rheumatoid arthritis.

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427 Epigenetic Features As Predictive Markers of Responsiveness to Epitope-Specific Therapy in Rheumatoid Arthritis. Roberto Spreafico, Maura Rossetti, Theodorus Van Der Broek, Olivia Morrow and Salvatore Alban. Sanford-Burnham Medical Research Institute, La Jolla, CA

Background/Purpose: The focus of current research for new therapeutic approaches in Rheumatoid arthritis (RA) is shifting from mere suppression to induction and maintenance of tolerance. Adaptive immunity, specifically the balance and functions of effector and regulatory CD4+ T cells, is central in this context. We have recently developed a protocol of oral tolerance induction to tau epitope (dnalp1) derived from a heat shock protein (HSP), a key component of the mechanism of perpetuation and amplification of chronic autoimmune inflammation. Phase II trial results showed clinical efficacy and an intriguing immune deviation of T cell immunity. In order to
dissect further the mechanism of action and also to identify biomarkers predictive of susceptibility to treatment, we employed here whole genome DNA methylation analysis, which can be correlated to gene expression and is relatively more stable compared to mRNA, the basis of the well-known whole transcriptome analysis.

**Methods:** Total CD4⁺ T cells from 12 patients taken at baseline, equally segregated in placebo responders/non-responders (R/NR) and HSP peptide R/NR (p<0.05) were used for the experiments. DNA was extracted from isolated lymphocytes from human peripheral blood, the expression of Annexin V and Caspase-3 by Tregs in RA patients might be correlated with DAS28 (r=0.82; p<0.05); the frequency of Tregs was higher in RA patients, while their apoptosis was lower (p<0.05). The expression of Annexin V and Caspase-3 by Tregs in anti-IL-10 group increased (p<0.05), the expression of Bcl-2 by CD4⁺ T cells was positively correlated with DAS28 (r=0.91p<0.01). There was positive correlation between the expression of Annexin V and Casepase-3 by Tregs and DAS28 in RA patients (r=0.82p<0.01 and r=0.79p<0.05, respectively).

**Results:** The frequency of Tregs and clinical activity parameters were analysed. The effects of IL-10 and anti-IL-10 were also observed. Compared with the controls, the level of CD4⁺ T cells was higher in RA patients, while their apoptosis was lower (p<0.05); the frequency of Tregs was lower (p<0.05). The expression of Annexin V and Caspase-3 by Tregs in IL-10 group decreased (p<0.05); the expression of Bcl-2 by CD4⁺ T cells in IL-10 group increased (p<0.05). The expression of Bcl-2 by CD4⁺ T cells in anti-IL-10 group was higher (p<0.05), the expression of Bcl-2 by CD4⁺ T cells in anti-IL-10 group decreased (p<0.05); the expression of Caspase-8 by CD4⁺ T cells in anti-IL-10 group was lower than that of the blank group (p<0.05), the expression of Bcl-2 by CD4⁺ T cells in anti-IL-10 group was higher (p<0.05); the expression of Caspase-8 by CD4⁺ T cells in anti-IL-10 group was lower than that of the blank group (p<0.05).

**Conclusion:** The higher level of CD4⁺ T cells and the lower frequency of Tregs may be caused by the decreased apoptosis of CD4⁺ T cells and the increased apoptosis of Tregs, which may be the reason of the abnormal autoimmune response in RA.

**Disclosure:** J. Han, None; T. Ma, None; J. Zhou, None; S. Zheng, None.

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TNFα Modulates the Expression of Circadian Clock Gene, Per2, Via D-Box Motif in the Promoter Region in Rheumatoid Synovial Cells, Kohsuke Yoshida¹, Akira Hashimamoto², Takaichi Okano¹, Nao Shibanuma³ and Shunichi Shiozawa⁴. ¹Hyogo Prefectural Rehabilitation Center at Nishiharima, Tatsuno, Japan, ²Department of Internal Medicine, Kobe University Graduate School of Medicine/The Center for Rheumatic Diseases, Kobe University Hospital, Kobe, Japan, ³Kobe University Hospital, Kobe, Japan, ⁴The Center for Rheumatic Diseases, Kobe University Hospital/Department of Orthopaedic Surgery, Kobe Kaisei Hospital, Kobe, Japan, ⁵Kyushu University Beppu Hospital, Beppu, Japan

**Background/Purpose:** The mammalian clock genes including *Clock* (circadian locomotor output cycles kaput), *Bmal1* (brain and muscle Arnt-like protein 1), *Per* (Period) and *Cry* (Cryptochrome) regulate the circadian rhythm. We previously showed that arthritis was significantly accelerated in *Cry¹−/−* mice due to the activation of TNFα (tumor necrosis factor α) transcription, and TNFα inhibited the expression of *Per2* mRNA in primary cultured human rheumatoid synovial cells. Here, we tried to elucidate the effects of TNFα on the transcription of *Per2* gene in rheumatoid synovial cells.

**Methods:** Primary cultured rheumatoid synovial cells were synchronized upon incubation with 50% horse serum for 2 hours, and then stimulated with 10 ng/ml TNFα. Total RNA was extracted from synovial cells every 8 hrs until 32 hrs’ culture period, and mRNA expression of D-box binding protein genes, including *Dhp* (D site of albumin promoter binding protein), *Hlf* (hepatic leukemia factor), *Tef* (thymotrophic embryonic factor) and *E4BP4* (E4-binding protein 4), were analyzed by real-time PCR. Synovial cells were transfected with the luciferase reporter vector containing the human *Per2* promoter to measure the transcriptional activity of *Per2* gene.

**Results:** The expression of *Dhp*, *Hlf*, and *Tef* mRNA were significantly inhibited (p<0.01), while those of *E4bp4* mRNA was significantly increased (p<0.01) upon incubation with TNFα in rheumatoid synovial cells. Since *Dhp*, *Hlf*, *Tef* and *E4bp4* genes could transactivate and suppress the expression of *Per2* gene, respectively, by binding to D-box motif in the promoter region, we next introduced site-directed mutations into the D-box 1 (TTAT-GTAA, −372 to −365) and/or D-box 2 (TTACGTAA, −47 to −40) motif in the promoter, and then transfected rheumatoid synovial cells with luciferase reporter gene constructs driven by the *Per2* promoter. As results, TNFα inhibited the transcriptional activity of the wild type of *Per2* gene. However, when the promoter containing a mutated both D-box 1 and D-box 2 motif was transfected, TNFα-mediated transcriptional inhibition did not observed as compared with the wild type and the D-box 1 mutated promoter (P<0.05 and P<0.05, respectively).

**Conclusion:** TNFα significantly modulates the expression of *Per2* gene via D-box binding protein, DBP, HLF, TEF and E4BP4, in rheumatoid synovial cells, and thereby may contribute to the pathogenesis of RA.

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The Significance of the Apoptosis Level and the Apoptosis Related Signal Proteins of CD4⁺ T ACD4⁺Foxp3⁺ T Cell in Patients with Rheumatoid Arthritis, Ning Li¹, Tianrui Ma², Jie Han¹, Jieru Zhou¹ and Songguo Zheng². ¹Shanghai East Hospital, Shanghai, China, ²Ningbo Pediatric Hospital, Ningbo, China, ³Keck School of Medicine of the University of Southern California, Los Angeles, CA

**Background/Purpose:** To investigate the apoptosis of CD4⁺ T cell and Tregs in the pathogenesis and disease activity of rheumatoid arthritis patients.

**Methods:** Isolated lymphocytes from human peripheral blood, the expression levels of Annexin V, Caspase-3/8, Fas and Bcl-2 of CD4⁺ T lymphocytes and Tregs in RA patients and controls were analysed by using flow cytometry. The correlation between the apoptosis level, the apoptosis signaling proteins expression of CD4⁺ Tregs, and clinical activity parameters were analysed. The effects of IL-10 and anti-IL-10 were also observed.

**Results:**

1. Compared with the controls, the level of CD4⁺ T cells was higher in RA patients, while their apoptosis was lower (p<0.05); the frequency of Tregs was lower in RA patients, while their apoptosis was higher (p<0.05).

2. Compared with the controls, the expression of Fas (p<0.01) and Caspase-8 (p<0.05) by CD4⁺ T cells decreased in RA patients, the expression of Bcl-2 by CD4⁺ T cells (p<0.05) increased; the expression of Fas (p<0.01), Caspase-8 (p<0.05) and Caspase-3 (p<0.05) by Tregs elevated in RA patients.

3. The expression of Annexin V and Caspase-8 by CD4⁺ T cell in RA patients were negatively correlated with DAS28 (r=−0.84, p<0.01 and r=−0.89, p<0.05, respectively). The expression of Bcl-2 by CD4⁺ T cells was positively correlated with DAS28 (r=0.91p<0.01). There was positive correlation between the expression of Annexin V and Casepase-3 by Tregs and DAS28 in RA patients(r=0.82p<0.01 and r=0.79p<0.05, respectively).

4. After IL-10 treatment, the apoptosis of CD4⁺ T cells increased (p<0.05), and that of Tregs decreased (p<0.05); the apoptosis of CD4⁺ T cells in anti-IL-10 group decreased (p<0.05), and that of Tregs increased (p<0.05). The expression of Caspase-8 by CD4⁺ T cells in anti-IL-10 group decreased (p<0.05); the expression of Bcl-2 by CD4⁺ T cells in IL-10 group increased (p<0.05), the expression of Caspase-8 by CD4⁺ T cells in anti-IL-10 group was lower than that of the blank group (p<0.05), the expression of Bcl-2 by CD4⁺ T cells in anti-IL-10 group was higher (p<0.05); the expression of Caspase-8/3 by Tregs in IL-10 group decreased (p<0.01), while the expression of Caspase-8/3 by Tregs in anti-IL-10 group was significantly elevated than that of the blank group (p<0.01).

**Conclusion:**

1. The higher level of CD4⁺ T cells and the lower frequency of Tregs may be caused by the decreased apoptosis of CD4⁺ T cells and the increased apoptosis of Tregs, which may be the reason of the abnormal autoimmune response in RA.

2. Fas, Caspase-8 and Bcl-2 may play a role in the the apoptosis of CD4⁺ T cells. The apoptosis of Tregs may be related to the higher expression of IL-10, by binding to CD4⁺ T cells and Caspase-8/3.

3. The expression of Annexin V, Fas and Bcl-2 by CD4⁺ T cells and the expression of Annexin V and Caspase-3 by Tregs in RA patients might be sensitive indicators of the clinical activity of RA.

4. IL-10 has different immunoregulatory functions in different cells. It can downregulate the expression of Bcl-2, stimulate the expression of Caspase-8 in CD4⁺ T cells and inhibit the expression of Caspase-8/3 in Tregs of RA patients.

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Comprehensive Microrna Analysis Identifies Mir-24, Mir-26a, and Mir-125a-5p As Plasma Biomarkers for Rheumatoid Arthritis. Koichi Murata, Moritoshi Furu, Hironori Yoshitomi, Masahiro Ishikawa, Hideyuki Shibuya, Hironobu Ito and Shuichi Matsuda. Kyoto University Graduate School of Medicine, Kyoto, Japan

Background/Purpose: MicroRNAs (miRNAs) are present in human plasma in a stable form despite the endogenous RNase activity. Plasma miRNAs are non-invasive biomarker for cancer detection and tissue injuries. We previously showed the potential ability of the plasma miRNAs as biomarkers for rheumatoid arthritis (RA) and designed this study to identify plasma miRNAs specific for RA by a comprehensive array approach.

Methods: We performed a systematic array-based miRNA expression analysis on plasma samples from patients with RA and healthy controls (HCs) (n=3, respectively). The expression of plasma miRNAs in the first comprehensive analysis with more than four times change or with significant (p<0.05) change between RA and HCs, or that of detectable plasma miRNAs only in RA plasma, were followed by confirmation analysis of eight patients with RA and eight HCs using real-time quantitative PCR (qPCR). Plasma miRNAs consistently detectable in our system and significantly different between RA and HCs. Receiver operation curves were generated, and correlations between miRNAs and other biomarkers of RA were statistically examined.

Results: The array analysis and the subsequent confirmation by qPCR in larger cohort identified eight RA-associated circulating miRNAs, including mir-24, mir-26a and mir-125a-5p (Table 1). The area under curve (AUCs) of each miRNA was 0.80, 0.81 and 0.83 respectively (Figure 1A). Logistic regression analysis provided a formula for estimated probability for RA by plasma miR-24, miR-30a-5p, miR-125-5p (ePRAM) with increased the diagnostic accuracy (AUC: 0.86, Figure 1B). The diagnostic ratio was not influenced by the anti-body values against anti-citrullinated peptide. These miRNAs levels in OA patients were as low as in HC and these miRNA levels in RA patients showed no significant changes with the administration of biologics.


cmiRNA (nM)  P value  AUC
miR-24
RA: 3.4 ± 3.2  0.80
HC: 0.91 ± 0.79  5.0 × 10^-13
miR-26a
RA: 3.5 ± 4.0  0.81
HC: 1.0 ± 3.7  7.3 × 10^-6
miR-28-3p
RA: 4.9 × 10^-2 ± 9.7 × 10^-2  0.59
HC: 1.8 × 10^-2 ± 2.6 × 10^-2  1.6 × 10^-3
miR-30a-5p
RA: 8.9 ± 8.6  0.75
HC: 3.8 ± 4.6  5.6 × 10^-7
miR-125a-5p
RA: 3.0 ± 3.4  0.71
HC: 3.4 ± 15  0.8
miR-30c-3p
RA: 1.3 ± 1.4  0.76
HC: 0.54 ± 0.49  1.7 × 10^-7
miR-30c-5p
RA: 15 ± 18  0.83
HC: 18 ± 12  0.76
miR-125a-5p
RA: 0.23 ± 0.30
HC: 0.10 ± 0.60  4.8 × 10^-2
miR-126-3p
RA: 8.1 ± 12  0.74
HC: 2.0 ± 2.7  7.2 × 10^-7
miR-502-3p
RA: 0.71 ± 0.13  0.70
HC: 0.24 ± 0.41  4.7 × 10^-4

Conclusion: Plasma levels of miR-24, miR-26a, miR-125a-5p, and ePRAM can be diagnostic biomarker for rheumatoid arthritis.

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Basic and Clinical Significance of Interleukin 6 (IL-6) in AA Amyloidosis with RA. Kazuyuki Yoshizaki, Prabha Tiwari, Lokesh P. Tripathi, Shandar Ahmad, Kenji Mizuguchi, Terpe, Nishikawa-Matsumura, Tomoyasu Isobe and Sokan-Nakazawa J. Song. Osaka University, Osaka, Japan

Background/Purpose: Cytokine-induced hepatic serum amyloid A (SAA) is associated with the pathogenesis of AA amyloidosis, a fatal disease with deposition of AA amyloid fibril on systemic organs, especially on kidney, thyroid and intestine in chronic inflammatory disease such as rheumatoid arthritis (RA). This study was to provide our recent results on SAA activation by IL-6-induced STAT3 and clinical analysis of IL-6 blocking therapy in AA amyloidosis complicating RA.

Methods: STAT3 contributing to transcriptional activation of SAA by forming a complex with NF-kb was analyzed by using the super shift assay, ChIP assay, and DNA affinity chromatography systems. A set of candidates for non-consensus STAT3 binding sites on SAA promoter was identified by using a new mathematics calculation theory. The binding of STAT3 to the non-consensus STAT3 binding sites was also confirmed by means of Luciferas assay and DNA affinity chromatography assay.

Results: We demonstrated that IL-6 activated STAT3 is essential for inducing SAA mRNA expression, and that NF-kb p65 complementally augments SAA mRNA induction by IL-6 stimulation combined with IL-1 or TNF-α. We found a non-consensus STAT3 response element (RE) at the 3’-downstream of NF-kb site on SAA promoter region for STAT3 binding. Anti-IL-6 receptor antibody can completely inhibit SAA expression and stat3-NF-kb complex formation induced by IL-6+IL-1+TNF-α.

Conclusion: We identified a non-consensus STAT3 binding site in SAA promoter based on a new statistical analysis method of protein-DNA complex structure, and confirmed that STAT3 binds to the predicted site following for SAA expression induced by IL-6+IL-1. Our basic results may explain why IL-6 blockade completely inhibit the SAA production in AA amyloidosis patients with RA, and IL-6 is a pivotal cytokine for induction of SAA. Our results also indicated that STAT3 may activate more broad genes during inflammation through non-consensus RE, and IL-6 inhibition may inactivate more broad inflammatory genes.

Disclosure: K. Yoshizaki, None; P. Tiwari, None; L. P. Tripathi, None; S. Ahmad, None; K. Mizuguchi, None; T. Nishikawa-Matsumura, None; T. Isobe, None; S. N. J. Song, None.
Background/Purpose: Rheumatoid arthritis (RA) is a common, highly debilitating systemic inflammatory condition. To date, little is known about which autoantigens are involved in RA and how T cells which recognize self-proteins may become pathogenic in disease. Fibrinogen is a common target of autoantibodies in RA patients, and a putative T cell autoantigen involved in disease development. The goal of this study is to identify and characterize fibrinogen-specific CD4 T cells.

Methods: Autoantigen-specific T cells were identified directly ex vivo using peptide-MHC tetramers. To identify individuals carrying the HLA-DRB1*0401 (DR4) allele, HLA typing was performed on healthy blood donors and RA patients using sequence-specific primer PCR. To identify antigen-specific T cells, tetramer staining was performed at room temperature for 1 hour using tetramers loaded with several fibrinogen peptides. Memory phenotyping was performed using antibodies against CD45RO and CCR7. Tetramer stained cells were magnetically enriched and analyzed by flow cytometry. Single cell TCR amplification and sequencing was performed to trace T cell clonality.

Results: We identified several populations of T cells recognizing citrullinated and unmodified fibrinogen peptides. The frequency of fibrinogen-specific T cells in RA patients ranges between 3 to 19 per million CD4 T cells. Many of these lymphocytes express the memory marker CD45RO, particularly among cells that recognize citrullinated forms of the fibrinogen peptides. Examination of the same antigen-specificities in healthy people demonstrated that the frequency and memory characteristics of these cells appear similar in individuals without disease. Moreover, we also found in some healthy people the presence of clonally expanded T cells that recognize citrullinated fibrinogen.

Conclusion: T cells that recognize citrullinated fibrinogen can be detected in the peripheral blood of RA patients and healthy individuals. These fibrinogen-specific populations contain large numbers of antigen-experienced T cells with some showing evidence of clonal expansion.

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Genome Wide Association Analysis of Pain Reduction in Rheumatoid Arthritis Patients Treated with Anti-TNF Medication. Results of the DREAM and Danbio Registries. Marijke J.H. Coenen1, Masha Umicevic-Mirko1, Hans Scheffer1, Sophie B. Krielt1, Sita H. Vermeulen1, Julia S. Johansen2, Wieteke Klevit1, Mart A.F.J. van de Laar1, Piet L.C.M. van Riel1, Juliana B. Franke1, Maarten F.J. van de Laar2, Piet L. C. M. van Riel3, Somit Mitra4, Christine Abria5 and Smriti K. Raychaudhuri 2. 1VASacramento Medical Center UCD Davis School of Medicine, Mather, CA, 2VASacramento Medical Center, Mather, CA, 3VASacramento Medical Center Mather, Mather, CA, 4Danish DANBIO registry. Meta-analysis led to the identification of three SNPs with a p-value < 1x10^-7. These SNPs can be linked to functions that might involve pain processing in the brain. They are located within or nearby ATN1 (rs2327304, rs2237199), a gene involved in the pathology of spinocerebellar ataxia type 1, a neurodegenerative disorder characterized by progressive degeneration of cerebellum and NRG3 (rs7921473) which influences neuroblast proliferation, migration and differentiation. Pathway analysis, including all SNPs with a p-value<1x10^-7 (n=2649) from the discovery cohort also point to the brain. The analysis shows that genes involved in neurotrogenesis are overrepresented in our dataset (p=6.78x10^-6). In addition, six SNPs map to the α-adrenergic signaling pathway (p=6.16x10^-5), an important target for pain medication.

Conclusion: Significant findings will be replicated in a third patient population. Confirmed biomarkers can be used to personalize medication for the individual patient.

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IL-22 Mediated Pannus Formation in Autoimmune Arthritis Is PI3K/Akt/mTOR Dependent. Siba P. Raychaudhuri1, Anupama Mitra1, Ananya Datta Mitra2, Christine Abria3 and Smriti K. Raychaudhuri4. 1VA Sacramento Medical Center UCD Davis School of Medicine, Mather, CA, 2VA Sacramento Medical Center, Mather, CA

Background/Purpose: IL-22, a Th17 cytokine plays a key role in the formation of “pannus” in autoimmune arthritis such as rheumatoid arthritis (RA) and psoriatic arthritis (PsA), by inducing proliferation of synovial fibroblasts (FLS)1. Among diverse functions of PI3K/Akt/mTOR signaling cascade, cell proliferation is an important one and is emerging as a potential therapeutic target for various malignant diseases. Here we are reporting that IL-22 induced FLS proliferation is PI3K/Akt/mTOR dependent.

Methods: FLS were derived from synovial tissues of PsA (n=5) and RA (n=5) patients. MTT assay in presence or absence of dual kinase (PI3K/mTOR) inhibitor, NVP-BEZ235 (BEZ) and mTOR inhibitor, Rapamycin were performed to determine the role of PI3K/Akt/mTOR signaling cascade, cell proliferation is an important one and is emerging as a potential therapeutic target for various malignant diseases. Here we are reporting that IL-22 induced FLS proliferation is PI3K/Akt/mTOR dependent.

Results: IL-22 significantly increased proliferation of FLS (OD: 1.70 ± 0.09 vs. 0.86 ±0.04, p<0.0001, ANOVA) (Figure 1) derived from patients of autoimmune arthritis. Both Rapamycin and BEZ significantly inhibited IL-22 induced FLS proliferation. Further we substantiate our findings by determining the expression of Akt/mTOR in presence or absence of IL-22, BEZ and Rapamycin with western blotting.

Conclusion: This is the first study showing the regulatory role of PI3K/Akt/mTOR signaling cascade in the IL-22 mediated FLS proliferation in autoimmune arthritis and thus provides a new insight in the signaling cascade of IL-22 in autoimmune arthritis.

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CIP2A Facilitates Apoptotic Resistance of Fibroblast-Like Synoviocytes in Rheumatoid Arthritis Independent of c-Myc Expression. Jaejoon Lee, Jiwon Hwang, Jinseok Kim, Joong Kyong Ahn, Hoon-Suk Cha and Eun-Mi Koh. 1 Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea, 2 Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea, 3 Jeju National University Hospital, Jeju, South Korea, 4 Kangbuk Samsung hospital, Sungkyunkwan University School of Medicine, Seoul, South Korea.

Background/Purpose: Cancerous inhibitor of protein phosphatase 2A (CIP2A) is a recently identified oncoprotein that leads to cellular proliferation in cancer cells by stabilizing c-Myc protein. The effect of CIP2A in stabilizing c-Myc by inhibition of protein phosphatase 2A activity is a prerequisite step in tumor cell growth and in vivo tumor formation. We have previously shown that CIP2A is expressed in rheumatoid arthritis (RA) fibroblast-like synoviocytes (FLS), and that its expression is strongly associated with histopathological synovitis score and invasive function of RA FLS. The aim of this study is to investigate the effects of CIP2A on the apoptosis of RA FLS and to determine the signaling pathway through which dysfunctional apoptosis is facilitated.

Methods: Proliferation and apoptotic activity of RA FLS following treatment with CIP2A siRNA or control siRNA were analyzed using MTT assays and Cell Death Detection ELISA kit. RA FLS was treated with CIP2A siRNA or control siRNA for 3, 6, and 9 days and intervals for Western blot analysis to determine C-Myc expression. To evaluate the signal transduction pathways engaged in apoptosis, caspase-3 activity, caspase-9 activity, PARP, and phosphorylation of the Akt kinase were analyzed by Western blot analysis.

Results: Cell viability of RA FLS, as measured by MTT assay, was significantly lower in the CIP2A siRNA-treated group compared with the control after 7 days (p=0.022). Apoptosis of RA FLS, as measured by DNA fragmentation, was significantly higher in the CIP2A siRNA-treated group compared with the control when incubated for 3, 6, and 9 days (p=0.029, p=0.021, p=0.043, respectively). Interestingly, c-Myc expression, as determined by Western blot analysis, did not change with the different incubation periods. CIP2A siRNA-treated FLS expressed higher level of activated caspase-3, caspase-9, and PARP (p=0.014, p=0.020, p=0.021, respectively) and lower level of phosphorylated Akt (p=0.001) compared with those treated with the control siRNA.

Conclusion: Our data show that CIP2A expression in RA FLS is an important mediatior of dysfunctional apoptosis independent of c-Myc stabilization. Expression of CIP2A may contribute to apoptotic resistance of RA FLS through activation of Akt and deactivation of caspase-3, caspase-9, and PARP. Inhibition of CIP2A may therefore constitute a novel, promising therapeutic target in RA.

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SIRT6 Regulates Cigarette Smoke Induced MMP1 Expression in Rheumatoid Arthritis Synovial Fibroblasts. Youngkyun Kim, Su-Jin Moon, Hyou Yi, and Ji Hyeon Ju. College of Medicine, The Catholic University of Korea, Seoul, South Korea, 2 College of Medicine, The Catholic University of Korea & Stanford University, Seoul & Palo Alto, CA.

Background/Purpose: Cigarette smoking is the best-known environmental risk factor for the development of rheumatoid arthritis (RA). However, the molecular mechanisms involved in the association of smoking and progression of RA are not well investigated. Sirtuins (SIRTs) are recently discovered regulators of inflammation. The aim of the current study was to investigate the impact of cigarette smoke extract (CSE) on the expression of interleukins (ILs) and matrix metalloproteinases (MMPs), and the possible function of SIRTs in the cigarette smoke induced inflammatory response in RA synovial fibroblasts (RASF).

Methods: Synovial tissues were obtained from RA patients undergoing joint replacement surgery, RASF from non smokers (n=16) were stimulated with 5% CSE or 10 ng/ml TNFα for 24 hours. Expression of SIRTs, ILs and MMPs was measured at the mRNA level by Real-time TaqMan and SYBR green PCR. Protein levels of SIRTs were detected by immunoblot in cell lysates and of ILs and MMPs in cell culture supernatants by ELISA. For silencing of SIRT6, RASF (n=10) were transfected with siRNA targeting SIRT6 or control siRNA for 48h prior to stimulation.

Results: Stimulation of RASF with CSE significantly increased protein levels of IL8 by 1.9-fold (p=0.02), MMP1 by 7.5-fold (p=0.01), but did not affect the protein expression of IL6 and MMP3. At the mRNA level IL8 was 4.1-fold increased (p=0.03) and MMP1 was 5.8-fold increased (p=0.02) in increased CSE stimulated RASF, indicating that cigarette smoke regulates the expression of IL8 and MMP1 at the transcriptional level. Analysing the expression of SIRTs 1–7 revealed that CSE increases significantly the expression of SIRT6. Furthermore, SIRT6 protein levels were elevated upon TNFα stimulation. Basal expression as well as induction of SIRT6 after stimulation was successfully blocked by transfection of RASF with SIRT6-specific siRNA. Basal production of MMP1 increased significantly by 31±6% (p=0.008) after silencing of SIRT6. After stimulation with CSE, silencing of SIRT6 enhanced the levels of MMP1 protein by 35±8.8% compared to control transfected cells. Also stimulation with TNFα had a significantly stronger effect on MMP1 expression in SIRT6 silenced, compared to control transfected cells (control: 4.1-fold ±1.4 induction, siSIRT6: 6.4-fold ±2.1 induction; p=0.004). Expression of IL6, IL8 and MMP3 was not affected by silencing of SIRT6 under basal as well as in stimulated conditions.

Conclusion: In the current study we found that CSE increases the expression of IL8 and MMP1 in RASF. Most interestingly, we could show that both CSE and TNFα induced production of MMP1 is specifically regulated by SIRT6. Therefore, we conclude that SIRT6 acts as a protective regulator attenuating CSE as well as TNFα induced MMP1 production in
Methyl Supplementation of Rheumatoid Arthritis Synovial Fibroblasts Regulates the Expression of Transcription Factors and Matrix Metalloproteinases. Edvardas Bagdonas, Emmanuelle Karouzakis, Astrid Jungel, Caroline Ospelt, Renate E. Gay, Steffen Gay, Beat A. Michel and Michel Neidhart. Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland

Background/Purpose: Previously we reported that methyl supplementation can reverse the global hypomethylation of rheumatoid arthritis synovial fibroblasts (RASF) and attenuate their aggressive behaviour. Now we analysed the molecular changes occurring in matrix metalloproteinases (MMPs) and transcription factors after treatment with methyl supplementation. Methods: RASF (n=6 patients) were cultured in DMEM/F12 + 10% FCS as a control and in medium supplemented with 10-fold excess amount of folic acid (70 μM), vitamin B12 (6 μM) and L-methionine (1.1 mM) (high supplementation - HS) for 10 days. After the treatment, cells were counted to determine doubling time, their RNA isolated and supernatants were tested using 2xMMP ELISA assays. The gene expression of MMPs and transcription factors was evaluated by real time-PCR and gene expression array (QiAGEN RT Profiler PCR Human Transcription Factors Array), respectively. The untreated and treated RASF were implanted together with normal human cartilage into SCID mice. The cartilage sample slides were scored by three independent investigators.

Results: After 10 days of culturing in HS medium, the expression of MMP1 gene was significantly down regulated (p = 0.034) while changes in the mRNA level of MMP3 was not significant (p = 0.56). There was also a significant reduction in the level of MMP1 protein in HS grown in HS medium (p = 0.027) and no significant reduction of MMP3 protein level (p = 0.49). The effect of HS on the state of DNA methylation and gene expression is dependent on cell proliferation. Indeed, MMP1 expression strongly correlated with the cell population doubling time – r = 0.9455, p = 0.0044. The expression of 6 out of 84 analyzed genes was significantly changed by methyl supplementation. ELK1, HDAC1, HSF1 were up regulated while JUN, NFATC3 and SMAD9 were down regulated (p < 0.05). Most interestingly, HS treated RASF showed reduced invasion and perichondrocytic degradation in the SCID mouse invasion model in vivo (invasion score: control 2.25±0.27; HS 1.26±0.26, p<0.03, n=5; perichondrocytic score: control 1.91±0.18; HS 1.17±0.23, p<0.01, n=5).

Conclusion: Methyl supplementation reduced the expression of MMP1, significantly suppressed expression pattern of 6 transcription factors and inhibited the invasive properties of RASF in vivo. Therefore, this supplementation might be used as a novel therapeutic approach to inhibit joint destruction in rheumatoid arthritis.

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Effects of Fetal Microchimerisms On Disease Onset and Severity in Women with Rheumatoid Arthritis and Systemic Lupus Erythematosus. Marianne Kekow1, Sam Fill Malfertheiner2, Maria Barleben1, Susanne Drynda1, Joern Kekow3 and Thomas Brune1.1 Univ of Magdeburg, Children’s Hospital, Magdeburg, Germany, 2 Uni of Magdeburg, Department of Obstetrics and Gynecology, Magdeburg, Germany, 3 Univ of Magdeburg, Vogelsang-Gommern, Germany

Background/Purpose: The major source of naturally acquired microchimerisms (MC) is the transplacental traffic of fetal cells between a mother and the fetus during pregnancy. Fetal cells have been found to persist in maternal blood for many years post partum. It was the aim of this study to analyze the prevalence of fetal MC in patients with inflammatory rheumatic diseases and to investigate the association of MC with disease severity.

Methods: A total of 143 women who had delivered at least one male offspring were recruited; 73 women with rheumatoid arthritis (RA), 16 women with systemic lupus erythematosus (SLE) and 54 women as non-affected controls. The mean age was 62.5 years (RA), 56.2 years (SLE), and 40.5 years (control cohort). Women who had received a blood transfusion in the past were not included in this study.

For the analysis of fetal MC in DNA from maternal circulation a nested PCR was used to detect a male fetal sequence in the TSPY gene on the Y chromosome.

Results: 30% of the disease groups age at disease onset and markers for disease activity were compared for MC+ and MC- patients, this includes for RA patients anti-CCP-antibodies (anti-CCP), rheumatoid factor (RF) and radiographic progression (Steinbrocker score); and for SLE antinuclear antibody
(ANA) and anti-dsDNA antibody, serum C3, C4, CH50, and soluble interleukin 2 receptor (sIL2R) levels.

Results: The prevalence of fetal MC was 18% in RA patients and 31% in patients with SLE, which is significantly increased compared to 3.7% in non-affected controls (p=0.02 and p=0.006, resp.).

The mean age at disease onset was comparable in MC+ and MC- RA patients with about 43.3 years. Disease onset occurred 18.7 and 19.8 years post partum in the first son for MC+ and MC- patients, respectively. The presence of anti-CCP and RF did not differ significantly; anti-CCP were found in 75% of MC+ and 87% of MC- RA patients, RF in 75% of both MC+ and MC- patients. A higher mean Steinerbrocker Score in MC+ patients (3.2 vs. 3.0) was associated with a longer disease duration: 19.4 years (MC+) vs. 16.5 years (MC-).

In SLE patients mean age at disease onset was 42.6 years in MC+ and 49.1 years in MC- patients. Disease onset occurred 24.0 and 26.4 years post partum of the first son for MC+ and MC- patients, respectively. The presence of ANA and anti-dsDNA antibodies, sIL2R, C3, C4, and CH50 did not differ significantly. In MC+ patients sicca symptoms were found most frequently (80%), followed by involvement of joints (60%), central nervous system (20%) and kidneys (20%). In contrast, in MC- patients joints were affected mostly (70%), followed by skin (60%), central nervous system (30%) and sicca symptoms (20%).

Conclusion: In a cohort of RA patients as well as in patients with SLE the prevalence of the disease was significantly increased compared to a cohort of non-affected controls. The disease severity in patients with RA or SLE did not differ depending on the presence of MC.

In conclusion our results indicate that the long persistence of microchimerism as a marker of a pathologic clearance of semi-allogeneic DNA is associated with rheumatic diseases without effect on disease severity.

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1University of Colorado School of Medicine, Aurora, CO, 2University of Colorado Anschutz Medical Campus, Aurora, CO, 3Cedars-Sinai Medical Center, Los Angeles, CA, 4Walter Reed National Military Medical Center, Bethesda, MD, 5University of Nebraska Medical Center, Omaha, NE, 6University of Chicago, Chicago, IL, 7North Shore University Hospital Research Center, Manhasset, NY, 8Benera Research Institute at Virginia Mason, Seattle, WA, 9Colorado School of Public Health, Aurora, CO

Background/Protocol: The 2010 ACR/EULAR RA criteria include autoantibodies to cyclic citrullinated peptides (CCP) that are highly specific for RA in the setting of inflammatory arthritis (IA). In addition, multiple studies demonstrate that CCP positivity can occur years prior to the onset of IA. Therefore, there is hope that CCP testing can be used to identify healthy subjects with sufficiently high risk for future RA who can be studied to understand the natural history of RA, as well as to identify subjects most likely to benefit from preventive interventions. However, while there are multiple types of CCP assays, there is limited data in subjects with and without RA comparing the performance of each assay or the ability of a positive test to predict future development of clinically-apparent RA.

Methods: CCP testing was performed using 2 commonly used ELISA assays [CCP2 (IgG) (Axile-Shield) and CCP3.1 (IgG, IgA) (INOVA)] in sera from the following: 1) RA cases from the Studies of the Etiology of RA (SERA) project, 2) RA cases from the Dept of Defense Serum Repository (DoDSR) with pre- and post-diagnosis samples available, 3) SERA first degree relatives (FDR) of probands with RA who are at elevated risk for future RA due to familial RA, and 4) controls (case-matched DoDSR subjects and randomly selected blood donors). The diagnostic accuracy of assays for established RA was calculated comparing cases and DoDSR and controls. Prevalence of positivity was compared using chi-squared/Fishers exact testing.

Results: For established RA, CCP2 was more specific but less sensitive than CCP3.1 (Table). As cut-off levels for positivity were increased, specificity increased. In all subjects, CCP3.1 was more prevalent than CCP2. In DoDSR samples prior to RA diagnosis, there was a strong association of CCP levels >2× normal with a diagnosis of RA within 2 years [CCP2 OR 7, 95% CI 3–17, p<0.01; CCP3.1 OR 7, 95% CI 3–16, p<0.01]. Agreement improved (k 0.5) in FDRs using cut-offs >2× normal suggesting the moderate range CCP titers encompass most of the discordant samples.

Results of CCP2 and CCP3.1 Assay Testing in Subjects with and without Rheumatoid Arthritis

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442 Joint Effects of Known Genetic Markers of Rheumatoid Arthritis Risk and 25-Hydroxyvitamin D On Rheumatoid Arthritis Risk. Linda T. Hiraki1, Chia-Yen Chen1, Jing Cui1, Susan Malspeis2, Karen H. Costenbader3 and Elizabeth W. Karlsson1,2,3, Brigham and Women’s Hospital, Harvard School of Public Health, Boston, MA, 3Harvard School of Public Health, Boston, MA, 4B Brigham and Women’s Hospital, Boston, MA, 5B Brigham and Women’s Hospital, Harvard Medical School, Boston, MA

Background/Protocol: Rheumatoid arthritis (RA) is a complex disease with both genetic and environmental risk factors. A number of susceptibility genes have been identified. Past studies have also observed an association between decreased levels of vitamin D and RA. We aimed to examine the joint effects of genetic markers of RA, and circulating vitamin D levels on RA risk.

Methods: We selected incident Caucasian RA cases (n=133) who contributed blood samples prior to first RA symptom and matched controls (n=134) from the Nurses’ Health Study and Nurses’ Health Study II cohorts. We genotyped 36 RA risk alleles identified by previous GWAS and meta-analysis, and 8 IL4/DRB1 shared epitope (SE) genotypes at 4 digit resolution. We measured 25-hydroxyvitamin D (25(OH)D) levels by chemiluminescence immunoassay. We used conditional logistic regression to examine the marginal genetic and 25(OH)D effects, as well as testing for
additive and multiplicative interaction between the genetic markers and 25(OH)D (sufficient vs. insufficient (≤20ng/mL)). We ran unconditional logistic regression analysis stratified by seropositive (n=66) and seronegative (n=67) RA phenotypes additionally adjusted for matching factors. We adjusted for multiple phenotypes with Bonferroni correction.

**Results:** We found statistically significant main effects of HLA-DRB1* SE and RA (p=0.0013) and seropositive RA (p=4×10⁻5). There was no significant main effect association between vitamin D insufficiency and RA. Among all RA cases we observed a statistically significant additive interaction between FCGR2A (rs7552317) and insufficient 25(OH)D (p=0.004). For subjects with having any FCGR2A alleles and insufficient 25(OH)D there was an >2-fold odds of RA (2.18 (95% CI 1.1, 5.81)) when compared to those without any FCGR2A alleles and sufficient 25(OH)D (Table). Among seropositive RA we observed a statistically significant additive interaction between HLA-DRB1*01011 and insufficient 25(OH)D (p=0.0002) where having any HLA-DRB1*01011 and insufficient 25(OH)D was associated with an >2-fold increase in odds of RA (2.18 (95% CI 0.82, 5.79)).

**Table.** Gene-vitamin D interactions between FCGR2A and HLA-DRB1*01011 polymorphisms and vitamin D insufficiency in relation to risk of all rheumatoid arthritis (RA) and seropositive RA.

<table>
<thead>
<tr>
<th>RA phenotype</th>
<th>Gene-vitamin D interaction</th>
<th>Categories of vitamin D</th>
<th>No. cases/controls</th>
<th>OR (95% CI)</th>
<th>Attributable proportion (p-value)</th>
<th>Multiplicative p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All RA</td>
<td>FCGR2A</td>
<td>Sufficient</td>
<td>28/14</td>
<td>1.0 (ref)</td>
<td>0.66 (0.0043)</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>vitamin D</td>
<td>11/12</td>
<td>0.93 (0.55–1.70)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>insufficient vitamin D</td>
<td>61/72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Any</td>
<td>Sufficient vitamin D</td>
<td>25/25</td>
<td>0.94 (0.36–2.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Any</td>
<td>Insufficient vitamin D</td>
<td>2.54 (1.1–5.81)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seropositive RA</td>
<td>HLA-DRB1*01011</td>
<td>Sufficient vitamin D</td>
<td>15/11</td>
<td>0.92 (0.0002)</td>
<td>0.03</td>
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</tr>
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<td></td>
<td>None</td>
<td>vitamin D</td>
<td>5/8</td>
<td>0.55 (0.27–1.12)</td>
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</tr>
<tr>
<td></td>
<td>Sufficient vitamin D</td>
<td>27/81</td>
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<tr>
<td></td>
<td>any</td>
<td>vitamin D</td>
<td>19/31</td>
<td>0.62 (0.14–2.67)</td>
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</tr>
<tr>
<td></td>
<td>any</td>
<td>Insufficient vitamin D</td>
<td>2.18 (0.82–5.79)</td>
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<td></td>
</tr>
</tbody>
</table>

**Conclusion:** We observed significant gene-vitamin D interactions when assessing RA risk and seropositive RA risk. FCGR2A (Fc fragment of IgG, low affinity IIa, receptor) and HLA-DRB1 play important roles in the immune system. FCGR2A has been associated with receptor aggregation, neutrophil activation, SLE and lupus nephritis. These results offer clues into the pathophysiology of RA and support a role for vitamin D in inflammatory pathways in pre-RA.

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Tocilizumab Improves Bone Mineral Density Compared with Abatcept in Patients with TNF Blockers-Resistant Active Rheumatoid Arthritis.

**Background:** Tocilizumab (TCZ), a humanized monoclonal antibody that blocks the active cytokine IL-6, has been approved by the US Food and Drug Administration (FDA) for the treatment of rheumatoid arthritis (RA). TCZ is a recombinant humanized anti-IL-6 receptor monoclonal antibody (mAb) that blocks both the receptor-ligand interaction and increases IL-6 degradation. It is the first biologic approved specifically for the treatment of moderate to severe active RA who are anti-TNF antibody treatment-naïve.

**Aim of the study:** The aim of this study was to evaluate the efficacy and safety of TCZ in patients with moderate to severe active RA who are TNF antibody treatment-naïve.

**Methods and Results:** Patients were randomly assigned to receive TCZ plus MTX (n=26) or MTX alone (n=26). The primary outcomes were changes in lumbar and femoral BMD by dual-energy X-ray absorptiometry (DXA). Secondary outcomes were changes in biomarkers of bone turnover (procollagen type I amino-terminal propeptide [P1NP]) from baseline to 52 weeks. Clinical data were collected at regular visit. All patients were taking calcium (1 g/day) and vitamin D (800 IU/day).

**Conclusion:** TCZ significantly increased bone mineral density (BMD) compared with MTX in patients with moderate to severe active RA who are TNF antibody treatment-naïve. This study supports TCZ as a potential therapeutic option for patients with moderate to severe active RA who are TNF antibody treatment-naïve.

**Disclosure:** Y. J. Kwon, None; T. Y. Kim, None; S. W. Lee, None; Y. B. Park, None; S. K. Lee, None; M. C. Park, None.

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Secreted Frizzled-Related Protein 5 Exerts the Anti-Inflammatory Role in Rheumatoid Arthritis Via Down-Regulation of c-Jun N-Terminal Kinase.

**Background:** Secreted frizzled-related protein 5 (Sfrp5) is a novel adipokine that has beneficial effects on metabolic dysfunction by controlling inflammatory cells within adipose tissue. Sfrp5 acts as a soluble modulator that binds to and sequesters Wnt proteins in the extracellular space and prevents the activation of frizzled and attenuating non-canonical Wnt signaling. Consequently, c-Jun N-terminal kinase (JNK), a downstream target of non-canonical Wnt signaling, is inhibited. The purposes of this study are to determine the expression of Sfrp5 in fibroblast-like synoviocytes (FLS) from rheumatoid arthritis (RA) patients and to investigate the correlation between the expression levels of Sfrp5 and that of pro-inflammatory genes in RA FLS.

**Methods:** FLS were isolated from synovial tissues obtained from patients with RA or osteoarthritis (OA) using a standard protocol. The mRNA expression of Sfrp5 in peripheral blood mononuclear cells (PBMCs) and FLS from patients with RA or OA were determined using real-time quantitative RT-PCR. Adenovirus containing Sfrp5 transcript was constructed and delivered into RA FLS to strengthen Sfrp5 expression, then, Sfrp5 RNAi plasmid was transfected to abrogate Sfrp5 expression in RA FLS.

The mRNA expressions of TNF-α, IL-1β, IL-6, CCL-2, CCL-7, COX-2 and MMP-9 were also determined using quantitative real-time PCR and western blot analysis. Inhibitory expression of Sfrp5 in RA FLS was confirmed by Western Blot and shown to be reduced by TCZ treatment. The mRNA expression of Sfrp5 in RA FLS was significantly reduced compared to OA FLS. The down-regulation of Sfrp5 expression by TCZ was further confirmed by Western Blot and shown to be reduced by TCZ treatment. The mRNA expression of Sfrp5 in RA FLS was significantly reduced compared to OA FLS. The down-regulation of Sfrp5 expression by TCZ was further confirmed by Western Blot and shown to be reduced by TCZ treatment. The mRNA expression of Sfrp5 in RA FLS was significantly reduced compared to OA FLS. The down-regulation of Sfrp5 expression by TCZ was further confirmed by Western Blot and shown to be reduced by TCZ treatment. The mRNA expression of Sfrp5 in RA FLS was significantly reduced compared to OA FLS. The down-regulation of Sfrp5 expression by TCZ was further confirmed by Western Blot and shown to be reduced by TCZ treatment.
Combination of Intra-Articular Steroid Injection and Infliximab More Effective Than Infliximab in Rapid Radiographic Progression Patients with Rheumatoid Arthritis: A Randomized, Open Label, x Ray Reader Blinded Study, Kenseku Kume1, Kanzo Amano1, Susurnu Yamada1, Kazuhiko Hatta1, Kuniki Amano1, Hiroyuki Ohta1 and Noriko Kukawa2.
1Hiroshima Clinic, Hiroshima, Japan, 2SKy Clinic, Hiroshima, Japan, 3Sanki Clinical Link, Hiroshima, Japan

Background/Purpose: Treatment of rheumatoid arthritis (RA) should aim at full remission. However, recent publications described rapid radiographic progression (RRP) existed despite initial biologics and methotrexate combination therapy in early RA. In RRP, initial biologics and methotrexate might be inadequate. To compare remission and radiographic non-progression in RRP patients treated with infliximab or with infliximab plus intra-articular steroid injection.

Methods: We designed a single-blinded study and assess the remission. We screened 38 RRP (CRP > 35mg/L, RF +, and ACPA+) early (disease duration<6 months) RA patients for inclusion. 39 were randomly allocated infliximab group (1 group) or ifliximab plus intra-articular steroid injection group (1 plus 1 group). All patients were taking methotrexate from 14 to 22mg a week. For 1 plus 1 group, palpate examinations of both MP and PIP joints, wrists, elbows, shoulders, and knees were performed every 4 weeks. If swollen joints were existed, intra-articular steroid injections were intensifying in each swollen joints. Co-primary endpoints were proportion of patients showing clinical remission (DAS28 <3.2) and radiographic non-progression (Δ modified total Sharp score ≤0.5) at 52 weeks. Analysis was by intention-to-treat with last observation carried forward to missing data.

Results: The characteristics of each group at baseline were not significantly different. Clinical remission at 52weeks was achieved by more patients in the 1 plus 1 group (32%) than in the I group (19%) (p=0.05). Radiographic non-progression at 52 weeks was achieved by more patients in the I plus 1 group (37%) than in the C group (24%) (p<0.05).

Conclusion: Results of this reveal that combination of intra-articular steroid injection and infliximab can achieve a high clinical and radiological remission rate in early RRP RA.

Discourse: K. Kume, None; K. Amano, None; S. Yamada, None; K. Hatta, None; K. Amano, None; N. Kukawa, None; H. Ohta, None.

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1Desert Medical Advances, Palm Desert, CA, 2Wydz. Fizjoterapii, Wyzsza Szkola Przysrodnia, Poland, 3Alastair C. Kennedy, MD, Vero Beach, FL, 4Eli Lilly and Company, Indianapolis, IN, 5Eli Lilly & Company, Indianapolis, IN, 6PharmaNet13, Blue Bell, PA

Background/Purpose: Tabalumab, a monoclonal antibody that neutralizes membrane-bound and soluble B cell activating factor (BAFF), has been shown to reduce rheumatoid arthritis (RA) signs and symptoms. This open-label study evaluated the long-term safety and efficacy of tabalumab in RA patients (pts).

Methods: This 52-week (wk) open-label, flexible-dose extension study enrolled pts who completed 24 wks of a randomized, controlled trial (RCT) of tabalumab vs placebo (pb) and received study drug for ≥6 or 12 wks. Pts remained on stable MTX doses throughout. In RCT 1, pts received pb or tabalumab 30 or 80 mg IV every 3 wks for 6 wks and followed-up for 18 wks. In RCT 2, pts received pb or tabalumab 1, 3, 10, 30, 60, or 120 mg SC every 4 wks (Q4W) for 24 wks. At extension study start, all pts received SC tabalumab 60 mg Q4W for 48 wks; a 1-time increase to tabalumab 120 mg Q4W (60/120 mg) and 1-time decrease to 60 mg Q4W per pt was allowed (60/120/60 mg).

Results: Of those who completed RCT 1 or 2, 98% (N=182, safety population) enrolled: tabalumab 60 mg (n=60), tabalumab 120 mg (n=121), and 1 pt after taking tabalumab 120 mg then returned to 60 mg. Baseline (pre-tabalumab) RA activity levels were generally higher for the 60/120 mg group. Overall, both groups appeared to maintain efficacy with long-term treatment (Table 1). One pt died due to myocardial infarction (60/120 mg). In each group, 5% discontinued due to an adverse event (AE). There was a higher frequency of serious AEs (SAEs) and treatment-emergent AEs (TEAEs, including severe events) as well as events of interest, including infections and injection-site reactions in the 60/120 mg group. Most infections involved the upper respiratory tract. One pt (60/120 mg) reported a fungal skin infection. No clinically significant differences in hematologic or chemistry values, vital signs, or ECGs were seen. Total B lymphocyte counts decreased by 40% from pre-tabalumab baseline for all groups. The incidence of treatment-emergent, anti-tabalumab antibodies was 4.4% (8/182). Table 2 shows more detailed safety data.

Table 1. Efficacy Outcomes In Extension Study

<table>
<thead>
<tr>
<th>Tabalumab (60 mg)</th>
<th>Tabalumab (120 mg)</th>
<th>All Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=59</td>
<td>N=120</td>
<td>N=180</td>
</tr>
<tr>
<td>Week 24</td>
<td>Week 52*</td>
<td>Week 24</td>
</tr>
<tr>
<td><strong>ACR response, %</strong></td>
<td>69.6</td>
<td>66.1</td>
</tr>
<tr>
<td>ACR20 response, %</td>
<td>35.7</td>
<td>33.9</td>
</tr>
<tr>
<td>ACR50 response, %</td>
<td>12.5</td>
<td>18.6</td>
</tr>
<tr>
<td>ACR-N, mean (SD)</td>
<td>28.7 (53.6)</td>
<td>31.9 (47.6)</td>
</tr>
<tr>
<td>EULAR (good/moderate), %</td>
<td>88.5</td>
<td>83.9</td>
</tr>
<tr>
<td>Baseline DAS28, mean (SD)</td>
<td>5.5 (1.3)</td>
<td>6.0 (1.1)</td>
</tr>
<tr>
<td>Change in DAS28, mean (SD)</td>
<td>-2.1 (1.5)</td>
<td>-2.1 (1.5)</td>
</tr>
<tr>
<td>Baseline HAQ, mean (SD)</td>
<td>1.54 (0.66)</td>
<td>1.72 (0.56)</td>
</tr>
<tr>
<td>Change in HAQ, mean (SD)</td>
<td>-0.25 (0.53)</td>
<td>-0.27 (0.53)</td>
</tr>
</tbody>
</table>

4For ACR measures, patients who discontinued from study prior to Week 52 are imputed as non-responders (n=34); for all other measures the LOCF approach was used.
5Only 1 patient received 60/120/60 mg SC every 4 wks. Table 2 includes in All Patients data.
6Two patients were excluded from efficacy analyses: 1 patient had no post-baseline efficacy data (60 mg) and was lost to follow-up, and 1 patient was removed due to good clinical practice violations (60 mg).
Table 2. Safety and Pharmacodynamic Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Tabulamab (60 mg)</th>
<th>Tabulamab (60/120 mg)</th>
<th>All Patients</th>
<th>Baseline</th>
<th>W24</th>
<th>W48</th>
<th>W72</th>
<th>W96</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=60</td>
<td>n=121</td>
<td>N=181</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Week 52</td>
<td>Week 52</td>
<td>Week 52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discontinued due to</td>
<td>3 (5.0)</td>
<td>6 (5.0)</td>
<td>9 (4.9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEs, n (%)</td>
<td>0 (0.0)</td>
<td>1 (0.8)</td>
<td>1 (0.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deaths, n (%)</td>
<td>4 (6.7)</td>
<td>16 (13.2)</td>
<td>21 (11.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious AE, n (%)</td>
<td>38 (63.3)</td>
<td>95 (78.5)</td>
<td>134 (73.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td>22 (36.7)</td>
<td>58 (47.9)</td>
<td>80 (44.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infections of the</td>
<td>16 (25.0)</td>
<td>32 (25.4)</td>
<td>47 (25.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper respiratory</td>
<td>(3.3)</td>
<td>(13.0)</td>
<td>(8.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tract</td>
<td>(11.83)</td>
<td>(30.24)</td>
<td>(41.22)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injection-site pain</td>
<td>2 (3.3)</td>
<td>(13.0)</td>
<td>(8.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injection-site cold</td>
<td>3 (2.3)</td>
<td>(12.0)</td>
<td>(7.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Safety and Pharmacodynamic Outcomes

**Disclosure:** M. W. Greenwald, Eli Lilly and Company, 2; L. Szczepanski, None; A. C. Kennedy, None; C. H. Lee, Eli Lilly and Company, 1, Eli Lilly and Company, 3; E. Polasek, Eli Lilly and Company, 3; M. Veenhuizen, Eli Lilly and Company, 3; E. Lilly and Company, 3; R. Jones-Taha, None; P. Y. Bercelaz, Eli Lilly and Company, 3.

**Background/Concept:** Although anti-TNF therapies moved forward the treatment of rheumatoid arthritis (RA), failure of the first anti-TNF medication is not uncommon. Many times modifying dosage/frequency of the initial drug or prescribing a different TNF inhibitor proves to be still inadequate. Using instead a biologic with a different mechanism of action, being a chronic disease and having finite budgets it is important to find also the best results/costs approach. In case of first anti-TNF medication failure, options are prescribing a different anti-TNF or switching to Rituximab (RTX).

**Conclusion:** Each RTX course led to an increased and cumulative clinical DA28 response compared to the previous one. With each following RTX course all patients registered consolidation of lower DA28 response, and continuously growing LDA or remission percentage. Response was sustained and cumulated regardless their rheumatoid factor status. Introducing Rituximab to patients with no response or intolerance to anti-TNF agents proved to be an adequate choice, therefore we consider its prescription after the first anti-TNF failure as a preferred option in terms of clinical response.

**Disclosure:** I. Ancuta, None; C. Codreanu, None; R. Ionescu, None; M. Parvu, None; M. Bojinca, None.

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Rituximab After First Anti Tumor Necrosis Factor Failure Is More Efficient with High Impact in Reducing Time and Costs to Achieve Superior Rates of Low Disease Activity and Remission. Ioan Ancuta1, Catalin Codreanu2, Ruxandra Ionescu3, Magda Parvu4 and Mihae Bojinca1, 2, "Dr. I. Cantacuzeno" Hospital, Bucharest, Romania, 3Clinic Hospital Sf. Maria, Bucharest, Romania, 4Clinic Hospital SF. Maria, Bucharest, Romania, 5N.Gh. Lupu" Clinical Hospital, Bucharest, Romania

**Background/Concept:** Significant steps were done in creating new medications for treatment of rheumatoid arthritis (RA). As RA seriously affects the patients’ quality of life, the effectiveness of selected approaches is a primary concern for the National Health Insurance House (NHIH). Also being a chronic disease and having finite budgets it is important to find also the best results/costs approach. In case of first anti-TNF medication failure, options are prescribing a different anti-TNF or switching to Rituximab (RTX).

Our objective was to identify the best results/costs ratio by comparing two RA therapeutic alternatives: (1) switch to RTX after first anti-TNF failure versus (2) switching after 2–3 anti-TNF failure.

**Methods:** Based on data from NHIH, we analysed clinical results and the corresponding costs for N=400 RA patients, within a longitudinal (2002–2011), observational, population-based, cohort study. All patients had an anti-TNF medication as first treatment stage for 2.5 years (average). In the second stage, 208 patients (Group 1) were switched to RTX after first anti-TNF failure, and 192 (Group 2) had one or two more anti-TNF before switched to RTX. We evaluated the clinical effectiveness of the 2 approaches using: DA28 and EULAR response. For efficiency assessment we calculated in each set-up indicators like: average spending to obtain the treatment target (LDA or remission), average cost per decreased DA28 point and duration of treatment versus target.

**Results:** In Group 1, after the first 2 RTX cycles (12 months) median ΔDA28 was ~3.36 (compared to its value before the RTX switch). Group 2 evidenced first development of resistance to the anti-TNF medication, median ΔDA28 was +0.26 and after switch to RTX, ΔDA28 decreased in 12 months with ~2.72. By September 1st 2011 (four RTX cycles), 91% of Group 1 patients experienced LDA (36.1%) and remission (54.9%) vs. 80.8% of the patients in Group 2 (40.4% LDA, 40.4% remission). While the groups are comparable in size, with respect to the total expenditure for N=400 patients, Group 1 represents 38% while Group 2 is 62% of the total costs. In terms of treatment objectives 51% of the patients in Group 1 after 12 months achieved LDA or remission vs. 23.4% in Group 2. Considering the budget spent to obtain these results, NHIH spent in average 58% more per patient per DA28 point with Group 2 vs. Group 1.

**Conclusion:** Switching on RTX after the first anti-TNF failure allows the achievement of a sooner and better EULAR response than RTX therapy after 2 or 3 anti TNF stages. DA28 decreased consistently for all
RTX patients, irrespective of their group, but those in Group 1 achieved a lowest value faster. RTX after first anti-TNF is clearly more efficient, the costs to obtain superior clinical response being almost half of those involved in the second therapeutic option. The savings could be used for higher grade of RA treated patients with the same budget and shortening the RA patient's waiting list. The balance cost-benefits being in favour of initiating a RTX medication after the first anti-TNF therapy (follow NICE recommendation) this is our recommendation for NHH.

Disclosure: I. Ancuta, None; C. Codreanu, None; R. Ionescu, None; M. Parvu, None; M. Bojinca, None.

LATE ONSET NEUTROPHENIA AFTER RITUXIMAB TREATMENT FOR RHUMATOLOGICAL CONDITIONS. Gabriel S. Breuer,1 Michael Z. Ehrenfeld2, Itzhak Rosner,3 Alexandra Balbir-Gurman,4 Devy Zisman5 and Daphna Paran,1
1 Sharee Zedek Medical Center, Jerusalem, Israel, 2 Chain Sheba Medical Center, Tel HaShomer, Israel, 3 Bnai Zion Medical Center, Technion Faculty of Medicine, Haifa, Israel, 4 Rambam Health Care Campus, Haifa, Israel, 5 Carmel Medical Center, Haifa, Israel, 6 Tel Aviv Sourasky Medical Ctr, Tel Aviv, Israel

Background/Purpose: Rituximab is a monoclonal chimeric antibody targeting the CD20 on the surface of normal and abnormal B cells. Late onset neutropenia (LON) is defined as an unexplained absolute neutrophil count of <1.5 × 10^9/liter occurring at a time point at least 4 weeks after therapy. LON following rituximab treatment has been described extensively in hematological malignancies. However it has been reported infrequently in association with rheumatological diseases. To the best of our knowledge only 29 such cases have been published so far in the English literature. The aim of this work is to review cases in Israel and to compare them to published cases in the literature thus adding to the body of knowledge regarding this unusual phenomenon.

Methods: Members of the Israeli Rheumatology Association were encountered by e-mail, requesting reports of cases of LON after therapy with rituximab. Submitted cases were reviewed, with demographics and clinical data collated and tabulated. Current cases were compared to previously published rheumatology cases.

Results: Eight episodes in seven patients were reported throughout the country after encountering 150 Israeli rheumatologists. Five of the patients had RA, one SLE and one MCTD. The average neutrophil count was 0.275/cubic mm in compare to 0.380/cubic mm in previously published cases. One patient had cellulitis of the forearm and all other patients did not have any infection. Five patients were treated with G-CSF. All patients had complete recovery. In comparison to published cases, a larger percentage were RA patients reflecting current usage of the medication in Israel. The average time to LON diagnosis was 177 days as compared to 148 days in published cases.

Table 1: LON: current series compared to previous published cases

<table>
<thead>
<tr>
<th>Age/Gender</th>
<th>No. of cases</th>
<th>Additional treatment</th>
<th>Days since onset</th>
<th>BWC (%) neutrophil</th>
<th>Repeat infection</th>
<th>Action taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>32F RA</td>
<td>4</td>
<td>MTX/PRED</td>
<td>151</td>
<td>1100 (10)</td>
<td>Yes</td>
<td>G-CSF</td>
</tr>
<tr>
<td>34F MCTD</td>
<td>1</td>
<td>CYC/AZA PRED</td>
<td>105</td>
<td>1000 (42)</td>
<td>Yes</td>
<td>G-CSF</td>
</tr>
<tr>
<td>22F SLE</td>
<td>1</td>
<td>CYC</td>
<td>240</td>
<td>0</td>
<td>No</td>
<td>G-CSF</td>
</tr>
<tr>
<td>34F RA</td>
<td>1</td>
<td>MTX</td>
<td>120</td>
<td>0</td>
<td>No</td>
<td>G-CSF</td>
</tr>
<tr>
<td>68F RA</td>
<td>1</td>
<td>IVIG/ABTIREN</td>
<td>330</td>
<td>1270 (90)</td>
<td>No</td>
<td>G-CSF</td>
</tr>
<tr>
<td>50F RA</td>
<td>1</td>
<td>MTX/HQ</td>
<td>138</td>
<td>2300 (47)</td>
<td>Yes</td>
<td>MTX/D</td>
</tr>
<tr>
<td>51F (same patient on following year)</td>
<td>1</td>
<td>MTX/HQ</td>
<td>180</td>
<td>2600 (45)</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Published cases
average age: 52
17 (49%) males
Foram both (40%) males
RA = 12
SLE = 3
VASCULITIS = 3
JRA = 1

Conclusion: LON is a well described finding and should be taken into consideration when following rheumatological patients treated with rituximab. In most cases it can be managed with a single dose of G-CSF and does not put the patient in an additional risk. Periodic complete blood count monitoring is recommended.

Disclosure: G. S. Breuer, None; M. Z. Ehrenfeld, None; I. Rosner, None; A. Balbir-Gurman, None; D. Zisman, None; D. Paran, None.

Pilot Study of Stimulation of the Cholinergic Anti-Inflammatory Pathway with an Implantable Vagus Nerve Stimulation Device in Patients with Rheumatoid Arthritis. Frieda A. Koopman1, Sanda Miljko2, Simeon Grazio3, Sekib Sokolovic4, Kevin Tracey5, Yaakov Levine6, Ralph Zitnik6 and Paul-Peter Tak7, 1 Academic Medical Center/University of Amsterdam, Amsterdam, Amsterdam, Netherlands, 2 University Clinical Hospital, Mostar, Bosnia, 3 Clinical Hospital Center Sestre Milosrdnice, Zagreb, Croatia, 4 University Clinical Center, Sarajevo, Bosnia, 5 Feinstein Institute for Medical Research, Manhasset, NY, 6 SetPoint Medical Corporation, Valencia, CA, 7 Academic Medical Center/GlaxoSmithKline, Amsterdam, Netherlands

Background/Purpose: The inflammatory reflex regulates innate and adaptive immunity (Andersson O, Tracey K. Annu. Rev. Immunol. 2012; 30:313). Activation of its efferent arm (the Cholinergic Anti-inflammatory Pathway (CAP)), by electrical vagus nerve stimulation (VNS) reduces systemic inflammation and ameliorates disease in many acute and chronic animal models. We determined whether VNS could similarly improve clinical manifestations of rheumatoid arthritis (RA).

Methods: This is an open label study of patients with active RA (> = 4 tender and 4 swollen joints (28 joint scoring), and CRP of at least 7 mg/L) despite stable methotrexate dose for 3 months. Patients failing TNF antagonists (only for safety or tolerability reasons) could also be enrolled after washout. After a pre-implantation baseline visit, patients were surgically implanted with a Cyberonics VNS system. The device delivered the first VNS during its standard intraoperative diagnostic check sequence. Two weeks following implantation patients returned for initial in-clinic VNS. One week after the first clinic visit (day 7), patients began self-delivery of 60 second, once daily home stimulations, escalated in output current intensity as tolerated, through day 28. At day 28 patients without a EULAR good or moderate response were increased to four times daily VNS. Primary endpoint results at day 42 are reported.

Results: 5 patients (4 female, 1 male), 5 VNS+6/8 ACPA+, mean age 56 [range 39–70], mean disease duration 8 yrs [range 0.5–13] were enrolled and implanted. Implantation and stimulation were generally well tolerated. Moderate postoperative hoarseness occurred in one patient. Pre implantation baseline values (mean, SD) were: DAS28-CRP: 6.06 (0.87), CRP: 17.5 mg/L (9.9), HAQ-DI: 1.63 (0.90). Changes at day 42 visit from pre-implantation values were: DAS28-CRP: –0.28 (1.65), CRP: –3.46 (17.95) mg/L, HAQ-DI: –0.44 (0.48).

Similar levels of improvement were seen across all ACR core set assessments. ACR 20/50/70 response rates from pre-implantation baseline to day 42 were 75% (6/8), 50% (4/8), and 25% (2/8), respectively.

Conclusion: In this pilot study VNS was generally well tolerated and improved signs and symptoms of RA. This is the first demonstration in humans that stimulation of the CAP can favorably impact clinical manifestations of systemic inflammation. If efficacy and safety are confirmed in larger controlled studies, implantable medical devices may offer a feasible alternative approach to the treatment of RA and other chronic inflammatory diseases.

Disclosure: F. A. Koopman, None; S. Miljko, SetPoint Medical, 2; S. Grazio, SetPoint Medical, 2; S. Sokolovic, SetPoint Medical, 2; K. Tracey, SetPoint Medical, 1; Y. Levine, SetPoint Medical, 1; S. Sokolovic, 3; R. Zitnik, SetPoint Medical, 1; SetPoint Medical, 3; P. P. Tak, SetPoint Medical, 2; SetPoint Medical, 5.
Effectiveness and Tolerance Infiltration Intraarticular Corticosteroid According to Dose. Daniele F. Pereira1,2, Rita N.V. Furtado1, Natalia P. Machado1 and Jamil Natour2. 1Universidade Federal de São Paulo (UNIFESP), São Paulo, Brazil, 2University of Melbourne, Melbourne, Australia. Background/Purpose: The optimal dose of corticosteroid to be used in intraarticular injection is not well established. The objective of this study is to compare the effectiveness and tolerance in the medium-term between small and large doses of triamcinolone hexacetonide (TH) used in intraarticular injection (IAI) of medium size joints of patients with rheumatoid arthritis (RA).

Methods: A controlled, randomized, prospective, double-blind study was carried out in patients with RA. It was evaluated 60 wrists joints (representing medium size joints) from the outpatient clinic at the Rheumatology Division UNIFESP, Brazil. Inclusion criteria were: patients with established RA, age between 18 and 65 years, disease modifying anti-rheumatic drugs (DMARDs) stable for at least 3 months, synovitis in wrist with pain visual analog scale (VAS) between 4 and 8cm. Patients with overlap syndromes, polyarticular synovitis, diabetes mellitus or uncontrolled hypertension and those with suspected local or systemic infection were excluded. Patients were randomized (Clapboard randomization) in two groups of 30 patients each: group 1 (high dose) was injected with 40mg (2ml) of TH and group 2 (low dose) was injected 20mg (1ml). Only one joint was injected per patient (IAI blindly). Evaluation was conducted by a blinded observer at five times: baseline (T0), one week (T1), four (T4), eight (T8) and twelve (T12) weeks and the following assessment instruments were used: visual analogue scale for pain and swollen (swelling) (VAS 0–10cm); wrist goniometry; chronic disease activity index (CDAI). Side effects and related events were reported in a medical questionnaire. The level of statistical significance was 5%.

Results: A total of 60 patients were injected (50 women, 37 white). Mean age was 50.0 (± 12.5) years old in the high dose group and 51.7 (± 11.6) in the low dose group (p=0.586). No statistically significant difference between groups was observed for VAS for pain, VAS for swelling, CDAI, HAQ and goniometry. But all study variables improved over time in both groups and particularly T0 improved statistically significant from all other times for VAS for pain and swelling; CDAI and HAQ (all p<0.008). Wrist goniometry was statistically different in some periods and on the high dose group was the improvement maintained until T12 (p<0.004). There was a significant increase of the use of nonsteroidal anti-inflammatory (NA) and analgesics necessary to relieve pain soon after IAI, but this use decreased after T1 equally between groups (p=0.692). Very few adverse effects and related events were reported in both groups (p=0.195).

Conclusion: There is no difference in effectiveness of the intraarticular injection between high and low doses of TH used in medium size joints of patients with RA.

Fish Oil in Rheumatoid Arthritis: A Randomised, Double Blind Trial Comparing High Dose with Low Dose. Susanna Proudman1, Llew Spargo2, Cindy Hall2, Leah Williams2, Anita Lee2, Maureen Rischmueler2, Robert Gibson2, Michael James2 and Leslie G. Cleland1. 1Royal Adelaide Hospital, Adelaide, Australia, 2Queen Elizabeth Hospital, Adelaide, Australia. Background/Purpose: The symptomatic benefit and NSAID-sparing effects of fish oil (FO) in RA are well known but effects on disease outcomes are less well established, especially in the context of contemporary treatment of early RA. The aim of this investigator-initiated randomized controlled trial was to assess the effects of high vs. low dose FO on disease outcomes in patients with early RA receiving a “treat-to-target” protocol of combination DMARDs.

Methods: Patients with RA according to ACR criteria with active polyarthritis of <12 months’ duration and who were DMARD-naive, received MTX, sulphasalazine and hydroxychloroquine. They were randomized 2:1 to fish oil at a high dose (FO) or low dose (control) providing 5.5 and 0.4 g/day respectively, of the marine omega-3 fats, EPA+DHA. DMARD doses were adjusted according to a pre-defined protocol taking disease activity and toxicity into account. DAS28-ESR, mHAQ, remission and plasma phospholipids were assessed 3 monthly. In a novel study design, the primary outcome was DMARD use at 52 weeks, defined as the addition of leflunomide to triple therapy (“failure of triple therapy”).

Results: After 52 weeks, there were no significant differences between treatment groups for the outcomes of MTX dose, DAS28 or mHAQ; but compared with controls (16/46, 35%), fewer FO patients (9/75, 12%) had commenced leflunomide (p = 0.005; Fisher’s exact test). In FO patients, the rate of commencement of leflunomide was lower (Hazard Ratio 0.27, 95%CI 0.12–0.59) whereas the rate of achieving first ACR remission was higher (HR 2.22, 95%CI 1.18–4.18) compared with controls (Kaplan-Meier estimate).

Disclosure: S. Proudman, None; L. Spargo, None; C. Hall, None; L. Williams, None; A. Lee, None; M. Rischmueler, None; R. Gibson, None; M. James, None; L. G. Cleland, Melrose Laboratories, 9.

There was considerable overlap in plasma omega-3 levels between the FO and control groups. Results were analysed by plasma omega-3 quartiles (t12AUC/unit time). Compared with the lowest quartile, patients in the highest quartile had significantly higher odds of achieving remission, by either DAS28 or ACR criteria (respectively, OR = 3.30, 95% CI; 1.13–9.71, OR = 3.53, 95%CI; 1.05–11.90).

Conclusion: FO was associated with benefits additional to those achieved by combination “treat-to-target” DMARDs with similar MTX use. The benefits included reduced likelihood of progression to leflunomide (“failure of triple therapy”) and a higher rate of ACR remission. High plasma n-3 fatty acids were associated with higher odds of achieving remission.
Long-Term Efficacy of Tocilizumab Monotherapy in Patients with Rheumatoid Arthritis Previously Methotrexate Naive or Methotrexate Free for 6 Months. Graeme Jones1, Anthony Sebba2, Denise Lepley2, Jenny Devenport3, Corrado Bernasconi3, Devi Smart5, and Juan J. Gomez-Reino5.

Background/Purpose: Treatment with tocilizumab (TCZ) monotherapy has been studied in 3 randomized clinical trials: AMBITION,1 ACT-RAY,2 and ADACTA.3 AMBITION1 was the first trial to demonstrate clinical superiority of a biologic monotherapy over methotrexate (MTX) monotherapy: in pts who were MTX naïve or MTX free for 6 mos before entry, treatment with TCZ 8 mg/kg monotherapy resulted in statistically greater ACR 20/50/70 responses than MTX at 24 wks. Numeric differences favoring TCZ monotherapy were observed for other endpoints and pt-reported outcomes as early as 2 wks. TCZ was generally well tolerated. In this post hoc exploratory analysis, long-term efficacy was evaluated in pts from AMBITION who remained on TCZ monotherapy in the ongoing long-term extension (LTE) period up to 240 wks. The rate, timing, and nature of the addition of disease-modifying anti- rheumatic drug (DMARD) for TCZ pts who added DMARDs were also characterized.

Methods: Pts randomized to TCZ 8 mg/kg monotherapy in AMBITION (n=286) who entered the LTE (n=243) were included. During the LTE period, MTX/other allowable DMARD could be added according to the investigator’s practice and as tolerated by the pt for those pts who did not achieve a 50% reduction in the number of tender and swollen joints from baseline of the core study. Efficacy assessments and DMARD status were evaluated up to 240 wks.

Results: Of 243 pts assigned to TCZ monotherapy who entered the LTE, 57.2% (n=139) remained on monotherapy in the LTE until withdrawal or data cut, 9.9% (n=24) added a DMARD before LTE entry, and 32.9% (n=80) added a DMARD after LTE entry (18.5% [n=45] ≤3 wks post-entry and 14.4% [n=35] >3 wks post-entry). Added DMARDs included MTX (93% [97/104]), hydroxychloroquine (3% [3/104]), leflunomide (2% [2/104]), and parenteral gold (2% [2/104]). Of the 139 pts who remained on TCZ monotherapy, 102 (73%) reached 240 wks of treatment for this data cut and 37 (27%) withdrew. Mean SJC, TJC, and DAS28 (data not shown) decreased sharply during the first 24 wks, and levels continued to decrease or were maintained thereafter (Table). Absolute numbers achieving these endpoints increased to wks 120 and 96 (data not shown for wk 96), respectively.

Table. Efficacy over time in patients on TCZ monotherapy

<table>
<thead>
<tr>
<th>Week</th>
<th>SJC</th>
<th>TJC</th>
<th>DAS28-ESR (mean ± SD, at week 52)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
<td>75</td>
<td>6.70</td>
</tr>
<tr>
<td>12</td>
<td>30</td>
<td>50</td>
<td>5.74</td>
</tr>
<tr>
<td>52</td>
<td>15</td>
<td>30</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Discussion: Baseline patient characteristics were as follows: mean age of 55.6 years; mean disease duration of RA of 8.54 years; prior treatment with TNF inhibitors in 46.6%; concomitant use of methotrexate (MTX) in 57.3% and use of concomitant glucocorticoid was in 43.7%. Baseline patients’ characteristics were comparable between the combination group of TCZ and MTX and the TCZ monotherapy group. TCZ improved disease activity measured by DAS28-ESR from 5.02 at baseline to 1.97 at week 52; 68.9% of patients achieved DAS28 remission (DAS28-ESR < 2.6 LOCF method), and 50.0% of patients achieved CDAI remission. Structural remission (DTSS=0/5.0) was achieved in 60.9% of the patients. The percentages of DAS28 remission, CDAI remission and structural remission in patients who received TCZ as monotherapy were comparable to those in the patients who received TCZ in combination with MTX. The retention rate of TCZ at week 52 was 81.4% in TCZ monotherapy and 86.4% in TCZ plus MTX group. Safety data was comparable between the 2 groups and was as reported in previous study reports.

Conclusion: Efficacy of TCZ was observed in RA patients regardless of the concomitant use of methotrexate in real-world clinical practice.

References

Disclosure: G. Jones, Roche Pharmaceuticals, 2; Roche Pharmaceuticals, 5, Roche Pharmaceuticals, 8; A. Sebba, Roche Pharmaceuticals, Amgen, 5, Roche Pharmaceuticals, Amgen, Novartis, 8; D. Lepley, Genentech and Biogen IDEC Inc., 3; J. Devenport, Genentech and Biogen IDEC Inc., 5; C. Bernasconi, Roche Pharmaceuticals, 3; D. Smart, Roche Pharmaceuticals, 3; C. Mpofu, Roche Pharmaceuticals, 3; J. J. Gomez-Reino, Roche Pharmaceuticals, Merck Sharp and Dohme, 2, BMS, Merck Sharp and Dohme, Pfizer, Roche Pharmaceuticals, UCB, 5, BMS, Merck Sharp and Dohme, Pfizer, Roche Pharmaceuticals, 8.

Background/Purpose: To explore the benefit of concomitant use of methotrexate (MTX) for the effectiveness of TCZ in rheumatoid arthritis (RA) patients in daily clinical practice.

Methods: A total of consecutive 115 RA patients initiating TCZ treatment in KEIO university hospital from July 2008 to March 2011 were enrolled. They received 8 mg/kg of TCZ every 4 weeks, and were observed for 52 weeks to evaluate the clinical and structural outcomes as well as safety.

Results: Baseline patient characteristics were as follows: mean age of 55.6 years; mean disease duration of RA of 8.54 years; prior treatment with TNF inhibitors in 46.6%; concomitant use of methotrexate (MTX) in 57.3% and use of concomitant glucocorticoid was in 43.7%. Baseline patients’ characteristics were comparable between the combination group of TCZ and MTX and the TCZ monotherapy group. TCZ improved disease activity measured by DAS28-ESR from 5.02 at baseline to 1.97 at week 52; 68.9% of patients achieved DAS28 remission (DAS28-ESR < 2.6 LOCF method), and 50.0% of patients achieved CDAI remission. Structural remission (DTSS=0/5.0) was achieved in 60.9% of the patients. The percentages of DAS28 remission, CDAI remission and structural remission in patients who received TCZ as monotherapy were comparable to those in the patients who received TCZ in combination with MTX. The retention rate of TCZ at week 52 was 81.4% in TCZ monotherapy and 86.4% in TCZ plus MTX group. Safety data was comparable between the 2 groups and was as reported in previous study reports.
Background/Purpose: SWITCH-RA is a global, observational study evaluating the effectiveness of switching to an alternative TNFi or rituximab (RTX) following initial TNFi failure in patients with RA. The study also assessed the reasons for discontinuation of initial TNFi therapy and factors that were predictive of RTX vs alternative TNFi as subsequent therapy.

Methods: Reasons for initial TNFi discontinuation and rationale for selection of subsequent therapy were recorded. The association between various factors and choice of RTX or alternative TNFi as second biologic were analyzed using logistic regression with a stepwise method for variable selection.

Results: A total of 1107 enrolled patients (mean age 55.5 yrs; mean disease duration 8.3 yrs) were analyzed. Reasons for discontinuing initial TNFi's included loss of efficacy (n=824 [74%]); intolerance (n=264 [24%]); and other (n=19 [2%]). In all, 602 (54%) received RTX and 505 (46%) an alternative TNFi as second biologic. Factors associated with choice of RTX or alternative TNFi are shown in the Figure.

Factors associated with choice of RTX or alternative TNFi

Factors most clearly associated with selection of RTX were generally associated with treatment characteristics related to the safety profile (no lymphoma risk, low infection risk, and good long-term tolerance after infusion) and frequency of administration. Factors most clearly associated with selection of alternative TNFi were associated with treatment (route of administration, rapidity of action, short administration duration) and patient (treatment being compatible with patient’s professional life) characteristics.

Conclusion: Lack of efficacy was the main reason for discontinuation of an initial TNFi. Factors associated with selection of RTX over an alternative TNFi tended to be associated with treatment characteristics related to the safety profile and frequency of administration, while those associated with selection of an alternative TNFi were associated with administration and patient characteristics.

Disclosure: A. Finckh, Roche, Pfizer, BMS, 2, Roche, BMS, Pfizer, 5; J. E. Gottschen, Roche, Pfizer, MSD, Abbott, 5; C. Mpiofu, F Hoffmann-La Roche Ltd, 3; W. G. Benson, Abbott, AstraZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proctor and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 2, AbbVie, AstraZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proctor and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 5; AbbVie, AstraZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proctor and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 5; AbbVie, AstraZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proctor and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 3; A. Bouchard, Roche, Pfizer, 2, Roche, Chugai, Abbott, Pfizer, UCB, MSD, 5, Roche, UCB, Chugai, MSD, 6, Roche, UCB, Chugai, MSD, 8; F. Irazoque, Pfizer, Roche, Janssen, 5; V. Martínez Taboada, Schering-Plough, Wyeth-Pharma, Roche, 2, UCB-Pharma, Bristol Myers Squibb, Roche-Genzyme, Pfizer, 5; C. Chung, Genentech Inc (full time) 3; C. Lyhke Hinsch-Glyvin, F Hoffmann-La Roche Ltd, 3; C. Ferré, None; P. Emeray, Pfizer, Merck, Abbott, BMS, Roche, UCB, 5.
**Methods:** The primary objective of this study is to compare the survival rates of two different anti-TNF agents, adalimumab (ADA) and etanercept (ETA) used as first biologic agent with and without associated DMARDS in the treatment of rheumatoid arthritis (RA) using the data coming from the Rhumadata computerized database at the Institute of Rheumatology of Montreal.

The secondary objective is to evaluate the influence of baseline demographic and clinical data on the primary outcome.

Data for all patients with rheumatoid arthritis according to the ACR criteria included in the database since 2005 and exposed for the first time only to an anti-TNF agents were extracted. Only patients exposed to adalimumab and etanercept were included in this analysis to standardize route of administration. Demographics and baseline clinical data are: age, gender, disease duration, tender joint count (TJC), swollen joint count (SJC), disease activity score including DAS 28 ESR and CRP 3-4 variables, CDAL, DASAI, Rheumatoid Factor and Anti-CCP baseline status, ESR and CRP at baseline. HAQ score, VAS fatigue scale, VAS pain Scale, morning stiffness duration, DMARDS and glucocorticoid usage.

**Results:** Data for 249 patients with rheumatoid arthritis are used. 95 and 154 patients were respectively using adalimumab or etanercept. All baseline demographic and clinical variables were comparable for both group (p=0.05). There were slightly more usage of DMards with ADA than ETA (89% vs 78%, p=0.02). TJC slightly lower for ETA than ADA (7.3 vs 9.5, p=0.04). There were more female patients in the monotherapy group than in the combination group (75% vs 90%, p=0.01). The 4 year survival rates (Kaplan-Meier survival proportion) for ADA+DMARDS vs ADA mono are respectively 56% and 11% (p=0.03 Log-rank statistic), for ETA+DMARDS vs ETA mono, 67% vs 47% (p=0.007), for combined ETA+DMARDS vs ETA-ADA MONO, 62% vs 40% (p=0.001) and for ADA+ETA both on MTX, 67% vs 57% (p=0.12).

**Conclusion:** Combination of etanercept or adalimumab with a traditional DMARDS agent such as methotrexate exhibit a far better survival rate at 5 years than adalimumab or etanercept used in monotherapy.

**Disclosure:** D. Choquette, None; D. Sauvageau, None; B. Harauyi, None; J. P. Raynauld, Arthrolab Inc., 4.

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**Long-Term Safety of Rituximab: 10-Year Follow-up in the Rheumatoid Arthritis Global Clinical Trial Program.** Ronald F. van Vollenhoven1, Paul Emery2, Clifton O. Bingham III3, Edgward Keystone4, Roy M. Fleischmann4, Daniel E. Furst5, Nicola Tyson6, Abdul Mehboob7 and Patricia B. Lehane1.

1 Karolinska University Hospital, Stockholm, Sweden, 2University of Leeds, Leeds, United Kingdom, 3Johns Hopkins University, Baltimore, MD, 4Mount Sinai Hospital, Toronto, ON, 5University of Texas Southwest Medical Center and Metropolis Clinical Research Center, Dallas, TX, 6UCCLA, Los Angeles, CA, 7Roche Products Limited, Welwyn Garden City, United Kingdom

**Background/Purpose:** This analysis evaluated the long-term safety of rituximab (RTX) in RA patients (pts) in a global clinical trial program.

**Methods:** Pooled observed case analysis of safety data from pts with moderate to severe active RA treated with RTX+MTX. Pts were retrospectively based on physician’s determination of clinical need and evidence of active disease (defined as either SJC and TJC ≥5 or DAS28 ≥2.6). Subgroup analysis of pts with follow-up >5 yrs was undertaken. Pooled data from pts who received placebo during placebo-controlled study periods were also analyzed.

**Results:** As of Sep 2011, 3595 pts (All-Exposure population) had received ≥19 courses of RTX over the 10-year observation period (14008 pt-yrs). Of these pts, 1145 had follow-up >5 yrs (7716 pt-yrs) (>5 yrs). The placebo population comprised 818 pts (1107 pt-yrs) with a mean follow-up of 1–1.5 yrs. In the All-Exposure population, infusion-related reaction (IRR) was the most frequent adverse event (AE); most were grade 1 or 2, were rarely serious, and generally occurred following the 1st infusion of the 1st course (789/3595 pts; 22%). Rates of AEs, serious AEs (SAEs), and infections were comparable across analysis populations and generally remained stable over time and multiple courses (Table). Overall serious infection (SIE) rates in the RTX All-Exposure and >5 yr sub-population were comparable to that observed in the placebo population. Pneumonia was the most frequently reported SIE (2% of RTX pts). There were no cases of hepatitis B and 2 cases of pulmonary tuberculosis (TB), treated with anti-TB medication, occurred in the All-Exposure population, as reported previously. No cases of extra-pulmonary TB, atypical mycobacterial infection, or multidrug-resistant TB were reported. Serious opportunistic infections were rare (0.05/100 pt-yrs in RTX pts vs 0.09/100 pt-yrs in placebo).

No further cases of PML in the RA clinical trial program have been reported other than the one case previously described. No increased risk of malignancy over time or course was evident, and MI rates (0.40/100 pt-yrs) were consistent with the general RA population (0.48–0.59/100 pt-yrs).

**Conclusion:** These long-term data from 3595 pts treated with RTX over 10 yrs (14008 pt-yrs) of follow-up in clinical trials confirm that RTX remains well tolerated over time and multiple courses with a consistent safety profile. No new safety signals were observed with increasing duration of exposure, including within a subgroup of pts with >5 yrs’ follow-up. Apart from IRRs, the overall safety profile of RTX remains similar to that of the pooled placebo population and is consistent with published data for moderate to severe RA and with previous analyses of this pt cohort.

1. van Vollenhoven RF et al. Arthritis Rheum 2011;63(10):SS57
2. Fleischmann RM. Arthritis Rheum 2009;60:3225

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1University Erlangen, Nürnberg, Germany, 2Schloßpark-Klinik, University Medicine, Berlin, Germany, 3University of Siena, Siena, Italy, 4University Hospital Heidelberg, Heidelberg, Germany, 5Pamepinisto Krins, Rethymnon, Greece, 6YU University Medical Center/Jan van Breemen Research Institute, Amsterdam, Netherlands, 7St Joseph’s Hospital and McMaster University, Hamilton, ON, 8Charité-Universitätsmedizin, Berlin, Germany, 9University Medical Center Freiburg, Freiburg, Germany, 10Hospital Barmherzige Brüeder, Graz, Austria, 11Institute of Rheumatology, Prague, Czech Republic, 12Chiltern International, Neuilly, France, 13Docs International, Sèvres, France, 14Bristol-Myers Squibb, Munich, Germany, 15Bristol-Myers Squibb, Rueil Malmaison, France

**Background/Purpose:** Randomized controlled trials (RCTs) of abatacept (ABA) in patients (pts) with RA have demonstrated sustained, long-term efficacy, high pt retention, and consistent safety. Data from the clinical setting can determine if benefits translate into the real world. We evaluate 1-yr retention, efficacy and safety of ABA in RA pts treated in routine clinical practice (according to label at time of enrollment) in Europe and Canada.

**Methods:** Abatacept in routine clinical practice (ACTION) is an ongoing, non-interventional, prospective cohort of ABA-treated RA pts with inadequate response to MTX or anti-TNF therapy in Europe and Canada.
Patterns of Tocilizumab Use, and Dosing Among Patients with Rheumatoid Arthritis in the Clinical Practice. Preliminary Analyses of ACT-Life Study. J.V. Tovar Beltrán, M.A. Guzmán Úbeda, I. Mateo Bernardo, Rosario García-Vicuña, M. Rodríguez-Gómez, M. Belmonte-Serrano, C. Marras, E. Loza Cortina, E. Pérez Pampin, V. Vila Fayos, A. B. Romero Silva, M. Vila, 1Hospital General Universitario de Elche, Alicante, Spain, 2Hospital Universitario Virgen de las Nieves, Granada, Spain, 3Hospital Universitario 12 de Octubre, Madrid, Spain, 4Hospital Universitario La Princesa, Madrid, Spain, 5Complejo Hospitalario Universitario de Ourense, Ourense, Spain, 6Hospital General de Castellón, Castellón, Spain, 7Hospital Universitario Virgen de las Arrixacas, Murcia, Spain, 8Hospital de Navarra, Navarra, Spain, 9Complejo Hospitalario Universitario de Santiago, Santiago de Compostela, Spain, 10Hospital Comarcal de Vinaroz, Castellón, Spain, 11Roche Farma, Madrid, Spain, 12Hospital La Paz, Madrid, Spain.

Background/Purpose: Currently, the available evidence about tocilizumab (TCZ) use for the treatment of rheumatoid arthritis (RA) in daily clinical practice is scarce. This study was devised to describe usage patterns of TCZ and reasons for dosage modification (reduction/interruption/discontinuation) in the routine clinical practice, as well as its effectiveness and safety profile under real conditions of use.

Methods: This is a 12-months prospective observational study in 40 Spanish centers. Patients with moderate or severe RA of ≥6 months duration initiated on treatment with TCZ after failure of at least one previous DMARD or TNF inhibitor were included. We present preliminary results at 6-month follow-up.

Results: A total of 390 patients were evaluable with a median age of 57 years (47-66) and 83% female. At baseline, patients had mean RA duration of 11.4±8.3 years, 70% were positive for rheumatoid factor and 68% for anti-CCP. Mean DAS28, SDAI, HAQ scores and CRP levels were 5.4±1.2, 22.4±14.9, 1.6±0.7 and 5.8±12.9 mg/dL, respectively. Patients had previously received a mean of 3±1 DMARDs and a mean of 2.3±1.2 biological agents, and 97.7% of them initiated TCZ at dose of 8 mg/kg. At the 6-month follow-up, the mean DAS28 decreased significantly from baseline (5.5±1.2 vs 2.9±1.4; p<0.001, paired t-test, n=143), and disease remission (DAS28<2.6) was achieved in 48% of patients. Based on EULAR response criteria, 59.4% of patients were good responders, 31.5% moderate responders and 9.1% non-responders. Of all patients, premature withdrawal from the study during the first 6 months was reported in 34 (9%), 14 (41.2%) as a result of adverse events and 12 (35.3%) due to inadequate response. Grade 3/4 adverse events were observed in 192 patients, of which 123 (64.5%) were related to TCZ. The most common adverse events were infections (93), cytopenia (42), and cardiovascular (21).

Conclusion: These results show that in daily clinical practice, tocilizumab is a safe and effective treatment for moderate or severe RA, with the majority of patients having a good EULAR response and a disease remission being achieved in approximately 50% of patients. Tocilizumab appears more effective when administered as a first-line biological agent. Additionally, TCZ proves to have a similar safety profile regardless of the use pattern as monotherapy or in combination, and the line-biological option may be used.

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Canada, initiated Mar 2008. At data cut-off in Feb 2012, all pts had reached 1-yr follow-up. Retention rate (Kaplan–Meier estimate) and disease activity (EULAR response) are reported over 12 mths for pts on treatment and with available data, according to whether pts received ABA as a first biologic, or after failure of 1 or ≥2 anti-TNFs. Safety is reported for all enrolled pts, up to data cut-off.

Results: 1138 pts were enrolled and 1120 were evaluable. 1000 (89.3%) had previously failed on biologic treatment, 982/1000 (98.2%) of whom failed ≥1 anti-TNF agent. 120 (10.7%) had not received biologic treatment prior to ABA initiation. Baseline characteristics for the three groups are shown in Table. Retention rates, reasons for discontinuation and % moderate and good EULAR responders at Mth 12 are presented for ABA when used as the first biologic, first switch agent, and after ≥2 anti-TNFs, and suggest that earlier usage results in higher pt retention (Table). 106 serious adverse events were reported in 60/1135 (5.3%) pts (21 discontinuations). 11 deaths were reported, including 3 due to serious infections (sepsis [4 mths after last ABA infusion; pt was receiving tocilizumab]; Pneumocystis jiroveci [4 mths after last ABA infusion, pt had deep vein thrombosis]; and urosepsis unrelated to ABA. 23 pts experienced serious infections; 9 malignancies; 5 serious cardiac disorders; and 3 serious vascular disorders. No TB occurred, two opportunistic infections were reported (cytomegalovirus and P. jiroveci).

EULAR response criteria: Moderate/good=ΔDAS28 improvement of ≥0.6 and a ΔDAS28 of ≥3.2; Moderate/ΔDAS28 improvement of >1.2 and a ΔDAS28 of ≥3.2, or ΔDAS28 improvement of 0.6–1.2 and a ΔDAS28 of ≤3.1.

Conclusion: This large-scale, international, observational real-life study showed that the use of ABA as the first biologic in MTX-inadequate responders, or after first or later switching from anti-TNFs, was associated with good pt retention over 12 mths, particularly when used earlier in the course of treatment. ABA was clinically effective and well tolerated. ABA was clinically effective and well tolerated. ABA was clinically effective and well tolerated.
Subcutaneous Abatacept: Long-Term Data From the Acquire Trial.


1Stanford University, Palo Alto, CA, 2Universidad Autonoma de Chihuahua, Chihuahua, Mexico, 3Centro Medico De Las Americas, Merida, Mexico, 4Instituto De Ginecologia Y Reproduccion, Lima, Peru, 5Organización Medica de Investigacion, Buenos Aires, Argentina, 6Pontifical Catholic University School of Medicine, Porto Alegre, Brazil, 7Arthritis Center of Medicine, Berlin, Germany, 8University of Queensland, Brisbane, Australia, 9ABA, University School of Medicine, Porto Alegre, Brazil, 10Box Arthritis & Rheumatology of the Carolinas, Charlotte, NC, 11Low Country Rheumatology, Charleston, SC, 12Institute of Rheumatology, Moscow, Russia, 13Université Catholique de Louvain, Brussels, Belgium, 14Bristol-Myers Squibb, Princeton, NJ, 15Schlosspark-Klinik, University Medicine, Berlin, Germany.

Background/Purpose: The Abatacept (ABA) Comparison of Subcutaneous (SC) versus Intravenous (IV) in Inadequate Responders to Methotrexate (MTX) (ACQUIRE) study showed comparable efficacy and safety of SC vs IV ABA over 6 months; here, we present 32-month data from the long-term extension (LTE), during which all patients (pts) received SC ABA.

Methods: ACQUIRE was a Phase IIIb, 6-month, double-blind (DB) study of pts with active RA (≥10 swollen and ≥12 tender joint count [TJC and SJC], C-reactive protein (CRP) ≥0.8 mg/dL) refractory to MTX. Pts were randomized to SC ABA (125 mg/wk) with IV ABA loading (10 mg/kg) on Day 1 or IV ABA (10 mg/kg every 4 weeks) for 6 months, plus MTX. After 6 months, pts could enter the open-label LTE to receive SC ABA 125 mg/wk. Safety and efficacy were assessed for pts treated in the LTE, with efficacy presented according to original DB treatment group (as observed). Not all pts had reached later time points at time of analysis, as a result of differential enrollment in the trial.

Results: Of 1372 pts entering the LTE, 1134 (82.7%) remained on therapy at time of reporting. Mean baseline RA duration was 8 yrs, TJC and SJC were 30 and 20, and HAQ-DI was 1.7. The median (range) ABA exposure was 33 (8–44) mths. The incidence rate (IR; events/100 pt-yrs) of serious adverse events for pts treated with SC ABA in the LTE (8.76 [95% CI: 7.71–9.95]) was comparable with that for SC ABA in the DB period (9.02 [6.31–12.90]) and did not increase with increasing exposure (not shown). The IR of overall and serious infections in the LTE (44.80 [41.81–48.01] and 1.72 [1.30–2.27], respectively) did not increase vs the DB period (48.62 [74.50–96.11] and 1.48 [0.62–3.56], respectively). Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56], respectively). Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively. Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively.

Conclusion: Over 32 months, SC abatacept showed consistent safety with high patient retention (82.7%). ACR, HAQ-DI responses and DAS28 remission rates were maintained through the long-term extension.


Disclosure: M. C. Genovese, Bristol-Myers Squibb, 2; Bristol-Myers Squibb, 5; C. Pacheco-Tena, BMS, Janssen, Roche and Pfizer, 5; A. Covarrubias, None; G. Leon, None; E. Mysler, None; M. Keiserman, Bristol-Myers Squibb, 2; Bristol-Myers Squibb, 5; R. Valente, BMS, Novartis, Pfizer, UBS, Contacor, Lilly, Takada, HGS, 9; P. Nash, Bristol-Myers Squibb, 2; Bristol-Myers Squibb, 5; R. Valente, BMS, 8; R. Valente, BMS, Novartis, Pfizer, UBS, Contacor.

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Drug Survival, Efficacy and Predictors for Survival On Tocilizumab in Real-Life Patients with Rheumatoid Arthritis; Results From the Swedish Biologics Register. Helena Forsblad-d’Elia1, Karin Bengtsson1, Lars-Erik Kristensen2 and Lennart TH Jacobsson3. 1Department of Rheumatology and Inflammation Research, Sahlgrenska Academy at University of Gothenburg, Gothenburg, Sweden, 2Department of Rheumatology, University Hospital of Skåne, Lund, Sweden.

Background/Purpose: To evaluate drug survival, clinical response and predictors for drug survival for tocilizumab in patients with rheumatoid arthritis (RA) with inadequate response and/or adverse effects to previous (as observed). Not all pts had reached later time points at time of analysis, as a result of differential enrollment in the trial.

Methods: All Swedish RA patients who had started treatment with tocilizumab from Sept, 2006 until March, 2012 were identified in ARTIS. Patients without DAS28 value at start and without known disease duration were excluded and were censored if the duration since the last follow-up extended 18 months. Clinical response was assessed by DAS28 and by EULAR response criteria. Kaplan Meier survival analyses with log-rank test and Cox Proportional Hazard Regression analyses were performed.

Results: 646 RA patients had started with tocilizumab of which 522, 81% were included in this report. 420 (80.5%) were females. The mean (SD) age, disease duration, HAQ, DAS28 and CRP at start was 57.8 (12.8) years, 1.4 (0.6) score, 5.4 (1.3) score and 27 (32) mg/L, respectively.

Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively. Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively. Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively. Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively. Bacterial, viral and hospitalized infections occurred at IRs of 27.28 (25.16–29.57), 18.25 (16.61–20.06) and 1.55 (1.16–3.56] respectively.

The overall 1 and 2-year estimated drug survival was 63% and 50%, respectively. 390 (74.7%) had ≥1 DAS28 value between 2.5 and 8 months follow-up, the first value was chosen. The percentages of EULAR Good/Moderate/No responders were 47.2/33.1/19.7%, 55% had DAS28 < 3.2 and 37% was in DAS28 remission. Univariate analyses revealed that men had significantly longer drug survival as compared to women (p=0.013). High CRP or ESR divided into quartiles were associated with longer drug survival, (p=0.0022 and p=0.013, respectively). Patients with HAQ <1.5 had longer drug survival compared to those with HAQ values ≥1.5 (p=0.014). Having been exposed to none or increasing number of biologics were associated with inverse drug survival (p=0.0002). Age, disease duration, seropositive RA, DAS28, being on MTX, on any DMARD or on steroids was not associated with drug survival. In the multivariate analysis with the above significant predictors as independent covariates, adjusted for age, the Hazard Ratios were: sex: 0.79 (95% CI 0.52–1.19), HAQ 1.34 (95% CI 1.05–1.70), previous biologies 1.39 (95% CI 1.17–1.67) and CRP 0.80 (95% CI 0.69–0.91, per 1 SD change).

Conclusion: In this cohort of real-life patients with longstanding RA treated with tocilizumab the estimated 1-year drug survival was 63%, about 80% of the patients achieved a EULAR Good/Moderate response and drug survival was predicted by high CRP, low HAQ and no/low exposure of biologics. Treatment with concomitant MTX, DAS28, disease duration or age was not predictors for drug survival.

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Rituximab for Treatment of Rheumatoid Arthritis: Treatment Effectiveness in the Corrona Database. Leslie R. Harrold,1 George W. Reed,2 Robert P. Magnen,1 Katherine C. Saunders,3 Jeffrey D. Greenberg,1 Joel M. Kremer,4 Ani John5, William Reiss,3 Steve Zlotnick4 and Ashwin Shewade.1
1University of Massachusetts Medical School, Worcester, MA; 2,5CORRONA, Inc., Southborough, MA; 3New York University School of Medicine, New York, NY; 4Alberton Medical College, Albany, NY; 5Genentech Inc., South San Francisco, CA

Background/Purpose: Rituximab (RTX) in combination with methotrexate is used for the treatment of adult RA with an inadequate response to TNF antagonists to describe the real-world use and effectiveness of RTX in a large cohort of patients enrolled in the Consortium of Rheumatology Researchers of North America (CORRONA) registry.

Methods: All patients with RTX initiations in CORRONA between Feb 2006 and May 2011, with available clinical disease activity index (CDAI) score at baseline and at 12-months and not in remission (CDAI ≥2.8) at the time of RTX initiation, were included. Demographic and disease characteristics at baseline; change in CDAI at 12 months (overall and based on number of prior TNFs); and reported safety events were summarized.

Results: Overall, 615 patients (mean 2.3 previous non-biologic disease-modifying anti-rheumatic drugs [DMARDs] and 2.2 prior biologic DMARDs) initiated RTX. Lack of efficacy was most commonly (65%) reported reason for discontinuing prior biologic. Of these, 265 patients (80% female; median age 57 years; median disease duration 13 years) met the inclusion criteria. Approximately 43% of the patients had received a prior TNF and 57% had ≥2 prior TNFs. Approximately 77% patients started RTX in combination with DMARDs and 42% with concomitant prednisone. Mean change in CDAI was −8.1 (95% CI: −9.8; −6.4) for all RTX initiators not in remission, with similar results when stratified by number of prior TNFs. Among the subset of patients with active disease (moderate/high disease activity; CDAI >10) at baseline (Table), 8% went into remission and 29% likely to have erosions at baseline (35% vs. 25%, p =0.01). Among patients who started RTX with concomitant prednisone, 43% decreased and 26% had no change in their prednisone dose at 12 months. Reported rates of all cardiovascular events, serious infections, and malignancies were 1.9 (95% CI: 0.6; 4.0), 1.6 (95% CI: 0.5; 4.9), and 1.5 (95% CI: 0.6; 4.0) per 100 person-years, respectively.

Conclusion: RTX appeared effective in usual care in patients with previous exposure to one or more prior TNFs, with a safety profile comparable to randomized controlled trials of RTX. More patients with 1 prior TNF versus ≥2 prior TNFs appeared to achieve improvement in disease activity at 12 months after initiating RTX. The magnitude of response in CDAI seemed to be similar regardless of number of prior TNFs, even with ≥2 prior TNFs, suggesting good response in more refractory RA patients.

CDAI = clinical disease activity index; CI = confidence interval; TNF = tumor necrosis factor-α antagonist.

Disclosure: L. R. Harrold, NIH-K23AR053856, 2, Corrona, 5, G. W. Reed, Corrona, 2, University of Massachusetts Medical School, 3, Corrona, 5, Harvard Medical School; R. P. Magnen, None; K. C. Saunders, Corrona, 3, J. D. Greenberg, Corrona, 1, AstraZeneca, Novartis, Pfizer; CORRONA, 5; J. M. Kremer, Genentech, Pfizer, BMS, UCB; M. Abbott, Amgen, 5, BMS, Pfizer, Genentech Abbott, 5; A. John, Genentech, 3; W. Reiss, Genentech, 3; S. Zlotnick, Genentech, 1, Genentech, 3; A. Shewade, Genentech, 5.

The Comparative Effectiveness of Oral Methotrexate Versus Subcutaneous Methotrexate for the Treatment of Early Rheumatoid Arthritis. Glen S. Hazlewood,1 J. Carter Thorne,2 Janet Pope,3 Gilles Boire4, Boulou Harauz5, Carol A. Hitchen6, Edward Keystone7, Diane Tim,8 CATCH Investigators9 and Vivian P. Bykerk.1 1University of Toronto, Toronto, ON, 2Southlake Regional Health Centre, Newmarket, ON, 3Schulich School of Medicine and Dentistry, Western University, London, ON, 4CHUS - Sherbrooke University, Sherbrooke, QC, 5Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRUCHUM), Montreal, QC, 6University of Manitoba, Winnipeg, MB, 7Toronto, ON, 8Hospital for Special Surgery, New York, NY

Background/Purpose: To determine the comparative effectiveness of subcutaneous (sc) versus oral methotrexate (MTX) as initial therapy for patients with early rheumatoid arthritis (ERA) in routine clinical care.

Methods: Patients with early inflammatory arthritis initiating methotrexate therapy were included from the Canadian Early Arthritis Cohort (CATCH), a multicenter, prospective cohort study of patients with ERA. In CATCH patients are treated at the discretion of the rheumatologist and followed every 3 months over the first year according to a standardized protocol. For this study, all patients had an age >16 years, a diagnosis of RA by 2010 criteria, symptom duration <1 year, used MTX within 3 months of study entry and were MTX-naïve or minimally exposed to MTX. The exposure was route of MTX (oral vs. sc) and the outcome was DAS28 over the first year (3, 6, 9, 12 months). A multilevel random-effects linear regression model was used to account for repeated measures within patients while adjusting for potential confounders: age, gender, comorbidities, smoking, education, symptom duration, serological status, erosions, baseline DAS-28, functional status (HAQ-DI), and other concurrent DMARDs or corticosteroids. The analysis was performed with and without adjusting for the starting dose of MTX and clustering of patients by treatment center.

Results: 653 patients were included (442 oral MTX, 211 sc MTX); mean age 54 (SD 14), 72% female, mean symptom duration 5.3 (SD 2.7) months, mean baseline DAS-28 4.6 (SD 1.2). Patients treated with sc MTX were more likely to have erosions at baseline (35% vs. 25%, p =0.01), were less likely to receive other DMARDs (38% vs. 58%, p =0.01), and had a higher median starting dose of MTX (25 mg vs. 15 mg, p =0.01). Other characteristics were similar between groups. In the repeated measures model, after adjusting for all potential confounders except starting dose of MTX, sc MTX was associated with a reduction in the average DAS-28 score over the first year of 0.23 [95%CI:0.08, 0.38], p =0.01. After adjusting for starting dose, the route of MTX (oral/sc) was no longer significant (p =0.22), but for each additional mg of MTX, the average DAS-28 decreased by 0.02 [95%CI:0.004, 0.03], p =0.02. After controlling for treatment center, neither route nor starting dose was significantly associated with DAS28 at follow-up.

Conclusion: Sc MTX was associated with lower DAS28 scores over the first year of treatment, which may be mediated through the higher starting dose used in clinical practice. There was no relationship after adjusting for treatment center, suggesting caution in generalizing the results and highlighting the importance of considering a treatment center effect when reporting comparative effectiveness research from observational studies.

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Sarzi-Puttini3, Jacques-Eric Gottenberg4, Denis Choquette5, Victor Martínez.

Background/Purpose: To determine remission in RA, recent publications point out the importance of radiological parameters, besides scores like DAS28, TJC, SJC, CRP, patient global assessment, or the SDAI.1,2 Inflammatory activity can remain despite clinical remission in RA.2,3 This process can be monitored using modern imaging without radiation exposure – high-field MRI and colour and power Doppler sonography. These diagnostic methods are also valuable for the determination of an OFF therapy or an individual dose adaption.4,5 The latest adaptions allow the precise monitoring of cartilage and subchondral bone under cytokine therapy in clinical practice.

The course of chronic active inflammation at affected joint structures can be quantitatively and qualitatively measured by aforementioned techniques. The aim is to optimize and control biologic therapy.

Methods: 22 RA-patients (12 men, 10 women, between 20 and 72 years of age) with high disease activity at baseline (DAS 28 over 3.3, CRP over 10, ESR over 20, fibrinogen over 470 mg/dl, RF positive, high erosion tendency (anti-CPP positive)) were treated 8mg TCZ/kg body weight from 08/2008 until now, data were analyzed retrospectively. 3 female patients from each group received TCZ (iv qw4) in combination with MTX, while all other patients received TCZ in monotherapy.

Examination criteria at baseline and before infusion administration were DAS 28, serum fibrinogen, colour and power Doppler ultrasound examination, and every 3 or 6 months high-field MRI (T1, T2 STIR KM 3.0 T, panoramic image) of the affected joints’ inflammation activity, the cartilage, or the subchondral bone. The evaluation was carried out using MRI (RAMRIS) and sonography score.

Results: Of the 22 patients observed 10 patients (6 men, 4 women) exhibited early or very early RA (group A); 5 patients (1 man, 4 women) established RA with low articular cartilage destruction and erosion (Sharp score of up to 2; group B); and 7 patients (3 men, 4 women) chronically established RA (Sharp Score 3; group C) at baseline.

After 12 week, all inflammation parameters, including DAS 28, were within the normal range. Inflammation activities could still be detected by Doppler ultrasound imaging and MRI. Cartilage imaging showed no erosions and changes in the subchondral bone in group A during the course of the therapy. In group B, the cartilage and bone erosion also stopped. In group C, the cartilage or subchondral bone destruction progressed, despite the decrease of inflammation parameters.

Conclusion: The cytokine therapy with tocilizumab leads to a rapid decrease in the inflammation parameters and hence to a normalization of DAS 28. The inflammation-verified imaging such as the aforementioned Doppler sonography and the high-field MRI still registered inflammation activities during the course of the therapy. The use of TCZ as mono therapy for early and very early RA extensively decreases the inflammation process and prevents cartilage/bone destruction. Chronically established RA (Sharp score 3), the systemic inflammation can be inhibited, while the cartilage and subchondral bone destructions remained progressive during the course of the disease.

Disclosure: M. Hoehle. None; M. Finkenstaedt. None.

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Seropositive Rheumatoid Arthritis Patients with an Inadequate Response to Tumor Necrosis Factor Inhibitors Achieve Improved Clinical Effectiveness After Switching to Rituximab Versus Switching to an Alternative Tumor Necrosis Factor Inhibitor. Andrea Rubbert-Roth1, Axel Finckh2, Piercarlo Sarzi-Putti3, Jacques-Eric Gottenberg4, Denis Choquette5, Victor Martinez Taboada6, Leonor Barile-Fabris7, Carol Chung8, Lykke Hirsch-Gyvin9 and Paul Emery10.

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Disclosure: M. Hoehle. None; M. Finkenstaedt. None.

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Disclosure: M. Hoehle. None; M. Finkenstaedt. None.
ology database (for physical examination data, laboratory tests, and patient outcomes) from more than 90 academic and private sites across the US. We examined RA patients enrolled in CORRONA between March 2002-September 2011 who initiated ADA and had at least one follow-up visit. RA-related concomitant medications (methotrexate [MTX], prednisone, non-steroidal anti-inflammatory drugs [NSAIDs], intra-articular joint injections [IA]), antidepressant use, comorbidities (high blood pressure, cardiovascular disease, pulmonary disease, diabetes mellitus, psoriasis), and demographics (age, sex, disease duration, insurance status) were examined. Trends in medication use over time were estimated using random effects logistic regression adjusting for sex, age, the number of comorbidities at initiation, and the use of ADA at each time point. Analyses included all patients with follow-up at 6, 12, 18, or 24 months after ADA initiation.

**Results:** Of the 1,173 patients who initiated treatment with ADA, available follow-up decreased over time to 417 patients by 24 months. The mean (SD) age and disease duration were 54.2 (12.3) and 10.1 (9.2) years, respectively, and 79.3% of patients were female. At baseline, 67% of patients were treated concomitantly with MTX, 30% with prednisone, 61% with NSAIDs, 8% with IAs, and 30% with antidepressants. Multivariable trend analysis revealed MTX and prednixone use to decrease over 24 months following ADA initiation (table). Controlling for time of follow-up and other factors, patients with ≥2 comorbidities were less likely to use MTX and more likely to use antidepressants than those with no comorbidities. The number of comorbidities was unrelated to prednisone, NSAID, or IA usage.

**Conclusion:** Among RA patients who initiated treatment with ADA, MTX and prednisone decreased over 24 months. This suggests the clinical efficacy of ADA in RA disease control across a medically diverse patient population.

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*Concomitant Assessment of Clinical and Ultrasound Efficacy and Safety of Tocilizumab in Patients with Moderate to Severe Rheumatoid Arthritis: The Torpedo Study.* Thierry Schaevebeke¹, Philippe Gaudin², Alois Perdriger³, Christian Roux⁴, Muriel Vray⁵, Stephanie Rouanet⁶, Ghislaine Steinberg⁷ and Fabien Etchepare⁷. ¹Groupe Hospitalier Pellegrin, Bordeaux, France, ²Hoˆpital Sud, Rennes, France, ³Paris Descartes University, Paris, France, ⁴ChU Hôpital Sud, Grenoble Teaching Hospital, Echirlores, France, ⁵Hôpital Sud, Rennes, France, ⁶Paris Descartes University, Paris, France, ⁷Paris, France, ⁸Roche, Boulogne, France, ⁹G.H. Pitié-Salpêtrière, Paris, France

**Background/Purpose:** The anti-IL-6-R tocilizumab (TCZ), indicated for the treatment of moderate to severe rheumatoid arthritis (RA), has demonstrated its clinical and structural efficacy in phase III trials, but little information is available on concomitant ultrasound and clinical evolution.

**Methods:** 103 patients with moderate to severe RA were treated with TCZ 8 mg/kg+ methotrexate (MTX) in the Torpedo study every 4 weeks during 12 months. 40-joint ultrasound (US) examinations (B and Doppler [D] modes scores 0 to 120) were performed at baseline, 12, 24 and 48 weeks of treatment in parallel with usual clinical parameters assessments (DAS28, SJC, TJC). Doppler score was semi-quantitative, graded as 0(normal), 1, 2 or 3 (worst) for each joint and for each US mode following a pre-established coding guideline. Analysis was performed on the intent-to-treat population (patients with at least one TCZ infusion). Non-responder imputation was performed for DAS 28 and CDAI remissions.

**Results:** 103 patients main characteristics at baseline were: mean age 52±12, disease duration 4±3 years, 75% women, 66% D3MARD IR*, 74% with concomitant steroid treatment, mean DAS 28 = 5.5±2.0. *Efficacy:* under TCZ + MTX, percentage of patients in DAS28 and CDAI remission increased in parallel with decrease in B and D modes ultrasound scores (table 1). Among the patients on DAS 28 remission at W48, 28 were on DAS28 remission for at least 6 months, and 15% of them had no synovitis in B mode
and 56% had no Doppler signal (D mode). At week 48, 17% (39% of patients under steroids at baseline could discontinue/decrease steroid dose below 5mg equivalent prednisone/day at W 48. Safety: reported AE(s)** (97% of patients with at least one AE) and SAE(s)** (23% of patients with at least one SAE) were in accordance with the known safety profile of TCZ.

<table>
<thead>
<tr>
<th>Table 1. Clinical and ultrasound evolution of patients</th>
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<tbody>
<tr>
<td><strong>Baseline</strong></td>
</tr>
<tr>
<td>Number of patients in the analysis</td>
</tr>
<tr>
<td>% patients in remission DAS28</td>
</tr>
<tr>
<td>% patients in remission CDAI</td>
</tr>
<tr>
<td>Number of patients in the analysis</td>
</tr>
<tr>
<td>40-joint US D mode mean score±SD</td>
</tr>
<tr>
<td>Median[Q1; Q3]</td>
</tr>
<tr>
<td>40-joint US B mode mean score±SD</td>
</tr>
<tr>
<td>*IR = inadequate responder **AE = adverse event, SAE = serious adverse event</td>
</tr>
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</table>

**Conclusion:** In this study, parallel efficacy was shown in RA patients treated with TCZ, clinical, ultrasound scores together with steroid sparing effect. However, long term clinical remission could be associated with persistence of Doppler signals and synovitis on ultrasound. Safety profile was consistent with the previously published data.

**Disclosure:** T. Schaeverbeke, Roche Pharmaceuticals, Pfizer, UCB, Abbott, BMS, 5; Roche Chugai, 2; P. Gaudin, Abbott, BMS, 5, Abbott, MSD, Pfizer, Chugai, Roche, 2; A. Perdriger, Roche-Chugai, 2; C. Roux, Roche-Chugai, Servier, Amgen, Lilly, Abbott, Novartis, 2; M. Vray, Roche-Chugai, 2, GSK, 5; S. Rouanet, Roche Pharmaceuticals, 3; G. Steinberg, Roche Pharmaceuticals, 3; F. Etchehare, Roche-Chugai, Abbott, Esatoé, Pfizer, 5.

**Efficacy and Safety of Golimumab As Add-On Therapy to Disease-Modifying Antirheumatic Drugs.** Bernard Combe1, Bhaskar Dasgupta2, Ingrid Louw3, Sarvejate Pal4, Jürgen Wollenhaupt5, Cristiano Zerbini6, Andre D. Beaulieu7, Hendrik Schulze-Koops8, Patrick Dreuz9, Ruji Yao10, Nathan Weng12 and Nathan Vastesaeger13. 1Southend University Hospital, 2Hoˆpital Lapeyronie-Service d'Immuno-rhumatologie, Montpellier, France, 3Panorama Medical Centre, Cape Town, South Africa, 4Advance Rheumatology Clinic, Hyderabad, India, 5Centre Paulista de Investigac¸o˜es, Sao Paulo, Brazil, 6Centro de Rhumatologie, St. Louis, QC, 7Centre de Rhumatologie, St. Louis, QC, 8University of Munich, Munich, Germany, 9UCL Saint-Luc, Brussels, Belgium, 10Merck Sharp and Dohme, Kenilworth, NJ, 11Hospital del Salvador, Santiago, Chile, 12Merck Sharp and Dohme, Kenilworth, NJ, 13Merck Sharp and Dohme, Brussels, Belgium

**Background/Purpose:** This study evaluated golimumab (GLM) as add-on therapy in patients with active RA despite treatment with non-biologic DMARDs. Two GLM treatment strategies (subcutaneous [SC] vs intravenous [IV]/SC combination) for induction and maintenance of remission were evaluated.

**Methods:** GO-MORE was an open-label, multinational, prospective study in biologic-naïve patients with active RA (DAS28-ESR ≥5.2). In Part I, patients received 50-mg SC GLM once monthly for 6 months. The primary outcome was the percentage of patients with good or moderate EULAR DAS28-ESR response at 6 months. Effects of several variables on response were evaluated: MTX dosage, type of concomitant DMARDs, corticosteroid (CS) use, and number of failed DMARDs. In Part II, patients who achieved good or moderate response but not remission at 6 months were eligible for random assignment to treatment up to month 12 with either continued 50-mg SC GLM once monthly or a combination of IV GLM and SC GLM. The coprimary efficacy endpoints in Part II were the percentage of patients with EULAR DAS28-ESR remission at the beginning of month 11 and the end of month 12. Treatment effects were evaluated with chi-square tests.

**Results:** At baseline of Part I, 3280 efficacy-evaluable patients had mean age 52.3 (SD=12.8) years, median disease duration 4.9 years, mean HAQ-DI 1.44 (SD=0.67), and mean DAS28-ESR 5.97 (SD=1.10). Concomitant MTX was used by 81.1% of patients, concomitant CSs by 63.4% of patients, 34.4%, 35.9%, and 29.7% of patients failed 1, 2, and 3 DMARDs, respectively. At month 6, 82.07% (2692/3280) of patients achieved a good or moderate EULAR DAS28-ESR response and 23.90% (784/3280) achieved remission. No statistically or clinically significant differences were seen when treatment was compared for patients who received concomitant MTX or CS vs those who did not, for high vs low-dose MTX, or for patients who failed multiple vs only 1 DMARD. In Part II, 490 responders who were not in remission were evaluated for efficacy. The 2 treatment arms had similar DAS28-ESR remission rates at the month-11 and -12 endpoints (ranging from 24% to 27%) and were similar in the time to first remission. GLM was generally well tolerated. Observed SAEs were consistent with those observed in RA patients treated with anti-TNF agents. In Part I, SAEs occurred in 5.7% of patients and 10 deaths (0.2%) occurred. In Part II, SAEs occurred in 6.9% and 2.4% of patients in the IV/SC and SC arms, respectively, and 1 death occurred in the IV/SC arm.

**Conclusion:** In patients with active RA despite DMARD therapy, addition of GLM 50-mg once monthly resulted in moderate or good EULAR DAS28 response at 6 months for 82.07% of patients. Response to GLM was not impacted by use of concomitant MTX or CS, dose of concomitant MTX, or number of failed DMARDs. Of patients with response but not remission at month 6, approximately 25% achieved remission after 6 additional months of GLM treatment. The IV/SC regimen provided no additional efficacy over the SC regimen and was associated with a higher incidence of AEs. The safety profile for the SC regimen was consistent with previous studies of GLM.

**Disclosure:** B. Combe, Merck Pharmaceuticals, 5; B. Dasgupta, EULAR, ACR, Health Technology Assessment, British Heart Foundation, Research for Patient benefits UK, Napp, 2, Schering Plough, Merck, Roche, Mundipharma, Astra Zeneca, 9, Schering Plough, Merck, Roche, Mundipharma, Astra Zeneca, 5; I. Louw, None; S. Pal, None; J. Wollenhaupt, MSD, 5, MSD, 8; C. Zerbini, Novartis, Pfizer, Bristol, Lilly, Amgen, and MSD, 2, Pfizer, Bristol, Lilly, and MSD, 5, Pfizer and Bristol, 6; A. D. Beaulieu, Merck, Servier, Amgen, Abbott, Pfizer, and Roche, 9; H. Schulze-Koops, Abbott, Actelion, Biotest, BMS, Chugai, Essex, GSK, MSD, Medac, Merck, Mundia Pharma, Novartis, Nycomed, Pfizer, Roche, UCB, 5, 9, Abbott, Actelion, Biotest, BMS, Chugai, Essex, GSK, MSD, Medac, Merck, Mundia Pharma, Novartis, Nycomed, Pfizer, Roche, UCB, 8, Merck Pharmaceutica11, 9; P. Durez, None, R. Yao, Merck Pharmaceuticals, 3; N. Vastesaeger, Merck Pharmaceuticals, 3; H. Weng, Merck Pharmaceuticals, 3.
current DMARD treatment. After 3 months of treatment, 85.1% expected the treatment to be more effective still by month 6. The attributes patients wanted to improve most were pain and quality of life, with pain selected by most patients at baseline and quality of life selected by most following 3 months of treatment. Patients with more positive expectations about treatment had greater improvement in DAS28-ESR and HAQ scores and were more likely to show good EULAR response at month 6 than patients with less positive expectations (Table 1).

Table 1. Relationship Between Patients’ Baseline Treatment Expectations and Improvement in Outcomes

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Baseline Treatment Expectations</th>
<th>DAS28-ESR</th>
<th>HAQ</th>
<th>DAS28-CRP</th>
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<tbody>
<tr>
<td></td>
<td>Baseline, Mean (N)</td>
<td>Change at Month 6, Mean (SD)</td>
<td>P Value</td>
<td>Baseline, Mean (N)</td>
</tr>
<tr>
<td>High</td>
<td>6.01(1212)</td>
<td>-2.41(1377)</td>
<td>1.46(1211)</td>
<td>-0.65(0.91)</td>
</tr>
<tr>
<td>Moderate</td>
<td>6.69(1009)</td>
<td>-2.20(1366)</td>
<td>1.45(1009)</td>
<td>-0.53(0.63)</td>
</tr>
</tbody>
</table>

At baseline, physicians expected 29.6% of patients to attain remission and 59.2% to attain low disease activity after 3 months of treatment. At the end of month 3, they expected 38.8% to attain remission and 53.1% to attain low disease activity by the end of month 6. Physicians identified pain and tender and swollen joints as the issues they thought their patients most wanted to improve.

Conclusion: Despite similar baseline scores, patients with more positive expectations about outcomes of GLM treatment demonstrated better outcomes than patients with less positive expectations.

Disclosure: B. Dasgupta, EULAR, ACR, Health Technology Assessment, British Heart Foundation, Research for Patient benefits UK, Napp, 2, Schering Plong, Merck, Roche, Mundipharma, Astra Zeneca, 9, Schering Plong, Merck, Roche, Mundipharma, Astra Zeneca, 5; B. Comb, Merck Pharmaceuticals, 5; I. Louw, None; S. Pul, None; J. Wollenhaupt, MSD, 5, MSD, 8; C. Zerbini, Novartis, Pfizer, Bristol, Lilly, Amgen, and MSD, 2, Pfizer, Bristol, Lilly, and MSD, 5, Pfizer and Bristol, 6; A. B. Beaulieu, Merck, Servier, Amgen, Abbott, Pfizer, and Roche.; H. Schulze-Koops, Abbott, Actelion, Biotest, BMS, Chugai, Essex, GSK, MSD, Medac, Merck, Mundipharma, Novartis, Nycomed, Pfizer, Roche, UCB, 5, Abbott, Actelion, Biotest, BMS, Chugai, Essex, GSK, MSD, Medac, Merck, Mundipharma, Novartis, Nycomed, Pfizer, Roche, UCB, 8, Merck Pharmaceuticals, 9; P. Durez, None; W. Bensen, Abbott, Amgen, BMS, Janssen, Merck, Pfizer, Roche, and Servier Warner Chilcott, 8; V. Wolff, Merck Pharmaceuticals, 9, Merck Pharmaceuticals, 2; R. Yao, Merck Pharmaceuticals, 3; H. Weng, Merck Pharmaceuticals, 3; N. Vastesaeger, Merck Pharmaceuticals, 3.

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The Addition of Another Disease-Modifying Anti-Rheumatic Drug to Methotrexate in Place of Infliximab Reduces the Flare Rate During 2 Years After Infliximab Discontinuation in Patients with Rheumatoid Arthritis, Hideto Kameda 1, Takahiko Kurasawa 1, Hayato Nagasawa 2, Koichi Amano 3 and Tsutomu Takeuchi 1. 1Keio University School of Medicine, Tokyo, Japan; 2Saitama Medical Ctr, Kawagoe, Japan; 3Department of Rheumatology and Clinical Immunology, Saitama Medical Center, Saitama Medical University, Saitama, Japan

Background/Purpose: The treatment strategy for rheumatoid arthritis (RA) should be divided into remission-induction phase and its maintenance phase. To date, the usefulness of the combination therapy of disease-modifying anti-rheumatic drugs (DMARDs) has been exclusively examined in remission-induction phase. Therefore, we examined whether the addition of another conventional DMARD to methotrexate (MTXx) in place of infliximab (IFX) could decrease the rate of disease flare after discontinuing IFX in well-controlled RA patients. The BuSHIDO (Bucill- lamine Study of Holding remission after Infliximab Dose-Off) trial is a prospective, randomized, controlled study comparing MTX monotherapy with MTX plus buciillamine (Buc), a DMARD structurally related to d-penicillamine, as to flare rate during the following 2 years.

Methods: RA patients who had been receiving 6 or more infusions of IFX, maintaining DAS28-ESR > 2.6 (or DAS28-ESR < 3.2) for more than 6 months, were randomized to either the addition of Buc 200 mg/day to MTX (the group 1) or non-addition of buciillamine (the group 2) upon discontinuing IFX. Primary endpoint was the flare rate (DAS28-ESR >3.2 and DAS28-ESR >2.6) within 2 years. The proportions of patients who met given criteria were compared with Fisher’s exact test.

Results: Finally, 24 and 31 patients, providing a written informed consent, were assigned to the group 1 and 2, respectively. Patients discontinuing MTX during the study period (2 in the group 1, and 4 in the group 2) had been excluded from the subsequent analyses. Seven patients experienced flares in the group 1, while 17 patients did in the group 2. Notably, Buc treatment was discontinued in seven patients because of rash (n=5), reversible proteinuria (n=1) and incompliance (n=1). Three of those seven patients experienced disease flare. The flare rates were 26.7% in Buc-continuing patients and 42.9% in Buc-discontinuing patients, respectively, in the group 1, while it was significantly higher in the group 2 (63.0% versus 31.8% in the whole group, p=0.045). Moreover, the flare rates sorted by the achievement of Boolean remission upon IFX discontinuation were significantly different in the group 2 (40.0% in patients achieving remission versus 91.7% in non-remission patients; p=0.014), while the flare rates were similarly reduced in the group 1 (29.4% versus 40.0% in remission and non-remission, respectively).

Conclusion: The combination therapy of non-biological DMARDs, such as bucillamine plus MTX, may be a better treatment strategy rather than MTX monotherapy for maintaining RA remission after the discontinuation of biological agents.

Disclosure: H. Kameda, None; T. Kurasawa, None; H. Nagasawa, None; K. Amano, None; T. Takeuchi, None.

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Dose Reduction in Rituximab Retreatment May Delay Achievement of Optimal Responses, Mohamned I. Shari3, Sudipto Das2, Paul Emery1, Helen Maclver1, Wendy Shingler1, Philip S. Hellwell2, Katharina Sokoll1 and Edward M. Vital1. 1Bradford Teaching Hospitals NHS Foundation Trust, Bradford, United Kingdom; 2NIHR Leeds Biomedical Research Unit, University of Leeds and Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom; 3Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom

Background/Purpose: The best long-term treatment strategy for rituximab has not been established. Retreatment at a fixed interval of 6 months maintains stable disease activity1 and half-dose is equally effective in first-cycle responders1. In first-cycle non- or moderate responders, responses may improve further after a second cycle at full-dose2.

We used a strategy of fixed 6-monthly retreatment at half-dose following an initial full dose cycle in responders and non-responders, and looked for changes in clinical response.

Methods: Patients received 2×1000mg rituximab at month 0 (C1), 2×500mg rituximab at month 6 (C2) and 2×500mg at month 12 (C3) regardless of C1 response. All patients were positive for RF and/or anti-CCP. 18/41 were taking concomitant MTX and 9/41 other DMARDs. DAS28 was measured at baseline and at 3–6 months after each cycle and compared to baseline of the first cycle.

Results: To date, 41 patients received C1, 34 C2, 17 C3 and 14 C4 with outcome data. For all patients, mean(SD) DAS28 at baseline and after C1, C2 and C3 were 6.15(0.74), 4.14(1.10), 3.82(1.14) and 3.13(1.06) respectively. EULAR Non/Moderate/Good responses were achieved by 5, 28 and 8/41 patients (12/68/20%) in C1; 5, 18 and 11/34 patients (15/53/33%) in C2; 1, 6, 10/17 patients (6/35/59%) in C3; and 1, 3 and 10/14 patients in C4 (7/21/71%). 3/5 patients with Non response in C1 responded to C2.

Proportions of patients with a change in EULAR response between C1-C2 and C2-C3 was compared for the 17 patients who received 3 cycles. For C1-C2: 53% patients maintained the same EULAR response, 18% improved and 29% worsened. For C2-C3, 45% maintained the same response, 41% improved and 12% worsened. DAS28 for these patients is shown in Figure 1. There was no significant difference between C1 and C2 and a trend to reduction in DAS28 after C3 (p=0.012, paired t-test).
**Figure 1.** DAS28 at baseline and after C1(2×1000mg) and C2 and C3 (2×500mg).

**Conclusion:** Some C1 non-responders responded to retreatment with half-dose at 6 months, but response rate across all patients was similar. Incremental improvements in C1 non- or moderate responders were seen more frequently after a second half-dose retreatment. This suggests that dose reduction may delay achievement of optimal responses in C1 non- or moderate responders, and these patients should have 2 full-dose cycles before reducing doses. Future work will analyse B cell depletion in this cohort.

**References**

**Disclosure:** M. I. Shariff, None; S. Das, None; P. Emery, Roche Pharmaceuticals, 5, Roche Pharmaceuticals, 2; H. Maciver, None; W. Shingler, None; P. S. Helliswell, None; K. Sokoll, None; E. M. Vital, Roche Pharmaceuticals, 2; Roche Pharmaceuticals, 8.

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**Immunologic Responsiveness in Patients with Juvenile Idiopathic Arthritis On Methotrexate and Etanercept: 23 Valent Pneumococcal Vaccination.** Ankur A. Kamdar, Patricia C. Giclas and Barry L. Myones. 1.University of Texas Medical School at Houston, Houston, TX, 2National Jewish Medical and Research Center, 8.

**Background/Purpose:** There is a paucity of data regarding response to vaccinations in patients with juvenile idiopathic arthritis (JIA) treated with methotrexate (MTX). It is also unclear whether biologic agents affect vaccination response. Data was previously reported on the secondary response to protein vaccination with tetanus. This study investigates the primary response to polysaccharide vaccination in this same cohort.

**Methods:** Patients with a diagnosis of polyarticular JIA on stable doses of NSAIDS and/or MTX for a minimum of 3 months were enrolled into this prospective study. All patients were naïve to both Pneumovax and Prevnar (7-valent) vaccines. All patients received 0.5 cc Pneumovax (23-valent) subcutaneously. Serum was obtained at vaccination and after 4–6 weeks. 12 Pneumococcal serotypes were measured (1, 3, 4, 6b, 7f, 8, 9n, 12f, 14, 18c, 19f, 23) by standard EIA. Positive response was considered a 2-fold increase in titer. 200 ng Ab N/ml was considered clinically protective by the clinical laboratory. Serum was subjected to C4 allotyping, immunoglobulin and complement levels to examine alternative causes for non-response. Statistical analysis was performed using parametric and non-parametric methods when appropriate.

**Results:** 50 patients were included for analysis. 3 additional patients were excluded because of reaction to vaccination requiring steroid treatment. Patients were subdivided into MTX and non-MTX groups for primary analysis. 38 patients were on MTX (n=16 on MTX + etanercept) & 12 patients were on NSAIDS. There was no statistical difference between the 2 groups in the 2-fold response for all serotypes. In addition, there was no difference in 2-fold response in the etanercept+MTX vs MTX vs non-MTX groups. The number of serotypes each group responded to was similar. 39 patients had a response to at least 1 serotype (36 to at least 2). In 11 patients who did not respond, there were no differences in proportion of patients on MTX or etanercept. For each serotype, the pre-dose geometric mean concentrations (GMC) were all greater than 200 ng Ab N/ml. Post immunization GMCs were similar in 9 of 12 serotypes between the MTX and non-MTX groups. Etanercept use did not influence this result. In the other 3 serotypes (1, 6b, 23), the MTX group had significantly higher post-GMCs. There were significant increases in post-GMCs for all serotypes. There was no difference in geometric mean ratio (GMR) for 10 of 12 serotypes between the 2 groups. Of interest, for the other serotypes (1, 18c), the MTX group had a significantly higher GMR when compared to the non-MTX group. Serotype 14 was the most immunogenic (GMR 2.57, 95% CI 1.92, 3.44) while serotype 3 was the least (GMR 1.37, 95% CI 1.08,1.74). Baseline age, MTX dose, or etanercept use did not predict response to pneumococcal vaccine.

**Conclusion:** In a non-immunosuppressed population of patients that were Prevnar naïve, with only environmental exposure to Pneumococcus, use of MTX and etanercept did not diminish humoral response to Pneumovax.

**Disclosure:** A. A. Kamdar, None; P. C. Giclas, None; B. L. Myones, None.

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**Effects of Vitamin D Repletion and Maintenance Therapy On Clinical Indicators of Disease Activity in Rheumatoid Arthritis.** Uzma J. Haque, Clifton O. Bingham III and Susan J. Bartlett. & Johns Hopkins Hospital, Baltimore, MD, &Johns Hopkins University, Baltimore, MD, &McGill University, Montreal, QC

**Background/Purpose:** Low Vitamin D levels are prevalent in Rheumatoid Arthritis (RA). We have previously reported that low vitamin D levels are associated with higher disease activity indicators and poorer patient reported outcomes (PROs). Our goal was to investigate the effect of vitamin D repletion and maintenance therapy in vitamin D deficient patients on clinical indicators of disease activity.

**Methods:** 139 persons who met 1987 ACR RA criteria were enrolled in an RCT at routine clinic visits from 1/2009 – 4/2011. Exclusion criteria included hypercalcemia and hyperparathyroidism. Tender and swollen joint counts (TJC, SJC) and evaluator disease assessments were performed. 25(OH)D levels were assessed using the Diasorin radioimmunoassay. Patients with 25(OH)D levels < 30 ng/ml were randomly assigned to receive either standard intensive therapy [50,000 IU ergocalciferol/week for 8 or 16 weeks] till repletion (25(OH)D > 30 ng/ml) was achieved or 16 weeks of maintenance therapy (50,000 IU ergocalciferol /month) or placebo for 16 weeks, followed by the above vitamin D protocol. At baseline visit, 83 of 139 (60%) patients had 25(OH)D levels < 30 ng/ml. Results show the effects of vitamin D repletion and maintenance therapy (independent of original treatment assignment).

**Results:** 39 patients had a mean (SD) age of 52.5 (12.8) yr, RA duration of 9.8 (9.6) yr and BMI of 31.8 (6.8) kg/m2 and were mostly female (83%).
white (76%), well-educated (60%) reported some college education) and non-smokers (61%). Of 73 who began repletion therapy, 58 were sufficient after 8 wk of therapy; 6 were sufficient after 16 weeks of therapy and 3 failed to achieve adequate levels. During maintenance, 62 people completed 8 wk and 61 completed 16 wk of therapy. Vitamin D increased an average of 71% (mean increase 17.3 [12.9]; range −22.4 + 57.8 ng/ml) during repletion then declined steadily during maintenance (see Table). Increases in Vitamin D were inversely and moderately associated with baseline vitamin D (r = 0.43; p < 0.001) but not with age, sex, minority status, BMI, RA duration or smoking status. Disease activity score (DAS) and TJC significantly (p < 0.05) increased during treatment and decreased during maintenance; other clinical indices were not significantly different at any time point.

**Conclusion:** Intensive repletion therapy modestly increased vitamin D levels in RA patients with 25(OH)D < 30 ng/ml. However, patients were unable to maintain adequate levels over 16 weeks of maintenance therapy. With the exception of tender joints which increased during treatment then returned to baseline levels following maintenance, other clinical indices remained stable throughout treatment. Thus, in RA patients who are insufficient, standardized intensive vitamin D protocols appear to only modestly increase circulating levels of 25(OH)D and do not impact clinical indicators of RA disease activity.

**Disclosure:** U. J. Haque, None; C. O. Bingham III, None; S. J. Bartlett, None.

**477 Impact of Etanercept On Incident Cancer in Taiwanese Patients with Rheumatoid Arthritis.** Jiunn Horng Chen¹ and Wen-Min Liang². ¹China Medical University Hospital, Taichung City, Taiwan; ²China Medical University, Taichung, Taiwan

**Background/Purpose:** The recent Taiwanese report has indicated an elevated risk of malignancy in RA patients¹. Etanercept, one of the tumor necrotic factor inhibitors (TNF-I) to treat severe rheumatoid arthritis (RA), has been approved in Taiwan for 10 years. Its effect in ameliorating inflammation in RA has been shown prominent. Although the potential risk of TNF-I on cancer in RA patients has been reported, the impact of TNF-I in Asian RA patients is still lacking. We used the National Health Insurance Database in Taiwan to investigate if etanercept impacts on incident cancer in RA patients.

**Methods:** A prospective one-to-one case-control study matched with age, gender, index day (prescription date of etanercept), RA duration (from the date of RA diagnosis to the index day), dosage and duration of methotrexate usage was conducted. Cancer incidence, including solid-tumor and hematological malignancy, was compared in RA patients between etanercept users and those who were naïve to the TNF-I. Cox proportional hazard model was used for analysis.

**Results:** Among the 1,931 matched pairs (3,180 women and 682 men with the mean age of 53.8 years) during a mean follow-up of 3.7 years, 36 subjects were found cancer in the case-cohort (31 solid-tumor and 5 hematologic malignancy), and 48 in the control-cohort (46 solid-tumor and 2 hematologic malignancy). The incidences of total cancer in subjects with RA duration within 1 year and 1–2 years were 37.0 x 10⁻³ and 11.6 x 10⁻³ person-years in the case-cohort, which were lower than those of 127.2 x 10⁻³ and 27.9 x 10⁻³ person-years in the control-cohort, respectively (the corresponding p = 0.002 and 0.03). On the other hand, the incidences of total cancer in subjects with RA duration within 2–3 years and more than 3 years were 12.8 x 10⁻³ and 2.8 x 10⁻³ person-years in the case-cohort, which were higher than those of 6.7 x 10⁻³ and 1.9 x 10⁻³ person-years in the control-cohort, respectively (the corresponding p = 0.15 and 0.35). The incidence of hematologic malignancy in the case-cohort was 0.95 x 10⁻³ person-years, which was 2.5 times higher than that of 0.38 x 10⁻³ person-years in the control-cohort (p = 0.26). Although no statistically significant risk of etanercept was noted for total cancer after multivariate adjustment, hazard ratios for solid tumor and hematologic malignancy were 0.70 (95% confidence interval, 0.44–1.33) and 2.17 (0.42–11.23), respectively.

**Conclusion:** A potential benefit of etanercept was shown for patients with shorter RA duration by a trend of lower cancer incidence in the etanercept users compared with controls, which was contrasted to the findings noted for patients with RA duration more than 2 years. Although a trend of higher risk of hematologic malignancy for etanercept users than controls was noted in the current study, we may not conclude a significantly higher risk for RA patients received etanercept than those who received the convention treatment to develop cancer. Further investigation is needed in the future.

**Disclosure:** J. H. Chen, None; W. M. Liang, None.

**478** Body Mass Index Negatively Influences the Response to Infliximab in Rheumatoid Arthritis. Sébastien Ottaviani¹, Anaïs Gardet², Emilie Quintin³, Karen Dawidowicz⁴, Ghislaine Gill⁵, Elisabeth Palazzo⁶, Olivier Meyer⁶ and Philippe Dieude⁶. ¹APHP, Paris, France; ²APHP, Hopital Bichat, Paris, France; ³Hopital Bichat, Paris, France

**Background/Purpose:** The excess of adipose tissue in obese individuals may have immunomodulating properties and pharmacokinetics consequences. Adipose tissue is potentially involved in the regulation of inflammation in rheumatoid arthritis (RA). Recently, an exploratory study suggested that body mass index (BMI) could affect infliximab (IFX) treatment responses in RA patients (1) and the aim of this study was to investigate whether body mass index (BMI) affects the response to IFX in RA patients.

**Methods:** In this retrospective study were included RA patients fulfilling the ACR 1987 criteria and receiving infliximab therapy. All individuals provided informed written consent as approved by the local ethic committee board. The BMI was assessed before the initiation of IFX treatment (3 mg/kg intravenously). After 6 months of treatment, changes in disease activity (DAS28) were assessed. The primary end point was the EULAR DAS28 response. The following covariates were included for the analysis: gender, anti-CCP antibodies and RF status, mean disease duration, erythrocyte sedimentation rate (ESR), CRP level, DAS28, concomitant DMARDS therapy and corticosteroids consummation.

**Results:** A total of 73 RA patients (age: 48.5 ± 10.5 years, 82% of females, disease duration: 8.8 ± 6.9 years, 77% RF + , 86% anti-CCP + ) were included. At M0, BMI was 27.1 ± 6.9 kg/m². Patients were classified in 3 distinct groups according to their BMI: normal (BMI < 25 kg/m²), overweight (BMI [25–30] kg/m²) and obesity (BMI > 30 kg/m²). At baseline no difference was observed between the 3 BMI subgroups according to the RA covariates, notably the DAS28. The EULAR non-response was found to be only influenced by 2 independent factors: a lower initial DAS28 (4.9 ± 1.4 vs 5.9 ± 1.0, P = 0.012) and a higher BMI (29.5 ± 8.7 vs 25.2 ± 3.9 kg/m², P = 0.013). When the 3 BMI subgroups were independently analyzed, the negative influence of BMI on response to IFX was only found in obese patients (P = 0.008, OR 5.2 [1.3–23.2]) in comparison to normal BMI group.

**Conclusion:** Our study supports the previously reported negative correlation between BMI and infliximab response in RA. Further prospective studies, including assessment of the fat mass, pharmacokinetics and adipokines dosages are mandatory to elucidate the role of obesity and the fat mass in modulating the RA IFX response.

**Disclosure:** S. Ottaviani, None; A. Gardette, None; E. Quintin, None; K. Dawidowicz, None; G. Gill, None; E. Palazzo, None; O. Meyer, None; P. Dieude, None.

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**Reference**


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**S208**

Background/Purpose: Blocking TNF alpha (TNFα) with monoclonal antibodies is a safe and successful treatment of rheumatoid arthritis. However secondary resistances are frequent and impose treatment changes. Active immunization with a TNF-Kinoid that safely induces self-polyclonal anti-TNFα antibodies (Abs) could be an alternative to anti-TNFα mAbs. We evaluated the immunogenicity and safety of TNF-K in patients with rheumatoid arthritis and secondary resistance to TNF blockers.

Methods: TNFα-Kinoid (TNF-K, NEOVACS SA, Paris, France) is an immunogen consisting of recombinant human TNF conjugated to KLH, inactivated and adjuvanted with ISA-51 emulsion. 40 patients with active rheumatoid arthritis (DAS28 ≥3.2) with history of positive clinical and anti-KLH Abs and neutralization assay. The T cell response was assessed by lymphoproliferative assay with tritiated thymidine incorporation. Clinical response was evaluated by the ACR and EULAR core set response.

Results: No related serious adverse event has been reported. Few minor transient local and systemic reactions have been recorded following immunization. Anti-TNFα Abs were induced in 50%, 75% and 91% of patients at 90 minutes, 180 mcg, and 360 mcg respectively. Among those with three positive titrations, 180 mcg had a positive response. A mean decrease of 31% of the 16 patients without Abs. A mean decrease of −14% of the C reactive protein level is measured in patients with Abs while in patients without Abs, the mean CRP level increased by 5%.

Conclusion: Active immunization with TNFα kinoid to induce a polyclonal, self-anti-TNFα antibody response is safe and immunogenic. A clear dose-response was observed for the dose of kinoid as well as for the number of administrations. Association of anti-TNF Abs induced by the kinoid with clinical and biological responses were observed in patients included in this preliminary phase 2 study. Further studies are needed to confirm this new approach in RA.

Disclosure: P. Durez, None; P. Miranda, None; A. Tonnecha, None; A. Berman Sr., None; O. L. Rillo, None; Y. Bounin, None; J. Kehler, None; E. Mociran, None; L. Soto Saez, None; B. Faurel, None; X. Marrie, NEOVACS SA, 5; P. Solakou, None; E. Lucero, None; T. Vlak, None; S. Grazio, None; K. Mastrovic, None; R. Chiriac, None; G. Grouard-Vogel, NEOVACS SA, 3; O. Drellin, NEOVACS SA, 3; S. Ouary, NEOVACS SA, 3; P. Vandepapeliere, NEOVACS SA, 3; M. C. Boissier, NEOVACS SA, 5.

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Background/Purpose: TNF-inhibitors are known to decrease cardiovascular events in rheumatoid arthritis (RA) as compared with synthetic disease modifying anti-rheumatic drugs (sDMARD). However, mechanisms involved remain to be explored. Osteoprotegerin (OPG) is increased and independently associated with coronary-artery atherosclerosis in patients with RA. Adiponectin has cardioprotective functions and joint-destruction role in RA. Oxidative stress, especially urinary F(2) isoprostanes, predicts cardiovascular mortality and is increased in RA. We aimed to explore metabolic parameters changes after 6 months of anti-TNF therapy or sDMARD in patients with RA.

Methods: Twenty-four patients were included in the etanercept (ETN) group and 17 in the sDMARD group. Metabolic parameters were evaluated at baseline and at 6 months. HOMA was calculated as (insulin*glycemia)/22.5. Urinary F(2) isoprostanes were assessed using negative ion chemical ionization gas chromatography-mass spectrometry. OPG and total adiponectine levels were determined by enzyme linked immunosorbant assay. Changes were evaluated using paired-t-tests or Wilcoxon matched-pairs signed rank tests and correlations using spearman tests.

Results: Patients of the ETN group had a significantly longer RA duration, more often were RF and ACPA positive and more often had erosions and steroids. Patients had similar blood pressure, body mass index (BMI), glycemic and lipid parameters, homocystein, OPG and isoprostanes at baseline in both groups. Adiponectine tended to be higher in ETN group (196 [126–228] vs 136 [196–286] µg/ml, p = 0.08).

Isoprostanes at baseline correlated with triglycerides (r = 0.42, p < 0.05) and inversely correlated with HDL (r = −0.37, p < 0.05), HbA1c (r = −0.38, p < 0.05). OPG at baseline was correlated with CRP (r = 0.38, p < 0.05), CRP (r = 0.53, p < 0.01), HbA1c (r = 0.51, p < 0.01).

A significant decrease of BMI at 6 months was observed in the ETN group (−0.6 ± 1.4 kg/m², p < 0.05) and 1.8 ± 0.62 kg/m² in ETN and sDMARD group respectively. The BMI variation was significantly different between the 2 groups (p = 0.02). No correlation was found between BMI change and steroid changes. No change in mean blood pressure, homocystein, HbA1c, cholesterol and homocystein was observed after 6 months of either treatment. A significant decrease of OPG (−0.03 ± 1.64 pmol/l, p = 0.03 vs 0.35 ± 0.05 pmol/l, NS; respectively in ETN and sDMARD groups), isoprostanes (−227 ± 243 pmol/mmol of urinary creatinine, p = 0.01 vs −18 ± 141, NS) and a tendency to adiponectine increase (62 ± 217 µg/ml, p = 0.08 vs −13 ± 67 µg/ml, NS) was found in patients treated with ETN at 6 months whereas no change was observed in the sDMARD group. Variations were different between the 2 groups for isoprostanes (p = 0.05) with a tendency for OPG (p = 0.06) and adiponectine (p = 0.09). Isoprostanes and OPG changes were not correlated with DAS28 and CRP variations between baseline and 6 months.

Conclusion: ETN induced a decrease of oxidative stress and OPG which may partially explain the protective cardiovascular effect of TNF inhibitors.

Disclosure: C. I. Daen, None; A. M. Dupuy Gorce, None; E. Pinot, None; T. Mura, None; J. P. Cristol, None; B. Combe, None; J. Morel, Roche CHUGAI, 5, Roche Pharmaceuticals, 2, Bristol-Myers Squibb, 5, UCB, 5, Pfizer Inc, 2, Pfizer Inc, 2, Abbott Laboratories, 5, Merck Pharmaceuticals, 5, Agenin, 5.

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Background/Purpose: Remission is increasingly becoming a treatment goal in rheumatoid arthritis (RA) patients and DAS28 remission criteria are widely used, despite their limitations.
The purpose of this study was to study frequency, duration, and timing of sustained remission (SR) defined as DAS≤2.6 for at least 6 months, and to compare efficacy of different therapies, in patients with established RA treated with Tumor Necrosis Factor inhibitors (aTNF) in the observational setting of Southern Sweden.

Methods: aTNF treatments in RA patients registered in the SSATG register were eligible for this study. Remission time was defined as time between first visit after treatment initiation with DAS28≤2.6 and subsequent visit with DAS28>2.6.

The comparison of the drugs was done using logistic regression analysis, adjusting for baseline variables, and the ORs for achieving SR 12 and 24 months were adjusted for baseline age, disease duration, DAS28, HAQ, concomitant MTX and prednisolone. Life-table techniques were used to estimate SR time, looking only on first biologic treatments.

Results: Of 3446 initiated treatments, 481 (14 %) fulfilled the criteria. Of those who reached SR 63.2% did so within the first year.

Among patients naïve to biologic treatments and after correction for baseline variables, the ORs for achieving SR within the first 12 months of treatment were 1.9 for etanercept and 1.7 for adalimumab, with infliximab as the reference drug, while etanercept and adalimumab were not significantly different, see figure 1.

Median estimated SR survival time was 3.9 years (etanercept 4.4y, adalimumab 4.8y and infliximab 3.0y). Estimated SR survival was significantly longer for etanercept and adalimumab compared to infliximab (p < 0.05), with no significant difference between etanercept and adalimumab. The estimated SR survival, at 12, 24, and 48 months was 94%, 68% and 48% respectively. After 120 months 11% remained in SR.

Conclusion: In this population treated with RTX for AI diseases, B-Ly counts before RTX infusion were not associated with incidence of infections. This data does not support the common concern of infection with low B-Ly counts, and does not encourage assessing B-Ly before RTX treatment. We confirm the higher risk of infection conferred by low IgG levels, older age and AI disease other than RA.

Disclosure: J. T. Einarsson None; P. Geborek None; T. Saxne None; M. C. Kapetanovic None.

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An Evaluation of Literature On Discontinuation Rates of Biologics in Rheumatoid Arthritis. Serach A. Williams1, Victoria Porter2, Victoria Zarotsky1, Sujatha Sundaram3, Elisabeth Nyman4, Cassie K. Gregson5 and Paul S. J. Miller5, 1AstraZeneca LP, Wilmington, DE, 2OptumInsight, Mastic Beach, NY, 3OptumInsight, Calabasas, CA, 4OptumInsight, Hamburg, NH, 5AstraZeneca, Möln达尔, Sweden, 6AstraZeneca, Maclesfield, United Kingdom

Background/Purpose: To assess reasons for biologic discontinuation or switching in the treatment of rheumatoid arthritis (RA).

Methods: A text mining strategy was developed to identify, from the biomedical information published through July 2011, data relevant to discontinuation or switching due to adverse events (AEs) or lack of efficacy or patient preference. Searches encompassed Medline, ACR and EULAR conference abstracts, and > 20,000 selected full-text documents. The abstracts of the identified documents were manually assessed to determine whether they reported on the incidence/duration of and/or reasons for discontinuing/switching therapy. Expert opinions including non-systematic reviews, case studies, and editorials and commentaries were excluded.

Results: 234 full-text articles and 45 meeting abstracts were identified as reporting on discontinuation due to AEs/lack of efficacy. Fourteen articles/abstracts reporting on discontinuation due to patient preference were identified. Sixty-one articles on discontinuation due to AEs/lack of efficacy met inclusion criteria (4 systematic reviews/meta-analyses, 17 randomized controlled trials, 7 registry studies, 21 prospective studies, and 12 observational studies), and 9 studies on patient preference met inclusion criteria (3 registry studies, 4 retrospective analyses, 1 cross-sectional, and 1 prospective study). AEs accounted for 5% to 40% of discontinuations within the 1st year of therapy. Injection/infusion site reactions were the most common discontinuation/reason-related AE, most frequently reported with infliximab use and in patients with history of allergic reactions. Discontinuation due to lack of efficacy varied from 1% to 52% in studies with a 6-month follow-up duration and from 17% to 47% per year over a 10-year period. Patients were more...
likely to start on a 2nd biologic if their 1st biologic was discontinued due to lack of efficacy if discontinued due to AEs. Patient preference accounted for 4% to 29% of the total discontinuations. Infliximab, followed by etanercept, were the most widely evaluated biologics. Limited data on withdrawal rates were available for 2nd generation and non-TNF inhibitor biologics.

Conclusion: Despite the availability of 9 RA biologics, a substantial proportion of patients discontinue treatment largely due to AEs or lack of efficacy. Heterogeneity in RA disease is well-known; hence, new therapies with different mechanisms of action may help mitigate this issue. Treatments offering equivalent efficacy to that of currently available biologics that can be sustained over longer time periods would benefit RA patients with inadequate response to available treatments.

Disclosure: S. A. Williams, AstraZeneca, 1, AstraZeneca, 3; V. Porter, OptumInsight, 3, AstraZeneca, 2; V. Zarotsky, OptumInsight, 3, AstraZeneca, 2; S. Sundaram, OptumInsight, 5, AstraZeneca, 2; E. Nyma, AstraZeneca, 3, AstraZeneca, 1; C. K. Gregson, AstraZeneca, 1, AstraZeneca, 3; P. S. J. Miller, AstraZeneca, 1, AstraZeneca, 3.

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Comparison of Rheumatoid Arthritis-Related Health Care Resource Use and Comorbidities Among Patients with Rheumatoid Arthritis Treated with Adalimumab Vs. Etanercept. Jipan Xie1, Arijit Ganguli2, Hongbo Yang1, Kejal Parikh1, Eric Q. Wu1 and Mary Cifaldi2. 1Analysis Group Inc., Boston, MA, 2Abbott Laboratories, Abbott Park, IL.

Background/Purpose: Adalimumab (ADA) and etanercept (ETN) are two commonly used tumor necrosis factor (TNF)-α antagonists for the treatment of rheumatoid arthritis (RA). The study is aimed to compare the rate of experiencing RA-related urgent care and surgery, and the risk of developing new comorbidities between ADA- and ETN-treated patients with RA.

Methods: Adult RA (ICD-9-CM: 714) patients who initiated ADA or ETN were identified from the Thomson MarketScan database (2005–2009). The date of the first prescription of ADA or ETN was defined as the index date. Patients were required to have continuous eligibility for at least 6 months prior to (baseline period) and 12 months after (study period) the index date. In addition, patients were required to be free of other medical conditions (e.g., Crohn’s disease and psoriasis), for which ADA or ETN is indicated, during the baseline period. Baseline characteristics (demographics, comorbidities, prior treatments for RA and health care resource use) were compared between the ADA and ETN cohorts using Chi-square tests for categorical variables or Wilcoxon rank-sum tests for continuous variables. The rate of experiencing RA-related urgent care (i.e., patient or emergency room visits associated with RA diagnoses), RA-related surgery, and the risk of developing new comorbidities (including gastrointestinal disease, cardiovascular disease, diabetes, hypertension, osteoporosis) during the study period were compared between the two cohorts using Cox proportional hazards models, adjusting for the above baseline characteristics.

Results: A total of 3,109 ADA-treated RA patients and 3,972 ETN-treated RA patients met the study inclusion and exclusion criteria. Compared to ETN-treated patients, ADA-treated patients were older (50.2 vs. 49.4, p = 0.006), and had a higher baseline use of methotrexate (62.9% vs. 58.7%, p = 0.001). After adjusting for baseline characteristics, ADA was associated with a significant lower rate of experiencing RA-related urgent care (hazard ratio [HR] = 0.82, 95% confidence interval [CI] = 0.67–0.99) and RA-related surgery (HR = 0.65, 95% CI = 0.47–0.91). ADA was also associated with a lower risk of developing new gastrointestinal disease compared to ETN (HR = 0.85; 95% CI: 0.76–0.95). The risks of developing other comorbidities including cardiovascular diseases, diabetes, hypertension, and osteoporosis were not significantly different between the two cohorts.

Conclusion: Compared to those treated with ETN, patients with RA treated with ADA, were less likely to experience an RA-related urgent care or RA-related surgery, and to develop new gastrointestinal disease.

Disclosure: J. Xie, Analysis Group, 3; A. Ganguli, Abbott Laboratories, 3; Abbott Laboratories, 3; H. Yang, Analysis Group, 3; K. Parikh, Analysis Group, 3; E. Q. Wu, Analysis Group, 3; M. Cifaldi, Abbott Laboratories, 1, Abbott Laboratories, 3.

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Immunogenicity of Infliximab Is Related to Reduction of Frequency of Infliximab Administration in Rheumatoid Arthritis and Spondyloarthr-itis Patients. Mathieu Verdet1, Clement Guillou1, Marie-Laure Potier1, Marie-Hélène Hizon2, Fabienne Joussel3, Olivier Boyer3, Thierry Lequerre2 and Olivier Vittecoq3. 1Rouen University Hospital, Bois Guillaume, France, 2Inserm 905 & Institute for Biomedical Research, University of Rouen, Rouen, France, 3Rouen University Hospital, Rouen Cedex, France, 4INSERM U905, University of Rouen, Rouen, France, 5Department of Rheumatology, Rouen University Hospital & Inserm 905, Institute for Biomedical Research, University of Rouen, Rouen, France, 6Rouen University Hospital & Inserm 905, University of Rouen, Rouen Cedex, France

Background/Purpose: To analyze the clinical and biological characteristics associated with presence of antibodies to Infliximab, in rheumatoid arthritis (RA) and spondyloarthritides patients (SpA).

Methods: Sera from RA (n=22) or SpA (n=23) patients receiving Infliximab have been analyzed with a commercial multiplex enzyme-linked immunosorbent assay kit (LISA-Tracker Infliximab BMD®). Antibodies toward Infliximab (ATI) and Infliximab trough concentrations were measured in their serum. Result was considered positive if ATI concentrations were >10ng/mL. Clinical and biological data were retrospectively collected from the patient’s medical file.

Results: Infliximab was given in association with methotrexate in 31 patients (69%). The time between two consecutive Infliximab administration was higher than 8 weeks in Fifteen patients (33%). Fifteen patients were in remission at time of analysis. Time between two Infliximab administration was significantly longer in patients who had obtained remission(9.27 weeks) compared to other patients (6.83 weeks; Mann-Whitney Test, p = 0.0005).

Seven patients (15%) were ATI+. Time since beginning of Infliximab was not different between ATI+ and ATI- patients.

Posology of Infliximab at time of analysis was not different between ATI+ (4.29mg/kg) and ATI- patients (4.13mg/kg; Mann-Whitney Test, p = 0.74).

Longer time between infliximab infusions was associated with presence of ATI (ATI+ : 9.57 weeks; ATI- : 7.29 weeks; Mann-Whitney Test p = 0.02).

As expected, Infliximab concentration was significantly lower in ATI+ patients (0.18µg/mL) compared to ATI- patients (2.1µg/mL; Mann-Whitney Test, p = 0.0005). There was a significant inverse correlation between ATI titer and Infliximab concentration in the serum(Spearman test, p = 0.0001). In contrast, no association was found between the posology of Methotrexate and presence of ATI.

Conclusion: Immunogenicity against Infliximab was associated to a longer interval between infusions. This result could impact on treatment strategy for patients in clinical remission since decreasing the frequency of Infliximab administration may favor the development of ATI.

Disclosure: M. Verdet, None; C. Guillou, None; M. L. Potier, None; M. Hiron, None; F. Jouen, None; O. Boyer, None; T. Lequerre, None; O. Vittecoq, None.

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Impact of Adalimumab Therapy On Laboratory Parameters of Interest in Patients with Early or Long-Standing Rheumatoid Arthritis. De Furst1, Ana P. Lacerda2, Nupun Andhivarthai2, Jasmina Kalabic3 and Neeluflar Mozaffarian1. 1University of California at Los Angeles, Los Angeles, CA, 2Abbott Laboratories, Sao Paulo, Brazil, 3Abbott Laboratories, Abbott Park, IL, 4Abbott GmbH & Co. KG, Ludwigshafen, Germany

Background/Purpose: The systemic inflammation of rheumatoid arthritis (RA) can have detrimental effects on the hematopoietic and cardiovascular systems. Additionally, effective DMARD treatments for RA can be hematotoxic or hepatotoxic. The effects of adalimumab (ADA) in combination with methotrexate (MTX) therapy on these systems in patients with early or long-standing RA have not been previously summarized. This analysis evaluates the effects of ADA+MTX therapy compared to MTX monotherapy on laboratory and vital sign parameters relevant to hematopoietic, cardiovascular, and hepatic organ systems.

Methods: Clinical trials DE013 and OPTIMA (MTX-naive patients, early RA, mean duration~0.8 yrs in DE013, 0.35 yrs in OPTIMA) and DE019 (MTX complete responders, long-standing RA, mean duration~11 yrs) were double-blind studies that compared ADA+MTX therapy to MTX monotherapy for ≥6 months. This post hoc analysis determined the percentage of patients who developed neutropenia, lymphocytopenia, thrombocyto-
Mozaffarian 2007

**Results:** Incidence rates for laboratory abnormalities are listed in the table. After 6 months, mean increase in Hgb levels was higher in ADA-MTX arms than in the MTX-only arms in early RA, and in long-standing RA. Mean HDL cholesterol changes were not different in the ADA-MTX treatment group compared to MTX alone. Mean total and LDL cholesterol increased numerically with ADA-MTX therapy vs. MTX alone. No differences were observed in the incidences or mean changes in serum creatinine, ALT, or AST between ADA-MTX therapy and MTX alone.

<table>
<thead>
<tr>
<th>Table. Incidence and mean change from baseline in laboratory values of interest at 6 months of treatment</th>
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<tbody>
<tr>
<td><strong>Incidence. n (%)</strong></td>
</tr>
<tr>
<td><strong>BO+MTX</strong></td>
</tr>
<tr>
<td>Neutropenia</td>
</tr>
<tr>
<td>&lt;1500 to 5000/mm³</td>
</tr>
<tr>
<td>Lymphocytopenia*</td>
</tr>
<tr>
<td>&lt;800 to 500/mm³</td>
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<tr>
<td>&lt;500 to 200/mm³</td>
</tr>
<tr>
<td>Anemia</td>
</tr>
<tr>
<td>Hgb &lt;10.0–8.0 g/dl</td>
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<tr>
<td>Hemoglobin decreased</td>
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<td>Hgb decrease –3.0 to –1.0 g/dl</td>
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<tr>
<td>Hgb decrease –&gt;3.0 g/dl</td>
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<tr>
<td>Serum creatinine increased</td>
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<td>&gt;3 to 6×ULN</td>
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<td>&gt;6×ULN</td>
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<tr>
<td>ALT increased</td>
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<tr>
<td>ALT &gt;3–5×ULN</td>
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<tr>
<td>Stage 2 treatmenta</td>
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</tbody>
</table>

**Mean change from baseline**

| Hemoglobin, g/dl | 0.24 | 0.45* | 0.18 | 0.44* |
| Fasting lipidsb | HDL cholesterol, mmol/L | 0.078 | 0.119 | – | – |
| LDL cholesterol, mmol/L | 0.193 | 0.284* | – | – |
| Cholesterol, mmol/L | 0.280 | 0.438* | – | – |

*P < 0.05 for ADA+MTX vs. PBO+MTX; χ² test for incidence rates. n=0 for low values/categoricals not shown; *ystolic BP: 160 mm Hg or diastolic BP:100 mm Hg; **OPTIMA study only; mm, cells per cubic millimeter; ADA, adalimumab; AS, aspartate transaminase; ALT, alanine transaminase; g/dL, gram per deciliter; HDL, high-density lipoprotein; Hgb, hemoglobin; LDL, low-density lipoprotein; MTX, methotrexate; PBO, placebo; RA, rheumatoid arthritis; ULN, upper limit of normal.

**Conclusion:** Over an observation period of 6 months, RA patients treated with ADA+MTX exhibited laboratory abnormalities and hypertension at levels and frequencies similar to those seen in patients treated with MTX alone. In fact, ADA+MTX therapy was associated with a statistically significantly reduced incidence of anemia and lymphocytopenia. Similar results were observed whether evaluating ADA treatment in MTX-naive patients or in those with long-standing RA.

Conclusion: In these early RA patients, baseline disease activity resulted in substantial functional impairment. Patients who responded to early treatment with either ADA+MTX or PBO+MTX had low ACT-HAQ and DAM-HAQ values at wk 26 that were sustained through week 78. Patients with an inadequate response after 22 and 26 wks of PBO+MTX or ADA+MTX therapy showed significant improvement in HAQ even though not achieving LDA, and further improvement when treated with O4–LDA. Treatment was well tolerated even among initial inadequate responders, the disability at week 78 mostly consisted of ACT-HAQ, suggesting the potential for further improvement in these patients with further adjustment of treatment regimen.

Reference

Disclosure: J. S. Smolen, Abbott, Amgen, Astra-Zeneca, BMS, Celgene Centocor-Jansen, Glaxo Lilly, Pfizer (Wyeth), MSD (Scherling-Plough), Novo-Nordisk, Roche, Sandoz, and UCB, 2; Abbott, Amgen, Astra-Zeneca, BMS, Celgene Centocor-Jansen, Glaxo, Lilly, Pfizer (Wyeth), MSD (Scherling-Plough), Novo-Nordisk, Roche, Sandoz, and UCB, 5; R. Fleischmann, Abbott, Pfizer, Merck, Roche, UCB, Celgene, Centocor-Janssen, Amgen, AstraZeneca, BMS, Lilly, and Novartis, 2; Abbott, Pfizer, Merck, Roche, UCB, Celgene, Centocor-Janssen, Amgen, Astra-Zeneca, BMS, Lilly, and Novartis, 5; P. Emery, Abbott, Merck, Pfizer, UCB, Roche, and BMS, 5; R. F. van Vollenhoven, Abbott Laboratories, 2; Bristol-Myers Squibb, 2; GlaxoSmithKline, 2; Human Genome Sciences, Inc., 2; MSD, 3; Pfizer Inc 2; Roche Pharmaceuticals, 5; UCB Pharma, 2; Abbott Laboratories, 2; Bristol-Myers Squibb, 5; GlaxoSmithKline, 5; Human Genome Sciences, Inc., 5; MSD, 5; Pfizer Inc 5; Roche Pharmaceuticals, 5; UCB Pharma, 5; S. Florentinus, Abbott Laboratories, 2; Oxford Outcomes, 3; F. Faccin, 1, S. Rathinam, Abbott Laboratories, 3; S. S. Rathinam, Abbott Laboratories, 3; H. Kupper, Abbott Laboratories, 1, Abbott Laboratories, 3; A. Kavanagh, Abbott, Amgen, Astra-Zeneca, BMS, Celgene, Centocor-Janssen, Pfizer, Roche, and UCB, 2; Abbott, Amgen, Astra-Zeneca, BMS, Celgene, Centocor-Janssen, Pfizer, Roche, and UCB, 5.

Table 1. Results of logit model by country

<table>
<thead>
<tr>
<th>Attribute and level</th>
<th>Odds Ratios (Lower – Upper 95% Confidence interval)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>US</td>
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<tr>
<td><strong>Administration &amp; Frequency – Sub-cutaneous weekly (reference)</strong></td>
<td></td>
</tr>
<tr>
<td>Oral daily</td>
<td>1.03 (0.78–1.36)</td>
</tr>
<tr>
<td>Oral twice daily</td>
<td>0.82 (0.56–1.18)</td>
</tr>
<tr>
<td>Intravenous-8 weeks</td>
<td>0.52 (0.35–0.77)</td>
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<tr>
<td>Intravenous-4 weeks</td>
<td>0.44 (0.29–0.66)</td>
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<tr>
<td>Sub-cutaneous-biweekly</td>
<td>0.95 (0.71–1.27)</td>
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<tr>
<td><strong>Time in Body-8 weeks (reference)</strong></td>
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<tr>
<td>1 day</td>
<td>0.77 (0.65–0.99)</td>
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<td>4 weeks</td>
<td>1.19 (1.01–1.41)</td>
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<td><strong>Level of pain while taking treatment–Current pain level reduced by 20% (reference)</strong></td>
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<tr>
<td>Current pain level reduced by 80%</td>
<td>6.25 (5.12–7.63)</td>
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<td>Current pain level reduced by 40%</td>
<td>2.68 (2.24–3.40)</td>
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<td><strong>Functional Ability-Some difficulty &amp; moderate discomfort (reference)</strong></td>
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<tr>
<td>No difficulty</td>
<td>2.29 (1.89–2.77)</td>
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<tr>
<td>Some difficulty</td>
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<td><strong>Number of Flares-5 (reference)</strong></td>
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<tr>
<td>2</td>
<td>3.09 (2.55–3.74)</td>
</tr>
<tr>
<td><strong>Cost ($)</strong></td>
<td>1.0 (1.0–1.0)</td>
</tr>
</tbody>
</table>

Conclusions: The results show the relative importance of different features of RA treatments to patients. Improving pain control, functioning, and avoiding flares were the most important aspects of treatment. Participants were much less concerned about the mode or frequency of administration.

Disclosure: B. Nafees, Oxford Outcomes, 3; A. Lloyd, Oxford Outcomes, 3; C. L. Gaich, Eli Lilly and Company, 1, Eli Lilly and Company, 3; J. Birt, Eli Lilly and Company, 1, Eli Lilly and Company, 3; R. A. Hughes, None.

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The Comparative Effectiveness of Anti-TNF Medications Among Older and Disabled Rheumatoid Arthritis Patients in the U.S. Medicare Population. Huifeng Yun1, Fenglong Xie 2, Elizabeth S. Delzell 2, Lang Chen2, Shao Yang2, Kenneth G. Saag3 and Jeffrey Curtis2. 1University of Alabama-Birmingham, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL, 3Univ of Alabama-Birmingham, Birmingham, AL.

Background/Purpose: Evaluating the real world effectiveness of biologic DMARDs in rheumatoid arthritis (RA) patients using administrative claims data has previously not been feasible due to the lack of clinical information present in such databases. A novel, recently published, validated administrative data-based algorithm (Curtis et al., Arthritis Res Ther 2011) provides the potential to compare the effectiveness of different biologics to one another, with focus on older and vulnerable populations that are sometimes excluded or not present in large numbers in clinical trials or registries.

Methods: We evaluated the effectiveness of etanercept, adalimumab, and infliximab in 100% of Medicare beneficiaries with RA and with >= 24 months of fee-for-service + drug coverage, 2006–2009. Patients included those eligible for Medicare on the basis of age >= 65 or disability. New users of anti-TNF agents had a 12 month baseline during which no prescription or infusion of any biologic medication was given. The outcome was effectiveness at 12 + 2 months according to the algorithm, which required six dichotomous conditions be met (Table). We calculated the proportion meeting effectiveness criteria by anti-TNF medication and compared effect sizes between them using robust Poisson regression to compute risk ratios (RRs), adjusted for demographics, income, comorbidities and other medications.

Results: We identified 1,635, 2,077 and 3,181 new users of adalimumab, etanercept and infliximab, respectively. Overall, 35% of patients were disabled, almost all of whom were younger than age 65. The algorithm classified the medication as effective for 27% of adalimumab users, 31% of etanercept users, and 29% of infliximab users. After multivariable adjustment, the RRs for effectiveness were 0.99 (95% confidence interval (CI): 0.90–1.10) for adalimumab, and 1.11 (95% CI: 1.02–1.22) for etanercept compared to infliximab. Across all anti-TNFs, patients who were not disabled had
higher effectiveness for anti-TNF medications than patients who were disabled (RR=1.26, 95% CI: 1.15–1.39).

**Table.** Components of the effectiveness algorithm for adalimumab, etanercept, and infliximab at 1 year*  

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Adalimumab</th>
<th>Etanercept</th>
<th>Infliximab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adalimumab</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Etanercept</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Infliximab</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td><strong>Effectiveness Criteria, %</strong></td>
<td><strong>55</strong></td>
<td><strong>59</strong></td>
<td><strong>65</strong></td>
</tr>
<tr>
<td>High adherence to the index drug</td>
<td>87</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>No switch to a different biologic DMARD</td>
<td>90</td>
<td>90</td>
<td>91</td>
</tr>
<tr>
<td>No addition of a new non-biologic DMARD</td>
<td><strong>94</strong></td>
<td><strong>99</strong></td>
<td><strong>84</strong></td>
</tr>
<tr>
<td>No biologic dose increase compared to starting dose</td>
<td><strong>84</strong></td>
<td><strong>88</strong></td>
<td><strong>84</strong></td>
</tr>
</tbody>
</table>

Satisfied all 6 effectiveness criteria 27 31 29

† The gold standard outcome was low disease activity (Disease Activity Score using 28 joint counts [DAS28] C 3.2) or improvement in DAS28 by ≥1.2 units at 12–2 months with high adherence to therapy. This newly published claims-based effectiveness algorithm was validated using the clinical information in Veterans affairs Registry as the gold standard.

* assessed between the first exposure date and the outcome rheumatologist visit date (11–14 months later)

**Conclusion:** A recently-published claims-based effectiveness algorithm provides opportunities to assess the comparative effectiveness of RA medications using administrative data. Etanercept was associated with somewhat higher effectiveness among new anti-TNF users compared to infliximab. Effectiveness of all anti-TNF medications combined was significantly higher among older patients who were not disabled compared to younger, disabled RA patients.

Disclosure: H. Yun, Agena, 2; F. Xie, None; E. Delzell, Agena, 2; L. Chen, None; S. Yang, None; K. G. Saag, AHRQ, NIH/NIAMS, 2; Agena;Abbott;Ardea:Lilly: Merck:Novartis:Regeneron:Savient:URL:5, NOF:ACR, 6; J. Curtis, Roche/Genetech, UCB< Centocor,Corona,Angen, Pfizer, BMS, Crescendo, Abbott, 2; Roche, Genetech,UCB, Centocor, CORRONA, Agena, Pfizer, BMS, Crescendo, Abbott, 5.


1. Keystone EC, Abbott Laboratories Agena Inc, AstraZeneca Pharmaceuticals LP, Bristol-Myers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc, Genzyme, Merck, Novartis Pharmaceuticals, Pfizer Pharmaceuticals, UCB, 2; Abbott Laboratories, Astra-Zeneca Pharma, Biotest, Bristol-Myers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc, Genentech Inc, Merck, Nycomed, Pfizer Pharmaceuticals, UCB, Agena, Janssen Inc; 5; P. Taylor, AstraZeneca, Merck, GSK, Celgene, 3; Lilly, Pfizer, Merck, NovoNordisk, Celgene, UCB, Roche, AstraZeneca, BMS, Abbott, Novartis, 9; M. C. Genovese, Eli Lilly and Company, 2; Eli Lilly and Company, 5; L. Johnson, None; J. C. Rizo Rodriguez, None; C. H. Lee, Eli Lilly and Company, 1; Eli Lilly and Company, 3; C. L. Gaich, Eli Lilly and Company, 1; Eli Lilly and Company, 3.

**Conclusion:** In this 2b phase study in patients with RA, those who received baricitinib reported clinically meaningful improvements as early as week 2 in most PROs relative to PBO as well as at 12 weeks. These improvements were maintained or continued to improve through 24 weeks.

1. J. S. Smolen, None; D. E. Schlichting, Eli Lilly and Company, 1, Eli Lilly and Company, 3; K. L. Sterling, Eli Lilly and Company, 1, Eli Lilly and Company, 3; E. Keystone, Abbott Laboratories Agena Inc, AstraZeneca Pharmaceuticals LP, Bristol-Myers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc, Genzyme, Merck, Novartis Pharmaceuticals, Pfizer Pharmaceuticals, UCB, 2; Abbott Laboratories, Astra-Zeneca Pharma, Biotest, Bristol-Myers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc, Genentech Inc, Merck, Nycomed, Pfizer Pharmaceuticals, UCB, Agena, Janssen Inc; 5; P. Taylor, AstraZeneca, Merck, GSK, Celgene, 3; Lilly, Pfizer, Merck, NovoNordisk, Celgene, UCB, Roche, AstraZeneca, BMS, Abbott, Novartis, 9; M. C. Genovese, Eli Lilly and Company, 2; Eli Lilly and Company, 5; L. Johnson, None; J. C. Rizo Rodriguez, None; C. H. Lee, Eli Lilly and Company, 1; Eli Lilly and Company, 3; C. L. Gaich, Eli Lilly and Company, 1; Eli Lilly and Company, 3.

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the biologic is approved for MT in the US, and d) and if the biologic was initiated prior to 2006 which marks the increased availability of biologics approved for MT. A random effect of individual physician’s prescribing patterns was also included in the model to estimate a median odds ratio (Larsen et al., 2000).

Results: Between October 2001 and April 2012, 3,923 previously Bio naïve patients initiated biologic therapy, of which 19% initiated as MT. Baseline characteristics of patients initiating Bio MT and Bio CMB were similar: age (years; mean±SD) 57±15 vs. 58±13, female 74% vs. 76%, duration of RA (years; mean±SD) 9±9 vs. 8±9, and CDAI (mean±SD) 19±14 vs. 19±14. A significantly higher proportion of patients initiating a Bio CMB had a history of non-biologic DMARDs (86% vs. 97%, p<0.0001) and specifically, a history of methotrexate (MTX) (72% vs. 92%, p<0.0001) and prednisone (62% vs. 72%, p<0.0001). The most frequently reported reason for discontinuing MTX was due to toxicity (Bio MT 45% vs. Bio CMB 36%, p = 0.05); similar results were seen for history of leflunomide.

Table 1. Adjusted Odds Ratios for Biologic Monotherapy Versus Combining in Biologic Naïve Patients

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=5861</td>
<td>N=2823</td>
<td>N=644</td>
</tr>
<tr>
<td>History of Hepatic Disease</td>
<td>6.5 [3.20, 13.07]</td>
<td>7.49 [3.19, 17.58]</td>
</tr>
<tr>
<td>History of Malignancy</td>
<td>3.79 [1.64, 8.73]</td>
<td>2.78 [1.02, 7.59]</td>
</tr>
<tr>
<td>Swollen Joint Count</td>
<td>0.97 [0.95, 0.99]</td>
<td>0.96 [0.95, 0.98]</td>
</tr>
<tr>
<td>Use of Mono Approved Biologic</td>
<td>1.47 [1.20, 1.91]</td>
<td>1.45 [1.13, 1.86]</td>
</tr>
<tr>
<td>Initiated after 2006</td>
<td>0.83 [0.68, 1.00]</td>
<td>0.79 [0.63, 0.99]</td>
</tr>
<tr>
<td>Erosions</td>
<td>0.84 [0.68, 1.03]</td>
<td>0.84 [0.63, 1.03]</td>
</tr>
<tr>
<td>History of Neuropathy</td>
<td>0.89 [1.66, 2.23]</td>
<td>1.86 [1.61, 2.25]</td>
</tr>
<tr>
<td>Random effect of individual physician’s prescribing patterns</td>
<td>4.89 [1.16, 20.59]</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- OR > 1 implies monotherapy more likely.
- Models fitted using available data among 3,923 previously Bio naïve patients initiating a biologic therapy.

Conclusion: Biologic approved for MT and effect of individual physician prescribing patterns consistently influenced the likelihood of Bio MT use along with significant effects in some instances of less severe disease, history of conditions potentially influencing use of concomitant DMARDs and year of initiation.

Disclosure: D. A. Pappas, None; G. W. Reed, Corrona, Inc., 2, Corrona, Inc., 5; A. John, Genentech, 3; A. Shewade, Genentech, 5; K. C. Saunders, Corrona, 3; J. Devenport, Genentech and Biogen IDEC Inc., 3; J. D. Greenberg, Corrona, 4, AstraZeneca, Novartis, Pfizer, 5, J. M. Kremer, Corrona, 4.

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Divergent Toxicity of TNF Inhibitors On Demyelinating Disorders and Neurological Events. Sergio Schwartzman1, John Clark2 and John J. Cush3.

Background/Purpose: There are currently five anti-TNF agents that have been approved for various autoimmune illnesses. There is no convincing evidence that any one of these is superior to the others in terms of efficacy. However, some differences in safety, such as tuberculosis risk, have been described. There is no single source of information on the safety of these agents that is universally precise. The Adverse Event Reporting System (AERS) maintained by the US Food and Drug Administration (FDA) receives spontaneous reports of adverse reactions to approved medications licensed for use in the United States. These are submitted by health care professionals or through the manufacturer. It is widely accepted that this type of reporting does not allow conclusions regarding causality, these results suggest that different anti-TNF agents may be associated with different rates of adverse neurological effects and with different sites of neurotoxicity within the nervous system.

Disclosure: S. Schwartzman, Janssen, Abbott, UCB, Amgen, Pfizer, Genentech, Human Genome Science, 4; J. Clark, None; J. J. Cush, Genentech, Pfizer, UCB, Celgene, Amgen, Novartis, CORRONA, NIH, 2, Jensen, Savient,Pfizer, BMS, Amgen, Genentech Abbott, UCB, 5.

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Background/Purpose: In the area of rheumatic diseases, there is limited evidence on the effect of a biologic on employment. The purpose of this analysis was to evaluate the prevalence of unemployment due to work disability and determine the effect of treatment with infliximab (IFX) in patients with RA and AS in a real-world, Canadian, routine clinical practice setting.

Methods: BioTRAC is an ongoing, prospective, registry of patients initiated on treatment with IFX or golimumab as first biologics or after having been treated with a biologic for less than six months. A total of 798 RA patients and 290 AS patients initiated IFX between 2002 and 2012 and were included in this analysis.

Results: Among the total number of RA and AS patients, 179 (22.4%) and 57 (19.7%), respectively, reported being unemployed due to their disability, while 335 (42.0%) and 77 (26.6%) were unemployed due to other reasons.

Table 1 shows the baseline patient characteristics by employment status. Patients reporting being unemployed due to disability had significantly higher disease severity. Furthermore, patients unemployed due to disability had RA evidence of joint abnormalities or disability, while 50% will have work disability after 10 years (1). Similarly, the prevalence of work disability in AS ranges from 13% to 45% based on the patient population (2–4). The purpose of this analysis was to evaluate the prevalence of unemployment due to work disability and determine the effect of treatment with infliximab (IFX) in patients with RA and AS in a real-world, Canadian, routine clinical practice setting.

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Table 1 shows the baseline patient characteristics by employment status. Patients reporting being unemployed due to disability had significantly higher disease severity. Furthermore, patients unemployed due to disability had RA
for a longer period, while disease duration was comparable in AS patients across employment statuses.

Table 1. Patient Characteristics at Baseline by Employment Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean (SD) or n</th>
<th>Male (n=188)</th>
<th>Female (n=593)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: years</td>
<td>53.8 (10.9)</td>
<td>54.3 (13.1)</td>
<td>55.6 (13.7)</td>
<td>0.228</td>
</tr>
<tr>
<td>Disease duration: years</td>
<td>12.0 (7.1)</td>
<td>11.6 (7.1)</td>
<td>11.4 (10.4)</td>
<td>0.008</td>
</tr>
<tr>
<td>RF-positive: n (%)</td>
<td>112 (67.1%)</td>
<td>425 (76.6%)</td>
<td>320 (42.6%)</td>
<td>0.001</td>
</tr>
<tr>
<td>TJC-28</td>
<td>7.2 (2.1)</td>
<td>6.6 (2.1)</td>
<td>6.1 (2.0)</td>
<td>0.002</td>
</tr>
<tr>
<td>CRP: mg/L</td>
<td>21.5 (27.8)</td>
<td>18.2 (22.7)</td>
<td>17.5 (26.2)</td>
<td>0.012</td>
</tr>
<tr>
<td>HAQ-DI</td>
<td>1.4 (0.7)</td>
<td>1.7 (0.7)</td>
<td>2.0 (0.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PMI: VAS cm</td>
<td>5.4 (2.5)</td>
<td>5.9 (2.3)</td>
<td>5.2 (2.4)</td>
<td>0.019</td>
</tr>
<tr>
<td>DAS28-ESR</td>
<td>6.3 (1.3)</td>
<td>6.0 (1.4)</td>
<td>6.1 (1.5)</td>
<td>0.004</td>
</tr>
<tr>
<td>DAS28-CRP</td>
<td>5.9 (1.2)</td>
<td>5.5 (1.2)</td>
<td>5.1 (1.4)</td>
<td>0.004</td>
</tr>
<tr>
<td>ASDAS-CRP</td>
<td>15.6 (6.7)</td>
<td>17.7 (6.0)</td>
<td>17.7 (6.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
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<td>112 (67.1%)</td>
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<td>0.001</td>
</tr>
</tbody>
</table>

Conclusion: Objective measures (SJC, TJC, MDGA, CRP) were similar for male and female patients at infliximab initiation. However, patient reported outcomes (HAQ-DI, Pain and PGa) were worse at baseline for female patients at initiation of biologic treatment in this Canadian rheumatoid arthritis population.

References
4. S. M. Otawa, Janssen Canada Inc, 3; H. Khalil, Janssen Canada Inc, 3.

495

Comparison of Discontinuation Rates by Biological Since 1998 in US Patients with Rheumatoid Arthritis

Background and Purpose: Cancer is a well-known cause of death in the rheumatoid arthritis (RA) population. The prevalence of rheumatoid arthritis (RA) is approximately 1% in the general population, with a higher prevalence in women. RA incidence increases from the age of menarche peaking around 15–20 years old. Furthermore, the prevalence of RA is 2–4 times higher in women compared to men depending on age. Furthermore, women RA incidence increases from the age of menarche peaking around menopause, while it is rare in men under the age of 45 years (1). Several studies have shown that treatment outcomes are worse in women (2). This analysis examined gender-specific differences in response to patient and disease parameters at initiation of the first anti-TNF agent for the treatment of RA in a Canadian routine clinical practice setting.

Methods: BioTRAC is an ongoing Canadian registry of RA, AS or PsA patients initiating treatment with infliximab (IFX) or golimumab (GOL) as first biologics or after having been treated with a biologic for less than six months. This analysis is based on 781 biologic naive RA patients initiating infliximab treatment between 2002 and 2012.

Results: Among the 781 patients, 593 (75.9%) were female and 188 (24.1%) were male. Mean age and disease duration at initiation of infliximab treatment were comparable between groups.

Overall patient characteristics differed significantly between genders (Table 1). Mean morning (AM) stiffness, HAQ-DI, pain, patient global assessment of disease activity (PtGA), CDAI, and RAPID 3 were statistically significantly higher in female patients. Furthermore, a higher proportion of women were rheumatoid factor (RF) positive and unemployed. However, physician assessment of global disease activity (MDGA), TJC, SJC, CRP, DAS28-CRP, and SDAI were comparable between genders.

Table 1. Patient Characteristics at Baseline by Gender

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<th>Parameter</th>
<th>Mean (SD) or n</th>
<th>Male (n=188)</th>
<th>Female (n=593)</th>
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<tr>
<td>Age: years</td>
<td>53.4 (13.1)</td>
<td>55.6 (13.7)</td>
<td>0.228</td>
<td></td>
</tr>
<tr>
<td>Disease duration: years</td>
<td>7.9 (8.2)</td>
<td>9.0 (9.7)</td>
<td>0.557</td>
<td></td>
</tr>
<tr>
<td>AM stiffness: min</td>
<td>63.8 (44.2)</td>
<td>72.9 (43.4)</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>HAQ-DI</td>
<td>1.4 (0.7)</td>
<td>1.7 (0.7)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Pain: VAS cm</td>
<td>5.4 (2.5)</td>
<td>5.9 (2.3)</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>CRP: mg/L</td>
<td>21.5 (27.8)</td>
<td>18.2 (22.7)</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>SJC-28</td>
<td>10.2 (7.4)</td>
<td>11.1 (6.9)</td>
<td>0.058</td>
<td></td>
</tr>
<tr>
<td>TJC-28</td>
<td>12.3 (8.5)</td>
<td>13.0 (7.9)</td>
<td>0.245</td>
<td></td>
</tr>
<tr>
<td>MDGA: VAS cm</td>
<td>6.3 (2.3)</td>
<td>6.6 (2)</td>
<td>0.137</td>
<td></td>
</tr>
<tr>
<td>CRP: VAS cm</td>
<td>5.6 (2.6)</td>
<td>6.2 (2.3)</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>SDAI</td>
<td>36.4 (18.5)</td>
<td>39.3 (16.6)</td>
<td>0.056</td>
<td></td>
</tr>
<tr>
<td>CDAI</td>
<td>34.5 (17.5)</td>
<td>37.2 (15.8)</td>
<td>0.035</td>
<td></td>
</tr>
<tr>
<td>RAPID 3</td>
<td>15.6 (6.7)</td>
<td>17.7 (6.0)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>RF-positive: n (%)</td>
<td>112 (67.1%)</td>
<td>425 (76.6%)</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>Employed: n (%)</td>
<td>92 (49.2%)</td>
<td>184 (31.3)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Objective measures (SJC, TJC, MDGA, CRP) were similar for male and female patients at infliximab initiation. However, patient reported outcomes (HAQ-DI, Pain and PtGA) were worse at baseline for female patients at initiation of biologic treatment in this Canadian rheumatoid arthritis population.
Results: A total of 2,340 RA patients initiated their 1st biologic; 1,148 (49%) discontinued and 1,128 initiated their 2nd biologic (50%) discontinued. The vast majority initiated one of the following: etanercept (1st 44%, 2nd 29%), infliximab (1st 37%, 2nd 29%), and adalimumab (1st 13%, 2nd 29%). The annual discontinuation rate of all 1st biologics was 18% (95% CI 17–19%) and 21% (19–23%). Annual discontinuation rates for 1st and 2nd by drug was 15% (14–16%) and 16% (14–19%) for etanercept; 19% (17–21%) and 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab. Anakinra had the highest annual rates, 1st 59% (44–78%) and 2nd 18% (16–20%) for infliximab; and 20% (17–23%) and 26% (22–32%) for adalimumab.

Conclusion: In this large cohort, RA patients tend to remain on their initial and second biologic for relatively long periods suggesting the drugs’ effectiveness. Discontinuation rates were higher for non-anti-TNFs and in patients who initiated a biologic more recently when more treatment options were available. Contrary to recent findings, there was no statistically significant difference in discontinuation rates of anti-TNFs and non-anti TNFs as second biologic treatment.

Disclosure: S. Ramiro, None; F. Wolfe, None; D. J. Harrison, Amgen, 1, Amgen, 3; G. Joseph, Amgen Inc., 1, Amgen Inc., 3; D. H. Collier, Amgen Inc., 1, Amgen Inc., 3; D. van der Heijde, Abbott, Amgen, AstraZeneca, BMS, Centocor, Chugai, Eli-Lilly, GSK, Merck, Novartis, Otsuka, Pfizer Inc., Roche, Sanofi-Aventis, Schering-Plough, UC B, Wyeth, 5; Imaging Rheumatology, 4; R. Landewe, Rheumatology Consultancy BV, 4; Abbott, Amgen, AstraZeneca, BMS, Centocor, GSK, Merck, Novartis, Pfizer, Roche, Schering-Plough, UC B, Wyeth, 5; K. Michaël, None.

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Real-World Effectiveness of Infliximab in Improving Routine Assessment of Patient Index Data 3 Outcomes: The Canadian Experience, Andrew Chow1, Majed M. Khraishi2, Jude F. Rodrigues3, Susan M. Otawa4 and Hayssam Khalil5. 1Credit Valley Rheumatology, Mississauga, ON, 2Memorial University of Newfoundland, St Johns, NF, 3Windsor, ON, 4Janssen Canada Inc, Mississauga, ON, 5Janssen Canada Inc, Toronto, ON

Background/Purpose: The routine assessment of patient index data 3 (RAPID3) was recently designed as a pooled index of 3 patient-reported outcomes (PROs): physical function, pain and patient global estimate. Compared to other simplified disease activity scores RAPID3 may be more desirable in a clinical setting due to the shorter scoring time required. The study objective was to assess in a Canadian real-world setting the RAPID3 outcomes in rheumatoid arthritis (RA) patients treated with infliximab (IFX).

Methods: BioTRAC is an ongoing Canadian registry of RA, AS or PsA patients initiating treatment with IFX or golimumab (GOL) as first biologics or after having been treated with a biologic < 6 months. A total of 806 RA patients initiated IFX between 2002 and 2012 and were included in this analysis. RAPID3 was assessed both in continuous and categorical scales defining high activity (>12), moderate activity (6.1–12), low activity (3.1–6), and remission (≤3).

Results: Mean (SD) age of the patient cohort was 55.3 (13.5) yrs, and mean (SD) duration since diagnosis was 8.9 (9.3) yrs. Mean (SD) patient characteristics at baseline were: ESR = 32.5 (24.2) mm/hr; CRP = 19.0 (24.0) mg/L; SJC-28 = 10.8 (7.0); TJC-28 = 12.7 (8.0); HAQ-DI = 1.7 (0.7); DAS28-CRP = 5.4 (1.3); Pain-VAS = 5.8 (2.4); PGA-VAS = 6.6 (2.1); SGA-VAS = 6.1 (2.4) and CDAI = 36.4 (16.2). By 6 months of treatment, clinically meaningful and statistically significant (P<0.05) improvements were observed in all parameters which were sustained over 24 months. Similarly, the mean (SD) RAPID3 score significantly decreased from 17.3 (6.2) at baseline to 11.4 (6.9), 10.5 (7.0), and 9.3 (6.9) at 6, 12, and 24 months, respectively. Figure 1 shows the RAPID3 disease categories over time upon IFX treatment. The proportion of patients with high disease activity decreased from 80.6% at baseline to 34.2% at month 24. Furthermore, the proportion of patients with low activity or remission increased from 6.0% at baseline to 41.6% at month 24.

Figure 1. RAPID3 Disease Activity Categories Over Time

The positive correlation over time between DAS28-CRP and RAPID3 (rho=0.748; P<0.001) and between SDAI and RAPID3 (rho=0.743; P<0.001) further confirms the validity of the RAPID3 as disease activity score in real-life RA patients.

Figure 2. Correlation between RAPID3 and DAS28-CRP Over Time

Conclusion: The results of this Canadian real-world observational study demonstrate that, over 2 yrs of treatment, IFX is effective in reducing symptom severity and improving patient-reported outcomes in RA patients. Furthermore, the data from this registry confirmed the validity of the RAPID3 as disease activity measure in a real-world RA cohort.

Disclosure: A. Chow, None; M. M. Khraishi, None; J. F. Rodrigues, None; S. M. Otawa, Janssen Canada Inc, 3; H. Khalil, Janssen Canada Inc, 3.
**Golimumab Drug Utilization Patterns in Canada – Higher Retention Rate in Golimumab Treated Rheumatoid Arthritis Patients Compared to Etanercept and Adalimumab.** Haysam Khalil1 and Amir Tahami1.
1Janssen Canada Inc, Toronto, ON, 2Janssen Canada Inc., Toronto, ON

**Background/Purpose:** Golimumab is a monthly self-injected anti-tumor necrosis factor alpha therapy for patients with rheumatoid arthritis (RA), ankylosing spondylitis (AS), and psoriatic arthritis (PsA). It was approved by Health Canada in April 2009 and is the first Canadian report of golimumab’s utilization in a real-world setting. The purpose of this project was to assess the utilization patterns of rheumatoid arthritis patients who received golimumab (GLM), etanercept (ETA) or adalimumab (ADA) in a large private drug plans database.

**Methods:** RA patients initiating therapy with GLM, ETA or ADA between January 1, 2009 and June 30, 2010 were selected from the IMS Brogan Canadian private drug plans database. Patients were included if they had ≥3 claims for GLM, ETA or ADA and were naïve to biologics prior to initiation of treatment. The 6-month period preceding the first GLM, ETA or ADA claim (index date) for each patient was used as a baseline to ensure that the patient were naïve to biologics. Patients were tracked for a maximum of 12 months after their index date to assess dosing patterns. The average dose had ‘3 claims for GLM, ETA or ADA and were naïve to biologics prior to initiation. The 6-month period preceding the first GLM, ETA or ADA claim (index date) for each patient was used as a baseline to ensure that the patient were naïve to biologics. Patients were tracked for a maximum of 12 months after their index date to assess dosing patterns. The average dose had ‘3 claims for GLM, ETA or ADA and were naïve to biologics prior to initiation.

**Results:** A total of 146, 1436 and 1171 RA patients receiving at least three prescriptions of GLM, ETA or ADA respectively were identified. Within the period of analysis, patients treated with ETA had a numerically higher discontinuation rate (44%) followed by ADA patients (41%) whereas patients treated with GLM had the lowest discontinuation rate (34%). The average dose of GLM, ETA or ADA were respectively 51.6 mg/month, 46.7 mg/week and 42 mg/q2weeks in accordance with their respective label in Canada for RA.

**Figure 1.** Treatment discontinuation rate within a period of 12 month following initiation (Bionaïve at initiation)

**Conclusion:** Results of these descriptive claims analyses show that in a real-world setting, the use of golimumab in RA patient’s naïve to biologics is in accordance with the approved dose of 50 mg/month and that a numerically higher drug survival rate is observed for GLM (76%) compared to ETA and ADA 1 year after initiation of treatment. This is the first time that drug utilization patterns of GLM in comparison to ETA and ADA is reported in a real-world setting. Further research is needed to compare the relationship between drug utilization patterns on healthcare resource utilization and outcomes.

**Disclosure:** H. Khalil, Janssen Canada Inc, 3; A. Tahami, Janssen Canada Inc., 3.

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**LIGHT (TNFSF14), Cathepsin-K, DKK-1 and Sclerostin in Rheumatoid Arthritis Patients: Effect of ANTI TNF-α Treatment in the WNT/β-Catenin Network Signaling.** Alberto Cauli, Grazia Desole, Giovanni Porru, Matteo Piga, Alessandra Vaccia, Valentina Ibbia, Pietro Garau and Alessandro Mathieu. University of Cagliari, Cagliari, Italy

**Background/Purpose:** We previously reported increased expression of cell membrane RANKL in PBMC of patients with active rheumatoid arthritis (RA) which was down-regulated by anti TNF-α treatment with adalimumab, while soluble RANKL and OPG were scarcely affected. We speculated that anti TNF-α induced down-regulation of membrane RANKL could be important in preventing articular damage in RA patients. Joint damage may also be mediated by the balance of other mediators involved in osteoclast functions such as LIGHT (TNFSF14) and cathepsin-K, while osteoblast functions are influenced by DKK-1 and sclerostin, although the biological role is still controversial. The aim of this study was to investigate the impact of anti TNF-α treatment on the major soluble mediators involved in bone homeostasis in RA patients.

**Methods:** The effects of anti TNF-α therapy on bone homeostasis was studied in 15 active RA patients (DAS28 5.9 ± 0.9) and compared with 20 healthy controls (HC); data were collected at baseline, after 6, 12 and 24 weeks. Adalimumab 40 mg (ADA) was administered every other week according to guidelines, all patients experienced a satisfactory clinical response according to EULAR criteria. The serum levels of DKK-1, Sclerostin, Cathepsin-K were measured by enzyme-linked immunosorbent assay (ELISA), all purchased from Biomedica (Vienna, Austria); LIGHT protein was detected with Quantikine ELISA (R&D System, Europe, UK). Values are presented as the median and interquartile range. Serum levels at different times after treatments were compared with those before therapy and HC. The significance of the results was analysed using the non parametric Mann-Whitney U-test or Wilcoxon, as appropriate, using Prism 5.0 software (GraphPadInc). P values less than 0.05 were considered significant.

**Results:** Cathepsin-K levels were found to be higher in active RA patients (12.7 IQR 11.3–15.3) compared to HC (9.1 IQR 14.5–13.4 pmol/mL; p = 0.019) and after ADA at W6 (15.5 IQR 12.5–26.8; p = 0.001), W12 (16.4 IQR 12.1–20.5; p = 0.003), W24 (15.0 IQR 12.9–16.0; p = 0.003). LIGHT levels were also consistently higher in the active RA group (96.6 IQR 65.3–179.2) compared with HC (66.0 IQR 42.6–112.0; p = 0.03) and after ADA (W6 101.6 IQR 88.7–203.1; p = 0.03), W12 (150.4 IQR 88.8–192.2; p = 0.003) and W24 (138.9 IQR 66–228.4; p = 0.015). Sclerostin levels were higher in the untreated RA group (31.5 IQR 26.3–48.7 pmol/L) compared to HC (24.5 IQR 18.7–29.6; p = 0.007). It is noteworthy that long term adalimumab treatment induced a significant reduction in sclerostin levels at W24 (19.30 IQR 14.6–29.79; p = 0.002); conversely, no significant differences in DKK-1 levels were observed in active RA (21.1 IQR 7.8–57.0 pmol/L) compared to HC (19.0 IQR 11–27) and following ADA, W6 (19.5 IQR 6.7–9.59), W12 (20.1 IQR 6.2–7.57), W24 (11.1 IQR 5.2–54.6).

**Conclusion:** The decreased levels of sclerostin following anti TNF-α treatment may reduce the inhibition of the WNT/β-catenin pathway leading to increased osteoblast activity which may balance the increased osteoclast function in RA patients (as mirrored by the persistent increase in cathepsin-K and LIGHT) and therefore contributing to the inhibition of joint damage seen in patients treated with anti-TNF-α drugs.

**Disclosure:** A. Cauli, None; G. Dessole, None; G. Porru, None; M. Piga, None; A. Vacca, None; V. Ibbia, None; P. Garau, None; A. Mathieu, None.

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**What Is the Right Dose to Start Methotrexate (7.5 or 15mg) in Rheumatoid Arthritis? (A Randomized Controlled Trial).** Varn Dhir, Mandep Singh, Palvi Goyal, Vinay Sagar, Aman Sharma and Shefali K. Sharma. Post Graduate Institute of Medical Education and Research, Chandigarh, India

**Background/Purpose:** Recent recommendations have suggested higher starting doses of methotrexate, i.e. 15 mg/week (3E initiative) in rheumatoid arthritis. However, studies comparing conventional (7.5mg) and newer (15mg) starting dose are limited. Unclear if any difference in control of disease activity or adverse effects with these starting doses.

**Methods:** This randomized controlled trial included 100 rheumatoid arthritis patients (fulfilling 1987 ACR), having active disease (‘Disease activity score 28 joints 3 variables’ DAS28-3v=5.1) and not on methotrexate 3 months. Using random number tables, patients were allocated (concealed by envelopes) to two groups—starting methotrexate at 7.5mg or 15mg/week. Methotrexate escalated by 2.5 mg every 2 weeks; similar folic acid dose (10 mg/week). Patients assessed 4 weekly (blinded assessor) for disease activity (DAS28-3v). In addition, minor adverse effects (symptoms like nausea etc) determined using a performa and major adverse effects determined using blood tests (cytopenias- WBC<4000, Platelet<110 or transaminitis- ALT or AST>80) or CXR (PA) if required. Analysis by intention to treat; difference in disease activity, adverse effects compared using students t and chi-square test respectively (or Fishers exact). (Trial Reg# NCT01404429)

**Results:** Patients in the two groups—7.5 mg and 15 mg had similar age (44.5±10.3, 42.8±11.2 yrs, p = 0.4), gender (F:M=36:11, 42:11, p = 0.4).
disease duration (4.8±4.8, 4.7±4.5 yrs, 0.9), disease activity (DAS28-3v=6.2±0.7, 6.2±0.8, p=0.9) and HAQ (1.3,1.3,p=0.9). In the 7.5 and 15 mg groups, 38 and 46 patients completed study, reaching final methotrexate dose of 19.3±1.8 mg and 24.3±2.0 mg per week respectively. Significant reduction in disease activity in both groups at 12 weeks (p<0.001), however, there was no intergroup difference at 4, 8 or 12 weeks (Figure 1), nor in HAQ at 12 weeks (1.1,0.9,p=0.4). No difference in 7.5 and 15mg groups in episodes of cytopenias (1.2, p=0.9) or transaminitis (6,7, p=0.8) or pneumonitis (0.0). However, minor adverse effects lower in 7.5mg compared to 15mg group (Relative Risk=0.58, 95% CI:0.36–0.95). Common were nausea (more in 15mg), loss of appetite, fatigue and uneasiness (Table 1).

Table 1. Frequency of minor adverse effects (symptoms) in the two groups

<table>
<thead>
<tr>
<th>Minor adverse effect (Symptom)</th>
<th>7.5 mg group</th>
<th>15 mg group</th>
<th>P value</th>
<th>Relative Risk 7.5 versus 15 mg (95% confidence intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any</td>
<td>31.9</td>
<td>54.7</td>
<td>0.02*</td>
<td>0.58 (0.36–0.95)</td>
</tr>
<tr>
<td>Nausea</td>
<td>19.2</td>
<td>39.6</td>
<td>0.02*</td>
<td>0.48(0.25, 0.94)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>6.4</td>
<td>13.2</td>
<td>0.43</td>
<td>0.48(0.13, 1.76)</td>
</tr>
<tr>
<td>Loss of appetite</td>
<td>12.8</td>
<td>11.3</td>
<td>0.80</td>
<td>1.13(0.39, 3.26)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>0.0</td>
<td>5.7</td>
<td>0.29</td>
<td>0.18 (0.01, 3.62)</td>
</tr>
<tr>
<td>Uneasiness or dizziness</td>
<td>17.0</td>
<td>13.2</td>
<td>0.59</td>
<td>1.29 (0.51, 3.28)</td>
</tr>
</tbody>
</table>

*statistically significant

Figure 1. Disease activity in the two groups at 4 weekly visits.

Conclusion: Starting treatment with either 7.5 mg or 15 mg per week of methotrexate followed by similar fast escalation (5mg/month) is equivalent in control of disease activity at 12 weeks. Although, no difference in transaminitis or cytopenia, higher minor adverse effects, especially nausea in 15mg group.

Disclosure: V. Dhir, None; M. Singla, None; P. Goyal, None; V. Sagar, None; A. Sharma, None; S. K. Sharma, None.

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Comparison of Tolerability Between Tumor Necrosis Factor-Inhibitors and Tocilizumab for the Treatment of Rheumatoid Arthritis. Yoshihiro Hishitani, Yoshiihiro Shima, Toru Hirano, Keisuke Hagihara, Kosuke Ebina, Yasuo Kumugiza, Kenrin Shi, Masashi Narazaki, Atsushi Ogata, Tetuya Tomita, Toshio Tanaka and Atsushi Kumanogoh. Osaka University Graduate School of Medicine, Suita, Japan

Background/Purpose: Some patients with rheumatoid arthritis (RA) receiving tumor necrosis factor-inhibitors (TNF-Is) show inadequate response to TNF-Is. But it has not been clarified what is better as the second biological agents by clinical trials, so observational study is necessary. We conducted a retrospective cohort study, especially focused on the difference of the drug retention rates between bio-naïve patients and switching patients.

Methods: We retrospectively reviewed the medical records of patients with RA, who were administered biologics (tocilizumab (TCZ) or TNF-Is (infliximab, etanercept, adalimumab, and golimumab)) in our institute from September 1999 to April 2012, and analyzed the retention rates and causes of the discontinuation of the biologics. Kaplan-Meier estimate and log-rank test were used to analyze the differences of the drug continuation rates between bio-naïve patients and switching patients.

Results: TCZ was administered to 97 bio-naïve patients and 53 switching patients. TNF-Is were administered to 318 bio-naïve patients and 89 switching patients. Median (range) administration duration of TCZ was 2.54 years (0.08–12.6) for bio-naïve patients and 1.78 years (0.08–3.87) for switching patients, respectively. And that of TNF-Is was 1.87 years (0–11.3) for bio-naïve patients and 0.94 years (0–5.95) for switching patients, respectively. Kaplan-Meier Curves of the time to discontinuation due to unfavorable causes were shown (Figure 1, 2). Regarding TCZ, there was no significant difference of the drug retention rates between bio-naïve patients and switching patients (p = 0.9561), while regarding TNF-Is, there was a significant difference (p = 0.0037). To clarify the reason for this difference between TCZ and TNF-Is, we conducted Kaplan-Meier estimate for cause-specific rates of discontinuation. About TCZ, the cumulative occurrence of discontinuation due to lack or loss of efficacy and adverse events were not statistically different between bio-naïve patients and switching patients (p = 0.1376, p = 0.3683, respectively). But about TNF-Is, discontinuation due to lack or loss of efficacy was significantly more in switching patients than in bio-naïve patients (p < 0.0001), while cumulative discontinuation due to adverse events was not statistically different (p=0.8334).
Conclusion: TCZ showed high tolerability in both bio-naive patients and switching patients, while TNF-Is showed significantly lower tolerability in switching patients than in bio-naive patients. This high retention rate of TCZ for switching patients was considered to be due to durability of its efficacy.

Disclosure: Y. Hishitani, None; Y. Shima, None; T. Hirano, None; K. Hagihara, None; K. Ebina, None; Y. Kunugiza, None; K. Shi, None; M. Narazaki, None; A. Ogata, Chugai, 5; T. Tomita, None; T. Tanaka, None; A. Kumanogoh, None.

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TNF Inhibitor Treatment in Rheumatoid Arthritis (RA) Patients with Moderate Versus High Disease Activity At Baseline: A Comparison of Utility Gains, Response and Remission Rates. Elisabeth Lie, Sir Lillegraven, Karen M. Fagerli, Till Uhlig and Tore K. Kvien. Diakonhjemmet Hospital, Oslo, Norway

Background/Purpose: Randomized clinical trials in RA have until recently focused on patients (pts) with high disease activity, but the majority of pts in the clinic have moderate disease activity. A specified threshold of disease activity for institution of TNF inhibitors (TNFi) has not been mandatory in Norwegian health care, thus pts with low or moderate disease activity have gained access to these therapies. Our objective was to assess what proportion of pts starting TNF therapy had moderate disease activity at baseline, and to compare the outcomes in these pts to those with high disease activity.

Methods: Data for this study were provided by NOR-DMARD – a Norwegian multicentre, longitudinal observational study of consecutive pts with arthritis starting new DMARD regimens. The current analyses included biologics naïve pts with moderate (DAS28 3.2–5.1) or high (DAS28 >5.1) baseline disease activity who started treatment with TNFi + methotrexate (MTX). Baseline characteristics, utility gains (SF-6D- and EQ-5D), ACR responses as well as remission rates at 3 and 6 months were compared by Chi² test, two-samples t test and Mann-Whitney U test as appropriate. 2-yr drug survival was compared by Kaplan-Meier analysis with log-rank test.

Results: The study included 296 pts with moderate (DAS28 3.2–5.1) and 347 pts with high (DAS28 >5.1) disease activity. 73 pts with DAS28 =3.2 at baseline were excluded. Mean(SD) DAS28 were 4.30(0.49) vs. 6.18(0.76), respectively. Overall, 73% were female, mean/median disease duration was 9.2/5.4 years, 75% were rheumatoid factor positive and 30% current smokers (no significant differences between the groups). The pts with moderate disease activity were significantly younger (mean 52 vs. 54 years, p=0.03) and had better baseline scores for 28-SJC, 28-TJC, patient and physician global, CRP, ESR, pain VAS and fatigue VAS (all p<0.001). Further, mean(SD) MHAQ scores were 0.57(0.81) vs. 0.97(0.52), SF-6D 0.62(0.11) vs. 0.54(0.11), and EQ-SD 0.56(0.28) vs. 0.32(0.31) in the moderate vs. high disease activity group (all p<0.001). Three- and 6-month utility gains were significantly larger in the high disease activity group while there were no statistically significant differences in ACR responses (table). As expected, remission rates were significantly higher in the moderate disease activity group (table). 2-yr drug survival was similar in the 2 groups (estimated 57% vs. 56%, p=0.42) and reasons for discontinuation were also similar.

Conclusion: Of biologics naïve pts starting TNFi + MTX, 52% had a baseline DAS28 <5.1. Pts with moderate disease activity when starting their first TNFi achieved higher remission rates but lower utility gains than pts with high disease activity, while ACR responses and drug survival were similar. Such comparisons can provide information for cost-effectiveness analyses which are increasingly important and necessary to guide decision making in this field.

Disclosure: E. Lie, Roche Pharmaceuticals, 5, Pfizer Inc, 8; S. Lillegraven, None; K. M. Fagerli, Abbott Immunology Pharmaceuticals, 8, Pfizer Inc, 8, Merck Pharmaceuticals, 8, Roche Pharmaceuticals, 8; T. Uhlig, Bristol-Myers Squibb, 5, Pfizer Inc, 5, Merck Pharmaceuticals, 5, UCB, 5, Roche Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 5; T. K. Kvien, Abbott Immunology Pharmaceuticals, 8, AstraZeneca, 5, Merck Pharmaceuticals, 8, NiCox, S.A., 8, Pfizer Inc, 8, Merck Pharmaceuticals, 8, UCB, 8, BMS, 5, Abbott Immunology Pharmaceuticals, 5, Merck Pharmaceuticals, 5, NiCox, S.A., 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5, UCB, 5.

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Safety and Efficacy of Rituximab in Patients with Rheumatoid Arthritis and Lung Involvement. Elena Becerra, Geraldine Cambridge and Maria J. Leandro. University College London, London, United Kingdom

Background/Purpose: Lung involvement is common in patients with Rheumatoid Arthritis (RA), including interstitial lung disease (ILD), pleural disease and small airway disease. There are no full reports in the literature analyzing the influence of Rituximab (RTX) in patients with RA with pre-existing lung disease, although it is a rising question in daily clinical practice. We aim to evaluate the safety and efficacy of RTX in our cohort of RA patients with pre-existing lung involvement.

Methods: Retrospective observational study of the RA cohort treated with RTX at University College Hospital, identifying patients treated with RTX with any lung involvement. Data were collected on type of lung disease, mortality, respiratory infections and stabilization/progression of symptoms.

Results: 264 patients with RA have received RTX in our unit between 1998 and 2012. A total of 38 patients (14%) had lung involvement, 24 of them (63%) were female, mean age was 64 years (range 37–79), mean disease duration was 19 years (range 3–42), mean number of RTX cycles was 4 (range 1–10), total follow up duration was 146.7 patient years (median 2.5 years, range 0.5–13.5). 19 of them (50%) had ILD: 3 usual interstitial pneumonitis (UIP), 5 nonspecific interstitial pneumonitis (NSIP, 2 of those had an overlap antisynthetase syndrome), 4 organizing pneumonia (OP) and 7 undetermined ILD. 15 patients (40%) had bronchiectasis. The remaining 4 patients had diagnosis of chronic obstructive pulmonary disease (COPD), small airway disease, pleural effusion requiring decortication and pleural plaques. 6 of the above patients had concomitant COPD.

Lung disease has remained clinically and radiologically stable in most patients. One patient with severe UIP before RTX showed slow lung progression over 4 years of follow up, and Mycophenolate mofetil is being considered. The 2 patients with antisynthetase syndrome have stable NSIP but on combination therapy (1 azathioprine, 1 mycophenolate mofetil). 25 patients (66%) reported respiratory infections but in only 6 of these patients was an increased frequency of infections after starting rituximab treatment noted. 2 of these 6 patients had low serum immunoglobulins (1 IgG only, 1 IgG and IgM). 2 patients had serious infections requiring hospitalization.

There were 2 deaths, both in patients with bronchiectasis and multiple comorbidities, none directly related to rituximab treatment.

Conclusion: RTX seems to be a relatively safe therapy in the cohort of RA patients with lung involvement. There is no definite evidence for improvement in lung involvement in RA patients treated with rituximab, but nor there is data suggesting that RTX can lead to a progression of lung symptoms. Only one patient with severe UIP before RTX showed lung progression after 4 years of follow up.

Disclosure: E. Becerra, None; G. Cambridge, None; M. J. Leandro, Roche and Changai, 5.
Safety Update On Certolizumab Pegol in Patients with Active Rheumatoid Arthritis with Long Term Exposure. Xavier Mariette, RF. van Vollenhoven, Vivian P. Bykerk, Marc de Longueville, Catherine Arendt, Kristel Luijtens and John J. Cush. 1Université Paris-Sud, Le Kremlin Bicêtre, France, 2The Karolinska Institute, Stockholm, Sweden, 3Hospital for Special Surgery, New York, NY, 4UCB Pharma, Brussels, Belgium, 5UCB, Brussels, Belgium, 6Baylor Research Institute, Dallas, TX

Background/Purpose: The safety of certolizumab pegol (CZP) in rheumatoid arthritis (RA) has been reported in previous pooled analyses of clinical trials. An update of long-term safety data of CZP in RA with a cut-off date of 30 Nov 2011 is provided.

Methods: The pooled analysis included 10 completed randomized controlled trials (RCTs) of CZP in RA and their open-label extensions (OLEs). Pooling was done across all doses. Some patients (pts) received CZP 400 mg Q2W (twice the registered dose) as per protocol. Adverse events were defined as those occurring after first dose and within a maximum of 84 days of last dose. Serious adverse events (SAEs) were defined conservatively by the regulatory definition with the addition of opportunistic infections (OIs), malignancies and medical events important to the investigator. Serious infectious events (SIEs) were defined according to the regulatory definition with addition of the need for IV antibiotics. Search terms for OIs were defined by 6 external experts and validated by the steering committee (JC, VB, RVV and XM). All cases of death, SIEs (including OIs) and malignancies were manually reviewed by external experts, classified according to pre-defined standard procedures and validated by the study authors. Deaths were categorized as primarily associated with cardiovascular (CV), infectious, malignant or other causes; malignancies were classified as non-melanoma skin cancer (NMSC), solid tumors or lymphoma. Incidence rates (IR) and event rates (ER) per 100 pt-years (PY) are presented.

Results: By 30 Nov 2011, 4049 RA pts had received CZP in all studies (RCTs and OLEs) for a total of 9277 PY. Mean exposure to CZP in all studies was 2.1 years (min 0.04, max 7.6); median exposure was 0.7 years. SIEs were the most common SAEs. In total, 43 tuberculosis (TB) infections occurred in 43 pts, of which 39 occurred in Central and Eastern Europe (CEE). 58 deaths occurred in CZP pts (IR: 0.63/100 PY) as a result of causes; malignancies were classified as non-melanoma skin cancer (NMSC), solid tumors or lymphoma. Incidence rates (IR) and event rates (ER) per 100 pt-years (PY) are presented.

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Conclusion: No new safety signals associated with CZP have emerged in this updated long-term safety analysis. While SIE rates were higher for CZP than for PBO in the RCTs, they did not increase with continued exposure to CZP. Due to the shorter duration of PBO treatment compared with CZP, comparisons between the CZP and PBO groups should be interpreted cautiously. TB incidence may be explained by high recruitment in CEE prior to 2007. The rates of malignancies and serious infections are in line with CZP data reported in the product label and anti-TNF registry data.2,3

References

Disclosure: X. Mariette, UCB Pharma, 5; R. van Vollenhoven, UCB Pharma, 5; V. P. Bykerk, UCB Pharma, 5; M. de Longueville, UCB, 3; C. Arendt, UCB Pharma, 3; K. Luijtens, UCB Pharma, 3; J. J. Cush, UCB Pharma, 5.

ACR Poster Session A
Sjögren’s Syndrome - Pathogenesis
Sunday, November 11, 2012, 9:00 AM–6:00 PM

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Pathogenic Autoantibodies to the Anti-Muscarinic Type 3 Receptor Act by Competitive Inhibition of Acetylcholine-Mediated Receptor Signalling in Sjögren’s Syndrome. Michael W. Jackson1, Isabell Bastian1 and Thomas P. Gordon. 2Flinders University, Adelaide, Australia, 3Flinders University and Flinders Medical Centre, Adelaide, Australia, 4Flinders Medical Centre, Bedford Park, Australia

Background/Purpose: Primary Sjögren’s syndrome (SS) is a systemic autoimmune disorder characterized by exocrine failure and widespread autonomic dysfunction. Functional autoantibodies (Abs) directed against the muscarinic type 3 receptor (M3R) have been postulated to underpin gastrointestinal, bladder and cardiac dysfunction in SS, and we have recently demonstrated that SS IgG acts specifically at the M3R to disrupt cholinergic neurotransmission and motility in murine gastrointestinal tissues. To date, the mechanism by which anti-M3R Abs exert an effect on receptor signalling has remained difficult to determine, due to a lack of suitable functional assays. In the current study, we use a novel, real-time cell bioassay of M3R signalling to explore the physiological mechanism by which anti-M3R Abs inhibit M3R activity.

Methods: HEK293 cells (2 × 10^5) were transiently transfected in 96 well culture plates for 24 hours with DNA encoding the human M3R, and with the pGL4.33 vector (Promega) containing a luciferase gene driven by the serum response element promoter. Cells were then incubated for 4 hours in the presence of the cholinergic agonist, carbachol, (0.3 to 300 µM) and patient IgG (4 mg/ml) characterised as positive (M3R+; n = 4) or negative (M3R-; n = 2) for inhibitory anti-M3R activity, as determined by in vitro bladder strip assays. IgG from healthy donors (n = 6) was used as controls. Luciferase gene activity was determined on a DTX 880 MultiMode Detector (Beckman Coulter).

Results: All M3R+ IgGs, but not control or M3R- IgG, significantly inhibited carbachol-induced luciferase activity at carbachol concentrations ranging from 0.3 to 30 µM, with a maximum inhibition of approximately 40%. In contrast, inhibition of luciferase activity by anti-M3R Abs was lost at carbachol concentrations of 100 and 300 µM, consistent with competitive antagonist activity by the Abs at the carbachol-binding site. Anti-M3R Abs had no effect on luciferase activity in M3R-expressing cells in the absence of carbachol.

Conclusion: We have used a real-time cell-based bioassay incorporating a luciferase reporter to characterise inhibitory anti-M3R antibodies in IgG from patients with SS. The bioassay allows a functional measure of receptor signalling activity, thereby facilitating investigation of the mechanism by which patient Abs alter M3R activity. We found that Abs inhibition of carbachol-mediated M3R activity was reversible at high agonist concentrations, consistent with competitive displacement of agonist at the carbachol-binding site. These findings contrast previous studies suggesting non-competitive interactions between anti-M3R Abs and receptor agonists, and confirm the carbachol binding site as the target of the functional anti-M3R Abs in SS. The ability of the assay to detect anti-M3R Abs compare favourably with whole-tissue in vitro assays, thereby combining the sensitivity of ex-vivo tissues with the convenience of a 96-well assay format. The bioassay should facilitate both detailed pharmacological characterization of the mechanism of antibody action at the M3R, and the studies required to establish the role of anti-M3R antibodies in the autonomic dysfunction associated with SS.

Disclosure: M. W. Jackson, None; I. Bastian, None; T. P. Gordon, None.

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Conclusion: No new safety signals associated with CZP have emerged in this updated long-term safety analysis. While SIE rates were higher for CZP than for PBO in the RCTs, they did not increase with continued exposure to CZP. Due to the shorter duration of PBO treatment compared with CZP, comparisons between the CZP and PBO groups should be interpreted cautiously. TB incidence may be explained by high recruitment in CEE prior to 2007. The rates of malignancies and serious infections are in line with CZP data reported in the product label and anti-TNF registry data.2,3

References

Disclosure: X. Mariette, UCB Pharma, 5; R. van Vollenhoven, UCB Pharma, 5; V. P. Bykerk, UCB Pharma, 5; M. de Longueville, UCB, 3; C. Arendt, UCB Pharma, 3; K. Luijtens, UCB Pharma, 3; J. J. Cush, UCB Pharma, 5.
Characterization of an in Vitro Model of Human Salivary Gland for Studying Sjögren Syndrome (SS). M. Jesus Domínguez-Luis1, M. Teresa Arce-Franco2, Estefanía Armas-González3, Ada Herrera-García1, Teresa Giraldéz2, Pablo Miranda3, Diego Alvarez de la Rosa1, Jose García-Verdugo4, Carlos Martínez-Jimeno5 and Federico Díaz-González1. 1Rheumatology Service, Hospital Universitario de Canarias, La Laguna, Spain, 2Unidad de Investigación de Hospital Universitario Nuestra Señora de Candelaria, Santa Cruz de Tenerife, Spain, 3Department of Physiology, Universidad de La Laguna, La Laguna, Spain, 4Cellular Morphology Laboratory, Centro de Investigación Príncipe Felipe., Valencia, Spain, 5Maxillofacial Department, Hospital Universitario de Canarias, La Laguna, Spain

Background/Purpose: Sjögren’s syndrome (SS) is an autoimmune exocrinopathy of unknown etiology that is characterized by decreased salivary secretion (xerostomia) and lacrimal (xerophthalmia). Histopathological lesions of the glandular tissue in SS are characterized by the presence of mononuclear cells infiltrates and acinar atrophy. Studies on the pattern of inflammatory mediators have shown high amounts of IL-2, IFN-γ, IL-10, IL-1β, IL-6, SDF-1α and TNF-α. However, little is known about the implication of this cytokine profile in SS pathogenesis.

Objectives: 1) to establish and characterize a model of human salivary gland in vitro, and 2) analyze if this model functional effect of proinflammatory mediators present in the glandular microenvironment of SS patients.

Methods: human epithelial cells from biopsies of non-cancerous parotid gland, were enzymatically dispersed, cultured and expanded in medium MCDI153 supplemented with insulin, hydrocortisone and epidermal growth factor. Proliferation assays were performed using a cell proliferation kit. The expression of amylose, VAMP-2, SMA and epithelial sodium channels (ENaC), were studied by immunofluorescence in confocal microscopy. The gene expression of the mineralocorticoid receptor, sodium channels (α, β, γ) and a number of genes characteristic of ducts or acini were analyzed by real-time RT-PCR. For the functional study of sodium channels in the plasma membrane were determined by patch clamp assays. Amylose activity in cell-free supernatant was assayed by a fibril-degradation assay and was used as a surrogate marker of exocrine gland function.

Results: Cells from human salivary gland had morphology of epithelial cells and were able to proliferate in culture. The pattern of gene expression of these cells was more compatible with an acinar rather than ductal origin. Furthermore, the functional of epithelial sodium channel in their surface was analyzed by patch clamp experiments. The presence of 10μM isoproterenol and 2 mM Ca2+ for 24 hours increased three times the basal activity of amylose in the cell-free supernatant of these cells. Moreover, the presence of TNF-α and SDF-1α caused a significant dose-response reduction in the amylose activity in the cell-free supernatant.

Conclusion: It is possible to set up a functional model of human salivary gland in vitro that allows the development of studies which could lead to better understanding of the pathogenesis of SS and may help to develop therapeutic interventions for this disease.

Disclosure: A. Callo, None; M. Tandon, None; S. L. Jung, None; H. L. Ong, None; I. Amdubak, None; G. G. Illebi, None; I. Alevizos, None.

Expression of Micrornas (miRNAs) Predicted to Target Ro/SSA and La/SSB Autoantigens in Sjögren’s Syndrome (SS). Vasiliki C. Gourzi1, Eftathia K. Kapsogeorgou1, Nikolaos C. Kyriakiidis1, Meneleos N. Manousakis1, Haralampus M. Moutsopoulous1 and Athanasios G. Tzioufas2. 1School of Medicine, National University of Athens, Athens, Greece, 2School of Medicine, University of Athens, Athens, Greece, 3School of Medicine, National University of Athens, Athens, Greece

Background/Purpose: microRNAs (miRNAs) are key post-translational regulators of gene expression and might be implicated in the over-expression of Ro/SSA and La/SSB autoantigens in the salivary gland (SG) tissues and epithelial cells (SGEC) of SS patients. We have previously identified 11 miRNAs (let-7b, miR-16, miR-129-5p, miR-153, miR-181a, miR-200b, miR-200b*, miR-223, miR-483-5p, miR-573, miR-583) that are transcriptional regulators of gene expression and might be implicated in the loss of translocation of NFAT, a transcriptional factor that drives the transcription of several genes, but most interestingly AQPS. The objective of this work is to establish if ebv-miR-BART13 leads to the decreased level of AQPS not only trough the Calcium-NFAT pathway but also by directly binding the 3'UTR of the AQPS mRNA.

Methods: We checked the AQPS messenger by Real-time PCR in a primary salivary epithelial cells line. To investigate if the viral microRNA can silence the 3'UTR of the target gene we transfected HSG cells and a primary salivary epithelial cells line derived by human minor salivary gland biopsy with a luciferase plasmid containing the AQPS 3'UTR fused with the luciferase firefly coding sequence and ebv-miR-BART13.

Results: We first checked if the mRNA level of the endogenous AQPS is affected by the presence of ebv-miR-BART13. For this, we used as system primary salivary epithelial cells because they maintain their acinar phenotype thus expressing AQPS mRNA level, compared to established salivary cell lines such as HSG cells. After 48 hour of transfection with ebv-miR-BART13, the AQPS mRNA was decreased (fold change) by the presence of this viral miRNA.

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Disclosure: A. Gallo, None; M. Tandon, None; S. L. Jung, None; H. L. Ong, None; I. Amdubak, None; G. G. Illebi, None; I. Alevizos, None.

Expression of Micrornas (miRNAs) Predicted to Target Ro/SSA and La/SSB Autoantigens in Sjögren’s Syndrome (SS). Vasiliki C. Gourzi1, Eftathia K. Kapsogeorgou1, Nikolaos C. Kyriakiidis1, Meneleos N. Manousakis1, Haralampus M. Moutsopoulous1 and Athanasios G. Tzioufas2. 1School of Medicine, National University of Athens, Athens, Greece, 2School of Medicine, University of Athens, Athens, Greece, 3School of Medicine, National University of Athens, Athens, Greece

Background/Purpose: microRNAs (miRNAs) are key post-translational regulators of gene expression and might be implicated in the over-expression of Ro/SSA and La/SSB autoantigens in the salivary gland (SG) tissues and epithelial cells (SGEC) of SS patients. We have previously identified 11 miRNAs (let-7b, miR-16, miR-129-5p, miR-153, miR-181a, miR-200b, miR-200b*, miR-223, miR-483-5p, miR-573, miR-583) that are predicted to target the Ro/SSA (TRIM21 or TROVE2) and La/SSB mRNAs. Herein, we sought to investigate the expression of these miRNAs in SS.

Therefore, we studied their expression in SG-tissues, SGECs and peripheral blood mononuclear cells (PBMCs) of SS patients and sicca-complaining non-SS controls (CT), as well as their association with the expression of target miRNAs.

Methods: miRNAs and mRNAs expression of Ro52/TRIM21, Ro60/TROVE2 and La/SSB were investigated by real-time PCR in total RNA from SG-tissues, SGECs and PBMCs obtained from 27 SS patients and 22 sicca-CT. Significant differences between SS patients and CT and associations between miRNAs and mRNAs expression were evaluated by non-parametric Mann-Whitney and Spearman’s rank correlation tests, respectively.

Results: From the 11 microRNAs studied, miRs 129-5p, 153, 573 and 583 were not expressed in any of the samples studied, whereas miR-200b* was not detected in PBMCs. All others miRNAs were found to be expressed in all samples tested. Differential miRNA expression between SS and controls involved miR-16 and miR-223 in SG tissues, miR-200b in SGECs and miR-223 in PBMCs (mean±SE: 12.71±5.26 vs 2.47±0.67, p=0.05, 8671±2430 vs 3519±777, p=0.008, 2353±367 vs 1116±196.5, p=0.02 and 447200±224400 vs 50470±9577, p=0.01 in SS vs CT, respectively; Mann-
TLR3-Signaling Induces the Expression of Ro/SSA and La/SSB Autoantigens in Salivary Gland Epithelial Cells (SGECs). Nikolaios C. Kyriakidis, Efstathia K. Kapsosegregou, Vasiliki C. Gourzi, Haralampos M. Manousakis, and Athanasios G. Tzioufas. School of Medicine, National University of Athens, Greece, Athens, Greece, School of Medicine, University of Athens, Athens, Greece, School of Medicine, National University of Athens, Athens, Greece.

Background/Purpose: Previous studies have shown that the mRNA expression levels of the Ro52/TRIM21, Ro60/TROVE2 and La/SSB intracellular autoantigens are elevated within the immunopathologic lesions of SS. High surface constitutive expression of TLR-3 has been described in long-term cultured SGECs, whereas stimulation of TLR-3 via synthetic analogues or viral RNA has been shown to be potent inducer of several immune-modulatory molecules, interferons and other cytokines, as well as apoptosis, in SGECs. Given that TLR3-mediated inflammatory responses have been shown to be negatively regulated by Ro52/TRIM21 autoantigen we sought to investigate whether TLR3 stimulation has a reciprocal effect in SGEC lines from SS patients (n = 10), were treated with the analogue of the TLR3 ligand polyinosinic:polycytidylic acid (polyI:C; 5 μg/ml, control TLR treatment) for various time-points. The expression of Ro52/TRIM21, Ro60/TROVE2 and La/SSB mRNAs was analyzed by real-time PCR at 0, 6, 12, 24, 48 and 72 hrs of treatment. The results were normalized by the expression of the HPRT1 gene and calculated by the ΔΔCt method using HeLa as calibrator. The expression of Ro52, Ro60 and La/SSB proteins was analyzed by immunoblotting, using specific antibodies. Mann-Whitney test was employed to analyze statistical significances.

Results: SGECs obtained from SS patients (n = 5) and non-SS controls (n = 5) were treated with the analogue of the TLR3 ligand polyinosinic:polycytidylic acid (polyI:C; 5 μg/ml) and the TLR4-ligand lipopolysaccharide (LPS, 1 μg/ml, control TLR treatment) for various time-points. The expression of Ro52/TRIM21, Ro60/TROVE2 and La/SSB mRNAs was analyzed by real-time PCR at 0, 6, 12, 24, 48 and 72 hrs of treatment. The results were normalized by the expression of the HPRT1 gene and calculated by the ΔΔCt method using HeLa as calibrator. The expression of Ro52, Ro60 and La/SSB proteins was analyzed by immunoblotting, using specific antibodies. Mann-Whitney test was employed to analyze statistical significances.

Conclusion: Our findings indicate a reciprocal regulation of TLR3 signaling in SS-related intracellular autoantigens, and particularly Ro52 expression, by SGECs. Further investigation is needed to clarify the mechanisms involved in this regulation.
recognizes ssRNA from viruses, and possibly self-srRNA, with which Ro- and/or La-proteins form complexes, facilitating anti-SSA/SSB auto-antibody production, one of the hallmark disease parameters of pSS. Interestingly, EBV-transformed B cells have been shown to express the IL-7R and secrete IL-7. Recently, we found increased levels of IL-7 and its receptor in the minor salivary gland of pSS patients. Our purpose was to investigate the role of IL-7/IL-7 receptor-mediated immune activation in TLR7-induced B cell activation in pSS patients.

Methods: Isolated CD4 T cells and CD19 B cells from HC (n = 7) and pSS patients (n = 5) were co-cultured with and without a TLR7 agonist (TLR7A, Gardiquimod) in the presence or absence of CD14 monocytes/macrophages. Additionally, PBMCs (HC n = 5, pSS n = 8) were cultured with TLR7A with and without soluble human IL-7 (shull7R) and fully human anti-human IL-7 mAb. Proliferation of T cells and B cells was measured using a Thymidine incorporation and Ki67 expression (FACS analysis). Activation markers (CD19, HLA-DR, CD25) and intracellular IL-7 and IL-7RA expression by B cells were measured by FACS analysis.

Results: A strongly TLR7A-increased proliferation of T and B cell co-cultures was associated with significant and selective increases in Ki67-proliferating CD19 B cells (HC from 1.2% to 9.3%, p < 0.01 vs. pSS from 1.2% to 7.0%, p < 0.05), but not CD4 T-cells. Additionally, markers of activation on CD19 B cells (HC: CD25 + from 42.2% to 80.1%; CD19 MFI from 26.8% to 63.4%; HLA-DR MFI from 214 to 649) were significantly increased as well, equally effective in HC and pSS (all p < 0.05). TLR7A-induced B cell activation was increased in the presence of monocytes (Ki67+ B cells: HC from 0.9% to 30.2% vs. pSS from 1.0% to 11.6%, both p < 0.05). IL-7R blockade markedly inhibited lymphocyte proliferation of TLR7A-stimulated PBMCs from HC (from 8880 to 2289 cpm; p < 0.05) and pSS patients (from 8580 to 4802 cpm; p < 0.01), which was associated by a selective inhibition of Ki67-proliferating B cells (from 47.5% to 9.4%). The specific role of IL-7R-mediated activation was supported by an increase in intracellular IL-7Ra and IL-7 upon TLR7 triggering in B cells. The role of IL-7 was confirmed by blockade of TLR7-induced B cell activation with a fully human anti-IL-7 mAb (mean inhibition 50%, < 0.05).

Conclusion: TLR7A-induced B cell activation is potently and selectively inhibited by IL-7 and IL-7R blockade. Together with the up-regulation of IL-7 and IL-7R in B cells upon TLR7A activation, these results suggest that TLR7/IL-7R/anti-IL-7R blockade blocks an autocrine function of IL-7 in B cells. This indicates that IL-7/IL-7R blockade, targeting not only T cells as previously shown, but also B cells, represents an interesting new therapeutic approach in pSS.

Disclosure: Y. Gong, None; G. Alsahleh, None; J. Silibia, None; J. E. Gottenberg, None.

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Memory B Cell Phenotype and Gene Expression Profiling in Primary Sjögren’s Syndrome: Implications for Disease Diagnosis. Mustimbo E. F. Roberts1, Craig Maguire2, Alex Rosenberg3, Andrea Coca4, Jennifer H. Anolik5 and Inaki Sanz2, 1University of Rochester School of Medicine and Dentistry, Rochester, NY, 2University of Rochester, Rochester, NY, 3Univ of Rochester, Rochester, NY, 4Rochester, Rochester, NY

Background/Purpose: A paucity of known causative mechanisms in primary Sjögren’s Syndrome (pSS) contributes to inadequate classification criteria. However, known memory-phenotype B cell aberrations could enrich diagnostic criteria if such alterations precede clinical disease onset. Therefore, to determine diagnostic potential, we compared the phenotype and gene expression of B cells in pSS patients, sicca patients (individuals with symptoms but without pSS diagnosis), and healthy controls (HCs).

Methods: CD19+ B cells from pSS (n = 26), from sicca symptomatic patients (n = 27), and from healthy controls (n = 22) were analyzed using flow cytometry to identify canonical B cell subsets. Sub-groups of these subjects were further analyzed for expression of CD21, CD23, CD24, CD95 CXCR5 and CD1c. Additionally, purified B cell subsets (n = 3–5, per group, per test) were analyzed for gene expression using Affymetrix gene arrays.

Results: pSS patients had lower frequencies and numbers of CD27+ IgM+ IgD+ expression, T-Cell Induction of OX40 and Promotion of T-Cell Survival, Proliferation and Activation. Yazhou Gong, Ghada Alsahleh, Jean Silibia and Jacques-Eric Gottenberg. EA4438 Laboratoire Physiopathologie des Arthrites, Illkirch-Strasbourg, France

Background/Purpose: OX40/OX40L interaction is a pivotal costimulatory pathway involved in multiple autoimmune diseases. It provides a key signal for T-cell proliferation and differentiation in effector and memory subsets. Polymorphisms of OX40L are involved in the genetic predisposition to primary Sjögren’s syndrome (pSS). Since SGECs express other costimulatory molecules such as CD80, CD86 or ICOSL, we investigated the expression of OX40L by salivary gland epithelial cells (SGECs) and the expression of OX40 by T cells cocultured with SGECs.

Methods: Primary culture of salivary epithelial cells was derived from minor salivary gland biopsies isolated from patients with SS or control subjects (complaining from dry symptoms without any feature of autoimmunity). Expression of OX40L by SGEC was measured using qPCR and immunohistochemistry. Naïve CD4 T cells were activated by anti-CD2, anti-CD3 and anti-CD28 and cultured alone or with SGECs. T-cell expression of OX40 was analyzed using flow cytometry. T-cell proliferation and survival were assessed by CFSE dilution and propidium iodide (PI)/DiOC6 staining, respectively. Levels of IFN-γ, IL-2, IL-4 and IL-6 were assessed in culture supernatants using ELISA.

Results: SGECs isolated from pSS patients (n = 4) or controls (n = 4) expressed OX40L mRNA and protein. Coculture of T cells with SGECs from patients with pSS (n = 7) significantly increased the expression of OX40 by CD4+ T cells (67.3% ± 9.2) compared to T cells cultured alone (33.9% ± 6.9, p = 0.02). A similar induction of OX40 expression was observed in coculture of T cells with SGECs from controls.

In addition, SGECs isolated from pSS patients promoted T cell survival and proliferation: 82% vs 22% living T cells (PI negative DiOC6 positive) were detected when cultured with SGEC, compared to cultured alone, IFN-γ and IL-2, markers of T-cell proliferation and activation, were detected in the supernatant of cocultures for 6 days (HC from 2.5 ± 0.4 ng/ml for IL-2) but not in the supernatant of SGEC or of T cells cultured alone. IL-6 was also increased in the supernatants of cocultures (2.7 ± 0.6 ng/ml, compared to SGECs isolated from pSS cultured alone (1.2 ± 0.7 ng/ml), or T cells cultured alone (0 ng/ml). The induction of T-cell expression of OX40 was not altered when the coculture of T cells and SGECs was performed using a transwell or not (n = 3), which demonstrates that this OX40 induction depends on cytokine(s) and not of cell-cell contacts.

Conclusion: SGECs are capable to induce a dramatic increase of OX40 expression, and promote T-cell survival, proliferation and activation. This crosstalk between epithelial and T cells might also result in subsequent B-cell activation as shown by the increase of IL-6 in coculture supernatants. Further analyses are ongoing to determine the mechanisms involved in the induction of OX40 and consequences on T-cell polarization. These results demonstrate a new mechanism by which salivary gland epithelial cells play a pathogenic role in this autoimmune epithelitis. These results also suggest that OX40/OX40L might represent relevant therapeutic targets in pSS.

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**Background/Purpose:** B cells have traditionally been considered as positive regulators of humoral immune response, however their negative regulatory role has recently being recognized. **Objective:** To characterize the phenotypes of regulatory B cells in peripheral blood of primary Sjögren syndrome (pSS) patients and compare their presence according to the clinical and/or serologic activity disease status.

**Methods:** We included 50 pSS patients according to the AECG classification criteria, all of them were evaluated by a rheumatologist. We defined clinical activity as the presence of parotid enlargement or any extraglandular manifestation assessed by the SDAI or the ESSDAI indexes (except fatigue, fever or arthralgias). We defined serologic activity as IgG immunoglobulin >16 g/l vs. control 14 g/l, IgA >1.9 g/l vs. control 1.1 g/l, IgM >2.2 g/l vs. control 1.4 g/l or low C3, C4 or serum viscosity >1.9 cP. Twelve matched subjects were used as controls. PBMCs were isolated by centrifugation over a Lymphoprep gradient. CD19-mAb-coated microbeads were used to purify B cells by positive selection. We used the following mAbs: anti-CD38-PE-Cy5, anti-CD38-PE, anti-CD24-APC, anti-CD20-APC, anti-CD27-APC, anti-CD4-APC and anti-CXCR3-Cy5. Cells immunofluorescent staining was analyzed by a FACScalibur flow cytometer. The relative % of the subtypes of IL-10 producing cells was calculated on the basis of the total positive selection of the phenotype CD19+/CD38bright/CD24bright. We used One way ANOVA analysis (post-hoc analysis Dunnett method) with the SigmaStat 11.2 software.

**Results:** Patients were predominantly females, mean age 53±12 years and median disease duration of 9.7 years. Seventeen patients (34%) were clinical active (parotid enlargement, vasculitis, arthritis, leucopenia, lymphopenia, pneumonitis or optic neuritis). Patients with or without clinical activity were similar in age, disease duration but received more frequently prednisone and azathioprine. Twenty-seven (54%) patients had serologic activity regardless their clinical status. IL-10− B cells represented the 0.55% of the total pSS B cell population and was higher in clinical inactive patients (0.63%), whereas controls had a lower prevalence (0.22%, p<0.05). We found a statistically significant increment in the following subtypes of Breg cells: CD19+/CD38bright/CD24bright/IL-10− (CD19+ cells 79%, clinical inactive 80%, control 96%), CD19+/CD24bright/CD38bright/CD5−/IL-10− (clinical inactive 24% vs. control 14%), CD10/IL-10− (pSS 23%, clinical inactive 26% vs. control 15%). IgD+ cells and CD27+/IL-10− cells were increased in all the groups regardless their clinical activity when compared vs. controls. The phenotypes CD19+/CD24bright/CD38bright/CD5−/IL-10−/CD20+ CD27− CXCR3+ and CXCR7+ were similar among groups. We did not find a difference when we analyzed by serologic activity.

**Conclusion:** Most of the studied Breg phenotypes were increased in pSS patients, particularly in those without clinical activity. The presence of these cells emphasizes the importance of the immunobiology of B cells in pSS.

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Stages of Sjögren’s Syndrome Defined by Immune Mediators. Lakshmanan Suresh1, Julian Ambrus Jr.2 and Long Shen3. IMMCO Diagnostics Inc., Amherst, NY, 2State University of New York at Buffalo, Buffalo, NY, 3SUNY at Buffalo, Buffalo, NY

**Background/Purpose:** Sjögren’s syndrome (SS) is characterized by destruction of the salivary and lachrymal glands but also systemic manifestations such as lung disease, kidney disease and lymphomas. We have utilized an animal model for SS, the IL-14alpha transgenic mouse (IL14aTG; J. Immunol 177: 5676 – 5686, 2006; Clin. Immunol, 130: 304 – 312, 2009) to understand factors regulating various aspects of the disease. Previous studies had demonstrated that IL14aTG mice lacking lymphotoxin did not develop any features of SS (IL14aTG.LTa−/−; J. Immunol. 185: 6355 – 6363, 2010). The present study: IL-14aTG mice lacking the type 1 interferon receptor (IL14aTG.IFNR−/−) or marginal zone B cells (MZB; IL14aTG.CD19Cre.RBP-J−/−) were compared to IL14aTG mice with regards to autoantibodies (determined by Western blots), salivary gland secretions (determined after Pilocarpine stimulation), and histology of the salivary glands.

**Results:** Both IL14aTG mice and IL14aTG.IFNR−/− developed IgM autoantibodies at 6 months of age. IgM antibodies were eliminated in IL14aTG.CD19Cre.RBP-J−/− at 6 months of age. Salivary gland secretions were normal in IL14aTG.CD19Cre.RBP-J−/− mice, mildly decreased in IL14aTG.IFNR−/− and severely decreased in IL14aTG mice at 12 months of age. Both IL14aTG and IL14aTG.IFNR−/− mice had lymphocytic infiltration of their submandibular and lachrymal glands at 10 months of age. Only IL14aTG mice had lymphocytic infiltration of the parotid glands between 6 and 12 months of age. Neither IL14aTG.LTa−/− mice nor IL14aTG.CD19Cre.RBP-J−/− mice had lymphocytic infiltration of any salivary or lachrymal glands.

**Conclusion:** These studies suggest a model for SS in which early injury to the submandibular and lachrymal glands is regulated by MZB that produce IgM antibodies and lymphotoxin. Later development of IgG autoantibodies and parotid gland injury is dependent upon type 1 interferon. Further studies will be needed to investigate these observations in patients with SS.

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Characterization of Dominant B- and Plasma Cell Clones in Patients with Primary Sjögren’s Syndrome and Patients with Sicca Syndrome.

Marielle E. Doorenspleet1, Erlin Haecke1, Paul L. Klarenbeck1, Annie Visser1, Rebecca E. Esvelt1, Fred Spijkervert1, Paul-Peter Tak1, Hendrik Bootsma2, Niek de Vries1 and Frans Kroese1, 1Academic Medical Center of the University of Amsterdam, Amsterdam, Netherlands, 2University Medical Center Groningen, University of Groningen, Groningen, Netherlands, 3University Medical Center Groningen, Groningen, Netherlands

Background/Purpose: Primary Sjögren’s syndrome (pSS) is an auto-immune exocrinopathy characterized by chronic inflammation and destruction of the salivary and lacrimal glands. Infiltration of B and T-cells and sometimes plasma cells in the salivary glands as well as the presence of lympho-epithelial lesions are characteristic for pSS. Recent studies showed clinical improvement upon rituximab therapy up to 9 months, enforcing the notion that B cells and to a lesser extent plasma cells are important in the pathogenesis. Further unravel BCR involvement for the development of pSS we characterize B-cell and plasma cell clones in an early stage of parotid gland inflammation.

Objectives: 1) to compare B cell and plasma cell clonality in patients with pSS and sicca in the absence of an auto-immune disease. 2) To determine ifotypes in clones identified and compare these between pSS and sicca.

Methods: Five patients with pSS and 5 patients with complaints of sicca without any auto-immune disease (sicca) were included. All pSS patients fulfilled the AECG criteria for pSS and were antibody (ANA, SSA, SSB, Rf) positive. All sicca patients were antibody negative. Immunohistochemistry stainings were performed on formalin-fixed paraffin embedded sections using antibodies against CD22, CD138, IgA, IgG and IgM and scored semi-quantitatively. mRNA was isolated from all parotid gland biopsies and full-repertoire analysis of the immunoglobulin heavy-chain was performed. All amplified products encode the CDR3, a unique sequence that defines a unique clone. The number of sequences reflects the amount of immunoglobulins produced by that clone and can be used as a measure for dominance of that particular clone. Of each sample >10,000 BCR sequences were obtained. Clones with a frequency of >0.5% were arbitrarily considered as dominant clones.

Results: In all patients, almost 3000 clones were recovered (mean 2910 and 2946 and SD 704 and 783 in pSS and sicca resp., p=n.s.) Multiple dominant clones were detected in the parotid gland of all pSS patients (mean 6.2 clones, SD 1.5). Only a few dominant clones were detected in the sicca patients (mean 2.4 clones, SD 1.1, p=0.02). Immunohistochemical stainings of the pSS parotid gland biopsies showed that the majority of the infiltrate consisted of B-cells, although a few plasma cells were detectable in all 5 pSS patients. In sicca patients, much less B cells and plasma cells detectable. Further isolating revealed that the plasma cells in pSS were mainly expressing IgG (55% IgG, 36% IgA, 15% IgM), while plasma cells from sicca patients were only IgA+ (100% IgA). In line, the highly dominant clones in pSS patients were mainly of the IgG isotype (80% IgG, 16% IgA, 4% IgD), or showing a mixture of isotypes, often including IgG. In sicca patients, the very few dominant clones all expressed IgA (100%).

Conclusion: Our observations suggest that the infiltrated parotid gland in pSS can be distinguished from sicca based on the expression of IgG by the most dominant B-cell and plasma cell clones. This provides the opportunity to further study the IgG+ B-cell and plasma cell clones in particular for their potential auto-reactive properties. This in turn might lead to understanding of the pathogenesis of pSS and might lead to more targeted therapy.

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Oxepression of BMP6 Is Associated with Loss of Salivary Gland Activity in Sjögren’s Syndrome Patients and Mice.

Javier Cabrera-Perez1, Brennan Lai2, Drew Michael1, Melodie Weller1, Bill Swaim1, Noreen Rana1, Xiaobo Liu1, Ilias Alevizos2, Indu Ambudkar1 and John A. Chiorini1, 1NIH/NIDCR, Bethesda, MD, 2NIDCR/NIH #10 1N110, Bethesda, MD, 3NIDCR, Bethesda, MD

Background/Purpose: A hallmark of Sjögren’s syndrome (SS) is the loss of activity in secretory epithelia, specifically the lacrimal and salivary glands. The mechanism(s) driving this disorder are poorly understood and may involve a combination of environmental and genetic factors. To date exten-
sive efforts have been focused on understanding the changes in the immune system in these patients, however little is understood regarding the changes in the epithelia associated with the loss of gland activity.

Methods: To identify genes associated with changes in the epithelia, RNA was isolated from patients with both low flow and low lymphocytic infiltrates (focus score) and used to probe customized high density microarrays. After normalization, the signal from the patient RNA samples was then compared to the signal from RNA isolated from healthy volunteers. The list of differentially expressed genes was then filtered for genes associated with salivary gland specific cell types.

Results: A significant increase in expression of the bone morphogenetic protein 6 (BMP6) was observed in RNA isolated from patients compared with healthy volunteers. Overexpression of BMP6 locally in the salivary gland or lacrimal glands of mice resulted in the loss of fluid secretion as well as changes in the connective tissue of the salivary gland. Assessment of the fluid movement in either isolated acinar cells of mice overexpressing BMP6 or HSG cells cultured in the presence of BMP6 identified a loss in volume regulation in these cells. Loss of fluid movement also correlated with a decrease in sodium concentration in the saliva. Lymphocytic infiltration in SMG of BMP6 overexpressing mice was increased. No significant changes were found in proinflammatory cytokines production, neither the auto-antibodies associated with SS, such as anti-Ro/SSA, anti-La SSB and anti-nuclear antibody (ANA) after BMP6 overexpression.

Conclusion: Our study identified BMP6 as a novel gene associated with xerostomia associated with Sjögren’s syndrome, which may become a new target for therapeutic intervention. In mice, a loss of salivary and lacrimal gland function can be induced by overexpression of BMP6, which further support our finding in patients. This study suggests the loss of salivary gland function can be separated from the autoantibodies and proinflammatory cytokines associated with this disease.

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Spontaneous Sialadenitis Like Sjogren's Syndrome in Orphan Nuclear Receptor γt (ROγt) Transgenic Mice. M. Izuka1, Hiroto Tsuboi2, Hiromitsu Asashima2, Yuya Kondo2, Satoru Takahashi2, Isao Matsumoto3 and Takayuki Sumida3, 1Department of Internal Medicine, Faculty of Medicine, University of Tsukuba, Tsukuba, Japan, 2Department of Anatomy and Embryology, Faculty of Medicine, University of Tsukuba, Tsukuba, Japan

Background/Purpose: The nuclear receptors retinoic-acid-receptor-related orphan receptors γt (ROγt) is required for the generation of Th17 cells expressing the proinflammatory cytokine IL-17. Th17 cells expressing IL-17 are involved in various autoimmune diseases including Sjögren’s syndrome (SS). Recent studies reported the expression of IL-17 and IL-23 in the salivary glands and serum from patients with SS. However, the pathological roles of ROγt in SS remain to be elucidated. We examined the ROγt transgenic (Tg) mice in order to clarify the role of ROγt in the pathogenesis of SS.

Methods: (1) Histological analysis of salivary glands from ROγt Tg mice and C57BL/6 mice were determined and saliva flow was measured. (2) Infiltrating cells were isolated from the salivary glands and then analyzed their character by fluorescent immunostaining and flow cytometer. (3) Cytokine expressions in salivary glands were detected by quantitative PCR. (4) CD4+ T cells from ROγt Tg mice were transferred to Rag2−/− mice (ROγt Tg→Rag2−/− mice).

Results: (1) ROγt Tg mice developed the severe sialadenitis like SS and focus score was significantly increased in ROγt Tg mice (2.33±0.88/4 mm2, p<0.05, Mann-Whitney U Test), compared with C57BL/6 mice (0.22±0.38/4 mm2). Saliva flow collected from ROγt Tg mice (6.11±1.08 μl/g, p<0.05, Mann-Whitney U Test) was significantly decreased than that of C57BL/6 mice (8.63±0.76 μl/g). (2) The majority of infiltrating cells were CD4+ T cells at the early phase of sialadenitis, and B220+ cells were gradually increased at the late phase. (3) Expression of IL-17 and IL-23 was significantly increased in salivary glands of ROγt Tg mice by the side of C57BL/6 mice (p<0.05, Mann-Whitney U Test). (4) In ROγt Tg→Rag2−/− mice, cellular infiltrations were observed in salivary glands.
Conclusion: These results suggested that the overexpression of RORγt on CD4+ T cells showed a crucial role in the development of spontaneous sialadenitis like SS.

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519 Sex-Specific Regulatory T Cell Dysfunction in a Mouse Model of Sjögren Syndrome, Scott M. Lieberman1, Portia A. Kreiger2 and Gary A. Koretzky3.
1The Children's Hospital of Philadelphia, Philadelphia, PA, 2Nemours/A.I. DuPont Hospital for Children, Wilmington, DE, 3University Pennsylvania

Background/Purpose: CD4+Foxp3+ regulatory T cells (Tregs) are a specialized population of lymphocytes which prevent autoimmunity in normal hosts. Treg dysfunction has been implicated in autoimmunity; however results are conflicting. Sjögren syndrome is an autoimmune disease characterized by destruction of lacrimal and salivary glands resulting in profound ocular and oral dryness. In the nonobese diabetic (NOD) mouse model of Sjögren syndrome, females develop earlier and more severe sialadenitis while males develop primarily dacyoadenitis. We previously reported that female NOD mice harbor a lacrimal gland-protective Treg population (Arthritis Rheum 2011;63 Suppl 10:495). Here, we characterize the role of sex-based Treg dysfunction in the sexually dimorphic disease manifestations in our NOD mouse-based transfer model of Sjögren syndrome.

Methods: Sjögren-like disease was induced by transfer of cervical lymph node cells, either whole or depleted of the Treg-enriched son1, Gunnel Nordmark3 and The Swedish-Norwegian Sjo¨gren's syndrome S. Takahashi

520 Genetic Associations to Germinal Centre Formation in Primary Sjögren’s Syndrome. Tove Ragna Reksten1, Malin V. Jonsson2, Roland Jonsson2, Gunnel Nordmark3 and The Swedish-Norwegian Sjögren’s syndrome Network4. 1Broegelmann Research Laboratory, the Gade Institute, University of Bergen, Bergen, Norway, 2University of Bergen, Bergen, Norway, 3Rheumatology, Uppsala, Sweden, 4Bergen

Background/Purpose: Primary Sjögren’s syndrome (pSS) is an autoimmune rheumatic disease mainly affecting the salivary and lacrimal glands causing xerostomia and keratoconjunctivitis sicca. Focal mononuclear cell infiltration in the form of germinal center-like structures (GC) is found in the minor salivary glands of 20–25 % of patients. We have previously shown that GC+ pSS patients presented with elevated serum levels of IL-1RA, IL-4, IL-17 and MCP compared to GC- patients. In this follow-up study, we aimed to assess the genetic variations in GC+ and GC- pSS patients.

Methods: In a Swedish-Norwegian pSS cohort (n=540), GC+ (n=76) and GC- (n=244) patients were identified. 1536 single-nucleotide polymorphisms (SNPs) were analysed in whole blood DNA by the Illumina GoldenGate assay (Illumina Inc.). Minor allele frequencies in GC+ and GC- patients were compared using Fisher’s exact test and associations were considered significant when p<0.001 and suggestive when p<0.01. Statistical analysis were performed using the PLINK software.

Results: In this case-only analysis of 320 pSS patients with known GC status, we identified two SNPs in Eotaxin associated with GC+ patients with OR 0.45 and 0.41. Furthermore, we found suggestive associations with BANK-1, ICA-1, IL-17, PRKCLL, CARD-8, Bel-2, TANK, IKKBE, AID and APRIL. We also detected weak associations (p<0.05) with SNPs in the BLK, STAT1, STAT4, SAA1, SSB, IL15RA, IL-6 and TNF-a genes. Serum eotaxin (CCL11) has previously been identified as a key discriminator between GC+ and GC- pSS patients. The formation of GCs depends on B cell stimulation by helper T cells via the CD40-CD40L system, which also contribute to the expression of activation induced deaminase (AID). Genetic variations in CD40L and AID suggest that GC+ patients may be genetically predisposed for ectopic GC formation. B lymphoid kinase (BLK) has a role in the development and activation of marginal zone B cells present in the GC formations, and Bel-2 is an anti-apoptotic protein which gene is implicated in a number of cancers and autoimmunity. CARD-8, IKKBE and TANK are regulators of the NF-kB pathway, a pathway with a well-established role in secondary lymphoid organ development.

Conclusion: Taken together, our findings suggest that genetic variations may help explain why ectopic GC-like structures are present in some pSS patients but not all.

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followed by studies of gene expression for regions associated with disease risk or severity will be required to fully define the role of DNA methylation in SS.

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Genetic Variation in the NCR3 Locus Is Associated with Anti-SSA/SSB Positive Primary Sjögren’s Syndrome in Scandinavian Samples. Gunnar Nordström1, Majsa-Leena Eloranta2, Per Eriksson3, Elke Theander4, Helena Forsblad-d’Elia4, Roald Omdal5, Marie Wahren-Herlenius6, Roland Jonsson7 and Lars Rännblom1. 1Rheumatology, Department of Medical Sciences, Uppsala University, Uppsala, Sweden, 2Rheumatology/AIR, Department of Clinical and Experimental Medicine, Linköping University, Linköping, Sweden, 3Skane University Hospital, Lund University, Malmö, Sweden, 4Sahlgrenska Academy at University of Gothenburg, Gothenburg, Sweden, 5Clinical Immunology Unit, Department of Internal Medicine, Stavanger University Hospital, Stavanger, Norway, 6Karolinska Institutet, Stockholm, Sweden, 7Broegelmann Research Laboratory, the Gade Institute, University of Bergen, Bergen, Norway

Background/Purpose: Candidate gene studies in primary Sjögren’s syndrome (pSS) have identified polymorphisms in genes involved in the type I interferon (IFN) system and the type I IFN system is activated in pSS. NK cells have been shown to increase the immune complex stimulated IFN-alpha production by plasmacytoid dendritic cells but the role for NK cells in pSS autoimmune has not been well studied. The natural cytotoxicity triggering receptor 3 (NCR3) gene locus (6p21.3) encodes the NKp30 activating receptor on NK cells. A French study identified an association between two rare alleles in the NCR3 promoter region and pSS, independent of the association to HLA-DRB1–03 (1p21.3) (1). The aim of this investigation was to analyze if the two NCR3 single nucleotide polymorphisms (SNPs) were associated with pSS in Scandinavian samples. The potential association with anti-SSA/SSB positivity or clinical phenotypes was investigated. In addition, the association with the HLA-DRB1–03 SNP proxy was studied.

Methods: A total of 671 Caucasian pSS patients from Sweden (n=478) and Norway (n=193) and 1586 healthy controls (Sweden, n=1369 and Norway, n=217) were included in the study. Two SNPs in the NCR3 locus, rs1575837 and rs2736191 and the SNP rs2187668 as a marker for HLA-DRB1–03 were selected. Genotyping was performed by single base extension with Fluorescent Polarization Template Dye Incorporation (FP-TDI). Data on anti-SSA and/or anti-SSB positivity and clinical manifestations were extracted from the patient files. Case-control and case-only allele association analyses were performed using PLINK.

Results: In our case-control analysis we did not find any association between the NCR3 SNPs and pSS in Sweden or Norway or in meta-analysis of the two cohorts. In case-only analysis of the combined cohorts, comparing anti-SSA/SSB positive (n=496, 74%) versus negative (n=175, 26%) pSS patients, we found an association between the SNP rs1575837 and anti-SSA/SSB positivity, p=0.060, OR 0.27 (95% CI 0.10–0.73). There were no associations between the NCR3 SNPs and clinical phenotypes. The HLA-DRB1–03 SNP marker rs2187668 was strongly associated with pSS, p=1.0×10–51. OR 3.2 (95% CI 2.8–3.8). When analyzing only anti-SSA/SSB positive patients versus controls the association was even stronger, p=6.9×10–55, OR 4.1 (95% CI 3.5–4.9). In case-only analysis rs2187668 was associated with major salivary gland swelling and leukopenia (p<0.05), dermal vasculitis (p=0.01), hypergammaglobulinemia (p=7.4×10–4) and anti-SSA/SSB positivity (p=1.6×10–32, OR 3.0, 95% CI 2.2–4.1).

Conclusion: We found an association between anti-SSA/SSB positivity and genetic variation in the NCR3 locus and confirmed the stronger association with anti-SSA/SSB positive pSS. We conclude that different mechanisms, possibly involving NK cell functions, might contribute to this autoimmune disease in anti-SSA/SSB positive versus negative patients. The potential functional implications for this rare promoter SNP on Nkp30 receptor activity has yet to be elucidated.

References

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Use of Global Gene Expression Profiling to Characterize Sjögren’s Patients Who Underexpress Interferon-Inducible Genes. John A. Ice1, He Li2, Jennifer A. Kelly1, Indra Adrianto3, Stuart B. Glenn4, Kimberly S. Heffner1, Evan G. Vista1, Donald U. Stone5, Raj Gopalakrishnan6, Glen D. Hamilton2,7, David M. Lewis6,8, Michael Rohrer6, Pamela Hughes6,9, John B. Harley1, Courtney G. Montgomery1, James Chodosh1, James A. Lessard9, Juan-Manuel Anaya8, Barbara M. Ségal10, Nelson L. Rhodus1, Lida Radfar11, Mark B. Frank1,2, R. Hal Scofield1, Christopher J. Lessard13 and Kathy Moser Sivils12. 1Oklahoma Medical Research Foundation, Oklahoma City, OK, 2University of Oklahoma Health Sciences Center, Oklahoma City, OK, 3Heffner Eye Care and Optical Center, Oklahoma City, OK, 4University of Santo Tomas, Taguig City, Philippines, 5University of Minnesota, Minneapolis, MN, 6Cincinnati Children’s Hospital Medical Center, US Department of Veterans Affairs Medical Center, Cincinnati, OH, 7Harvard Clinical and Translational Science Center, Boston, MA, 8Valley Bone & Joint Clinic, Grand Forks, ND, 9Universidad del Rosario-Corporacion para Investigaciones Biologicas, Bogota, Colombia, 10Hennepin County Medical Center, Minneapolis, MN, 11Oklahoma Medical Research Foundation; University of Oklahoma Health Sciences Center, Oklahoma City, OK

Background/Purpose: Sjögren’s syndrome (SS) is a progressive autoimmune exocrinopathy characterized by symptoms of dry eyes and mouth. We previously reported overexpression of interferon-inducible (IFI) genes in a subset of SS patients. Using global gene expression profiling (GEP) and autoantibody serologies, we characterized SS patients who underexpress IFI genes in order to better understand and potentially divergent SS subgroups.

Methods: A total of 48803 mRNA transcripts per sample was sequenced from whole blood were measured using the Illumina HumanWG-6 v3.0 BeadChip in 201 SS cases and 79 healthy controls. After quality control, Welch’s t-tests, q-values, and fold changes (FC) were calculated for 20342 probes (15607 genes). Differentially expressed (DE) transcripts were selected by: q<0.05; and FC >1.25 or <0.87. Hierarchical clustering was performed and cases were divided according to underexpression (UNDER; n=53) or overexpression (OVER; n=128) of 32 IFI genes; both groups were then compared to healthy controls. Pathway analysis for DE genes was carried out in Genomatix. Antibodies to Ro, La, centromere B, chromatin, dsDNA, Jo-1, ribosomal P (riboP), ribonucleoprotein (RNP), Scl-70, Sm and Sm/RNP were determined using Bioplex assays. Antibiotic antibody (ANA) and rheumatoid factor (RF) were determined by immunofluorescence and ELISA, respectively. Autoantibody composition was compared using Fisher’s exact test.

Results: Comparing the UNDER group (n=53) vs. controls (n=79) and removing IFI genes yields 1767 DE genes involved in cellular metabolism (725/7548 genes; P<10E-13); RNA processing (89/618 genes; P<10E-7); viral transcription (31/140 genes; P<10E-6); and viral replication (41/224 genes; P<10E-6). These genes comprise canonical pathways that include: protein import into the nucleus (6/12 genes; P<10E-3); TCR signaling in naïve CD8+ T cells (6/11 genes; P<10E-3); p53 signaling (5/22 genes; P<10E-3); and BCR signaling (14/99 genes; P<10E-2). Additional genes of interest include ANTXR2 (q=2.6×10E-4; FC=1.35) and CATGE5 (q=3.2×10E-4; FC=1.45). ANTXR2, an anthrax toxin receptor that binds collagen IV and laminin with potential involvement in extracellular matrix adhesion, has been associated with amylohydric spondylitis, while mutations in this gene cause juvenile hyaline fibromatosis. CATGE5 encodes an antigen found in T-cell lymphoma and other cancers. Anti-Ro and anti-La are more common in the OVER group compared to the UNDER group (P<10E-12 and P<10E-7, respectively), as is ANA alone (P<10E-5) and in combination with RF (P<10E-3). Interestingly, by excluding subjects positive for anti-Ro, anti-La, RF, and ANA, we find that patients in the UNDER group are more likely to produce any combination of antibodies to centromere B, chromatin, dsDNA, Jo-1, riboP, RNP, Scl-70, Sm, or Sm/RNP autoantibodies than are those in the OVER group (P=0.015).

Conclusion: SS patients who underexpress IFI genes are more likely to produce non-traditional antibodies and are less likely to produce anti-Ro, anti-La, ANA, or ANA/RF than their counterparts. Additionally, GEP within this subphenotype has identified novel candidate genes and molecular pathways for further study that may help elucidate complex SS pathophysiology.

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RNA-sequencing Identifies Novel Differentially Expressed Coding and Non-Coding Transcripts in Sjögren’s Syndrome. Indri Adrianto1, Graham B. Wiley2, John A. Ice1, H. Li1, Jennifer A. Kelly1, Astrid Rasmussen1, Stuart B. Glenn1, Kimberly Hefner2, Donald U. Stone3, Raj Gopalakrishnan4, Glen D. Houston4, David M. Lewis5, Michael Rohrer6, James A. Lessard7, Juan-Manuel Anaya1, Barbara M. Segal1, Nelson L. Rhodus1, Lida Radfar8, John B. Harley9, Judith A. James9, Courtney G. Montgomery10, R. Hal Scinfoeld11, Patrick M. Gaffney12, Kathy Moser Sivils13 and Christopher J. Lessard14. 1Oklahoma Medical Research Foundation, 10University del Rosario-Corporacion para Investigaciones Biologicas, Bogota, Colombia, 2Hennepin County Medical Center, 3University of Oklahoma Health Sciences Center, 4University, Minneapolis, MN, 5Valley Bone & Joint Clinic, Grand Forks, ND, 6Universidad del Rosario-Corporacion para Investigaciones Biologicas, Bogota, Colombia, 7University of Minnesota, Minneapolis, MN, 8Cincinnati Children’s Hospital Medical Center; US Department of Veterans Affairs Medical Center, 9Hennepin County Medical Center; US Department of Veterans Affairs Medical Center, Chicago, OH, 10Oklahoma Medical Research Foundation, 11University del Rosario-Corporacion para Investigaciones Biologicas, Bogota, Colombia, 12Oklahoma Medical Research Foundation; University of Oklahoma Health Sciences Center, Oklahoma City, OK, 13Oklahoma Medical Research Foundation, Oklahoma City, OK, 14Hefner Eye Care and Optical Center, Oklahoma City, OK, 3Hefner Eye Care and Optical Center, Oklahoma City, OK, 4University of Minnesota, Minneapolis, MN, 5Valley Bone & Joint Clinic, Grand Forks, ND, 6Universidad del Rosario-Corporacion para Investigaciones Biologicas, Bogota, Colombia, 7University of Oklahoma Health Sciences Center, Oklahoma City, OK, 8Oklahoma Medical Research Foundation, Oklahoma City, OK, 9University del Rosario-Corporacion para Investigaciones Biologicas, Bogota, Colombia, 10Hennepin County Medical Center, Minneapolis, MN.

Background/Purpose: Sjögren’s syndrome (SS) is a common, clinically heterogeneous autoimmune disease characterized by exocrine gland dysfunction that involves both innate and adaptive immune responses. SS etiology is complex, with both environmental and genetic/genomic factors contributing. Recent genetic studies in complex disease have shown that 80% of associations are up to several times the genome-wide active non-coding DNA segments that comprise 60% of the human genome. Microarray technology, which requires prior knowledge of the transcripts being interrogated, has been extensively used to study gene expression of mRNA. Far more powerful, emerging RNA-sequencing (RNA-seq) technology allows for unbiased transcript identification and quantification across the genome. We used RNA-seq to identify differentially expressed (DE) transcripts in 60 SS cases and 30 healthy controls.

Methods: RNA samples were isolated from whole blood and prepared for sequencing using the NtGn Encore kit, and sequencing was performed using the Illumina HiSeq 2000. Quality of raw sequence data was assessed using FASTQC. Raw FASTQ files were aligned to the human genome (hg19) using TOPHAT. Probable transcripts were assembled using CUFLINKS, and DE transcripts were determined using CUFFDIFF using a false discovery rate (FDR) q-value of 0.1. Fold change (FC; positive values for overexpressed, negative values for underexpressed) calculations were obtained using the log2(FPKMControl/FPKMCase), where FPKM is the fragments per kilobase of transcript per million mapped fragments. Transcripts were verified using the Integrated Genome Viewer (IGV).

Results: The average number of reads per sample was 38.6 million, representing 346,234 transcripts across the genome. Of the protein-coding regions, TGF-beta activated kinase 1/MAP3K7 binding protein 1 (TAB1) was the up-regulated DE locus (p=0.049), whereas TAP2, regulated MAP kinase kinase MAP3K7/TAK1 and is involved in TGF beta, interleukin 1, VNT-1, NF-CB pathways. Genome-wide association studies of primary biliary cirrhosis and Crohn’s disease have reported association to 22q13.1. Two other DE protein-coding transcripts of interest were D-aspartate 2D (p=1.69) and D-aspartate 2D; p=1.78). lncRNAs are important regulators of oncotranscriptional patterns and a third of SS patients. Several DE genes overlap with genetic associations identified through genome-wide association studies in SS, including the MHC genes TRIM38 (q<1E-12), TAPI (q<1E-14), and TAP2 (q<1E-13), in addition to those identified previously by candidate gene approaches, including IL1RN (q<1E-5), FAS (q<1E-2), and EBF1 (q<1E-2). Additionally, 1q-ETL analysis identified 41 single-nucleotide polymorphisms (SNPs) that were associated with gene expression levels (1E-10<q<0.01). The most significant canonical pathways of DE genes were apoptotic DNA fragmentation/angiogenesis (7/11 genes; p<1E-4) and antigen processing/presentation (5/12 genes; p<1E-2). DE genes were also involved in several biological processes, including immune response (171/906 genes; p<1E-16), translational termination/elongation (42/105 genes; p<1E-15), viral transcription and genome expression (47/140 genes; p<1E-13), and type I interferon-mediated signaling (31/70 genes; p<1E-13). Thirteen of the top 50 upregulated genes belong to the IFN pathway, which mirrors the IFN signature observed in lupus patients. Of note, elevated IFN expression levels were found to be correlated with anti-Ro and anti-La in SS. Nearly all DE genes in viral pathways were down-regulated with the notable exception of SP100 (p<1E-12, FC=1.58), an interferon-inducible protein believed to play a role in transcriptional regulation and the innate immune response following viral infection toward which antibodies are made in primary biliary cirrhosis.

Conclusion: These results highlight alterations in immunologically-relevant pathways in SS, reveal several new candidate expression quantitative trait loci, and provide focus for the development of novel hypotheses for further studies in this complex autoimmune disorder.

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Use of a Novel Probe to Demonstrate Granzyme B Activity in Sjögren’s Syndrome Salivary Glands. Kimberly Doering Maurer1, Laura Gutierrez-Alamillo1, Elfstathia K. Kapsogeorgou1, Athanasios G. Tzioufas2, Livia Casciola-Rosen3 and Antony Rosen3. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2School of Medicine, National University of Athens, Greece, Athens, Greece, 3School of Medicine, National University of Athens, Greece, 4Johns Hopkins University, Baltimore, MD, 5Johns Hopkins University, Baltimore, MD

Background/Purpose: Salivary glands are a prominent target organ in Sjögren’s syndrome (SS), with patients having abnormal secretory function and inflammatory infiltration of these glands. Little is currently known about the mechanisms whereby the immune system contributes to ongoing tissue damage and dysfunction in this disease. IRF1 is one of the most efficiently cleaved granzyme B substrates ever defined. The purpose of this study was to define whether cytotoxic lymphocytes in the gland actively granzyme-proteolysis in salivary gland epithelial cells in situ by using an antibody highly specific for granzyme B (GrB)-cleaved IRF-1 to probe for activity of the GrB pathway in vivo in SS salivary gland biopsies.

Methods: Immunohistochemical staining of salivary gland paraffin sections was used to assess the presence of CD8 infiltrates, and the extent of GrB staining. Lyssates generated from frozen salivary gland biopsies were immunoblotted to detect CD8 and IRF1 expression. SS-methionine labeled IRF1 was generated by in vitro transcription and translation, and was used to demonstrate cleavability by GrB, and as a template for site-directed D204A mutagenesis to confirm the GrB cleavage site in IRF1. Using this information, an antibody detecting exclusively the N-terminal GrB cleaved IRF1 fragment (R6017) (and not the intact molecule) was generated. This antibody was carefully validated and used for immunohistochemistry and immunoblotting on salivary gland tissue and lysates obtained from SS patients.

Results: CD8 infiltrates were prominent in 60% of SS salivary glands by immunoblotting and immunohistochemistry. IRF1 is expressed at high levels in SS salivary glands, but not control salivary glands. IRF1 is efficiently cleaved by GrB at D204. Using the antibody R6017 that is highly specific for the N-terminal fragment generated by GrB cleavage, we demonstrated the presence of GrB-induced fragments by immunoblotting and immunohistochemistry performed on SS patient but not control salivary gland tissue.

Conclusion: These studies provide the first direct in vivo evidence that the cytotoxic lymphocyte granule pathway is actively modifying salivary epithelial cells in patients with SS. Defining granzyme-induced effects on salivary epithelial transcription and translation, and inflammatory infiltration of these glands. Little is currently known about the mechanisms whereby the immune system contributes to ongoing tissue damage and dysfunction in this disease. IRF1 is one of the most efficiently cleaved granzyme B substrates ever defined. The purpose of this study was to define whether cytotoxic lymphocytes in the gland actively granzyme-proteolysis in salivary gland epithelial cells in situ by using an antibody highly specific for granzyme B (GrB)-cleaved IRF-1 to probe for activity of the GrB pathway in vivo in SS salivary gland biopsies.

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Results: CD8 infiltrates were prominent in 60% of SS salivary glands by immunoblotting and immunohistochemistry. IRF1 is expressed at high levels in SS salivary glands, but not control salivary glands. IRF1 is efficiently cleaved by GrB at D204. Using the antibody R6017 that is highly specific for the N-terminal fragment generated by GrB cleavage, we demonstrated the presence of GrB-induced fragments by immunoblotting and immunohistochemistry performed on SS patient but not control salivary gland tissue.

Conclusion: These studies provide the first direct in vivo evidence that the cytotoxic lymphocyte granule pathway is actively modifying salivary epithelial cells in patients with SS. Defining granzyme-induced effects on salivary epithelial function in this disease, with therapeutic implications.

Disclosure: K. Doering Maurer, None; L. Gutierrez-Alamillo, None; E. K. Kapsogeorgou, None; A. G. Tzioufas, None; L. Casciola-Rosen, None; A. Rosen, None.

Multiplexed Nanostring Screening for Salivary Gland Viral Elements in Sjögren’s Syndrome. Kristin Haffizulla1, Glen Barber1, Juan Chen2 and Eric L. Casciola-Rosen3,4. 1University of Miami Miller School of Medicine, Miami, FL, 2The First Affiliated Hospital of Xiamen University, China, Miami, FL, 3University of Miami, Miami, FL

Background/Purpose: To test the hypothesis that viruses are associated with Sjögren’s syndrome, salivary gland RNA extracts from Sjögren’s patients and non-Sjögren’s controls were screened for virus-associated sequences using a multiplexed NanoString nCounter chip designed to detect sequences from all known human viral and endogenous retrovirus subtypes for potential pathogenic roles in SS, but does not support a role for endogenous retroviruses. This work also for the first time identifies two distinct subsets of SS patients with regard to viral salivary expression.

Methods: RNA was then directly assayed by Nanostring nCounter gene expression system for 334 viral, retroviral, and human immune gene sequences at once.

Results: Cases (11 female, 8 primary SS, 4 in RA) were confirmed by serology, histopathology, and parotid sialography. Controls were 7 patients (6 female) with normal histopathology, including 4 with negative ANA, SS-A, and SS-B. RNA extract quality and nCounter internal controls were robust for all tested samples. Gene expression in all samples was normalized to GAPDH expression. Cases and controls were compared for expression levels of the studied sequences. The 45 genes with the highest fold difference between cases and controls were all increased in the Sjögren’s cases. Genes represented in this group included primarily HPV and polyoma-derived viral sequences but not endogenous retroviruses. The SS group had two distinct subsets, one of which (N = 6) showed increased expression of multiple viral genes compared to controls, and one of which (N = 6) showed reduced expression of multiple viral genes compared to controls. Subgroup analysis of the cases with high viral gene expression revealed multiple HPV Type 35 and 56 genes that were at least 2 fold overexpressed compared to controls. CD79a was the only tested gene at least 2 fold upregulated in the patients without high viral gene expression when compared to controls. A trend toward more Primary SS was present in patients with high viral expression (5/6 vs 2/6 for other SS, Fisher’s Exact p = 0.2).

Conclusion: Using a new highly sensitive and specific technique, we find evidence of overexpressed viral elements in salivary tissue in a subset of a Chinese Sjögren’s Syndrome cohort. This data increases scrutiny of HPV and polyoma subtypes for potential pathogenic roles in SS, but does not support a role for endogenous retroviruses. This work also for the first time identifies two distinct subsets of SS patients with regard to viral salivary expression.

Disclosure: K. Haffizulla, None; G. Barber, None; J. Chen, None; E. L. Casciola-Rosen, None.

Mxa As a Biomarker for Systemic Interferon Type I Activation in Primary Sjögren’s Syndrome. Naomi I. Maria1, Zana Brkic1, Matti Warisz1, Cornelia G. van Helden-Meeuwsen1, Kim Heezen1, Joop P. van de Merwe1, Paul L. van Dael1, Virgil A. Dahn1, Hemmo A. Drexhage1 and Marjan A. Versnel1. 1Erasmus Medical Center, Rotterdam, Netherlands, 2University of Turku, Turku, Finland

Background/Purpose: To establish an easy and practical assay for detection of systemic Interferon (IFN) type I activation in primary Sjögren’s syndrome (pSS). The monocyte IFN type I signature is present in over half of pSS patients and identifies a subgroup of patients with higher clinical disease activity [Z. Brkic et al., 2012]. Currently, detection of the IFN type I signature is performed via laborious mRNA expression profiles of multiple IFN type I inducible genes.

Methods: In a cohort of 35 pSS patients Myxovirus resistance protein A (MxA) was tested as potential biomarker for systemic IFN type I bioactivity. An MxA enzyme immunoassay (EIA) on whole blood was compared with flow cytometric detection of MxA in CD14+ monocytes. In addition CD64 (FcγRI), CD169 (Siglec-I) and BAFF (B-cell activating factor), previously described as biomarkers for IFN type I in other systemic autoimmune diseases, were assessed in CD14+ monocytes using flow cytometry. The IFNscore, a measure for total IFN type I activation, was calculated using expression values of the IFN type I signature genes – IFI44, IFI44L, IFIT3, LY6E, MX1 – in CD14+ monocytes, determined by real-time quantitative PCR. pSS patients were stratified in an IFN-positive (IFNscore >10) and IFN-negative pSS subgroup (IFNscore <10).

Results: Twenty-one out of 35 pSS patients were IFN-positive (IFNpos), whereas HC were negative for the IFN type I signature. Significant correlations were found between IFNscores and CD14+ monocyte protein expression of MxA (p = 0.007; r = 0.436), CD169 (p = 0.001; r = 0.495) and MxA protein expression in whole blood (p < 0.001; r = 0.717). MxA assessed by the MxA-EIA showed significantly elevated levels in IFNpos patients with a median of 212.5 (10–1295) µg/l, whereas IFNneg patients [1µg/l(1–330)] (p < 0.001). Similar results were obtained for MxA assessed by flow cytometry (p < 0.001). MxA-EIA protein levels correlated with the EULAR Sjögren’s syndrome Disease Activity Index score; Immunoglobulin levels; rheumatoid factor; haemoglobin levels and neutrophil counts.
Conclusion: MxA protein analysis is a promising tool for assessment of IFN type I activation in pSS. MxA levels determined by MxA-EIA correlated with features of disease activity. The EIA was shown to be a functional assay and could contribute to future studies on disease pathogenesis and pSS subclassification, possibly leading to more targeted treatment strategies.

Disclosure: N. L. Maria, Not applicable; Z. B. Bick, None; M. Waris, None; C. G. van Helden-Meeuwsen, None; K. Heezen, None; J. P. V. D. Merwe, None; P. L. V. Dael, None; V. A. Dalm, None; H. A. Dreuxhage, None; M. A. Versnel, Not applicable; 2.

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The Axis P2X7 Receptor-Inflammasome: A Role in Modulating Inflammatory Response in Primary Sjögren's Syndrome? Chiara Baldini, Chiara Rossi, Eleonora Santini, Francesco Ferro, Alessia Gallo, Daniela Martiní, Francesca Seminsí, Valentina Donati, Camillo Giacomelli, Nicoletta Luciano, Anna Solini and Stefano Bombardieri. 1 Rheumatology Unit, University of Pisa, Pisa, Italy; 2 NIDCR, Bethesda, MD

Background/ Purpose: The exact cause of exocrine gland dysfunction in primary Sjögren’s syndrome (pSS) has not been fully delineated, but it is thought that both innate and adaptive immunity may contribute significantly. Recent data have unveiled the structure and function of the P2X7 receptor/NLRP3 inflammasome pathway in stimulating caspase-1 activation and the release of IL-18; 3) to correlate P2X7 receptor to patients clinical and histopathological features

Methods: Consecutive patients with a diagnosis of pSS (AECG criteria) were enrolled in this proof of concept study. The control group consisted of subjects with suspected SS who did not fulfill the AECG criteria for pSS. Analysis of P2X7R, NLRP3 and caspase-1 gene expression was performed by real-time PCR on an ABI PRISM 7900 sequence detector (Applied Biosystems). Levels of IL-18 were assessed in patients unstimulated whole saliva by Western blot. Patients’ clinico-serological and histopathological data were prospectively collected. For statistical comparisons, the t-test, the chi square test and logistic regression analysis were employed. P-values <0.05 were considered significant.

Results: Out of the 36 consecutive patients included in the study, 21/36 met the AECG criteria for pSS while the other 15/36 no-SS represented the control group. The P2X7R-mRNA was represented in MSGBs and in peripheral lymphocytes of both pSS and no-SS but its expression was significantly higher in pSS subjects than in no-SS control group (MSGBs p<0.0001; peripheral lymphocytes p=0.002). Similarly NLRP3 (p=0.0002) and caspase-1 (p=0.0004) gene expression was significantly higher in pSS and this was paralleled by an increased expression of IL-18 in pSS salivary samples (p<0.0001). The IL-18 production was significantly higher in pSS patients with anti-Ro/SSA positivity for anti-Ro/SSA (p<0.0001) and correlated with MSGBs score (p=0.01).

Conclusion: This study suggests a potential involvement of the P2X7R/ inflammasome-caspase-1-IL-18 axis in the pathogenesis of pSS exocrinopathy and opens novel opportunities for studying the complex mechanisms underlying pSS.

Disclosure: C. Baldini, None; C. Rossi, None; E. Santini, None; F. Ferro, None; A. Gallo, None; D. Martiní, None; F. Seminsí, None; V. Donati, None; C. Giacomelli, None; N. Luciano, None; A. Solini, None; S. Bombardieri, None.

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S100A8/A9 Is Upregulated and Triggers the Secretion of Pro-Inflammatory Cytokines in Primary Sjögren's Syndrome. Laura Wichelselbaum1 and Muhammad S. Soyfooo. 1 Department of rheumatology, Hôpital Erasme, Brussels, Belgium; 2 Hôpital Erasme, Université Libre de Bruxelles, Brussels, Belgium

Background/ Purpose: To determine the involvement of S100A8/A9 in the pathogenesis of primary Sjögren’s syndrome (pSS)

Methods: The serum levels of S100A8/A9, IL-17A and IL-17C were determined by ELISA. The expression of S100A8/A9, TLR4, IL-17A, IL-17C, IL-17RA, IL-17RC and IL-17RE was assessed by immunohistochemistry. PBMCs were isolated from 10 pSS patients and 10 healthy controls, stimulated with increasing concentrations of S100A8/A9 and interferon-γ. The cytokine profile was next investigated by flow cytometry and ELISA.

Results: Serum levels of S100A8/A9 were increased in pSS patients compared to controls. The expressions of S100A8/A9, TLR4, IL-17A, IL-17C, IL-17RA, IL-17RC, IL-17RE were enhanced in the salivary glands of pSS patients. No significant serum levels of IL-17A and IL-17C were detected in both groups of patients. S100A8/A9 significantly increased the production of TNF-α and IL-1β in pSS patients. We observed increased production of IL-17A following stimulation with S100A8/A9 but not achieving statistical significance. No secretion of IL-17C was detected upon PBMC’s stimulation by S100A8/A9. Moreover, S100A8/A9 with IFN-γ synergistically increased significantly the production of TNF-α and IL-1β.

Conclusion: S100A8/A9 is increased in pSS and contributed to the increased production of TNF-α and IL-1β alone and in synergy with IFN-γ. S100A8/A9 induced the secretion of IL-17A in controls and pSS patients. IL-17A, IL-17C and their respective receptors were upregulated in the salivary glands of pSS patients.

Disclosure: L. Weichselbaum, None; M. S. Soyfoo, None.

Session A
Spondyloarthropathies and Psoriatic Arthritis: Clinical Aspects and Treatment

ACR Poster Session A
Sunday, November 11, 2012, 9:00 AM–6:00 PM
Conclusion: This new, developed instrument to measure HRQoL in PA patients has shown good reliability, validity, and sensitivity to change. It has also proved easy to use and administer in daily clinical practice and future research projects.

Disclosure: J. C. Terro-Alonso, None; J. Santos-Rey, None; J. Ruiz-Martin, None; P. Valdazo-De Diego, None; M. Moreno, None; J. A. Fernandez, None.

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The Prevalence of Autoimmune Thyroid Dysfunction in Ankylosing Spondylitis. Hakan Emmungil1, Mehmet Erdogan2, Melike Kalfa3, Gonca Karabulut4, Hayriye Kocanaogullari5, Vedat Inal6, Yasarim Kabasakal7, Fahrettin Oksel1, Kenan Aksu8 and Gokhan Keser9. 1Dept. of Internal Medicine, Division of Rheumatology, Ege University, Izmir, Turkey, 2Dept. of Internal Medicine, Division of Endocrinology, Ege University, Izmir, Turkey, 3Ege University, Izmir, Turkey, 4Dept. Of Internal Medicine, Division of Rheumatology, Ege University, Izmir, Turkey

Background/Purpose: Although the association of autoimmune thyroid dysfunction and primary Sjogren's syndrome (SjS) is well known, it is less clear whether a similar relationship also exists between autoimmune thyroid dysfunction and ankylosing spondylitis (AS). Therefore, we aimed to define the frequency of autoimmune thyroid dysfunction in patients with AS, to find out whether the frequency was significantly different from the healthy controls.

Methods: Eighty patients with AS (mean age: 40.57±10.13 years; M/F: 50/30) fulfilling the 1984 Modified New York Criteria and 80 healthy subjects, age and sex-matched with AS patients were included. As the positive control group, 62 female patients with primary SjS (mean age: 50.27± 10.84 years) fulfilling the diagnostic criteria of the European Consensus Group were also studied. All cases underwent thyroid ultrasonography by a single endocrinologist to evaluate the size, nodularity and homogeneity of the thyroid gland. Besides, serum free triiodothyronine (fT3), thyroxine (fT4), thyroid-stimulating hormone (TSH), and thyroid autoantibodies were measured. The diagnosis of Hashimoto's thyroiditis was made only if the patient had thyroid autoantibody positivity plus at least one of the following criteria, namely diffuse goiter with physical examination, abnormality in thyroid function tests and ultrasonographic thyroid hypoechogenicity. Statistical analysis was performed with SPSS 15 for Windows. The chi-squared test and Fisher's exact test, when appropriate, were used to compare cases and controls. p values < 0.05 were considered statistically significant.

Results: The frequency of Hashimoto's thyroiditis was significantly higher in patients with AS compared with age and sex-matched healthy controls (10% vs 1.3% p: 0.034). Similarly, the frequencies of any thyroid autoantibody positivity (13.8% vs 2.5% p: 0.017) and ultrasonographic thyroid hypoechogenicity (30% vs 11.3% p: 0.045) were also significantly higher in AS group. Other parameters such as thyroid gland volume and nodularity, and thyroid function tests did not differ significantly between AS and healthy control groups. As expected, frequencies of Hashimoto's thyroiditis, thyroid autoantibodies and thyroid hypoechogenicity were highest in primary SjS group, however differences did not reach to statistically significant levels between the SjS and AS groups.

Conclusion: The present study showed that the frequency of autoimmune thyroid dysfunction was significantly higher in AS group, compared with healthy controls. It should be kept in mind that, patients with AS may have concomitant autoimmune thyroid dysfunction, and in case of clinical suspicion, such patients should be further evaluated with clinical and laboratory parameters.

Disclosure: H. Emmungil, None; M. Erdogan, None; M. Kalfa, None; G. Karabulut, None; H. Kocanaogullari, None; V. Inal, None; Y. Kabasakal, None; F. Oksel, None; K. Aksu, None; G. Keser, None.

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Background/Purpose: Cardiovascular disease plays a central role in morbidity and mortality in rheumatic patients. N-terminal pro-brain natriuretic peptide (NT-proBNP) is a strong marker of cardiovascular risk with recent evidence that inflammation may also influence its levels. The discrimination of this confounding variable is of particular interest in rheumatic diseases. Therefore, we evaluated NT-proBNP in ankylosing spondylitis (AS) patients pre- and post-TNF blockage therapy to determine the possible association between NT-proBNP levels and inflammatory parameters.

Methods: Forty-five consecutive AS patients without previous/current cardiovascular disease or systolic myocardial dysfunction, who were eligible to anti-TNF therapy, were prospectively enrolled. All patients received TNF blockers (infliximab, adalimumab and etanercept in their regular schedule) and they were evaluated for circulating NT-proBNP levels, clinical and laboratory parameters of disease activity including BASDAI, ASDAS, ESR and CRP, traditional cardiovascular risk factors including blood pressure, body mass index, waist circumference and dyslipidemia; conventional and tissue Doppler imaging echocardiography and treatment data at baseline (BL) and six months after (6M). Statistical analysis included: Spearman rank order correlation, Mann-Whitney test or t-test to observe differences between patients with high or normal NT-proBNP levels at BL; paired-sample t tests or the Wilcoxon signed-rank test to observe differences between measurements at BL and 6M; Fisher exact test to compare categorical variables and multivariable linear regression analysis. All analyses used a two-sided significance level of 0.05.

Results: At BL, all patients had active AS, NT-proBNP levels had a median of 36 (20–72)pg/ml and 11% were high in spite of no systolic alteration. Multiple linear regression analysis revealed that this peptide, at BL, was independently correlated with ESR (p<0.001), age (p=0.01) and pulse pressure (p=0.01). After 6M, all disease parameters improved and NT-proBNP levels were significantly reduced [24 (16–47) pg/ml, p<0.037] compared to BL. Changes in NT-proBNP were positively correlated with ESR changes (r=0.41, p=0.006). Cardiovascular risk factors remained stable during follow-up.

Conclusion: Elevations of NT-proBNP should be interpreted with caution in active AS patients with no evidence of cardiovascular disease. The short-term reduction of NT-proBNP levels in these patients treated with anti-TNF therapy appears to reflect an improvement in inflammatory status. (ClinicalTrials.gov: number:NCT01072058).

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Increased Risk of Acute and Chronic Renal Comorbidity in Ankylosing Spondylitis: Results From a Population-Based Study. Walter P. Marks, Lwych1, Shelagh Szabo2, Sumati Rao3, M. Cifaldi4 and AR Levy5. 1University of Alberta, Edmonton, AB, 2Oxford Outcomes, Vancouver, BC, 3Abbott Laboratories, Abbott Park, IL, 4Oxford Outcomes Ltd, Vancouver, BC

Background/Purpose: Clinical evidence points to an increased risk of renal comorbidity in ankylosing spondylitis (AS) compared to the general population. However, there are no population-based estimates available in the literature. An increased risk of renal comorbidity would have substantial implications for the monitoring and treatment of AS because the mainstay of pharmacological treatment is the use of non-steroidal anti-inflammatory agents (NSAIDs). We aimed to estimate the prevalence and age- and sex-standardized increased risk of renal comorbidity, including acute and chronic kidney disease, and amyloidosis in a population-based cohort of persons diagnosed with AS in Quebec between 1996 and 2006, compared to the general population.

Methods: A retrospective cohort study was conducted using the administrative physician-billing database of the Régie de l’Assurance Maladie du Québec. The cohort included patients with at least one International Classification of Diseases, 9th Revision (ICD-9) billing code for AS between 1996 and 2006. A comparison cohort was generated using a 1% random sample of individuals without AS. Renal complications were identified by ICD-9 codes for amyloidosis, hypertensive chronic renal disease, acute and chronic renal disease. Age- and sex-stratified prevalence, and standardized prevalence ratios with 95% confidence intervals (CI), of renal complications in AS compared with the general population were calculated. Sensitivity analysis was conducted using two ICD-9 codes for AS.
Results: There were 8,616 individuals identified with AS; 56% were male and the median age at diagnosis was 42 years. Overall, renal complications were diagnosed among 3.4% and 2.1% of males and females with AS, compared to 2.0% and 1.6% of males and females in the general population cohort, respectively. Prevalence of renal complications increased with age in both the AS and general population cohort. Age- and sex-stratified prevalence ratios, comparing the risk of renal complications among those with AS to the general population, demonstrated a significantly increased risk of renal complications that was highest among younger individuals with AS. Overall, individuals with AS were at a significantly increased risk of renal complications compared to members of the general population (irrespective of a coding for hypertension), with a standardized prevalence ratio of 1.7 (1.5–2.0). Standardized prevalence ratios were 6.0 (2.0–18.0) for amiodarone, 1.7 (1.4–2.0) for chronic kidney disease, 3.2 (0.8–12.4) for hyperensive kidney disease, and 1.9 (1.5–2.3) for acute kidney disease. The excess risk was highest among younger individuals with AS, and results were similar when two ICD-9 codes were used to identify AS.

Conclusion: This population-based analysis shows that individuals with AS are at increased risk of many types of renal complications, including acute kidney disease, with the point estimates of excess risk being greatest among younger individuals. These data highlight the importance of careful monitoring for renal complications among those with AS, particularly during long-term continuous use of NSAIDs.

Disclosure: W. P. Maksymowych, None; S. Szabo, None; S. Rao, Abbott Laboratories, 1; Abbott Laboratories, 3; M. Cifaldi, Abbott Laboratories, 1; Abbott Laboratories, 3; A. Levy, Abbott Laboratories, 5.

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Reduced Joint Counts Misclassify Psoriatic Arthritis Patients with Oligoarthritis and Miss Significant Active Disease

Laura C. Coates1, Oliver M. Fitzgerald2, Dafna D. Gladman3, Neil J. McHugh4, and GRAPPA Composite A. Levy5.

Background/Purpose: Of the 270 patients, 164 patients did not have 1 or more tender joints that had been missed (23%), leaving 126 patients with no tender joints. The PsA-44 and PsA-56 missed tender joints in 38 patients (14.8%) did have 1 or more tender joints that had been missed (23%), leaving 126 patients with no tender joints. The PsA-44 and PsA-56 missed tender joints in 38 patients (14.8%). The PsA-44 and PsA-56 missed tender joints in 38 patients (14.8%). The PsA-44 and PsA-56 missed tender joints in 38 patients (14.8%). The PsA-44 and PsA-56 missed tender joints in 38 patients (14.8%). The PsA-44 and PsA-56 missed tender joints in 38 patients (14.8%).

Results: There were 100 patients enrolled; 41.9% were non-Caucasian, 90% of whom were AA (Table). Mean PSO and PsA disease duration was 181 (SD14.3) and 13.3 (SD10.9) years, respectively. Mean BMI was 30.3 (SD5.7) kg/m2 and PsA patients had a mean DAS28 of 2.7 (SD1.7). Non-Caucasians had worse PASI scores. Compared to Caucasians, AA had a lower frequency of PsA, worse SF-36 mental component and psoriasis related quality of life scores, received less years of education, had lower frequencies of tobacco use, uric acid levels or other psoriatic disease-related parameters.

Methods: IBD consented patients with PSO diagnosed by a dermatologist and PsA satisfying CASPAR criteria, were enrolled from 4 academic outpatient clinics. Socio-demographic data, disease duration, time to diagnosis, disease phenotype and activity, quality of life measures, comorbidities, use of disease modifying anti-rheumatic drugs (DMARD) and biologic therapies were recorded.

Conclusion: There were 160 PSO/PsA patients enrolled; 41.9% were non-Caucasian, 90% of whom were AA (Table). Mean PSO and PsA disease duration was 181 (SD14.3) and 13.3 (SD10.9) years, respectively. Mean BMI was 30.3 (SD5.7) kg/m2 and PsA patients had a mean DAS28 of 2.7 (SD1.7). Non-Caucasians had worse PASI scores. Compared to Caucasians, AA had a lower frequency of PsA, worse SF-36 mental component and psoriasis related quality of life scores, received less years of education, had lower frequencies of private insurance coverage, DMARD and biologic use, and lower Vitamin D levels. AA also had higher frequencies of tobacco use, hypertension, diabetes, hyperlipidemia and cerebrovascular accidents. There were no differences in alcohol use, uric acid levels or other psoriatic disease-related parameters.

Variable, n (%)  

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Cohort</th>
<th>Caucasian</th>
<th>Non-Caucasian*</th>
<th>African American p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort</td>
<td>160 (100)</td>
<td>93 (60.0)</td>
<td>67 (41.9)</td>
<td>60 (39.2)</td>
</tr>
<tr>
<td>PSO</td>
<td>44 (27.5)</td>
<td>41 (26.8)</td>
<td>23 (14.3)</td>
<td>30 (19.4)</td>
</tr>
<tr>
<td>NSAID</td>
<td>78 (50.0)</td>
<td>60 (40.6)</td>
<td>18 (11.3)</td>
<td>42 (30.0)</td>
</tr>
<tr>
<td>Age (Mean ± SD)</td>
<td>56.7 ± 13.3</td>
<td>55.6 ± 13.4</td>
<td>56.8 ± 14.7</td>
<td>57.8 ± 13.2</td>
</tr>
<tr>
<td>Male</td>
<td>120 (78.4)</td>
<td>77 (82.8)</td>
<td>48 (71.6)</td>
<td>43 (71.7)</td>
</tr>
<tr>
<td>Education Years</td>
<td>14.5 ± 3.3</td>
<td>15.1 ± 3.2</td>
<td>13.6 ± 3.2</td>
<td>12.8 ± 3.1</td>
</tr>
<tr>
<td>Private Insurance</td>
<td>71 (46.4)</td>
<td>51 (45.4)</td>
<td>8 (11.9)</td>
<td>11 (33.3)</td>
</tr>
<tr>
<td>Tobacco Use</td>
<td>39 (26.8)</td>
<td>19 (20.7)</td>
<td>21 (33.3)</td>
<td>14 (23.3)</td>
</tr>
<tr>
<td>Dactylitis</td>
<td>45 (9.8)</td>
<td>13 (9.0)</td>
<td>2 (3.3)</td>
<td>3 (3.3)</td>
</tr>
<tr>
<td>Arthritis &amp; PsA</td>
<td>42 (53.8)</td>
<td>32 (53.3)</td>
<td>10 (45.5)</td>
<td>7 (37.9)</td>
</tr>
<tr>
<td>Symmetric</td>
<td>14 (47.9)</td>
<td>20 (28.6)</td>
<td>2 (11.1)</td>
<td>11 (0.5)</td>
</tr>
<tr>
<td>PASI (Mean ± SD)</td>
<td>6.6 ± 5.1</td>
<td>5.5 ± 6.4</td>
<td>6.8 ± 10.4</td>
<td>8.4 ± 10.0</td>
</tr>
<tr>
<td>SF36 Physical</td>
<td>40.5</td>
<td>41.0</td>
<td>41.0</td>
<td>11.1</td>
</tr>
<tr>
<td>SF36 Mental</td>
<td>45.8</td>
<td>47.7</td>
<td>43.5</td>
<td>12.2</td>
</tr>
<tr>
<td>PSEQOL</td>
<td>5.5</td>
<td>5.8</td>
<td>5.2</td>
<td>6.6</td>
</tr>
<tr>
<td>PSEQOL</td>
<td>7.5</td>
<td>6.8</td>
<td>6.1</td>
<td>6.6</td>
</tr>
<tr>
<td>DMARD</td>
<td>31 (20.3)</td>
<td>26 (28.0)</td>
<td>7 (10.5)</td>
<td>4 (14.3)</td>
</tr>
<tr>
<td>Biologic</td>
<td>51 (33.3)</td>
<td>43 (64.6)</td>
<td>9 (13.4)</td>
<td>8 (13.3)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>28 (18.3)</td>
<td>14 (15.0)</td>
<td>14 (23.6)</td>
<td>24 (38.1)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>68 (44.8)</td>
<td>33 (35.5)</td>
<td>36 (65.5)</td>
<td>35 (58.3)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>51 (33.3)</td>
<td>28 (30.1)</td>
<td>23 (45.5)</td>
<td>23 (38.3)</td>
</tr>
<tr>
<td>Cerebrovascular Accident</td>
<td>7 (4.6)</td>
<td>2 (2.2)</td>
<td>5 (8.3)</td>
<td>3 (8.3)</td>
</tr>
</tbody>
</table>

Vitamin D (Mean ± SD) | 28.3 ± 13.8 | 31.2 ± 13.9 | 21.8 ± 10.8 | 21.6 ± 11.0* |

* Indicates corresponding p-value
** Includes African American, Hispanic and Asian

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Psoriasis and Psoriatic Arthritis in a Diverse Ethnic Cohort

Gail S. Kerr1, Seema Qaiyumi2, John S. Richards3, Chesahna Kindred4, Sean A. Whelton4 and Florina M. Constantinescu5. 1Washington DC VAMC, Georgetown and Howard University, Washington, DC, 2Washington DC VA and Georgetown University, Washington, DC, 3Howard University Hospital, Washington, DC, 4Georgetown University, Washington, DC, 5Washington Hospital Center, Washington, DC

Background/Purpose: Few clinical studies describe psoriasis (PSO) and psoriatic arthritis (PsA) in ethnic minority groups. Previous patient-reported data show PSO/PsA to be less frequent in African Americans (AA) compared to Caucasians, but of equal severity. We describe the clinical characteristics of a diverse ethnic cohort of patients with PSO and PsA in an urban setting.

Methods: IBD consented patients with PSO diagnosed by a dermatologist and PsA satisfying CASPAR criteria, were enrolled from 4 academic outpatient clinics. Socio-demographic data, disease duration, time to diagnosis, disease phenotype and activity, quality of life measures, comorbidities, use of disease modifying anti-rheumatic drugs (DMARD) and biologic therapies were recorded.

Conclusion: There were 160 PSO/PsA patients enrolled; 41.9% were non-Caucasian, 90% of whom were AA (Table). Mean PSO and PsA disease duration was 181 (SD14.3) and 13.3 (SD10.9) years, respectively. Mean BMI was 30.3 (SD5.7) kg/m2 and PsA patients had a mean DAS28 of 2.7 (SD1.7). Non-Caucasians had worse PASI scores. Compared to Caucasians, AA had a lower frequency of PsA, worse SF-36 mental component and psoriasis related quality of life scores, received less years of education, had lower frequencies of private insurance coverage, DMARD and biologic use, and lower Vitamin D levels. AA also had higher frequencies of tobacco use, hypertension, diabetes, hyperlipidemia and cerebrovascular accidents. There were no differences in alcohol use, uric acid levels or other psoriatic disease-related parameters.
Conclusion: Compared to Caucasians, African Americans had less frequent PsA but experienced greater impact on quality of life from psoriatic disease. Improved implementation and evaluation of disease activity and quality of life measures are needed in psoriatic disease, particularly in African American patients. Ours is the first study to use validated clinical measures to describe psoriatic disease in a diverse ethnic cohort.

Disclosure: G. S. Kerr, Angen, Abbott; 2; S. Qaiyumi, None; J. S. Richards, None; C. Kindred, None; S. A. Whelton, None; F. M. Constantinescu, None.

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The Association of alpha7 Nicotinic Acetylcholine Receptor Polymorphisms with Psoriatic Arthritis and Its Interaction with Smoking, Líli Eder1, Vinod Chandran2, Fawnda Pellett2, Remy Pollock2, Fatima Abji2, Adele Cartý2, Sutharshini Shanmugarahaj2, Cheryl Rosen2 and D. D. Gladman3, 1Carmel Medical Center, Haifa, Israel, 2Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Alpha7 nicotinic acetylcholine receptor (CHRNA7) is an ion channel that is gated by the binding of nicotinic ligands. Nicotine interacts with CHRNA7 leading to down-regulation of intracellular pro-inflammatory pathways. It has been suggested that smoking may protect against the development of PsA among patients with psoriasis. We aimed to study the association of CHRNA7 gene polymorphisms with PsA and its interaction with smoking.

Methods: We genotyped three groups of Caucasian individuals: patients with PsA, patients with psoriasis without arthritis (PsC) and healthy controls, for the following Single Nucleotide Polymorphisms (SNPs): rs904952, rs6494223, rs12915265, rs3826029 and rs6494165 within the CHRNA7 locus. PsA patients satisfied the CASPAR criteria. The psoriasis patients were assessed by a dermatologist to rule out inflammatory arthritis. The control DNA was from a commercial bio-bank. Smoking status was defined as current smoker for smokers and lifetime non-smoker for non-smokers. SNP genotyping was performed using Taqman SNP Genotyping Assays run on an ABI 7900HT Real-Time PCR system. The differences in allelic and genotype distributions were compared by Chi square test and trend test using PLINK software. The frequencies of rs6494223*T/C genotypes were then compared across the patient groups within smokers and non-smokers and the baseline biomarkers were not different.

Results: 238 PsA patients, 219 PsC patients and 210 healthy controls were included in the study. A significant inverse association was found between the rs6494223*T/C genotype and PsA (Table 1) compared to PsC (p = 0.01) and to healthy controls (p = 0.01), although no significant association was found between the minor allele rs6494223*T and PsA compared to PsC (p = 0.14) and to healthy controls (p = 0.26). Among smokers, the minor allele rs6494223*T was inversely associated with PsA compared to PsC (Odds Ratio (OR) 0.65, p = 0.01, p = 0.01). Among non-smokers, the association between rs6494223*T and PsA compared to PsC and to healthy controls was not significant (p = 0.79 and 0.54, respectively).

A statistically significant interaction between smoking status and rs6494223*T genotype was found when PsA patients were compared to healthy controls (p = 0.02). The remaining SNPs were not found to be associated with PsA compared to either PsC patients or to healthy controls in the entire study population and after stratification by smoking status.

Table 1. The association between rs6494223*T/C genotype and PsA vs. PsC and healthy controls by smoking status

<table>
<thead>
<tr>
<th></th>
<th>PsA</th>
<th>PsC</th>
<th>Allele</th>
<th>P allele</th>
<th>P genotype</th>
<th>Control</th>
<th>Allele</th>
<th>P allele</th>
<th>P genotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>TT</td>
<td>24 (10.1%)</td>
<td>43 (19.7%)</td>
<td>0.14</td>
<td>0.01</td>
<td>39 (19.1%)</td>
<td>0.26</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TC</td>
<td>137 (57.8%)</td>
<td>105 (48.2%)</td>
<td>96 (47.1%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>CC</td>
<td>76 (32.1%)</td>
<td>70 (32.1%)</td>
<td>69 (33.8%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>TT</td>
<td>6 (6.5%)</td>
<td>27 (29.6%)</td>
<td>0.04</td>
<td>0.02</td>
<td>26 (23.9%)</td>
<td>0.02</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TC</td>
<td>53 (57.6%)</td>
<td>45 (49.5%)</td>
<td>49 (45%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>33 (35.9%)</td>
<td>19 (20.9%)</td>
<td>34 (31.6%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Smoker</td>
<td>TT</td>
<td>18 (12.3%)</td>
<td>24 (18.9%)</td>
<td>0.79</td>
<td>0.14</td>
<td>13 (13.4%)</td>
<td>0.54</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TC</td>
<td>85 (58.2%)</td>
<td>60 (47.2%)</td>
<td>49 (50.5%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>45 (32.9%)</td>
<td>43 (31.9%)</td>
<td>35 (36.1%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: A CHRNA7 gene polymorphism is associated with PsA. The rs6494223*TT genotype may protect against the development of PsA particularly among smokers. This effect was not significant among non-smokers. This finding may explain why psoriasis patients who smoke are less likely to develop PsA.

Disclosure: L. Eder, None; V. Chandran, None; F. Pellett, None; R. Pollock, None; F. Abji, None; A. Cartý, None; S. Shanmugarahaj, None; C. Rosen, None; D. D. Gladman, None.

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Association Between Biomarkers (Metalloproteinase-3, Dikkopf-1 and Sclerostin) with Disease Activity and Prediction of Anti-TNFα Therapy Response in Patients with Ankylosing Spondylitis, Victoria Navarro-Compañ, Rafael Ariza, Rufino Mondejar-Garcia, Virginia Moreira-Navarrete, Enrique Melguizo-Madrid, Blanca Hernandez-Cruz, Concepcion Gonzalez-Rodriguez and Federico Navarro-Sarabia. University Hospital Virgen Macarena, Sevilla, Spain

Background/Purpose: Better objectives measures for evaluating disease activity and anti-TNFα response in patients with ankylosing spondylitis (AS) are needed. MMP-3 seems to be the most promising biomarker but published data are not conclusive. The aim of this study was to investigate the association between serum levels of biomarkers (MMP-3, DKK-1 and sclerostin) and disease activity parameters and to evaluate if these biomarkers are useful to predict anti-TNFα response in patients with AS.

Methods: From November 2010 to July 2011, consecutive patients with AS (New York criteria) who initiated anti-TNFα therapy in a University hospital were included. Before and after 3 months of therapy, disease activity was measured using BASDAI, ASDAScrp, CRP, patient’s VAS of pain and patient’s and physician’s VAS of global disease activity (GDA). Blood samples for determination of serum levels of biomarkers by enzyme immunoassay were also collected at both visits. Spearman correlation test was used to evaluate association between biomarkers and disease activity parameters.

Table 2. Change in serum levels of MMP-3, DKK-1, sclerostin and CRP after 3 months of anti-TNFα therapy based on the clinical response.

<table>
<thead>
<tr>
<th></th>
<th>BasDAI</th>
<th>ASDAScrp</th>
<th>Pt GDA</th>
<th>Pt VAS</th>
<th>Phy GDA</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MMP-3</td>
<td>−0.318</td>
<td>−0.086</td>
<td>−0.334</td>
<td>−0.477</td>
<td>−0.551</td>
</tr>
<tr>
<td></td>
<td>DKK-1</td>
<td>−0.017</td>
<td>−0.045</td>
<td>0.003</td>
<td>0.149</td>
<td>0.234</td>
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<tr>
<td></td>
<td>SOST</td>
<td>−0.096</td>
<td>−0.039</td>
<td>−0.074</td>
<td>0.066</td>
<td>−0.154</td>
</tr>
<tr>
<td></td>
<td>CRP</td>
<td>−0.288</td>
<td>0.577**</td>
<td>0.122</td>
<td>0.039</td>
<td>0.072</td>
</tr>
<tr>
<td>After 3 months</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMP-3</td>
<td>−0.135</td>
<td>−0.144</td>
<td>−0.169</td>
<td>−0.154</td>
<td>−0.156</td>
<td>−0.024</td>
</tr>
<tr>
<td>DKK-1</td>
<td>−0.007</td>
<td>0.168</td>
<td>0.155</td>
<td>0.179</td>
<td>0.270</td>
<td>0.296</td>
</tr>
<tr>
<td>SOST</td>
<td>−0.006</td>
<td>0.114</td>
<td>0.306</td>
<td>0.166</td>
<td>0.427</td>
<td>0.172</td>
</tr>
<tr>
<td>CRP</td>
<td>0.003</td>
<td>0.457**</td>
<td>0.177</td>
<td>0.173</td>
<td>0.266</td>
<td>1.000</td>
</tr>
</tbody>
</table>

* p < 0.05 ** p < 0.01.
Conclusion: No correlation was observed between serum levels of MMP-3, DKK-1 and sclerostin and disease activity parameters in patients with AS. Serum levels of MMP-3 may be useful to predict response to anti-TNFα therapy in patients with AS.

Disclosure: V. Navarro-Compañ, None; R. Ariza, None; R. Mondjar-Garcia, None; V. Moreira-Navarrete, None; E. Melguizo-Madrid, None; B. Hernández-Cruz, None; C. González-Rodriguez, None; F. Navarro-Sarabia, None.

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Efficacy and Safety of Adalimumab for the Treatment of Peripheral Arthritis in Spondyloarthritis Patients without Ankylosing Spondylitis or Psoriatic Arthritis, Jacqueline E. Paramarta, Leen De Rycke, Tanja F. Heijida, Carmen A. Ambarus, Koen Vos, Huib J. Dinant, Paul P. Tak and Dominique L. Baeten. Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands

Background/Purpose: The treatment of spondyloarthritis (SpA) has improved dramatically since the introduction of TNF-blockade. However, this therapy is only approved and reimbursed for the treatment of ankylosing spondylitis (AS) and psoriatic arthritis (PsA), which are the best described and studied phenotypic subtypes of SpA. Approximately one third of the SpA population cannot be classified as AS or PsA. Randomized clinical trials (RCTs) in non-radiographic axial SpA have recently been performed and showed good results, but for peripheral non-AS, non-PsA SpA patients RCTs are lacking. This study aimed to assess the efficacy and safety of adalimumab in patients with peripheral SpA not fulfilling the criteria for AS or PsA.

Methods: Forty patients with active peripheral SpA fulfilling the ESSG or Amor criteria but not the criteria for AS or PsA were included in a randomized, double-blind, placebo-controlled clinical trial. Patients were treated 1:1 with adalimumab or placebo for 12 weeks, followed by an open label extension up to week 24. Safety and efficacy measurements were performed every 6 weeks, with as primary endpoint the patient’s global assessment of disease activity at week 12.

Results: The baseline demographic and disease characteristics were similar across both treatment arms, except for HLA-B27 positivity which tended to be higher in the adalimumab group (55%) versus the placebo group (25%) (P=0.053), and the physician’s global assessment of disease activity which was somewhat higher in the placebo (57.0 ± 12.6 mm) versus the adalimumab treated patients (47.8 ± 11.8 mm) (P=0.022). At week 12 the patient’s and physician’s global assessment of disease activity, swollen joint count, BASDAI, ASDAS and ESR improved significantly in the adalimumab group compared with the baseline values and compared with placebo (Table 1). A similar improvement was seen upon adalimumab treatment from week 12 to 24 in the patients originally randomized to placebo, whereas the clinical response was maintained or even augmented. Week 24 in the patients who received adalimumab from the beginning. ASDAS inactive disease and BASDAI50 responses were met in 42% of the adalimumab group versus 0–5% in the placebo group at week 12 (P=0.001 and P=0.008 respectively), and were further increased at week 24. Quality of life and disability scores also improved upon adalimumab treatment. Multiple regression analysis showed that features such as gender, HLA-B27 status and concomitant DMARD treatment did not act as confounders in this trial. The number of adverse events was not different between the adalimumab and placebo group.

Table 1. Mean changes in disease activity from baseline to week 12 by treatment group

<table>
<thead>
<tr>
<th>Baseline to week 12</th>
<th>Adalimumab</th>
<th>Placebo</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient’s global assessment, 0–100 mm VAS</td>
<td>-31.0 (23.1)</td>
<td>-5.9 (21.4)</td>
<td>0.001</td>
</tr>
<tr>
<td>Physician’s global assessment, 0–100 mm VAS</td>
<td>-19.8 (19.5)</td>
<td>-4.1 (16.4)</td>
<td>0.011</td>
</tr>
<tr>
<td>Swollen joint count, 0–66 joints</td>
<td>-2.5 (4.0)</td>
<td>-0.4 (1.8)</td>
<td>0.046</td>
</tr>
<tr>
<td>Tender joint count, 0–68 joints</td>
<td>-1.8 (9.2)</td>
<td>1.7 (6.5)</td>
<td>0.174</td>
</tr>
<tr>
<td>BASDAI</td>
<td>-1.8 (2.6)</td>
<td>-0.3 (1.5)</td>
<td>0.030</td>
</tr>
<tr>
<td>ASDAS</td>
<td>-1.0 (1.0)</td>
<td>-0.1 (0.6)</td>
<td>0.003</td>
</tr>
<tr>
<td>CRP, mg/l</td>
<td>-5.7 (12.4)</td>
<td>4.0 (22.9)</td>
<td>0.112</td>
</tr>
<tr>
<td>ESR, mm/hour</td>
<td>-6.0 (12.5)</td>
<td>1.7 (9.3)</td>
<td>0.039</td>
</tr>
</tbody>
</table>

Values are the mean change (standard deviation) from baseline to week 12.

Conclusion: Adalimumab is effective and safe in SpA patients with active peripheral disease, also in those patients not fulfilling the AS or PsA criteria. Therefore, this treatment should be considered and made available for these patients when their peripheral SpA is refractory to conventional treatments.

Disclosure: J. E. Paramarta, None; L. De Rycke, None; T. F. Heijida, None; C. A. Ambarus, None; K. Vos, None; H. J. Dinant, None; P. P. Tak, GlaxoSmithKline, 3; D. L. Baeten, AbbVie Immunology Pharmaceuticals, 2.

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The Predictors of Reduced Work Productivity in Patients with Psoriatic Arthritis, Anjali Papneja1, Matthew Kennedy2, Arane Thavaneswaran3, Daniel Pereira3, Vinod Chandran2 and Dafna D. Gladman1. 1University of Toronto, Toronto, ON, 2University of Toronto, TOronto, ON, 3Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Psoriatic arthritis (PsA) is a unique inflammatory musculoskeletal disorder associated with psoriasis. Related to its detrimental impact on health and quality of life, PsA patients have also been affected with reduced work productivity. Work productivity is an essential determinant of health because it affects a patient’s physical and psychological wellbeing. The purpose of this study was to identify the factors that predict reduced work productivity, as measured by the Work Limitations Questionnaire (WLQ), among patients with PsA. These predictors can be divided into demographic factors, clinical factors, and work related factors.

Methods: Patients attending a single centre Psoriatic Arthritis Clinic were recruited for participation. Employed participants (including home makers) first completed a Questionnaire for the Assessment of Work Related Factors (QAWRF), to shed light upon the nature of their work. Eligible participants then completed the WLQ. The WLQ scores were used as the dependent variable in a linear regression analysis. The independent variables assessed in this study included work characteristics, demographic factors, and clinical measures, such as PASI, active joint count, damage joint count, and ESR.

Results: 152 patients participated (53% males) with a mean age of 50.7 years, disease duration of 14.6 years, and 85.6% with a post-secondary school education. The mean actively inflamed joint count was 5.3. The damage joint count was 10.4. The mean PASI was 3.2. All patients completed the WLQ, of whom 137 completed both the WLQ and the QAWRF. 18.8% of patients lost 1 or more full days at work and 28.3% lost 1 or more partial work days, due to their health. On both univariate and multivariate linear regression education status, PASI, active joint count, and ESR were associated with reduced work productivity among working PsA patients. Support in the workplace was negatively correlated with reduced work limitations.

Table 1. Univariate and multivariate linear regression to determine associates of WLQ (N=137)

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Univariate Model</th>
<th>Multivariate Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>P-value</td>
</tr>
<tr>
<td>Age at visit</td>
<td>0.06</td>
<td>0.1543</td>
</tr>
<tr>
<td>Sex</td>
<td>–3.89</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Duration of PsA</td>
<td>–0.04</td>
<td>0.41</td>
</tr>
<tr>
<td>Education status</td>
<td>–2.96</td>
<td>0.026</td>
</tr>
<tr>
<td>PASI</td>
<td>0.25</td>
<td>0.061</td>
</tr>
<tr>
<td>Active joint count</td>
<td>0.36</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Damage joint count</td>
<td>–0.007</td>
<td>0.87</td>
</tr>
<tr>
<td>ESR</td>
<td>0.07</td>
<td>0.0001</td>
</tr>
<tr>
<td>Physical labour work</td>
<td>0.50</td>
<td>0.1251</td>
</tr>
<tr>
<td>Control work schedule</td>
<td>–0.38</td>
<td>0.2440</td>
</tr>
<tr>
<td>Support at work</td>
<td>–1.32</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

Conclusion: Work productivity is associated with demographic, clinical, and work related factors. This endorses the use of an effective drug to control disease activity and advocates for a more supportive work environment for these patients.

Disclosure: A. Papneja, None; M. Kennedy, None; A. Thavaneswaran, None; D. Pereira, None; V. Chandran, None; D. D. Gladman, None.

Background/Purpose: At least grade 2 unilateral sacroiliitis in the presence of spinal symptoms (defined as a combination of inflammatory back pain and/or back stiffness) in our criteria allowed us to classify axial psoriatic arthritis (axPsA). However it is unknown to what extent this sacroiliac involvement is specific for axPsA. The objective was to determine the prevalence of at least grade II unilateral radiological sacroiliitis in the general population, cutaneous psoriasis and PsA.

Methods: Descriptive cross sectional study of 3 cohorts: a) general population: consecutive digitalized pelvis x ray films taken to patients that acceded to the emergency room of the Complexo Hospitalario Universitario A Coruña (CHUAC) between January-March 2010 for spinal pain (1174 x-rays out of 928 patients, 621 patients met inclusion criteria for the analysis), b) patients of a follow up cohort of cutaneous psoriasis (Ps) (n=106), c) PsA patients from CHUAC (n=168) and Complexo Hospitalario Universitario de Ourense (CHOU) (n=89). X ray films were red independently by two expert’s rheumatologist, x ray films were discarded if: absence of vision of both sacroiliac joints, blurred x rays, age <18 years old, prosthesis, dysplasia, Paget’s disease and osteitis condensans illi. If there was a discrepancy consensus was reached between both readers. Prevalence of sacroilitis, together with its 95% confidence interval (CI), was estimated in each cohort. Odds ratio and prevalence ratio values were estimated from a multivariate logistic regression model, adjusted by age and gender.

Results: 621 sacroiliac x-rays in the general population, 106 in Ps and 257 in PsA were analysed. Medium age was 58.7±20.1, 54.6±13.1 and 54.6±15.9 years, respectively. The percentage of males in each cohort was 34.6% 39.6% y 63%, respectively. Prevalence of at least unilateral grade II sacroilitis or higher was significantly higher in Ps (16.0%, 95% IC: 8.6%–23.5%) and in PsA (34.2%, 95% IC: 28.2%–40.2%) than in the general population (0.6%, 95% IC: 0.2%–1.6%). Logistic regression analysis showed that the prevalence of sacroilitis was significantly higher in Ps (OR=35.2; p<0.001) and in PsA (OR=78.6; p<0.001) independently of age and sex.

Conclusion: The prevalence of at least grade 2 unilateral sacroilitis or higher was 34.2% in PsA and 16% in Ps, both were higher than in the general population, Prevalence was higher in PsA than in Ps. Prevalence of sacroilitis increased with age and male gender. These data suggest that the presence of at least grade II unilateral sacroilitis is specific of PsA and may be used to classify a patient with axial involvement.

*Financed with a grant from the Ministry of Health, Spain FIS PI0800789

Disclosure: J. L. Fernandez-Sueuré, None; C. Fernandez-Lopez, None; S. Pertegá-Díaz, None; J. Pinto, None; E. Gonzalez, None; F. J. de Toro-Santos, None; F. J. Blanco, None.

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Validation of a Reference Imaging Module for Calibration of Readers Scoring with the Modified Stoke Ankylosing Spondylitis Spine Score. Walter P. Maksymowycz1, Thomas J. Learch2, Robert GW Lambert1, Michael M. Ward3, Nigel Haroon, David Salonen1, Robert D. Inman4 and Michael H. Weinman1. 1University of Alberta, Edmonton, AB, 2Cedars-Sinai, Los Angeles, CA, 3NIAMS/NIH, Bethesda, MD, 4University Health Network, Toronto Western Hospital Research Institute, University of Toronto, Toronto, ON, 5University Health Network, Toronto, ON, 6Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON, 7Cedars-Sinai Medical Center, Los Angeles, CA

Background/Purpose: To develop a modified Stoke Ankylosing Spondylitis Spine Score module to calibrate musculoskeletal radiologists with special expertise in AS. We conducted the following: 1. Systematic review of the literature to identify aspects of the mSASSS requiring methodological clarity. 2. Independent assessment by 6 readers of baseline and 2 year radiographs from 25 patients with AS (exercise 1). 3. Consensus development of an imaging module (SPAR module) which clarifies definitions, scoring methodology, and a set of extensively annotated reference images. In exercise 2 the same 6 readers assessed radiographs from 39 patients with AS, which included 15 from exercise 1 (Subgroup 1), where baseline and 2 year radiographs were scored blinded to time point. Readers first scored only the lateral radiographs of the lumbar (LS) and cervical spine (CS), then only the AP radiograph, and then both radiographs simultaneously. Inter-observer reliability of the mSASSS was assessed by the intraclass correlation method (ICC).

Methods: The group readers comprised 5 rheumatologists and 3 musculoskeletal radiologists with special expertise in AS. We conducted the following: 1. Systematic review of the literature to identify aspects of the mSASSS requiring methodological clarity. 2. Independent assessment by 6 readers of baseline and 2 year radiographs from 25 patients with AS (exercise 1). 3. Consensus development of an imaging module (SPAR module) which clarifies definitions, scoring methodology, and a set of extensively annotated reference images. In exercise 2 the same 6 readers assessed radiographs from 39 patients with AS, which included 15 from exercise 1 (Subgroup 1), where baseline and 2 year radiographs were scored blinded to time point. Readers first scored only the lateral radiographs of the lumbar (LS) and cervical spine (CS), then only the AP radiograph, and then both radiographs simultaneously. Inter-observer reliability of the mSASSS was assessed by the intraclass correlation method (ICC).

Results: The first exercise demonstrated excellent reliability for status scores (ICC for 6 readers (range) = 0.92; Median (range) ICC for 15 reader pairs = 0.92 (0.84–0.96)) but poor reliability for change scores (ICC for 6 readers = 0.46; Median (range) for 15 reader pairs = 0.52 (0.11–0.66)). In particular, ICC for change score for the radiologist reading pair was only 0.46. In exercise 2, the ICC for change score for the radiologist reading pair improved substantially to 0.62 while improvement from 0.49 to 0.57 was also noted for the overall group in the subgroup of patients scored in both exercises. Reliability was not further enhanced when lateral and A-P radiographs were assessed simultaneously for either status or change mSASSS score. There was substantial variation between readers in the contribution of the AP radiograph to staging (mean (range) 27.2% (21.1–42.1)) and progression (mean (range) 15.4% (5.3–31.6)) and was most consistent for staging.

Disclosure: W. P. Maksymowycz, None; T. J. Learch, None; R. G. Lambert, None; M. M. Ward, None; N. Haroon, None; D. Salonen, None; R. D. Inman, None; M. H. Weisman, None.

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Wnt Pathway Inhibitors in Patients with Psoriatic and Rheumatoid Arthritis Treated with Anti-TNF Therapy. Agnes Szemeteyeri, Harjit P. Bhattoo, Peter Antal-Szalmas, Zoltan Szekanez and Olivier M. FitzGerald. 1Department of Rheumatology, St. Vincent’s University Hospital, Dublin, Ireland, 2Department of Laboratory Medicine, University of Debrecen, Medical and Health Science Center, Debrecen, Hungary, 3Department of Rheumatology, University of Debrecen Medical and Health Sciences Center, Debrecen, Hungary, 4Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: Both rheumatoid arthritis (RA) and psoriatic arthritis (PsA) are characterised by bone erosion but aberrant bone formation is also a feature in PsA. Wnt proteins have recently been identified as key promoters of osteoblastogenesis hence new bone formation in inflammatory arthritis. Dickkopf 1 (Dkk-1) and sclerostin are natural inhibitors of Wnt signalling. Dkk-1 induces sclerostin expression by osteocytes and promotes osteoclastogenesis through suppression of osteoprotegerin (OPG). It has been shown that TNF-alpha inhibits bone formation by inducing Dkk-1 and sclerostin expression. The effect of anti-TNF on endogenous antagonists of the Wnt pathway in RA and PsA has not been studied previously in a prospective study design.

The aim of this study was to: (1) investigate serum levels of Dkk-1 and sclerostin in patients with RA and PsA; (2) compare both the very early (1 month) and more long-term (12 months) effects of anti-TNF treatment on
inhibitors of Wnt signalling; and (3) explore associations between serum levels of Dkk-1 and sclerostin and acute phase response measures.

Methods: RA and PsA patients with active disease were recruited prior to starting anti-TNF therapy. Serum levels of Dkk-1, sclerostin and OPG were measured by ELISA at baseline, 1 month and 12 months and were related to CRP levels at all time points. OPG/Dkk-1 and OPG/sclerostin ratios were calculated from previously measured OPG levels.

Results: 62 patients (35 RA, 27 PsA) were recruited with a median age of 53 years (28–74) and median disease duration of 7 years. Older age was associated with lower sclerostin levels in the entire group (r = -0.316 p = 0.023).

No significant difference in Dkk-1 and sclerostin levels was observed between RA and PsA at any time point, though Dkk-1 levels were lower in PsA at 12 months approaching significance (p = 0.08). Serum Dkk-1 and sclerostin levels did not change significantly with anti-TNF therapy in either RA or PsA during the course of the study. There were significant positive correlations between both Dkk-1 and sclerostin levels across the different time points with the exception of DKK-1 between baseline and 1 year in both diseases. High serum sclerostin levels were associated with low Dkk-1 levels in PsA (r = -0.605 p = 0.004) and in the entire group (r = -0.453 p = 0.001) after 12 months of anti-TNF therapy.

Conclusions: This study provides data suggesting differences in the cross-talk between TNF-alpha, Dkk-1 and sclerostin between RA and PsA. After 12 months of anti-TNF treatment Dkk-1 levels were lower in PsA compared to RA. This may contribute to an imbalance in bone remodeling in favour of bone formation in PsA. High serum sclerostin levels were associated with low Dkk-1 levels in PsA and in the entire group after 12 months only suggesting that DKK-1 but not sclerostin might be altered with anti-TNF therapy. Neither Dkk-1 nor sclerostin correlated with CRP at any time point indicating that these Wnt inhibitors may not linked to inflammation.

Disclosure: A. Szentpetery, None; H. P. Bhattacha, None; P. Antal-Szalmas, None; Z. Szekeane, None; O. M. FitzGerald, Abbott Immunology Pharmaceuticals, Bristol-Myers Squibb, 2, Abbott Immunology Pharmaceuticals, UCB, 5, Abbott Immunology Pharmaceuticals, 8.

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Anterior Chest Wall Pain in Recent Inflammatory Back Pain. Data From the DESIR Cohort. Daniel Wendling1, Clément Prat, Christiane Demattei2, Darnieu LoeulxIL, P. Richette2 and Maxime Dougdas3, 1Minjoz University Hospital, Besancon, France, 2CHU J Minjoz, Besancon, France, 3CHU, Nimes, France, 4CHU Brabois, Vandoeuvre les Nancy, France, 5Hôpital Lariboisière, Paris, France, 6Paris-Descartes University, APHP, Cochin Hospital, Paris, France

Background/Purpose: Anterior chest wall pain (ACW) may be suggestive of spondyloarthritides (SpA), but little is known about this clinical feature in recent inflammatory back pain (IBP).

Objective: To determine the prevalence of ACW in patients with recent IBP suggestive of SpA, and to investigate the influence of ACW on the overall features of patients presenting with recent IBP.

Methods: The DESIR cohort is a prospective, multicenter French cohort of patients with early IBP (Calin or Berlin criteria) (>3 months and <3 years of duration) suggestive of SpA according to the investigator, including 708 patients (mean age 33.8 years, 53.8% female, 57.3% HLA-B27 positive). ACW was defined by at least one episode of chest wall pain attributed to SpA by the rheumatologist, after ruling out other causes of chest pain. Data on the baseline demographic characteristics, functional status and quality of life, imaging features (standard X-Rays, MRI, Ultrasounds), BMD, and blood tests were compared in patients with and without ACW. Both the date of the first symptom of IBP and the symptoms at onset of ACW were recorded, as well as the date of the visit. Factors associated with ACW were identified both by univariate and multivariate analysis (logistic regression).

Results: The prevalence of ACW in the DESIR cohort was 46.6% [95%CI 40.9–48.3] (n = 316/708 patients). ACW occurred after the first symptoms of IBP in 62%, before in 14%, and simultaneously in 24% of the cases. Localization was diffuse in 41% of the positive cases, sternum costal (35%), manubrio sternal (29%) or sterno clavicular (26%). Presence of ACW was significantly associated in univariate analysis with pain in cervical and thoracic spine, buttock, peripheral arthritis and enthesitis, fulfilment of ASAS and ESSG criteria, associated reactive arthritis and SAPHO, increased BASDAI, ASDAS, BASFI, BASG, SF-36, BASMI, articular index, increased CRP, radiographic sacro iliac involvement and reduced BMD. ACW was not associated with HLA-B27, uveitis, psoriasis, smoking, age and MRI findings. A stepwise multivariate analysis found an association between ACW and (Table): the enthesitis score, involvement of the thoracic spine, diagnosis of ankylosing spondylitis and radiographic abnormality of the sacral iliac joints.

Disclosure: D. Wendling, None; C. Prat, None; C. Demattei, None; D. Loeulx, None; P. Richette, None; M. Dougdas, None.

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Correlates of Inflammatory Back Pain in a Nationally Representative Sample of the US Population. Shervin Assassi1, Michael H. Weissman2, Zhiyong Chen3, Mohammad Rabbar4, Daniel O. Clegg5, Robert A. Cobert6, Atul A. Deodhar7, Laurie M. Savage8, Tiffany Graham9, James P. Witter10 and John D. Reveille11, 1Univ of Texas Health Science Center at Houston, Houston, TX, 2Cedars-Sinai Medical Center, Los Angeles, CA, 3George E. Wahlen VA Medical Center, Salt Lake City, UT, 4NIAMS NIH, Bethesda, MD, 5Oregon Health & Science University, Portland, OR, 6Spondyloitis Association of America, Van Nuys, CA, 7NIH, Bethesda, MD

Background/Purpose: There are no published studies on correlates of inflammatory back pain (IBP) based on a large-scale nationally representative sample. In the present study, we examine the demographic and clinical features that are associated with IBP among adults with chronic back pain who participated in the US National Health and Nutrition Examination Survey (NHANES) 2009–2010.

Methods: NHANES 2009–2010 surveyed 5106 adults (ages: 20 to 69), representative of the US population. The study participants were interviewed and examined by trained personnel to obtain demographic and clinical data. A detailed questionnaire focused on back pain and associated features was administered. Chronic back pain was defined as back discomfort present on most days for more than 3 months. Based on this definition, 980 (19.2%) had chronic back pain. Two published sets of criteria for IBP were utilized to identify participants with IBP in the chronic back pain group. Specifically, the outcome variable was IBP as defined by presence of four (out of five) European Spondyloarthritides Study Group (ESSG) or two (out of four) 2006 Berlin Criteria. The investigated independent variables included a comprehensive list of demographic features including age, gender, ethnicity, education, income, exercise habits, body mass index (BMI), alcohol use, and smoking status. In addition, laboratory and clinical features including C-reactive protein, presence of diabetes, hepatitis C, arthritis, uveitis, inflammatory bowel disease, psoriasis, rapid response to NSAIDs, and heel pain were also investigated. Specifically, presence of arthritis was determined by affirmative response to the question “has a doctor ever told you that you had arthritis?”. Obesity was defined as BMI ≥30. Among patients with chronic back pain, the association of demographic and clinical features with IBP was assessed with weighted logistical regression analysis in univariable and multivariable models in order to identify the independent correlates of IBP.
Results: First, correlates of IBP according to the ESSG criteria were examined. Among participants with chronic back pain, absence of morbid obesity (OR: 1.86, p<0.001), presence of arthritis diagnosed by a physician (OR: 1.6, p=0.021), rapid response to NSAIDs (OR: 1.6, p=0.032), younger age (20–49 versus 50–65 age group, OR: 3.68, p<0.001) were independent correlates of IBP in the multivariable model. Next, correlates of IBP according to the Berlin Criteria were investigated. For this purpose, participants over 50 year of age were excluded because the Berlin Criteria are not applicable to this age group. The presence of arthritis diagnosed by a physician (OR=1.7, p=0.039), psoriatic skin disease (OR=3.2, p=0.04), current smoking (OR: 1.8, p=0.017), and lower education level (high school diploma or less versus the rest, OR=1.6, p=0.04) were independently associated with IBP in the multivariable model.

Conclusion: Demographic factors including younger age, lower BMI, lower educational level, and current smoking, as well as several clinical characteristics, specifically arthritis, psoriasis, and rapid response to NSAIDs are associated with IBP in adults with chronic back pain in the US population.

Disclosure: S. Assassi, None; M. H. Weisman, None; Z. Chen, None; M. Rahbar, None; D. O. Cleland, None; R. A. Colbert, None; A. A. Deodhar, None; L. M. Savage, None; T. Graham, None; J. P. Witter, None; J. D. Reveille, None.

546 The Immunogenicity to the First Anti-TNF Therapy Determines the Outcome of Switching to a Second Anti-TNF in Spondyloarthropathy Patients.

Chamaiid Plascencia1, Dora Pascual-Salcedo2, Sara Garcia-Carazo2, Gema Bonilla1, Leticia Lojo1, Laura Nuño1, Alejandro Villalba1, Diana Peiteado1, Concepcion Castillo-Gallego Jr1, Florence Arribas1, Daniel Nagero1,2, Maria-Mola2, and Alejandro Bahia1.

RATIONALE: The use of biological drugs has increased the treatment of rheumatic diseases. Anti-TNF agents are frequently used in the treatment of patients with rheumatoid arthritis (RA), and sometimes in patients with ankylosing spondylitis (AS). After achieving remission with a first anti-TNF agent, some patients may experience deterioration of their disease, and in this situation, a switch to a second anti-TNF is considered. However, little is known about the immunogenicity to a first anti-TNF (primary anti-TNF Ab), its association with disease deterioration and response to a second anti-TNF.

Objectives: The aim of our study was to validate and compare the Hebrew versions of PASE and ToPAS questionnaires among Israeli psoriasis patients.

Methods: A cross-sectional study included 99 patients with psoriasis attending dermatology clinics and 15 patients from a combined rheumatology-dermatology clinic who completed the PASE and ToPAS questionnaires. Psoriasis patients who had PASE scores >8 were considered to be suspected psA cases. Specialized rheumatologists, blind to the questionnaires’ results, evaluated all participants for symptoms and signs of PsA. Patients with inflammatory arthritis underwent laboratory and radiology work-ups. A definitive diagnosis of PsA was made by a rheumatologist applying the CASPAR criteria. The questionnaires’ performance was assessed using the receiver operating curve (ROC) analysis and the magnitudes of sensitivity and specificity.

Results: The questionnaires were completed by 114 patients with psoriasis, of which 38 (33.3%) met the CASPAR criteria for PsA (group A) and 76 (66.7%) did not (group B). The two groups were comparable with regard to age, gender, duration of psoriasis, family history of psoriasis, ethnicity and education. A statistically significant difference was noted between the average scores of patients with PsA and those with psoriasis but without arthritis (Mean 95% Confidence Interval): PASE symptoms (24.2 (21.67–26.76), 12.3 (11.01–13.52) P<0.0001, respectively), PASE functional (26.02 (23.28–28.77), 11.75 (10.42–13.08) P<0.0001, respectively), PASE total (50.24 (43.32–55.15), 24.04 (21.63–26.45) P<0.0001, respectively) and ToPAS symptoms (4.4 (3.92–4.9) P<0.0001, respectively) and ToPAS total (5.29 (4.58–5.98), 4.4 (3.92–4.9) P<0.0001, respectively). The sensitivity and specificity of the PASE questionnaire were 71.1% and 89.5%, respectively, and those of the ToPAS questionnaire were 52.6% and 93.4%, respectively. The area under the ROC curve (AUC) was 0.9093 and 0.8901 for the PASE and ToPAS questionnaires, respectively. The difference between the AUC’s (0.0192) was not significant.

Conclusion: The ToPAS and PASE questionnaires identified PsA patients with moderate to high sensitivity and specificity among Israeli patients with psoriasis. No statistically significant difference in the performance of the two questionnaires appeared, although the PASE questionnaire had higher sensitivity. Administering the questionnaires may facilitate early detection, referral and treatment of psoriatic arthritis patients.

Disclosure: D. Zisman, None; L. Eder, None; B. Zamir, None; A. Laor, None; J. Feld, None.

548 Assessment of the T1-Weighted Sequence Is Essential in Defining a Positive MRI Scan of the Sacroiliac Joints in Spondyloarthropitits.


Background/Relevance: There are criteria for the diagnosis of sacroiliac joints (SJ) inflammation in patients with spondyloarthritis (SpA). These are the Assessment of Spondyloarthritis International Society (ASAS) classification criteria, which include high or very high disease activity state by the ASDAS (18 out of 24 (75%) without ADAs vs 3 out of 9 (33.3%) with ADAs, p=0.022), and more patients with ADAs had inactive disease (2 of 9 (22.2%) with ADAs vs 1 out of 4 (24.2%) without ADAs, p=0.022).

Conclusion: In SpA, the failure to respond to the first anti-TNF treatment due to the development of ADAs predicts a better clinical response to a second anti-TNF treatment. The study of immunogenicity in biological treatment failure may help predict the response to a second biological treatment for SpA.

Disclosure: C. Plascencia, Pfizer Inc; 2. D. Pascual-Salcedo, Pfizer Inc; 2. S. Garcia-Carazo, None; G. Bonilla, None; L. Lojo, None; L. Nuño, None; A. Villalba, None; D. Peiteado, None; C. Castillo-Gallego Jr, None; F. Arribas, None; D. Nagore, None; E. Martin-Mola, Pfizer Inc; 2. A. Balsa, Pfizer Inc; 2.
based on expert clinical opinion as gold standard. The definition of a positive SI MRI in the CASAS criteria was generated by consensus among experts. Studies using a data-driven approach are scarce. We aimed to assess candidate definitions for a positive SI MRI using both clinical gold standard and confidence in the diagnosis of SpA according to global assessment of MRI (T1-weighted and STIR sequences) by expert readers.

Methods: The study comprised 2 independent cohorts (cohort A/B) of 157 consecutive patients with back pain ≤50 years newly referred to 2 university clinics, and 20 healthy controls. Patients were classified according to clinical examination and pelvic radiography as having non-radiographic SpA (n = 51), ankylosing spondylitis (n = 34), or mechanical back pain (n = 72). SIJ MRI were assessed by 4 blinded readers according to a standardized module. Readers recorded their level of confidence in the diagnosis of SpA by global evaluation of the MRI scan on a 0–10 scale (0 = definitely not SpA; 10 = definitely SpA). An MRI-based gold-standard criterion for SpA was pre-specified as the majority of readers (≥3/4) recording a confidence of 8–10. We estimated the type and extent of involvement according to number of affected SIJ quadrants attaining specificity of 90% for SpA using ROC analysis according to both clinical and MRI-based gold-standard criteria.

Results: The agreement between 4 readers regarding confidence for MRI-based global assessment of SpA was substantial with kappa of 0.76/0.80 for cohort A/B. BME was recorded in up to 30%/24.2% of controls in cohort A/B, whereas erosion was seen in only 0%/12.1% of controls. The combination of erosion and/or BME increased sensitivity compared to either lesion alone without reducing specificity irrespective of which gold standard criterion was used.

Sensitivity and cut-off for number of affected SIJ quadrants for a pre-defined specificity ≥0.90, and AUC, for the 2 gold standards and for cohort A/B

<table>
<thead>
<tr>
<th>Gold standard</th>
<th>Lesion</th>
<th>Sensitivity</th>
<th>Number of SIJ quadrants</th>
<th>AUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI criterion</td>
<td>BME</td>
<td>0.91/0.83</td>
<td>3/2</td>
<td>0.97/0.91</td>
</tr>
<tr>
<td>Clinical evaluation</td>
<td>BME</td>
<td>0.73/0.48</td>
<td>4/4</td>
<td>0.91/0.75</td>
</tr>
<tr>
<td>MRI criterion</td>
<td>ER</td>
<td>1.00/1.00</td>
<td>1/1</td>
<td>1.00/1.00</td>
</tr>
<tr>
<td>Clinical evaluation</td>
<td>ER</td>
<td>0.83/0.58</td>
<td>1/2</td>
<td>0.94/0.79</td>
</tr>
<tr>
<td>MRI criterion</td>
<td>BME+ER</td>
<td>1.00/1.00</td>
<td>3/2</td>
<td>1.00/1.00</td>
</tr>
<tr>
<td>Clinical evaluation</td>
<td>BME+ER</td>
<td>0.83/0.58</td>
<td>4/6</td>
<td>0.96/0.83</td>
</tr>
</tbody>
</table>

AUC: Area under the curve. BME: Bone marrow edema. ER: Erosion. Number of SIJ quadrants: Cut-off for the number of affected SIJ quadrants

Conclusion: This data driven study shows that assessment of the T1-weighted sequence enhances diagnostic certainty when viewed simultaneously with the STIR and supports the case for revision of the CASAS definition of a positive MRI in SpA.

Disclosure: U. Weber, None; V. Zuber, None; S. J. Pedersen, None; K. Rutfuch, None; R. G. Lambert, None; S. Chan, None; M. Ostergaard, None; W. P. Maksymowycz, None.

549

A Randomized, Open-Label Study of Maintenance of Partial Remission with Naproxen Vs No Treatment: Results of the INFAST As First Line Therapy in Patients with Early Active Axial Spondyloarthritis Trial, Part II

Methods: To determine differences in the prevalence of inflammatory articular disease (IAD) in patients with cutaneous psoriasis when applying clinical, ultrasound (PDUS) or radiological diagnostic criteria. To determine the prevalence of PsA in these patients, applying different definitions for the initial stem of the CASPAR criteria, and to compare this prevalence with that based on clinical judgment.

Methods: Descriptive, observational, cross-sectional study of 122 patients referred from the primary care with a confirmed diagnosis of cutaneous psoriasis, without arthritis. For the diagnosis of IAD, the following criteria were used: Peripheral arthritis: a) Clinical (TJC ≥0 or SJC ≥0 (78/76)), b) PDUS (carpal, MCP, PIP, MTPs, carpal tendons, hands, feet tendons), c) Radiological (hands and/or feet erosions).

Table 1. Efficacy Outcomes by Treatment Group

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Week 28</th>
<th>Change (mean (SD))</th>
<th>Week 52</th>
<th>Change (mean (SD))</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASDAI (0-10)</td>
<td>7.1</td>
<td>0.6 (2.03)</td>
<td>6.6</td>
<td>0.5 (1.99)</td>
<td>0.426</td>
</tr>
<tr>
<td>ASDAS (0-4.5)</td>
<td>16.7</td>
<td>1.2 (1.53)</td>
<td>13.4</td>
<td>0.6 (1.43)</td>
<td>0.256</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>7.1</td>
<td>1.5 (4.8)</td>
<td>10.6</td>
<td>2.3 (5.32)</td>
<td>0.327</td>
</tr>
</tbody>
</table>

NPX: Naproxen. BASDAI: Boolean Assessment of SpondyloArthritis Disease Activity Index. ASDAS: Ankylosing Spondylitis Disease Activity Score. ESR: Erythrocyte Sedimentation Rate.

Conclusion: In patients with axial SpA who reached partial remission after treatment with either IFX+NPX or NPX alone, disease activity remained low during 6 months in which NPX was maintained or all treatment was discontinued. About half of patients remained in clinical remission for 6 months. A slight advantage may occur for patients continuing NPX treatment vs no treatment at all.

Disclosure: J. Sieper, Merck, Abbott, Pfizer, 2, Merck, Abbott, Pfizer, UCB, Roche, Lilly, 5, Merck, Abbott, Pfizer, 8, J. Lenaerts, Abbott, BMS, MSD, Pfizer, Roche, AstraZeneca, 5, J. Wollenhaupt, MSD, 3, MSD, 8, V. Mazurov, None; L. Myasoutova, None; S. H. Park, None; Y. W. Song, None; R. Yao, Merck Pharmaceuticals, 3; D. Chitkara, Merck Pharmaceuticals, 3; N. Vastesaeger, Merck Pharmaceuticals, 3.
**Enthesal:** a) Clinical (MASES plus lateral and medial epicondyle, quadriceps tendon, proximal and distal patella, plantar aponeuroses), b) PDUS (lateral and medial epicondyle, quadriceps tendon, proximal and distal patella, aquilles tendon plantar aponeuroses)

Prevalence of IAD was obtained, according to different definitions. PsA prevalence was also determined according to CASPAR criteria and clinical judgement. Agreement was evaluated by the Kappa’s index.

Results: Prevalence of PsA for peripheral articular clinical criteria, 12.5% (95%CI: 8.9%-16.1%), PDUS 16 (15%) and erosions 20 (19%). Of 122 patients, 41 (41.4%) met at least one of the criteria for peripheral arthritis. None of them met all three criteria. Criteria for spinal disease: IBP 8 (12.5%), VAS overall spinal pain in the past week: 5-22 (18%), unilateral sacroiliitis grade II or higher 17 (15.5%). Of the patients studied, 5 (4.4%) met the radiological criteria plus one of the clinical criteria. None of them met all three criteria altogether.

For enthesal disease: clinical 13 (10.7%), PDUS 40 (32.8%). Of the 122 patients, 45 (36.9%) met one of this two criteria, 8 patients met both of them.

Prevalence of inflammatory articular disease, based on clinical criteria, was 44.2% (95%CI: 33.1%-55.2%). By combining clinical, ultrasound and radiological results, the prevalence was 61.8% (95%CI: 51.8%-71.7%). Using only clinical criteria for the diagnosis of inflammatory articular disease, PsA prevalence according to CASPAR criteria was 27.2% (95%CI: 16.9%-37.5%). Combining clinical, ultrasound and radiological criteria, the prevalence was 34.7% (95%CI: 24.6%-44.8%). Only 12 (9.8%) of the patients had PsA according to clinical judgment. Agreement between clinical judgment and CASPAR criteria was low, both when clinical criteria (Kappa=0.247) or clinical+ultrasound+radiologic criteria (Kappa=0.140) were used to define IAD.

**Conclusion:** The prevalence of PsA in patients with psoriasis varies from 27.2% to 34.7%, according to the definition of the initial term in CASPAR criteria. On the other hand, only 9.8% were diagnosed of PsA based on clinical judgment. These data suggest the need for clarifying the stem definition of CASPAR criteria.

*SGrant from the Ministry of Health PI080789

Disclosure: J. L. Fernandez-Sueiro, None; S. Pertega-Diaz, None; J. Pinto, None; E. Gonzalez, None.

### 551

**Prevalence of Enthesitis in Psoriatic Patients: Agreement Between Clinical and Power Doppler Ultrasonography Exploration and Its Implications for the Classification of Psoriatic Arthritis.**

**Jose Luis Fernandez-Sueiro**, JA Pinto, S. Pertega-Diaz and Carlos Fernandez-Lopez.

1. Complejo Hospitalario Universitario La Coruña, La Coruña, Spain, 2INIBIC- Complejo Hospitalario Universitario La Coruña(CHUAC). Rheumatology Division., La Coruña, Spain

**Background/Purpose:** Enthesitis constitutes one of the CASPAR stem criteria for the classification of psoriatic arthritis, however as enthesitis may be evident in psoriatic many psoriatic patients may have unnoticed enthesitis and may in fact have silent psoriatic arthritis. Objective: To determine the prevalence of enthesitis by PDUS examination in a cohort of psoriatic patients without a diagnosis of PsA. To determine the agreement between clinical exploration and ultrasound results, and the prevalence of “silent” disease according to CASPAR criteria.

**Methods:** Descriptive and observational cross-sectional study of 122 patients referred from the primary care with cutaneous psoriasis without arthritis, 20 healthy subjects were used as controls. The entheseal examination was performed by the MASES plus lateral and medial epicondyle, quadriceps tendon, proximal and distal patella and plantar aponeuroses. PDUS was performed in longitudinal and transverse multiplanar examination (Logiq 5 PRO; General Electric Healthcare, Kyunngi-do, Korea), using multifrequency linear array transducers (7–12 MHz) in the following enthesis: lateral and medial epicondyle, quadriceps tendon, proximal and distal patella, aquilles tendon plantar aponeuroses. Active enthesitis was defined by the presence of thickness or altered echogenicity as well as the presence of vascularity. Intraobserver reliability was verified by blindly assessed the stored baseline images 3 months after the real time examination. Prevalence of enthesitis between psoriatic patients and controls was compared with the chi-squared test. Considering PDUS results as the gold standard, sensitivity, specificity and predictive values of clinical exploration were estimated. Agreement was evaluated with the Kappa index.

**Results:** 107/122 psoriatic patients had both clinical and PDUS examination performed. 10.3% (n=11) of the patients had clinical enthesitis, whereas 70.1% (n=75) of psoriatic patients and 45% (n=9) (p=0.03; OR=2.86) of controls had PDUS findings of past or present enthesitis. 37.4% (n=40) of psoriatic patients and 5% (n=1) of controls had active enthesitis by PDUS criteria (p=0.003; OR=11.34). Agreement between clinical exploration and PDUS to identify present enthesitis was low (Kappa index=0.182). Only 8 of the 40 patients with active enthesitis in PDUS had clinical enthesitis. Considering PDUS results as the gold standard, clinical findings showed a sensitivity of 20% (95% CI: 6.3-33.6%), specificity 95.5% (95% CI: 89.8%-100%), positive predictive value 72.7% (95% CI: 41.9%-100%), negative predictive value 66.7% (95% CI: 56.7%-76.6%). By applying CASPAR criteria, 8 (8.7%) patients would have a diagnosis of PsA based on clinical enthesitis whereas 22 (23.9%) would have, by PDUS, a diagnosis of silent enthesal PsA.

**Conclusion:** The prevalence of PsA enthesopathy in psoriatic patients without psoriatic arthritis is high, 70.1%. There is not a good agreement between clinical and PDUS findings. If active enthesitis, although clinically silent, is considered only by PDUS definitions, 23.9% of patients would meet CASPAR criteria in this study.

Disclosure: J. L. Fernandez-Sueiro, None; J. Pinto, None; S. Pertega-Diaz, None; C. Fernandez-Lopez, None.

### 552

**Simple Questions in the Dermatology Office May Reasonably Exclude, but Do Not Reliably Identify Psoriatic Arthritis Patients:**

**Results From the Center of Excellence for Psoriasis and Psoriatic Arthritis.**

Neha Garg, Atul A. Deodhar, Benjamin Ebst, Andrew Blauvelt, Jennifer Ku and Brian Truong. Oregon Health and Sciences University, Portland, OR

**Background/ Purpose:** Psoriatic arthritis (PsA) affects between 10–30% of patients with psoriasis (PsO), but is often missed when assessed in a dermatology clinic. The Center of Excellence for Psoriasis and Psoriatic Arthritis (CEPPA) is a specialized multidisciplinary clinic consisting of expert dermatologists and rheumatologists experienced in diagnosing PsO as well as PsA. We wanted to identify simple clinical questions and findings on physical examination for dermatologists to screen PsO patients for PsA so as to refer appropriate patients to rheumatology.

**Methods:** This is a cross-sectional study of all PsO patients seen by dermatologists in the CEPPA clinic since its inception in 2006 through 2010. Possibility of PsA was assessed by four screening questions: “Do you have a history of joint pain or swelling,” “Do you have morning stiffness,” “Have you ever had x-rays taken?” and “Do you have PsA”. Since nail involvement is now known to predict development of PsA, assessment of nail changes was included as a physical finding for screening. Quality of life (QoL) measures were assessed with validated instruments (SF12, PQLQ12 and RAPID3).

**Results:** Of 524 patients assessed in dermatology, 237 were referred to rheumatology, 34 were lost to follow up, 203 were evaluated and 128 (24.4%) were found to have PsA. Of those who answered “no” to all the four screening questions, 95.3 % did not have PsA. However, of those fulfilling all five questions and nail changes individually and in combination. The median age (48 years) and smoking history (in 20%) was not significantly different in patients with and without PsA. The median body mass index (BMI) and PsO body surface area (BSA) were significantly higher in patients with PsA than those without [31.5(IQR 11) vs 28.6 (IQR 8) and 10% (IQR 15)] vs 7% (IQR 12), respectively, p ≤ 0.01. PsA patients were more likely to have nail changes (OR 12.4, 95% CI: 5.9 – 26.5, P ≤ 0.01). Onset of PsA occurred 10 years earlier in patients with a family history of PsO than those without (median age 25 vs 38, p < 0.01). Six percent of patients developed PsA before, 8% with and 86% after the onset of PsO. Ninety percent were diagnosed with PsA within 25 years of PsO onset. Mean delay in PsA diagnosis from onset of joint pain was 1 year. Compared to PsO patients, patients with PsA had significantly worse QoL scores (P < 0.01). Percent of BSA involvement with PsO did not correlate with any clinical variables.

**Sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) of four screening questions and examination for psoriatic nail changes**

<table>
<thead>
<tr>
<th>Question</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have joint pain or swelling?</td>
<td>88.7</td>
<td>54.7</td>
<td>41.8</td>
<td>93</td>
</tr>
<tr>
<td>Do you have morning stiffness?</td>
<td>88.5</td>
<td>51</td>
<td>39.3</td>
<td>92.6</td>
</tr>
<tr>
<td>Do you have psoriatic arthritis?</td>
<td>68.1</td>
<td>86.6</td>
<td>64.8</td>
<td>88.2</td>
</tr>
<tr>
<td>Have you ever had x-rays taken?</td>
<td>56.6</td>
<td>73.2</td>
<td>43.2</td>
<td>82.4</td>
</tr>
<tr>
<td>Have you ever had x-rays taken?</td>
<td>55.4</td>
<td>68.1</td>
<td>70.7</td>
<td>83.8</td>
</tr>
<tr>
<td>All five of the above</td>
<td>22.4</td>
<td>95.9</td>
<td>88.9</td>
<td>46.1</td>
</tr>
</tbody>
</table>
Conclusion: In this large cohort of PsO patients, the prevalence of PsA was 24.4%. PsA patients had significantly worse QoL than those with PsO alone. A negative response to all four screening questions correctly ruled out the diagnosis of PsA in 95.3% of patients. Positive response to all four screening questions with PsO nail changes led to a correct diagnosis of PsA in 89% of patients.

Disclosure: N. Garg, None; A. A. Deodhar, None; B. Ebst, None; A. Blauvelt, None; J. Ku, None; B. Truong, None.

553 Identification of Axial Spondyloarthritis Among Patients with Chronic Back Pain in Primary Care — How Does Determination of HLA B27 Influence the Performance of Clinical Assessments of Inflammatory Back Pain? Annalina Braun1, Holger Gnann2, Ertan Sarachasi1, Joachim Grifka1, Uta Kiltz1, J. Schmittker5, Katrin Letscher3 and Juergen Braun1.

Background/Purpose: To determine the performance of HLA B27 determination for early identification of patients with axSpA in primary care.

Methods: Consecutive patients <45 years (n = 950) with back pain >2 months who presented to orthopaedists (n = 143) were randomized based on 4 key questions related to inflammatory back pain (IBP) for referral to rheumatologists (n = 36) who made the diagnosis. HLA B27 was either assessed in primary or in secondary care in 298 patients. The predictive value of HLA B27 alone and in combination with other items for a diagnosis of axSpA was calculated. For variable selection logistic regression was applied, optimizing sensitivity, specificity and likelihood ratios using different strategies to predict axSpA.

Results: Rheumatologists saw 325 randomly selected patients. Due to missing HLA B27 values the main analysis is based on 298 patients, mean age 36 years (y), 52% female, median duration of back pain 32 months: 107 patients were diagnosed as axSpA (36%), 46 ankylosing spondylitis and 61 axial non-naradiographic axSpA. A simple model with only HLA B27 as independent variable, indicates that HLA B27+ patients have an odds ratio (OR) of 12.24 to have axSpA in comparison with HLA B27- patients (sensitivity 62.6%, specificity 88.0%). The positive likelihood ratio (LR+) was 5.2 and the negative LR- 0.43. Thus, HLA B27 alone performed better than our recent 3/5 items proposal, which had an LR+ of 1.47 and LR- 0.53. Simply adding HLA B27 to those 5 criteria did not improve the LR+ substantially: for 3/6 items it was 1.64 (LR-: 0.33) and for 4/6 LR + 3.26 (LR-. 0.51). However, the simple combination of HLA B27 and/or buttock pain was 89.7% sensitive and 40.3% specific.A model based on determination of HLA B27 in primary care enabled us to analyse the performance of a two-phase strategy by dividing the patients into two groups according to their B27 status. Including additional variables to HLA B27+ patients did not improve the overall performance. However, in the HLA B27- group the following items were most relevant: improvement by movement, buttock pain and psoriasis. Moreover, a combination of this information revealed that a young patient with chronic back pain is likely to have axSpA if HLA B27 is positive and/or if 2 or 3 of the following symptoms are present: improvement by movement, buttock pain (both sided) and history of psoriasis. This combination was 80.4% sensitive and 75.4% specific (LR+: 3.27 and LR-: 0.26).

Conclusion: This study shows that patients with axSpA can be identified with or without knowledge of HLA B27 based on questions specific for IBP in primary care. However, since models including HLA B27 had better predictive results in this study, it seems to be more useful to generally determine HLA B27 in all patients with chronic back pain of young age in primary care to further reduce the delay in diagnosing axSpA.

Disclosure: A. Braun, None; H. Gnann, None; E. Sarachasi, None; J. Grifka, None; U. Kiltz, None; J. Schmittker, Abbott Laboratories, 3; J. Braun, Abbott Laboratories, 2.

554 A Reduction in Ultrasound Synovitis Score Discriminates Between Clinical Responders and Non-Responders and Is Predictive for a Favorable Clinical Outcome in Early Psoriatic Arthritis. Axel P. Nigg1, Anna M. Malchus1, Jörg C. Prinz1, Mathias Gruenke1 and Hendrik Schulze-Koops1.

Background/Purpose: Accurate monitoring of disease activity in early PsA is limited by the potential underestimation of inflammation by clinical examination, the absence of disease-specific biochemical markers and heterogeneity of clinical manifestations. Sensitive and reliable diagnostic modalities enabling visualization of early inflammatory changes are considered as useful tools for monitoring the response to therapy. The aims of this prospective study were to assess the utility of musculoskeletal ultrasound (US) in detection of inflammatory changes in early PsA and to analyze the association of changes in a semiquantitative ultrasound score on the overall clinical improvement, defined by EULAR response criteria and MDA (minimal disease activity).

Methods: 51 patients with early PsA (onset of symptoms <5 years) naive to immunosuppressive treatment were eligible for study inclusion (disease duration 18.6 months). Patients were evaluated by US and clinically (baseline, 3/6/12 months). In each patient, 50 joints were examined by Grey-SCALE-US (GSUS) and power doppler imaging (PDUS) in US findings were scored separately on a 0–3 semi-quantitative scale. US synovitis score was calculated by adding the GSUS and PDUS scores for all joints examined. Clinical assessment included TJC68, SJC66, VAS for disease activity (patient/physician), DAS28-1CP, LDI, HAQ and CRP. Treatment was initiated and modified at the discretion of the primary rheumatologist following international recommendations. Criteria for EULAR response and minimal disease activity (MDA) (Coates L. et. al.) were defined for each follow-up period.

Results: Clinical responders were more likely to have higher US scores and PDUS scores at baseline and showed a significantly higher relative reduction of the mean US synovitis and the mean PDUS score during follow-up intervals compared to non-responders. A reduction of the ultrasound score after 3 months of systemic treatment was predictive for achieving or maintaining a good/moderate EULAR response (OR 3.64, p = 0.21) or MDA respectively (OR 6.01, p = 0.05) after 6 and 12 months. Reduction of ultrasound inflammatory activity during systemic treatment was not only detected in symptomatic joints but also in those joints with subclinical inflammation, however clinical responders showed a tendentially larger relative reduction of subclinical synovitis than non-responders.

Conclusion: Reduction of inflammatory changes detected by US during systemic treatment allows discrimination between clinical responders and non-responders (defined by EULAR response criteria and MDA) in early PsA. A reduced US synovitis score 3 months after initiation of treatment is predictive for a favourable clinical outcome after 6 and 12 months. Longitudinal analysis of subclinical synovitis in responders and non-responders reveal evidence that subclinical US findings have to be regarded as a pathophysiologically relevant pre-stage of clinical synovitis.

Disclosure: A. P. Nigg, None; A. M. Malchus, None; J. C. Prinz, None; M. Gruenke, None; H. Schulze-Koops, None.

555 Performances of the ASAS Axial Spondyloarthritis Criteria for Diagnosis and Classification Purposes in Patients Visiting a Rheumatologist Because of Chronic Back Pain: The Decline Study. Anna Molto1, Simon Paternotte1, Denis Comet2, Cécile Hacquard-Bouder3, Martin Rudwaleit4, Pascal Claudemiere4, Désirée van der Heijde5 and Maxime DDougados4.

Background/Purpose: To evaluate the performances at diagnosis (sensitivity [Se], specificity [Sp], positive and negative predictive values) and study visit (classification purpose) of the ASAS criteria in axial spondyloarthritis (axSpA) in patients visiting their rheumatologist because of chronic back pain (CBP). Secondary objectives: identifying the most contributive item to diagnosis/classification of SpA, evaluating the performances of each of the ASAS criteria and other SpA criteria’s performances.
Methods: Multi-centric, cross-sectional. Patients: history of CBP before the age of 40 visiting a rheumatologist in France. Data: a) items of the different sets of criteria, checking if present at diagnosis or at study visit; b) diagnosis of the rheumatologist at study visit. Statistical analysis: description of the population. Rheumatologist’s diagnosis was considered as the “gold standard” for the estimation of all psychometric properties.

Results: 1210 patients were included for our analysis. At diagnosis, 96 were positive for ASAS axial criteria and 75 were positive for ASAS sacral criteria. The sensitivity (Se) and specificity (Sp) of CR were 0.38 and 0.15 for ASAS sacral criteria and 0.38 and 0.15 for ASAS axial criteria. When replacing CR with EOS, Se and Sp were 0.45 and 0.09 for ASAS sacral criteria and 0.45 and 0.09 for ASAS axial criteria. The positive and negative predictive values of CR and EOS were 0.54 and 0.41 for ASAS sacral criteria and 0.54 and 0.41 for ASAS axial criteria. The AUC was 0.58 for CR and 0.60 for EOS.

Conclusion: We found that EOS imaging could replace CR for the diagnosis and follow-up of ankylosis of the spine in SpA, since radiation exposure is much lower. However, its place in the diagnosis of sacroiliitis remains unclear. Further studies using MRI as a discriminative method are ongoing.

Disclosure: A. Molto, None; V. Freire, None; A. Feydy, None; S. Paternotte, None; W. P. Maksymowycz, None; M. Benhamou, None; F. Rannou, None; M. Dougados, None; L. Gossec, None.

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Effect of Certolizumab Pegol on the Multiple Facets of Psoriatic Arthritis As Reported by Patients: 24 Week Patient Reported Outcome Results of a Phase 3 Double Blind Randomized Placebo-Controlled Study. Dafna D. Gladman1, Roy M. Fleischmann2, Geoffrey Coteur3, Franz Woltering4 and Philip Mease5. 1Toronto Western Research Institute, University of Toronto, Toronto Health Network, Toronto, ON, 2University of Texas Southwestern Medical Center at Dallas, Dallas, TX, 3UCB Pharma, Brussels, Belgium, 4UCB Pharma, Monheim, Germany, 5Seattle Rheumatology Associates, Seattle, WA

Background/Purpose: RAPID-PsA (NCT01087788) reports efficacy and safety of certolizumab pegol (CZP), a PEGylated Fc-free anti-TNF, in psoriatic arthritis (PsA). The effect of different imputation methodologies on radiographic progression outcomes is reported.

Methods: The ongoing 158 week (Wk) RAPID-PsA trial is double-blind and placebo (PBO) controlled to Wk24, dose-blind to Wk48 and then open label to Wk158. Recruited patients (pts) had active PsA and had failed ≥1 DMARD. Pts could have been secondary failures to 1 previous anti-TNF. Pts were randomized 1:1:1 to PBO or 400mg CZP at Wk0, 2 and 4 (loading dose, LD) followed by either 200mg CZP every 2 wks (Q2W) or 400mg CZP every 4 wks (Q4W). 1 Pre-specified analyses included change from baseline (CBF) in modified Total Sharp Score (mTSS) (average scores of 2 independent readers), the primary endpoint, and % non-progressors (mTSS CFB ≤0). In the pre-specified imputation methodology performed in all randomized pts minimum observed baseline (BL) score for missing BL values (0) and maximum observed Wk24 score for missing Wk24 values (356.5) in pts with <2 available x-rays were imputed. Post hoc analyses used alternative methods of imputation for no change in mTSS for pts with <2 available x-rays, including no imputation, imputation with the median, mean or maximum CFB in mTSS scores.

Results: 409 pts were randomized. BL demographics were similar between groups. 19.1% and 19.8% of PBO and CZP (combined dose) pts received prior anti-TNF. The pre-specified imputation analysis inappropriately overestimated radiographic progression in all arms including PBO (LS mean 28.9 and 18.3 for PBO and CZP (combined dose) respectively p≤0.05) (Table) as pts with missing Wk24 values were assigned to a change from BL in mTSS of up to 356.5, which is an implausible progression with respect to clinical practice. Significantly more pts were non-progressors in both CZP groups (200mg Q2W and 400mg Q4W) compared with PBO (83.3% and 76.3% vs 34.6%, respectively, p<0.001). Multiple post-hoc analyses showed that CZP effectively inhibited radiographic progression compared to PBO (Table). ACR20 response at Wk12 was significantly higher in both CZP arms (200mg Q2W and 400mg Q4W) vs PBO (38.0% and 51.9% vs 24.3%, respectively, p<0.001). The safety profile was similar to that observed with CZP in RA.

Table. LS mean CBF in mTSS at Wk24, evaluated using an analysis of covariance model

<table>
<thead>
<tr>
<th>CBF</th>
<th>PBO (n=135)</th>
<th>CZP 200mg Q2W (n=138)</th>
<th>CZP 400mg Q4W (n=135)</th>
<th>CZP 200mg Q2W + CZP 400mg Q4W (n=135)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS mean mTSS at Wk24 (SB)</td>
<td>PBO</td>
<td>CZP 200mg Q2W</td>
<td>CZP 400mg Q4W</td>
<td>CZP 200mg Q2W + CZP 400mg Q4W</td>
</tr>
<tr>
<td>Imputation in pts with &lt;2 x-rays available</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBO</td>
<td>28.92 (77.7; 152.7; 99)</td>
<td>25.08 (77.9; 152.7; 99)</td>
<td>22.86 (77.9; 152.7; 99)</td>
<td>22.86 (77.9; 152.7; 99)</td>
</tr>
<tr>
<td>Posthoc: 1* No imputation</td>
<td>0.02 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
</tr>
<tr>
<td>Posthoc: 2* Median mTSS change from BL of all pts observed</td>
<td>0.02 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
</tr>
<tr>
<td>Posthoc: 3* Mean mTSS change from BL of all pts observed</td>
<td>0.02 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
</tr>
<tr>
<td>Posthoc: 4* Minimum mTSS change from BL of enrolled pts</td>
<td>0.02 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
</tr>
<tr>
<td>Posthoc: 5* Minimum mTSS change from BL by treatment group</td>
<td>0.02 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
<td>0.01 (0.00; 0.04)</td>
</tr>
</tbody>
</table>

For PBO pts who escaped early to CZP, the Wk24 values, if available, were ignored and linearly extrapolated (LS mean mTSS). **p<0.001 vs PBO

S242
**Conclusion:** Conventional radiographic imputation methods showed that CZP effectively inhibited radiographic progression in pts with PsA. Significantly fewer patients had progression with either CZP dose compared to placebo. The highly conservative pre-specified imputation method resulted in an unrealistic assessment of progression in all arms including PBO. Differences in methodologies for imputing missing radiographic data can greatly impact assessment and reporting of mean changes from BL in mTSST.

**References**

**Disclosure:** D. D. Gladman, None; R. M. Fleischmann, UCB, 2, UCB; G. Coteur, UCB, 1, UCB; F. Woltering, UCB, 1, UCB; P. Mease, UCB, 2, UCB, 5, UCB.

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**Rapid Improvements in Patient Reported Outcomes with Certolizumab Pegol in Patients with Axial Spondyloarthritis, Including Ankylosing Spondylitis and Non-Radiographic Axial Spondyloarthritis: 24 Week Results of a Phase 3 Double Blind Randomized Placebo-Controlled Study.**

**Background/Purpose:** Axial spondyloarthritis (axSpA) is a form of spondyloarthritis (SpA) that includes both ankylosing spondylitis (AS) and non-radiographic axial SpA (nr-axSpA), as defined by the ASAS criteria. Both subgroups of patients (pts) have been shown to have a similar burden on Quality of Life (QoL). 1 A recent survey estimated that SpA may affect up to 1.4% of the US population. 2 Certolizumab pegol (CZP) is a PEGylated Fc-free anti-TNF that improved patient reported outcomes (PRO) in rheumatoid arthritis (RA). 3 RAPID-axSpA (NCT01087762) is the first report of the effect of CZP on PRO in axSpA.

**Methods:** The ongoing 158-patient RAPID-axSpA trial is a double-blind and placebo-controlled to Wk24, dose-blind to Wk48 and then open label to Wk158. Recruited pts had adult-onset active axSpA as defined by the ASAS criteria, 4 Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) ≥4, spinal pain ≥4 on a 10 point NRS, and CRP > upper limit of normal or sacroiliitis on MRI. Pts must have failed ≥1 NSAID. Pts could have been secondary failures to 1 previous TNF inhibitor. The population reflected the usual axSpA population including AS pts also meeting the modified New York criteria and nr-axSpA pts who met the ASAS MRI or clinical criteria. Pts were randomized 1:1:1 to placebo (PBO), or 400mg CZP at week (Wk) 0, 2 and 4 (loading dose, LD) followed by either 200mg CZP every 2 weeks (Q2W) or 400mg CZP every 4 weeks (Q4W). Pts receiving PBO who failed to achieve ASAS response at both Wk14 and Wk16 were rescued and randomized at Wk16 to receive CZP 200mg Q2W or CZP 400mg Q4W following LD. The primary endpoint was ASAS20 response at Wk12. PRO endpoints included ASAS pts also meeting the modified New York criteria and nr-axSpA pts who met the ASAS MRI or clinical criteria. Pts were randomized 1:1:1 to placebo (PBO), or 400mg CZP at week (Wk) 0, 2 and 4 (loading dose, LD) followed by either 200mg CZP every 2 weeks (Q2W) or 400mg CZP every 4 weeks (Q4W). Pts receiving PBO who failed to achieve ASAS response at both Wk14 and Wk16 were rescued and randomized at Wk16 to receive CZP 200mg Q2W or CZP 400mg Q4W following LD. The primary endpoint was ASAS20 response at Wk12. PRO endpoints included SF-36 physical component summary (PCS), physical function (BASFI), total spinal pain (NRS), fatigue (NRS from BASDAI), Ankylosing Spondylitis Quality of Life (AsQoL), Sleep Problems Index II (MOS sleep) and Pain NRS. During analysis of covariance on change from baseline (CFB) with last observation carried forward imputation. Improvements in the CZP-treated groups were observed in all PRO endpoints. The CZP vs PBO difference was significantly larger for all PRO than the placebo effect of 0.52 (2.10) for Pain NRS and 0.56 (1.71) for Fatigue NRS. Small but statistically significant differences were observed for each PROs at all time points. Statistically significantly fewer patients had progression with either CZP dose compared to placebo. The highly conservative pre-specified imputation method resulted in an unrealistic assessment of progression in all arms including PBO. Differences in methodologies for imputing missing PRO data can greatly impact assessment and reporting of mean changes from BL in mTSST.

**Results:** 325 pts were randomized. Baseline characteristics were similar between groups. Improvements in the CZP-treated groups were observed in pain NRS, fatigue NRS, BASFI and AsQoL, from the first measurement at Wk1 through to Wk24 compared to PBO. Pts in both CZP-treated dosages arms had greater improvements in SF-36 PCS, compared to PBO (Table). Improvements were also seen in MOS-SPI, SF-36 MCS and domains.

**Table 1.** Mean BL scores (SD) and mean change from baseline (CFB) at Wk12 and Wk24 in PRO

<table>
<thead>
<tr>
<th>Mean (SD)</th>
<th>PRO (n = 106)</th>
<th>CZP 200mg Q2W (n = 111)</th>
<th>CZP 400mg Q4W (n = 107)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36PCS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wk12</td>
<td>3.26 (0.65)</td>
<td>2.38 (0.63)</td>
<td>2.36 (0.64)</td>
</tr>
<tr>
<td>Wk24</td>
<td>2.75 (1.63)</td>
<td>1.88 (0.55)</td>
<td>1.86 (0.60)</td>
</tr>
<tr>
<td>MCS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wk12</td>
<td>39.47 (12.67)</td>
<td>41.93 (11.78)</td>
<td>41.92 (11.78)</td>
</tr>
<tr>
<td>Wk24</td>
<td>41.70 (19.80)</td>
<td>44.90 (18.00)</td>
<td>44.93 (16.90)</td>
</tr>
<tr>
<td>BASFI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wk12</td>
<td>5.49 (2.33)</td>
<td>5.36 (2.26)</td>
<td>5.40 (2.34)</td>
</tr>
<tr>
<td>Wk24</td>
<td>5.02 (2.10)</td>
<td>4.92 (2.05)</td>
<td>5.02 (2.10)</td>
</tr>
</tbody>
</table>

**Conclusion:** Both dosing regimens of CZP rapidly improved all PRO including pain, fatigue, physical function and QoL of axSpA pts. CZP effectively improved patient-relevant outcomes in the broad population of axSpA pts classified using the ASAS criteria.

**References**

**Disclosure:** J. Sieper, UCB Pharma, 5; A. J. Kivitz, UCB Pharma, 5; A. M. Van Tubergen, UCB Pharma, 5; A. A. Deodhar, UCB Pharma, 2, UCB Pharma, 5; G. Coteur, UCB, 1, UCB; F. Woltering, UCB, 1, UCB; R. B. M. Landewe, 5.

**559**

**Utility of Dual-Energy X-Ray absorptiometry Scanning and Risk of Osteoporosis in Ankylosing Spondylitis: A Prospective Study.**

**Background/Purpose:** Conventional DXA imaging of spine and hip to measure bone mineral density (BMD) has limitations in patients with ankylosing spondylitis (AS) as their spinal DXA measurements may be falsely elevated due to syndesmophyte formation and ligament ossification. Therefore, we investigated the correlation of hip and spine BMD measurements in patients with AS to determine if hip DXA will prove clinically useful while avoiding the confounding effect of spinal disease. We also studied risk factors for osteoporosis (OP) in AS.

**Methods:** We identified patients from our AS registry ≥18 years of age who met the ASAS (Assessment of Spondyloarthritis International Society) classification criteria for AS. Patients with thyroid and parathyroid disease, chronic liver or kidney disease, on anti-convulsant medications, surgical spinal fusions and hip arthroplasties were excluded. Demographic and clinical data were recorded and included HLA-B27 status, disease duration >5 years, presence of syndesmophytes on lumbar X-ray. Disease activity was measured using Bath AS Disease Activity Index (BASDI). BMD was measured using a Hologic machine and interpreted using ISCD 2005 guidelines and WHO criteria for definition of OP. Patients were divided into 3 groups based on hip BMD: osteoporosis (T-score < −2.5), osteopenia (T-score of −1.0 and −2.5) and normal (T-score of ≥ −1.0). In addition, ESR and blood levels of CRP, and 25-hydroxy vitamin D were measured.

**Correlation between the lowest T-scores of hip (total or femoral neck) and lumbar spine was measured using Spearman’s correlation coefficient (rho). Chi-square and odds ratio using logistic regression were used to assess the association of the purported risk factors for OP in these patients.

**Results:** We identified 101 patients with AS; 26.2% females and 73.8% African-Americans (AA). The mean age was 43.0 years (±13.7) in patients with normal BMD versus 47.8 years (±14.4) with OP and osteopenia (p = 0.0867), and 40.5% of patients had syndesmophytes on lumbar Xray. Prevalence of OP was 16.8%, osteopenia was 36.6% and 46.5% had normal BMD. There was moderate correlation between the lowest T-values of hip and lumbar spine (AP view), rho = 0.59 (figure 1). The AA with AS had higher odds of having osteoporosis than Whites; Odds ratio (OR) was 5.3 (1.03–26.84) (95% CI), p < 0.045 and also AS patients with high CRP levels had higher odds of having OP, OR= 4.1(1.22–13.97) (95% CI), p=0.0226. There was no association between OP and age, sex, BASDI, vitamin D levels, HLAB27 positivity, and ESR.
Proteomic Profiling of Synovial Fluid Reveals Candidate Psoriatic Arthritis Biomarkers. Daniela Cretu1, Ihor Batruch2, Punit Saraon1, Eleftherios Diamandis2 and Vinod Chandran1.

**Background/Purpose:** Psoriatic arthritis (PsA) is a unique form of arthritis occurring in 30% of psoriasis patients. There is a high prevalence of undiagnosed PsA in patients seen in dermatology clinics and identifying soluble biomarkers for PsA will help in screening psoriasis patients for appropriate referral to a rheumatologist, as well as provide further insight into disease pathogenesis. However, identification of novel biomarkers in peripheral blood is difficult and unreliable. Potential PsA biomarkers are likely to originate in sites of inflammation such as inflamed joints and subsequently enter systemic circulation. Our purpose was to identify candidate PsA biomarkers by conducting high-throughput quantitative proteomic analysis of synovial fluid from inflammatory and non-inflammatory controls. Gene ontology (GO) analysis classified these proteins into categories pertaining to five main biological processes: complement activation, defense response, immunoglobulin mediated response, response to wounding, and extracellular matrix remodelling, all of which are attributes of PsA. The candidate proteins include also COMP, CD14, and MMP2, all of which have been previously investigated as PsA biomarkers.

**Conclusion:** Quantitative proteomic profiling of synovial fluid has the potential to identify candidate PsA screening biomarkers. Verification and validation of these markers in SF and serum, respectively, is essential and is currently under way.

Disclosure: M. N. Magrey, None; M. A. Khan, None.

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Quantitative proteomic profiling of synovial fluid from inflammatory and non-inflammatory controls, and (2) tissue specificity analysis through examination of protein abundance ratios. Two strategies were then employed for identification of candidate biomarkers: (1) examination of differential protein expression between the PsA, RA, Gout, LOA, and Non-Inflammatory controls, and (2) tissue specificity analysis through mining of publicly available databases.

**Results:** A total of 594 non-redundant proteins were identified with one peptide (384 with two-peptides or more) in SF from all arthritis subsets, with a false discovery rate <1.5%. Of the 521 high-confidence proteins that were quantified from all patient groups, there were significant quantitative differences in 89 PsA SF-derived proteins compared to other arthritis. Following additional manual filtering, we obtained a preliminary list of 35 proteins as increased in PsA compared to all arthritic and non-inflammatory controls. Gene ontology (GO) analysis classified these proteins into categories pertaining to five main biological processes: complement activation, defense response, immunoglobulin mediated response, response to wounding, and extracellular matrix remodelling, all of which are attributes of PsA. The candidate proteins include also COMP, CD14, and MMP2, all of which have been previously investigated as PsA biomarkers.

**Conclusion:** Quantitative proteomic profiling of synovial fluid has the potential to identify candidate PsA screening biomarkers. Verification and validation of these markers in SF and serum, respectively, is essential and is currently under way.

Disclosure: D. Cretu, None; I. Batruch, None; P. Saraon, None; D. Gladman, None; F. Pellett, None; E. Diamandis, None; V. Chandran, None.

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**Performance of Magnetic Resonance Imaging in Detection of Chronic Structural Changes in Sacroiliac Joints As Compared to Conventional X-Rays in Axial Spondyloarthritis.** Denis Poddubnyy¹, Inna Gaydukova¹, Hildrun Haibel¹, In-Ho Song¹ and Joachim Sieper². ¹Charité Medical University, Campus Benjamin Franklin, Berlin, Germany, ²Saratov State Medical University, Saratov, Russia

**Background/Purpose:** Conventional x-rays of the sacroiliac joints (SIJ) remains the first imaging method in case of suspicion of axial spondyloarthritis (SpA). Moreover, a diagnosis of definite ankylosing spondylitis (AS) according to the modified New York criteria relies on the presence of definite radiographic sacroiliitis (SI). Magnetic resonance imaging (MRI) is a reliable method of detection of active inflammatory changes in the SIJ (active SI) and is potentially able to detect also chronic structural changes (such as sclerosis, erosions, and ankylosis) visible on conventional X-rays. Furthermore, chronic changes might be better visible in MRI because of tomography and MRI is not associated with radiation exposure. However, reliability of MRI in detection of chronic structural changes in SIJ remains unclear.

This study was aimed at comparing the performance of MRI in comparison to conventional X-rays in detection of chronic structural changes in patients with axial SpA.

**Methods:** We included 112 patients with definite axial SpA (68 with AS and 44 with non-radiographic axial SpA – nr-axSpA), for whom sets consisting of an X-rays of the SIJ and an MRI of the SIJ (at least in a T1-weighted sequence) performed at the same time point were available. X-rays of the SIJ were scored according to the modified New York criteria (grade 0 to grade IV) and according to the recently proposed new scoring system [1], which contains separate scores for subchondral sclerosis (score 0–2), erosions (score 0–3), and joint space changes (score 0–5) in each SIJ. MRIs of the SIJ (T1) were scored in the similar way for the same structural changes. In addition, readers were asked to provide an overall impression of the damage extent on MRI according to the scoring system of the modified New York criteria. X-rays and MRIs were scored separately by two trained readers, which were blinded for all clinical data and for the diagnosis of AS or nr-axSpA.

**Results:** 224 SIJ from 112 patients were available for the analysis. There was a moderate agreement between MRI and X-ray regarding definite subchondral sclerosis scored by both readers (Kappa=0.46, p<0.001), rather low agreement concerning definite erosions (Kappa=0.11, p=0.07), moderate agreement regarding definite joint space abnormalities (Kappa=0.41, p<0.001) and very good agreement regarding joint ankylosis (Kappa=0.85, p<0.001). Importantly, there was a good overall agreement regarding the presence of definite SIJ in 84% of the SIJ (128 out of 153) with definite X-rays SI it was also seen in MRI. Interestingly, in 16% of the cases definite SI was seen in X-rays only in 18% of the cases – in MRI only. Furthermore, on the patients’ level, SI fulfilling the modified New York criteria was confirmed on MRI in 81% of the cases (55 out of 68).

**Conclusion:** MRI demonstrated good overall performance regarding detection of chronic structural changes in the SIJ and was able to confirm the presence of definite sacroiliitis in more than 80% of the cases.

Disclosure: D. Poddubnyy, None; I. Gaydukova, None; H. Haibel, None; I. H. Song, None; J. Sieper, None.

References
2. Disclosure: D. Poddubnyy, None; I. Gaydukova, None; H. Haibel, None; I. H. Song, None; J. Sieper, None.
Prevalence and Predictors of Significant Liver Fibrosis in Methotrexate Treated Rheumatoid and Psoriatic Arthritis Patients Using Transient Elastography (fibroscan), WC Chan, ML Yip and CK Loo. Kwong Wah Hospital, Kowloon, Hong Kong

Background/Purpose: Methotrexate (MTX) is an anchor drug in the treatment of Rheumatoid (RA) and Psoriatic arthritis (PSA) and is the first line therapy in RA according to international guidelines and recommendations. However, there is constant concern on drug related hepatotoxicity in long term use, particularly in patients with psoriasis. Guidelines had laid out the need for liver biopsy depending on the cumulative methotrexate dose but were controversial as liver biopsy itself carries considerable risk. Fibroscan (transient elastography TE) is a newly developed non-invasive technique to examine liver stiffness and hence liver fibrosis. Validation and correlations have been made in various liver diseases for fibrosis and cirrhosis detection and screening.

Methods: RA and PsA patients in a local rheumatology clinic were recruited. Patients with known pre-existing liver diseases were excluded. Demographic variables including age, sex, alcohol use, disease characteristics, concurrent co-morbidities, cumulative and duration of MTX use were recorded. TE were performed on these patients and liver stiffness were measured. A stiffness level of 7.9 kPa was used as cut off value as probable significant liver fibrosis and liver biopsy was offered.

Results: A total of 50 PsA and 215 RA patients were contacted and 128 (33 PsA, 95 RA) of them were eligible for TE. Average disease duration was 8 years (SD 6.2). Cumulative mean MTX dose was 2427.3 mg (SD 2330.6). 55% of patients had cumulative dose of MTX > 1500 mg and 21% had cumulative dose of MTX > 3500 mg. Mean duration of MTX use was 4.2 years (SD 3.5). PsA patients had higher body mass index (25.2 vs 23.2, p=0.02), higher percentage of insulin resistance (45.5 vs 21.1%, p=0.07) and abnormal HDL cholesterol level (63.3 vs 37.9%, p=0.01) at baseline but lower cumulative MTX dose use (1775 vs 2654 mg, p=0.06) than RA patients. Mean liver stiffness was significantly lower in RA-4.67 kPa (SD 1.42) than in PsA patients- 5.67 kPa (SD 3.84). In univariate analysis, liver stiffness determined by TE was found to be positively associated with the presence of psoriasis, age, insulin resistance, hypertension, metabolic syndrome and duration of MTX use. However, only presence of psoriasis (β=0.947; p=0.022), insulin resistance (β=0.813; p=0.043) and age (β=0.058; p=0.001) was found to be significant associative factors on multivariate analysis. At a cutoff point of 7.9 kPa, only 4.9% of patients (3 RA and 3 PsA) had probable significant fibrosis. All 6 patients had cumulative MTX dose >1500 mg. However, logistic regression analysis only found that hypertension (OR= 11.02, 95% CI: 1.13–107.5, p=0.039) to be an independent risk factor for development of significant fibrosis. There is no correlation of MTX dose, duration of MTX use, and disease entity with significant fibrosis. 2 of these 6 patients had liver biopsies performed showing mild peri-portal fibrosis and steatosis.

Conclusion: PsA patient on MTX had higher liver stiffness than RA patients on TE. However, significant liver fibrosis was not common in these patients on methotrexate. Cumulative dose of MTX was probably not related to the development of significant liver fibrosis.

Disclosure: W. Chan, None; M. Yip, None; C. Loo, None.

Methods: Baseline, 24- and 102-week data of a random 80% sample of the AS Study for the Evaluation of Recombinant Infliximab Therapy (ASSERT) cohort were used. Spinal mobility was expressed by the linear version of the Bath AS Metrology Index (BASMI), spinal inflammation by the AS spinal MRI activity score (ASspiMRI-a) and spinal disease activity by the Bath AS disease activity index or by the AS disease activity score (ASDAS). BASMI, ASspiMRI-a, BASDAI and ASDAS change scores were calculated (from baseline to 24 weeks and from 24 weeks to 102 weeks). The longitudinal association between change in BASMI (dependent variable) and change in ASspiMRI-a (independent variable) was investigated using generalised estimating equations (GEE). Potential confounders (change in BASDAI, change in ASDAS, change in C-reactive protein, gender, age, disease duration, body mass index, HLA-B27 status and baseline modified Stoke AS Spine Score (mSASSS)) and interactions were tested.

Results: In total 199 patients and 367 visits were analysed (31 patients did not have complete 102-week data). After taking potential confounders into account, multivariable GEE analysis showed that change in ASspiMRI-a, change in BASDAI and baseline mSASSS are longitudinally associated with change in BASMI (table 1, model A). When change in BASDAI was replaced by change in ASDAS in the multivariable model, only change in ASDAS and baseline mSASSS were significantly associated with change in BASMI, but not change in ASspiMRI-a (table 1, model B).

Table 1. GEE models for change in BASMI

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Model A (with change in BASDAI)</th>
<th>Model B (with change in ASDAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in ASspiMRI-a</td>
<td>0.016 (0.001, 0.031), p=0.054</td>
<td>0.111 (0.004, 0.261), p&lt;0.152</td>
</tr>
<tr>
<td>Change in BASDAI/ASDAS</td>
<td>0.099 (0.065, 0.132), p=0.001</td>
<td>0.183 (0.122, 0.244), p&lt;0.001</td>
</tr>
<tr>
<td>Baseline mSASSS</td>
<td>0.006 (0.003, 0.009), p=0.001</td>
<td>0.006 (0.003, 0.009), p&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: A decrease in MRI spinal inflammation predicts improvement in spinal mobility. This relationship is confounded by change in ASDAS but not by change in BASDAI. Spinal inflammation plays an important role in spinal mobility and therefore ASDAS (semi-objective) is a better means to follow (changes in) disease activity in AS than BASDAI (subjective). Therapeutic strategies specifically targeting MRI inflammation may contribute to improving spinal mobility of AS patients, independently of patient reported symptomatic improvement.

Disclosure: P. Machado, None; R. Landewé, None; J. Braun, None; X. Baraliakos, None; K. G. A. Hermann, None; B. Hsu, Centocor, Inc., J. 3. Baker, Centocor, Inc., D. van der Heijde, None.

Background/Purpose: Chronic back pain is a very prevalent complaint in the general population but only a small proportion of these patients suffer from spondyloarthritides (SpA). Unfortunately, it is not clear when primary care or other physicians should refer a patient with chronic back pain to a rheumatologist. Many rheumatologists fear their practices will be overloaded with patients not having SpA if they have to see all patients with chronic back pain. Some have recommended inflammatory back pain (IBP) as the referral symptom but this is not an ideal criterion since many patients with SpA do not have IBP.

The purpose of this study is to describe how many patients with chronic back pain referred to the rheumatology outpatient clinic fulfill at least one of the classification criteria sets for spondyloarthritides (SpA).

Methods: We started the SpondyloArthritis Caught Early (SPACE)-project and included all (n=157) patients with chronic back pain (almost daily ≥3 months), starting before the age of 45 years of short duration (≤2 years). Patients were classified according to the modified New York (mNY), European SpA Study Group (ESSG), Amor and ASAS axial SpA classification criteria sets.

Results: In total, 93 (59.2%) patients fulfilled any of the criteria sets. Twelve (7.6%) patients fulfilled the mNY criteria; 68 (43.3%) patients fulfilled the ESSG criteria, 44 (28.0%) the Amor criteria and 60 (38.2%) the ASAS criteria for axial SpA. The overlap of the criteria is presented.
in the table and the figure. Eight of the 12 patients who fulfill the mNY criteria also fulfilled all the other criteria sets. The one patient only fulfilling the mNY criteria and no other criteria sets has ‘night pain’ as only SpA feature.

**Classification criteria sets**

<table>
<thead>
<tr>
<th>Patients (n)</th>
<th>No criteria set</th>
<th>All criteria sets</th>
<th>All ASAS</th>
<th>All ESSG</th>
<th>All Amor</th>
<th>All mNY</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>93</td>
<td>8</td>
<td>60</td>
<td>68</td>
<td>44</td>
<td>12</td>
</tr>
</tbody>
</table>

**Conclusion:** Approximately 60% of the patients included in the SPACE-cohort fulfill at least one of the SpA criteria sets; 38% fulfill the ASAS axial SpA criteria. The selection criteria as used in the SPACE-project are easily applicable and work very well. Almost daily chronic back pain of short duration starting before the age of 45 years (in accordance with the entry criterion of the ASAS axial SpA criteria) appears to be a very good and simple referral strategy at a rheumatology department, with a high yield of patients with SpA.

**References:**

2. Disclosure: M. de Hooge, None; R. van den Berg, None; F. van Gaalen, None; M. Reijnierse, None; T. Huizinga, None; D. van der Heijde, None.

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**Fetuin A: A New Biomarker Related with Syndesmophytes in Patients with Ankylosing Spondylitis.** Tugba Tuylu1, Dilek Solmaz2, Ismail Sari1, Didem L. Kozaci2, Servet Akar2, Necati Gunay2 and Nurullah Akkoc3.

**Background/Purpose:** In recent years, there is considerable interest regarding prediction and pathogenesis of syndesmophyte formation. Thus, several studies were conducted in order to identify the factors affecting this process. Today, biomarkers have become a very important field of research in spondyloarthritis. In this regard, various biomarkers have been used to understand the underlying factors responsible from syndesmophyte formation. However, available data on this subject is still limited and additional information is required. In this study, we aimed to determine the levels of different biomarkers and analyze their relationships with syndesmophytes in ankylosing spondylitis (AS).

**Methods:** Lateral plain radiographs of the cervical and lumbar spine were used for scoring syndesmophytes. The anterior sites of the lower and upper portion of each vertebra were randomly and blindly scored by 2 experienced rheumatologists. Any presence of syndesmophyses or bridging syndesmophytes was categorized as positive. The following ELISA kits were studied: hsCRP, IL-6, dickkopf-1 (DKK-1), receptor activator of nuclear factor-κB ligand (RANKL), osteoprotegerin (OPG), bone morphogenetic protein-7 (BMP-7), and fetuin A.

**Results:** There were 86 patients (31 non-syndesmophyte, 65% male [M], 41.5±8.2 years; 55 with syndesmophyte, 71% M, 43.9±9.7 years) in the study group. Disease duration, age and sex distributions, BASFI and BAS-DAI were similar between the non-syndesmophyte and syndesmophyte groups (P > 0.05). However, BASMI values and current or past smoking history percentages were significantly different between the syndesmophyte positive and negative patients (P < 0.05, 3.18±1.5 vs. 4.53±1.9, and 86% vs. 58% respectively). Evaluation of soluble biomarkers revealed that the levels of OPG, sRANKL, DKK-1, sclerostin, and BMP-7 were comparable between AS patients with and without syndesmophytes (P > 0.05, table 2). However, fetuin A was significantly higher in the in the patients with syndesmophytes compared to non-syndesmophyte group (P < 0.05, Table 1). Correlation analysis showed that the presence of syndesmophytes were significantly and positively correlated with BASMI, current or past smoking history, and fetuin-A (P < 0.05, r = 0.3, 0.3 and 0.2 respectively). Regression analysis showed that fetuin A was the most important predictor of syndesmophytes (odds ratio, and 95% confidence interval = 31.2, and 0.94–1039).

**Table 1.** Laboratory characteristics of the study group

<table>
<thead>
<tr>
<th>AS patients</th>
<th>Syndesmophyte (+), n = 55</th>
<th>Syndesmophyte (−), n = 31</th>
<th>P value</th>
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<tbody>
<tr>
<td>DKK-1 (pg/ml)</td>
<td>1967±1318</td>
<td>1718±1054</td>
<td>0.37</td>
</tr>
<tr>
<td>Sclerostin (pg/ml)</td>
<td>143±117</td>
<td>130±116</td>
<td>0.64</td>
</tr>
<tr>
<td>sRANKL (pmol/l)</td>
<td>110±95</td>
<td>130±74</td>
<td>0.32</td>
</tr>
<tr>
<td>OPG (pg/ml)</td>
<td>1916±593</td>
<td>1905±493</td>
<td>0.93</td>
</tr>
<tr>
<td>BMP-7 (pg/ml)</td>
<td>7.8±14</td>
<td>8.4±17</td>
<td>0.87</td>
</tr>
<tr>
<td>Fetuin-A (ng/ml)</td>
<td>1.15±0.17</td>
<td>1.08±0.12</td>
<td>0.04</td>
</tr>
<tr>
<td>hsCRP (mg/ml)</td>
<td>9.9±6.4</td>
<td>9.2±7.1</td>
<td>0.62</td>
</tr>
<tr>
<td>IL-6 (ng/ml)</td>
<td>0.003±0.001</td>
<td>0.003±0.001</td>
<td>0.86</td>
</tr>
</tbody>
</table>

**Conclusion:** We suggest that fetuin A may be used as a novel biomarker to predict new bone formation in patients with AS.

Disclosure: T. Tuylu, None; D. Solmaz, None; I. Sari, None; D. L. Kozaci, None; S. Akar, None; N. Gunay, None; N. Akkoc, None.

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**Effect of TNF Antagonists On Radiographic Progression in Psoriatic Arthritis: Systematic Review and Meta-Analysis of Randomized Controlled Trials.** Radjiv Goulabchand1, Gael Mouterde1, Cédric Lukas1, Thomas Barnetche2, Jacques Morel1 and Bernard Combe1. 1Montpellier 1 University, Lapeyronie Hospital, Montpellier, France, CHU Bordeaux Pellegrin, Bordeaux, France

**Background/Purpose:** Psoriatic arthritis (PsA) can cause important structural damages which can lead to disability. TNF antagonists have shown their clinical efficacy in PsA, but only limited data are available regarding their structural effect.

To determine whether TNF antagonists have an effect on radiographic progression in patients with PsA by performing a systematic review and meta-analysis based on data from randomized controlled trials (RCTs) versus placebo. To evaluate whether the combination with methotrexate (MTX) has an additional efficacy over monotherapy.

**Methods:** A systematic review of literature was performed until March 2011. Bibliographic references were selected from Embase and Medline databases, and from the two last EULAR and ACR annual meetings. Radiographic progression was scored by Sharp method modified for PsA (mTSS). Primary endpoint was the proportion of patients showing no radiographic progression at week 24 (defined by a mTSS variation score ≤ 0.5). Secondary end point included the proportion of non progressors at week 48 and mean variation of mTSS at week 24. The
Mantel-Haenszel method was used to provide a common odds-ratio (OR) estimate and 95% confidence interval (CI) in TNF antagonists (+/- DMARDs) versus placebo (+/- DMARDs) treated patients for infliximab, etanercept, adalimumab and golimumab RCTs. Statistical heterogeneity was assessed by the Q test ($\chi^2$), using a significance level of 0.05. OR and 95% CI were shown on forest plots.

**Results:** Search found out 206 articles and 3 abstracts. Retrieved data allowed meta-analysis on 4 articles and 1 abstract for the proportion of non-progressors at week 24. Data from 1110 patients were pooled. 484/584 (82.9%) were considered as non-progressors at week 24 in the TNF antagonists group versus 362/526 (68.8%) in the placebo group (OR=2.68 [1.99; 3.60] p<0.0001), without significant heterogeneity ($I^2=33\%; p=0.39$) (figure 1). Based on 3 studies, similar results were found at week 48 in favor of TNF antagonist group (OR=2.42 [1.57; 3.71] $I^2=60\%; p=0.91$). Among 533 patients receiving TNF antagonists versus 454 receiving placebo in 3 studies (4 comparisons), the mean change of the mTSS at week 24 was lower in the TNF antagonist group versus placebo (mean difference = -0.69 [-1.12; -0.27], with substantial heterogeneity ($I^2=76\%; p=0.006$). Only two RCTs provided data on the combination with MTX: the mean or median change of the mTSS was similar in adalimumab or infliximab subgroups, irrespective of the MTX use.

**Conclusion:** This meta-analysis of RCTs showed that all TNF antagonists lead to a better control of structural damage due to PsA than a placebo after 24 and 48 weeks of treatment. The respective role of the additional DMARDs could not be determined due to a lack of data.

**Disclosure:** R. Goulabchand, None; G. Mouterde, None; C. Lukas, None; T. Barnetche, None; J. Morel, None; B. Combe, None.

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567 Prevalence of Psoriasis and Psoriatic Arthritis in a Northern Population of Spain, Jose Luis Fernandez-Sueiro1, J. Pinto1, S. Pertega-Diaz2, Manuel Acasuso2 and Ignacio Herrero de Padura2. 1Complejo Hospitalario Universitario La Coruña, La Coruña, Spain, 2Centro de Salud, San José, La Coruña, Spain

**Background/Purpose:** There are few data in Spain evaluating the prevalence of psoriasis in the general population, accordingly there are not data evaluating the prevalence of psoriatic arthritis in Spain.

**Objectives:** to estimate the prevalence of psoriasis and PsA in the general population. To estimate the prevalence of PsA in patients with cutaneous psoriasis, referred from the primary care and the prevalence in of PsA in the general population.

**Methods:** All patients identified with a diagnose code of cutaneous psoriasis or PsA, from the database of a primary care centre (San Jose from La Coruña, northwest of Spain) were invited to participate in the study by a telephonic call. Patients were evaluated in the following way: personal and family history, criteria for inflammatory back pain (IBP), spinal and peripheral pain (VAS), peripheral joint count: tender and swollen (78/76), metrology (cervical rotation (CR), occipt to wall distance (OW), lateral lumbar flexion (LLF), modified Schober (mS)), MASES, SF12, DLQI, PASI, BSA, peripheral and axial x-rays, ESR, CRP, anti CCP and HLA-B27. Case definition was made according to clinical judgement. A descriptive analysis of the variables was performed. Prevalence estimates were obtained, together with their 95% confidence intervals. Adjustment to the prevalence figures was made based on detected erroneous psoriasis coding.

**Results:** From a referral population of 36610 persons, 458 patients were identified with a code diagnosis of psoriasis or PsA. From those, 21 had already a diagnosis of PsA, 161 agreed to participate, 126 came to the hospital. From those, 4 patients were excluded because they do not have a diagnosis of psoriasis, at the end 122 psoriatic patients without arthritis were evaluated.

From a total of 122 patients studied, 12 patients were judged to have a clinical diagnosis of PsA. This leads to an estimated prevalence of PsA in psoriatic patients of 9.8% (95% IC: 4.1%–15.5%). From these figures, the estimated prevalence of cutaneous psoriasis in the general population was 1.2% (95% CI=1.1%–1.3%), whereas the prevalence of PsA in the general population taken into account all cases was 0.17% (95% CI=0.13%–0.21%). The prevalence of undiagnosed cases was 0.06% (95% CI=0.03%–0.08%). The clinical features of the patients 12 patients diagnosed as PsA were as follows: nail involvement: 25%, dactylitis 8.3%, Nocturnal and overall spinal pain past week 3.25±3.57 and 4.17±3.35, peripheral VAS 6.33±3.11, TJC 4.50±9.04, SIC 0.00, mS 4.48±1.03, OW 0.00, LLF 14.92±4.42, CR <70°: 8.3%, enthesis 41.7%, PASI 0.33±1.15, BSA <10%: 100%, DLQI 1.42±1.56 SF12 physical 43.09±11.39, SF12 mental 39.28±12.11, ESR≤20 70%, CRP <0.80% anti-CCP ≤25 100%, Negative FR 91.7%, Negative HLA-B27 91.7%. Peripheral erosions 18.2%, sacroiliitis grade II unilateral or higher 45.5%.

**Conclusion:** In this study, the estimated prevalence of cutaneous psoriasis in a northern general population of Spain was 1.2%. The estimate (clinically judged) prevalence of psoriatic arthritis in patients with psoriasis was 9.8%, and the estimate prevalence of psoriatic arthritis in the general population was 0.17%, of these 0.06% of the cases may be undiagnosed.

**Disclosure:** J. L. Fernandez-Sueiro, None; J. Pinto, None; S. Pertega-Diaz, None; M. Acasuso, None; I. Herrero de Padura, None.

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568 14-3-3 Eta Is a Modifiable Serum Biomarker That Marks Adalimumab Response in Psoriatic Arthritis, Anthony Marotta1, A. W van Kuijk2, Walter P. Maksymowych3 and Paul Peter Tak4. 1Augurex Life Sciences Corp, North Vancouver, BC, 2Academic Medical Centre/University of Amsterdam, Amsterdam, Netherlands, 3University of Alberta, Edmonton, AB, 4Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands

**Background/Purpose:** 14-3-3 eta is a synovial-derived biomarker whose serum expression is independently associated with joint damage in RA and PsA. We previously reported that 14-3-3 eta pre-treatment levels in PsA patients on anti-TNF therapy and that the change in 14-3-3 eta titres correlates with measures of clinical improvement. We therefore examined whether a change in 14-3-3 eta expression may also serve as a useful marker of adalimumab therapy response monitoring in PsA.

**Methods:** Serum 14-3-3 eta levels of 24 patients (15 males and 9 females) with active PsA fulfilling the CASPAR classification criteria were measured before receiving adalimumab therapy and 8- or 12-weeks post-treatment. Clinical assessment at those time points included SJC68, PASI, CRP, ESR, DAS28 and ACR50 response. Pearson correlations (r) were performed to examine relationships between the changes in clinical variables and the change in 14-3-3 eta (Δ14-3-3 eta). Contingency analysis was used to determine if absolute decrease, increase or no change in 14-3-3 eta post-treatment levels corresponded with an ACR50 response. Regression analyses were performed to determine the predictive power of changes in CRP (ΔCRP) and 14-3-3 eta for that response, represented by the significance of chi-square likelihood ratios (LR). Areas under the receiver operating characteristic curves (AUC) were used to determine the accuracy of the regression model.

**Results:** Of the 24 PsA patients, 10 patients achieved an ACR50 response while 14 did not. Baseline 14-3-3 eta titres were predictive of an good EULAR response in RA patients on anti-TNF therapy and consistent with published data the ΔCRP reflected ACR50 response LR=5.98, AUC=0.74, p=0.01 with the model strengthened when 14-3-3 eta baseline positivity was added LR=10.1, p=0.006, AUC = 0.87.

**Conclusion:** In PsA, 14-3-3 eta titres together with a decrease in the levels of 14-3-3 eta following treatment is independently associated with ACR50 response to adalimumab therapy. 14-3-3 eta enhances the predictive capacity of CRP and serves as a biomarker of treatment response for both RA and PsA.

**Disclosure:** A. Marotta, Augurex Life Sciences Corp, 3; A. W. van Kuijk, None; W. P. Maksymowych, Augurex Life Sciences Corp, 7; P. P. Tak, None.
Ustekinumab Improves Arthritis-Related and Skin-Related Quality of Life in Patients with Active Psoriatic Arthritis: Patient Reported Outcomes From Randomized and Double Blinded Phase III PSMUMMIT 1 Trial. Arthur Kavanagh1, MD; M. Clark2; Alice B. Gottlieb3, L. Puig4,5; Proton Rahman4,6; Christopher T. Ritchlin7; Shu Li8; Yuha Wang9; Chenglong Han9; Alan Mendelsohn10 and Mittie K. Doyle11. 1UCSD School of Medicine, La Jolla, CA, 2University of Glasgow, Glasgow, United Kingdom, 3Tufts Medical Center, Boston, MA, 4Universitat Autonoma de Barcelona, 5Memorial University, St. John’s, NF, 6University of Rochester Medical Center, Rochester, NY, 7Janssen Research & Development, LLC, Spring House, PA, 8Johnson & Johnson Pharmaceutical Services, LLC, Malverns, PA

Background/Purpose: To examine the impact of ustekinumab treatment on general and disease specific patient reported outcomes (PROs) of patients with active psoriatic arthritis (PsA) using data from PSMUMMIT I, a Phase 3 clinical study.

Methods: In PSMUMMIT I, adult PsA patients (n=615) with active disease despite DMARD and/or NSAID therapy were randomized to receive ustekinumab 45mg, 90mg, or placebo (PBO) at wks 0, 4, and q12wks, thereafter. Patients with prior anti-TNF agents were excluded. At wk16, patient with <5% improvement in swollen and tender joint counts entered blinded early escape (PBO→ustekinumab 45mg; ustekinumab 45mg→90mg; 90mg→90mg). Patient-reported outcomes were measured with Health Assessment Questionnaire (HAQ), Dermatology Quality Life Index (DLQI), SF-36 health survey questionnaire (SF-36), Visual Analogue Scales (VAS) for impact of PsA on work productivity (0–10), patient assessment of pain (0–10) and disease activity (0–10). An ANOVA on van der Waerden normal scores was used for continuous variables and chi-square or the Cochran-Mantel-Haenszel (CMH) test for binary variables.

Results: At baseline, PRO measures indicated that the study population had severe physical disability and impaired health related quality of life with a mean HAQ score of 1.25 and mean DLQI score of ≥10. At wk 24, greater improvements in HAQ, DLQI, and SF-36 PCS were observed in ustekinumab groups compared to the PBO group. Proportions of patient who achieved clinical meaningful improvements in HAQ (≥0.3), DLQI (≥5), and SF-36 PCS (≥5) were greater in the ustekinumab 45mg or 90 mg group than in the PBO group. Additionally, ustekinumab-treated patients also achieved greater improvements in patient assessment of pain, patient assessment of disease activity and greater reduction in impact of disease on work productivity than PBO-treated patients (Table).

Table. Baseline Characteristics and Change in Patient Reported Outcomes at Week 24 by Treatment Group: Results from PSMUMMIT I

<table>
<thead>
<tr>
<th>PROs at Week 24</th>
<th>PBO (N=206)</th>
<th>Ustekinumab 45mg (N=208)</th>
<th>Ustekinumab 90mg (N=204)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>47.4</td>
<td>47.1</td>
<td>46.8</td>
</tr>
<tr>
<td>Male Gender (%)</td>
<td>52.4</td>
<td>51.7</td>
<td>56.9</td>
</tr>
<tr>
<td>Baseline HAQ (0–3)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Baseline DLQI (0–30*)</td>
<td>11.7</td>
<td>11.0</td>
<td>10.5</td>
</tr>
<tr>
<td>Baseline SF-36 PCS (0–100)</td>
<td>36.2</td>
<td>35.7</td>
<td>36.5</td>
</tr>
<tr>
<td>Baseline SF-36 MCS (0–100)</td>
<td>41.9</td>
<td>43.1</td>
<td>42.1</td>
</tr>
<tr>
<td>Mean improvement in HAQ</td>
<td>1.4</td>
<td>6.6</td>
<td>7.5</td>
</tr>
<tr>
<td>Mean improvement in DLQI</td>
<td>8.3</td>
<td>37.2</td>
<td>53.3</td>
</tr>
<tr>
<td>Mean improvement in EQ5D</td>
<td>0.1</td>
<td>0.31</td>
<td>0.4</td>
</tr>
<tr>
<td>Improvement in EQ5D=0.3</td>
<td>28.2</td>
<td>47.8</td>
<td>47.5</td>
</tr>
<tr>
<td>Mean change in SF36 PCS</td>
<td>0.3</td>
<td>3.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Improvement in SF36 PCS ≥5 (%)</td>
<td>17.9</td>
<td>30.5</td>
<td>38.1</td>
</tr>
<tr>
<td>Mean change in SF-36 MCS</td>
<td>1.2</td>
<td>0.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Improvement in SF-36 MCS ≥5 (%)</td>
<td>30.1</td>
<td>23</td>
<td>36.5</td>
</tr>
<tr>
<td>Percent improvement in pain</td>
<td>4.5</td>
<td>25.9</td>
<td>29.6</td>
</tr>
<tr>
<td>Percent improvement in disease activity</td>
<td>7.6</td>
<td>25.4</td>
<td>27.6</td>
</tr>
<tr>
<td>Mean improvement in productivity</td>
<td>0.78</td>
<td>1.8</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Data presented were mean or percent; Compared to PBO, *p<0.05*, **p<0.01**, ***p<0.001**

Conclusion: Ustekinumab improves general as well as arthritis and skin-related quality of life, and reduces the impact of disease on work productivity in patients with active PsA.

Conclusion: Adalimumab significantly improved signs, symptoms, and physical function of pts with active non-PSA peripheral SpA and was well-tolerated. ABILITY-2 results suggest that ADA may be an effective treatment option for non-PSA peripheral SpA pts with inadequate response or intolerance to NSAIDs. Further, these results suggest that the PsSpARC assessment instrument, pioneered in this study to evaluate this patient population, is a responsive and discriminative outcome measure.

Reference

Disclosure: P. Mease, Abbott, Amgen, Biogen Idec, Bristol Myers, Celgene, Genentech, Janssen, Lilly, Merck, Novartis, Pfizer, and UCB, 2; Abbott, Amgen, Biogen Idec, Bristol Myers, Celgene, Genentech, Janssen, Lilly, Merck, Novartis, Pfizer, and UCB, 5; J. Sieper, Abbott, Merck, Pfizer, and UCB, 2; Abbott, Merck, Pfizer, and UCB, 5; Abbott, Merck, Pfizer, and UCB, 8; P. Van den Bosch, Abbott, Merck, Pfizer, and UCB, 5, Abbott, Merck, Pfizer, and UCB, 8; P. Rahman, Janssen, Schering, 2; Abbott, Amgen, Janssen, Schering, Bristol-Myers Squibb, 8; K. Obermeyer, Abbott Laboratories, 1; Abbott Laboratories, 3; A. L. Pangan, Abbott Laboratories, 3, Abbott Laboratories, 1.

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Background/Purpose: To address the question whether active inflammation starts at specific sites of the sacroiliac joints (SI-joints) and/or the spine.

Methods: WB-MRIs of 75 patients with early axial spondyloarthritis (SpA) with a disease duration of <5 years [1] were scored for active inflammatory lesions on STIR sequences and T1 weighted images in the 23 vertebral units (VUs) of the spine and in the 8 sacroiliac (SI)-joint quadrants. Scoring was performed by two blinded radiologists.

Results: In the total group of patients, 52% (39/75) showed active inflammation only at the SI-joints (active sacroiliatitis), 41.3% (31/75) in the SI-joints and the spine and 5.3 (4/75) only in the spine (isolated spinal inflammation). Mean scores for active inflammatory changes were 6.7 (SD 5.8) out of possible 24 points for the SI-joints and 1.9 (SD 3.3) out of possible 69 for the spine.

Active inflammation in the SI-joint quadrants were found as the following (in decreasing order): quadrant I (sacral bone, upper quadrant, 66% of patients, n = 50); quadrant II (sacral bone, lower quadrant, 60%, n = 45), quadrant IV (iliac bone, upper quadrant, 53%, n = 40), quadrant III (iliac bone, lower quadrant, 69%, n = 52).

The most frequently affected sites of active inflammation in the spine were the lower thoracic spine and the lumbar spine: in decreasing order the most frequently affected VUs were T6/T7 (n = 11), T10/T11 (n = 11), T7/T8 (n = 10), L1/L2 (n = 10) and L4/L5 (n = 9) and L5/S1 (n = 9). The cervical spine was less often affected.

Table. Distribution of active inflammation in the Sacroiliac Joint Quadrants and the Spinal vertebral units

<table>
<thead>
<tr>
<th>Anatomical site</th>
<th>Percentage of affected patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI-joint quadrant I (sacral bone, upper quadrant)</td>
<td>66%</td>
</tr>
<tr>
<td>SI-joint quadrant II (sacral bone, lower quadrant)</td>
<td>60%</td>
</tr>
<tr>
<td>SI-joint quadrant IV (iliac bone, upper quadrant)</td>
<td>53%</td>
</tr>
<tr>
<td>SI-joint quadrant III (iliac bone, lower quadrant)</td>
<td>69%</td>
</tr>
<tr>
<td>T1/T2</td>
<td>1%</td>
</tr>
<tr>
<td>C3/C4</td>
<td>1%</td>
</tr>
<tr>
<td>C4/C5</td>
<td>1%</td>
</tr>
<tr>
<td>C5/C6</td>
<td>4%</td>
</tr>
<tr>
<td>C6/C7</td>
<td>7%</td>
</tr>
<tr>
<td>C7/T1</td>
<td>3%</td>
</tr>
<tr>
<td>T1/T2</td>
<td>4%</td>
</tr>
<tr>
<td>T2/T3</td>
<td>7%</td>
</tr>
<tr>
<td>T3/T4</td>
<td>7%</td>
</tr>
<tr>
<td>T4/T5</td>
<td>9%</td>
</tr>
</tbody>
</table>


Conclusion: In this cohort of early axial SpA patients there was no significant predilection of SI-joint quadrants affected by active inflammation.

In the spine the thoracic and lumbar parts were mostly affected.

Disclosure: I. H. Song, Pfizer Pharmaceuticals, Merck Sharp Dohme/Schering Plough, Abbott Immunology Pharmaceuticals, 5; C. Althoff, None; H. Haibel, Pfizer Pharmaceuticals, Merck Sharp Dohme/Schering Plough, Abbott Immunology Pharmaceuticals, 2, Abbott Laboratories, 3; A. Wieß, None; B. Freundlich, former employee from Pfizer, 3; M. Rudwaleit, Abbott, BMS, MSD, Pfizer, Roche, and UCB, 5; J. Sieper, Abbott, Merck, Pfizer, and UCB, 2; Abbott, Merck, Pfizer, and UCB, 5, Abbott, Merck, Pfizer, and UCB, 8.

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Radiographic Damage in Ankylosing Spondylitis Over 12 Years of Follow-up: A Longitudinal Analysis. Sofia Ramiro1, Carmen Stolwijk2, A.M. Van Tubergen3, Désirée van der Heijde1 and Robert Landewe4.

1Academic Medical Center, University of Amsterdam, The Netherlands and Hospital Garcia de Orta, Almada, Portugal, 2Maastricht University Medical Center, Maastricht, Netherlands, 3Leiden University Medical Center, Leiden, Netherlands, 4Academic Medical Center, University of Amsterdam and Atrium Medical Center, Heerlen, Netherlands

Background/Purpose: Radiographic damage is one of the core outcomes recommended by the Assessment in Spondyloarthritis international Society (ASAS) for follow-up of patients with axial SpA. So far, the evolution of radiographic damage over a long period has not been described in detail. We aimed to describe the evolution of radiographic abnormalities over time in a prevalence cohort of patients with ankylosing spondylitis (AS).

Methods: The modified Stoke AS Spine Score (mSASSS) was calculated using 2-yearly radiographs of patients followed for 12 years in the Outcome in AS International Study (OASIS). Two readers independently scored the x-rays and scores were averaged. Status and progression scores (2- and 12-year-progression) were computed for patients with at least one 2-year interval available (n = 186) and for those with an mSASSS at 12-years (n = 68). New syndesmophytes at vertebral corners (VCs) “at risk” (i.e. without a previous syndesmophyte or bridge) were computed. Radiographic progression over time was investigated using generalized estimating equations. Relevant interactions with time were explored. Time was modeled in different forms (linear and non-linear) and the best model fit was assessed using the quasi-likelihood information criterion.

Results: 809 radiographs of 186 patients (70% males, mean (SD) age 43(12) years, mean disease duration 11.0(8.8) years and 83% HLA-B27 positive) were included. The mean (SD) mSASSS at baseline was 11.6 (16.2) [11.2 (15.7) in patients with mSASSS at 12-years]. The mean (SD) 2-year interval progression score in (520 2-year intervals) was 2.0 (3.5) [2.2 (3.9) for the subset of 12-year-completers]. Over the 12 years, the mean (SD) progression was 11.7 (11.5). A new syndesmophyte was assessed in 38% by one reader (R1) and 39% by reader 2 of all 2-year intervals and, throughout follow-up, in 55% (R1) and 63% (R2) of the patients with at least one VC “at risk”. In 24% of the patients (39% of the 2-year intervals) there was no progression in mSASSS. A progression ≥1 mSASSS occurred in 72% of the patients (54% of the intervals) and a progression ≥5 mSASSS in 22% of the patients (12% of the intervals). At the group level, a linear time course model fitted the observed data the best. Time was positively associated with radiographic progression, with an increase of 0.98 mSASSS/year (95% CI 0.36-1.60) (Table).
Radiographic progression occurred significantly faster in males (vs females) and in HLA-B27 positive patients (vs HLA-B27 negative). HLA-B27 positive male (but not female) patients had a significantly higher progression than HLA-B27 negative males. Progression was independent of disease- and symptom duration.

**Conclusion**: Long-term radiographic progression in AS is more severe in HLA-B27-positive males. About 60% of all patients have at least one new syndesmophyte. Radiographic progression is dependent on time and, at the group level, linear.

Disclosure: S. Ramiro, None; C. Stolwijk, None; A. M. Van Tubergen, None; D. van der Heijde, None; R. Landewe, None.

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**Differential Association Between Human Leukocyte Antigen (HLA) Alleles and Joint Subluxation and Ankylosis in Patients with Psoriatic Arthritis.** Vinod Chandran, Arane Thavaneswaran, Amir Haddad, Fawnda Pellett and Dafina Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

**Background/ Purpose:** We have previously reported the association between HLA and KIR gene variants with the development of arthritis mutilans - HLA-A*11, -B*27, -A*29, -B*27, -C*02, -C*03, -C*04, -DB8*02 and KIRD3S1 were predictors variables. In a recent proof-of-concept (PoC) trial it was shown that secukinumab, a fully human IgG1k anti-IL17A monoclonal antibody, significantly improved clinical signs and symptoms of patients with active ankylosing spondylitis (AS). Magnetic resonance images (MRI) of these patients showed reduction of spinal inflammation at week (wk) 6 and wk 28 after initiation of treatment. Here we report on a subgroup of patients (N=13) who entered the open label extension study, received and completed treatment and had MRI assessments at wk 28 and up to 24 months.

**Methods:** In the 28-wk PoC study, 27/30 patients had sequential MRI studies, 22 had received secukinumab 2×10 mg/kg administered intravenously wks apart, and 5 patients had been randomized to placebo. Of those 27 patients, 20 entered the extension study. 13 of these 20 patients had MRI data at wk 94. Of these 13, ten had been treated with secukinumab and 3 with placebo in the core study. In the extension study, all received secukinumab 14×3 mg/kg administered 4 wks apart. MRIs (T1 and STIR) were rescored for this study by analyzing the images from baseline (BL), wk 28 and wk 94. All MRIs were analyzed together by an independent blinded reader using the ASAS MRI-a scoring system, and also recording the amount of vertebral edges (VEs) which showed inflammation or fatty degeneration at the different time points.

**Results:** All 13 patients completed the study. For patients receiving secukinumab and placebo, the ASAS20 and ASAS40 responses are shown in Table 1. In group 1, ASASMRI-a scores were reduced in comparison to BL at wk 28 – similar to the results of the core study – and these reduced scores were sustained at a similar level at wk 94 (Table 1). Of the 920 VEs evaluated, the proportion of inflammatory lesions was reduced from 9.9% (N=91) at BL to 3.7% (N=34) at wk 28 and 3.6% (N=33) at wk 94. There was no increase in the number of VEs with fatty lesions between BL and wk 28 and 94 (Table 1). In the 3 patients who had initially received placebo and who were then switched to secukinumab at wk 28 (group 2), MRI inflammatory scores at wk 94 also improved (Table 1).

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**Long Term Inhibition of Interleukin (IL)-17A with Secukinumab Improves Clinical Symptoms and Reduces Spinal Inflammation As Assessed by Magnetic Resonance Imaging in Patients with Ankylosing Spondylitis.** Xenofon Baraliakos1, Jurgen Braun2, D. D. Lauren3, D. Baeten1, D. van der Heijde4, J. Steeper5, Paul Emery6, Iain B. McInnes7, Paul Devaucelle8, Anthony Coates9, Francois Vancraen10, Marktand11, None; C. Stolwijk, None; A. M. Van Tubergen, None; D. van der Heijde, None; R. Landewe, None.
Table 1. Clinical and MRI parameters in patients receiving secukinumab 2 x 10 mg/kg followed by 14 x 3 mg/kg monthly (group 1), or placebo followed by secukinumab 14 x 3 mg/kg monthly (group 2)

<table>
<thead>
<tr>
<th></th>
<th>Secukinumab (group 1)</th>
<th>Placebo/Secukinumab (group 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Week 28</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Week 52</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Week 54</td>
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<td>3</td>
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<tr>
<td>Week 56</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Number of Patients</td>
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<tr>
<td>Week 28</td>
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<td>50</td>
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<td>Week 52</td>
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<td>12</td>
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<td>Week 54</td>
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<td>Week 56</td>
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<td>Week 58</td>
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<tr>
<td>Number of Patients</td>
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<td>Week 28</td>
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<td>Week 52</td>
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<td>Week 54</td>
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<td>10</td>
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<td>Week 54</td>
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<td>3</td>
</tr>
<tr>
<td>Week 56</td>
<td>3</td>
<td>3</td>
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</table>

**Results:** Serum C3M (P<0.0002), CRPM (P<0.0001), and VICM (P=0.0011) all decreased significantly after anti-TNF-alpha therapy. There was no significant difference in serum C2M (P>0.05) and MMP3 (P>0.05) before and after anti-TNF-alpha therapy, although 1/3 of the patients did decrease in response to treatment. CRP (P<0.0001) and ESR (P<0.0001) decreased significantly with treatment. There was a significant correlation between CRPM and the conventional biomarkers before treatment. However, this correlation was lost after 3 months of treatment (table). VICM was strongly correlated to C3M at both time points and to CRPM after treatment, but not at baseline. There was a significant correlation between C2M and VICM at baseline, which was lost after treatment. Before treatment CRP was correlated to C3M, but not after treatment.

**Conclusion:** Biomarkers of cartilage degradation (C2M), synovial inflammation (C3M, CRPM, VICM and MMP3) and systemic biomarkers (CRP and ESR) were decreased in response to anti-TNF-alpha treatment in these AS patients. Whereas the level of CRP and ESR was completely blocked by treatment in a majority of the patients, the suppression in the level of the other markers was patient-dependent. It was clear that each marker reflects different molecular processes in the tissue and responded differentially to the treatment. This specific profiles for treatment efficacy may be generated by measuring a biomarker panel of tissue degradation end products.

**Disclosure:** A. S. Siebner, None; A. C. Bay-Jensen, None; M. A. Karsdal, Nordic Bioscience Diagnostic, 4; K. Vassiliadis, None; S. Wichuk, None; C. Christiansen, Nordic Bioscience AS, CBCR, Novum, 4; Roche, Eli Lilly, Novartis, Novo Nordisk, Proctor and Gamble, Groupe Fournier, Besins EscoVesco, Merck Sharp and Dohme, Chiesi, Boehringer Mannheim, Pfizer, GlaxoSmithKline, Amgen, 5; W. P. Maksymowycz, None.

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1. Glistrup Hospital, Copenhagen, Denmark, 2. University of Alberta, Edmonton, AB

**Background/Purpose:** The current gold standard for detection of disease progression in ankylosing spondylitis (AS) is conventional radiography. The most reliable method mSASS includes the anterior parts of the cervical and lumbar spine. However, sensitivity to change is limited (1). MRI, that visualizes the total spine tomographically, may therefore improve detection of new bone formation. The aim of this study was to develop standardized definitions for new bone formation on MRI, to test the reliability of their detection in patients with AS, to compare this reliability with radiography, and to determine whether availability of radiographs enhances the reliability of detection on MRI.

**Methods:** The Canada-Denmark MRI working group developed standardized consensus based definitions for bone spurs and ankylosis.
observed on sagittal images of T1-weighted MRI scans. The definitions included lesions at anterior and posterior vertebral corners as well as non-corner lesions in the disc space and lesions in the lateral segments. A reference image set was generated that included examples of all these lesions as well as variations in normal anatomy. In the MRI-based score, bone spurs and ankylosis were assigned a score of 2 and 3, respectively. In exercise 1, reliability for status and change scores for lesions were assessed on baseline and 2 year scans in 55 patients with AS by 3 readers scoring in known time sequence. Discrepant scans were reviewed extensively using radiography as a reference. In exercise 2, baseline/2 year pairs of radiographs and MRIs of 25 patients with AS (numbered independently) were assessed in 3 reads. Read 1: Radiographs were assessed for syndesmophytes and ankylosis; Read 2: MRI scans were assessed for new bone; Read 3: Simultaneous assessment of radiographs and MRI scans. Reliability was assessed by intra-class correlation coefficient (ICC).

**Results:** ICC for 3 readers reading MRI scans in the first exercise were 0.79 and 0.23 for baseline status and 2 year change scores, respectively. In exercise 2, radiography was superior to MRI in reliably detecting new bone. (Table). Simultaneous availability of radiographs enhanced the reliability of detecting new bone in the C spine by MRI but this was still inferior to radiography. ICC for detection of new bone in the thoracic spine by MRI was 0.48 and 0.36 for baseline status and 2-year change scores, respectively.

<table>
<thead>
<tr>
<th>Table. Intra-class correlation coefficient (ICC) for detection of bone spurs and ankylosis in exercise 2</th>
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<tbody>
<tr>
<td>X-ray*</td>
</tr>
<tr>
<td>C spine</td>
</tr>
<tr>
<td>T spine</td>
</tr>
<tr>
<td>L spine</td>
</tr>
</tbody>
</table>

*ICC (status) for 3 readers
**Mean ICC for comparison of radiography and MRI

**Conclusion:** Standardization of MRI features, scoring methodology, and calibration of expert readers with radiography failed to show any major advantage of MRI over radiography in the reliable detection of new bone in the cervical and lumbar spine of patients with AS. Future efforts should focus on the methodology for assessment of the thoracic spine.

**Reference**
Wanders AJ et al. AR 2004

**Disclosure:** S. J. Pedersen, None; M. Ostergaard, None; R. G. Lambert, None; W. P. Maksymowych, None.

**578**

**Assessment of the Link Between Inflammation and Fat Metaplasia in Patients with Spondyloarthropathy on Non-Biological Therapy: A Long Term Magnetic Resonance Imaging Study.** Zheng Zhao1, Susanne Juhi Pedersen2, Robert GW Lambert3, Stephanie Wichuk3, Mikkel Ostergaard4 and Walter P. Maksymowych4. 1Department of Rheumatology, University of Alberta and PL A General Hospital, Beijing, PR China, Beijing, China, 2Glostrup Hospital, Copenhagen, Denmark, University of Alberta, Edmonton, AB, 3Copenhagen University Hospital at Glostrup, Copenhagen, Denmark.

**Background/Purpose:** There is growing awareness of the importance of fat metaplasia in the pathogenesis of SpA and its potential link with inflammation and new bone formation. Recent data has demonstrated fat metaplasia at vertebral corners after resolution of inflammation in patients receiving anti-TNF therapies. There is no data that assesses this link in patients receiving non-biological (non-B) therapies. These processes can be reliably measured using STIR and T1-weighted (T1W) MRI sequences, respectively, and we aim to compare these findings in patients with SpA according to treatment.

**Methods:** Two readers assessed MRI scans from 103 patients with SpA, males n = 81, mean age = 39.3 years, mean disease duration = 16.2 years, in a prospective cohort. MRI was conducted at intervals up to 4 years (mean 18.1 months) and 56 patients received anti-TNF while 47 received non-B therapies. Fat metaplasia was scored on T1W scans using a new scoring method, the CanDen FAt SpA Spine Score (FASSS) which scores six different types of fat lesions defined according to anatomical location. Lesions are recorded dichotomously (present/absent) at each vertebral endplate from C2 lower to S1 upper (scoring range per disco-vertebral unit (DVU) in C spine: 0–8, and in T and L spine: 0–18). Inflammation was scored on STIR scans using the SPARCC MRI Spine 23DVU method with lesions being scored at each DVU (scoring range per DVU 0–18). We calculated SPARCC 23DVU and FASSS change scores, responsiveness by standardized response mean (SRM), and associations by Pearson c and regression.

**Results:** Change (a decrease) in SPARCC 23-DVU score from baseline was significant in anti-TNF treated patients (p = 0.01) but not non-B patients, while a significant increase in FASSS was evident in both anti-TNF (p = 0.005, SRM = 0.38) and non-B (p = 0.003, SRM = 0.45) treated patients indicating new fat lesions irrespective of treatment. For patients with at least 2 year follow up, 14 (56%) and 16 (61.5%) of anti-TNF and non-B treated patients, respectively, had an increase in FASSS score while 7 (28%) and 6 (23.1%), respectively, had a decrease in FASSS score indicating resolution of fat lesions in a minority of patients. However, change in FASSS and SPARCC 23-DVU were highly correlated in anti-TNF treated patients (c2 = −0.58, p = 3 × 10−6) but not in non-B treated patients. Change in SPARCC 23-DVU was also independently associated with change in FASSS only in anti-TNF treated patients (β = −0.61, p <0.0001) (adjusted for age, sex, disease duration, BASDAI, CRP).

**Conclusion:** Long-term follow up reveals a strong link between inflammation and fat metaplasia in patients on anti-TNF while a disconnect is evident in patients receiving non-B therapies. This may have implications for pathways leading to new bone formation.

**Disclosure:** Z. Zhao, None; S. J. Pedersen, None; R. G. Lambert, None; S. Wichuk, None; M. Ostergaard, None; W. P. Maksymowych, None.

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**Prevalence of Psoriatic Arthritis in Psoriasis Patients According to Newer Classification Criteria.** Hernan Maldonado-Facco1, Gustavo Citera1, Ana Alba Porrini2 and Jose A. Maldonado-Cocco3. 1Instituto de Rehabilitación Psicosocial - Fundación Reumatologica Argentina Dr. Oswaldo Garcia-Morteo, Buenos Aires, Argentina, 2Hospital Argerich, Buenos Aires, Argentina.

**Background/Purpose:** To determine the prevalence of Psoriatic Arthritis (PsA) in a cohort of psoriasis patients according to CASPAR criteria, and compare it with that resulting from the use of ASAS peripheral and axial criteria for SpA and New York criteria for AS.

**Methods:** The first 100 patients that consecutively attended the Psoriasis clinic of a Dermatology Service were assessed. Demographic and clinical data were collected, and all patients were questioned and examined by a rheumatologist for joint manifestations. In all cases, rheumatoid factor and radiographs of hands, feet, cervical spine and pelvis for sacroiliac joints were obtained. All X-rays were read independently by two observers in blinded fashion. Patients with objective joint manifestations, both axial and peripheral, were evaluated for their fulfillment of CASPAR, ASAS peripheral and axial, and New York criteria. Correlations were calculated by Spearman’s test. Categorical variables were compared by x2, and continuous variables were compared by Student’s test.

**Results:** Of the 100 patients included (62 males) median age was 48 years and median duration of psoriasis 11 years. 93% of patients presented psoriasis vulgaris, and 56% nail involvement. Seventeen patients had peripheral arthritis, mostly oligoarticular in 9 and polyarticular in 8. Median time of arthritis duration was of 8 years. Seven patients had chronic neck pain while 6 patients had chronic low back pain. 13 patients had cervical spine and 6 patients lumbar spine limitation. Among all psoriatic patients, radiographic sacroiliitis grade 2 and 3 was detected in 12, and grade 4 in 2, being symmetric in 7 of the patients. At cervical level, 10 patients presented syndesmophytes and 3 had interapophyseal ankylosis. Of all patients, 17% fulfilled CASPAR and ASAS peripheral criteria, 6% New York and 5% ASAS axial criteria. Patients who met CASPAR criteria showed a significant
cantly higher time of psoriasis duration compared to those without arthritis (median 16 vs 10 years, p = 0.02), and a higher frequency of nail involvement (88.2% vs 49.4%, p = 0.003). Five patients (29.4%) fulfilled the ASAS axial criteria; all of them presented peripheral involvement: mono-/polyarticular in 3 and polyarticular in 2 patients. Patients with peripheral and axial involvement presented a significantly higher frequency of erythrodermic psoriasis compared to the other patients (35.3% vs 1.2%, p = 0.006) and 80% vs 16.7%, p = 0.02). Among the 95 patients without the ASAS axial criteria, 9 showed sacroiliitis grade 2 or higher. Among the 83 patients without arthritis, only 1 presented peripheral radiological changes, whereas 5 presented perinatal changes grade 2 or 3.

**Conclusion:** Prevalence of PsA, for both CASPAR and ASAS peripheral criteria was of 17%. According to the ASAS criteria, 5% of patients presented axial involvement, while 6% presented axial involvement regarding the New York criteria. All cases with articular involvement presented a higher frequency of psoriasis nail involvement and skin severity. It is worth to note that few patients without signs or symptoms of arthritis had radiological changes, both axial and peripheral, precluding a proper classification.

**Disclosure:** H. Maldonado-Fico, None; G. Citera, None; A. A. Porroni, None; J. A. Maldonado-Cocco, None.

**ACR Poster Session A**

**Spondyloarthritis and Psoriatic Arthritis - Pathogenesis, Etiology**

Sunday, November 11, 2012, 9:00 AM–6:00 PM

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**Changes in Sclerostin, Dickkopf-1 and Serum Markers of Inflammation, Cartilage and Bone Turnover in Patients with Axial Spondyloarthritis**

*Treated with Adalimumab*, Susanne Jul Pedersen1, Inge Jul Sorensen2, Julia S. Johansen3, Patrick Garniero4, Anne Gitte Lof5, Jens Skoedt6, Gorm Thamsborg1, Karsten Asmussen7, Elka Kluger8, Jesper Norregaard9, Torben Grube Christensen10 and Mikkel Østergaard1. 1Glostrup Hospital, Copenhagen, Denmark, 4INSERM, Lyon, France, 5Sygehus Lillebaelt, Vejle, Hospital at Gråsten, Denmark, 9Hørsholm Hospital, Denmark, 10Slagelse Hospital at Gråsten, Denmark, 9Vangsø Hospital, Copenhagen, Denmark, 6Gentofte Hospital, Copenhagen, Denmark, 7Bispebjerg Hospital, Copenhagen, Denmark, 2King Christian 10th Rheumatism Hospital at Gråsten, Denmark, 3Hvidovre Hospital, Copenhagen, Denmark, 4Herlev Hospital, Herlev, Denmark, 5INSERM, Lyon, France, 6Sygehus Lillebaelt, Vejle, Copenhagen, Denmark, 7Gentofte Hospital, Copenhagen, Denmark, 8Bispebjerg Hospital, Copenhagen, Denmark, 10Slagelse Hospital, Slagelse, Denmark

**Background/Purpose:** Few studies have investigated changes in plasma sclerostin and Dickkopf1 (DKK-1) in relation to other biomarkers of inflammation, cartilage and bone turnover in patients with axial spondyloarthritis (SpA) before and during treatment with adalimumab (adalimumab) inhibitors. The aim of this study was to investigate plasma concentrations of sclerostin, DKK-1 and serum markers of inflammation, cartilage and bone turnover in patients with axial spondyloarthritis (SpA) and changes thereof after the first 12 weeks of treatment.

**Methods:** In a randomized double-blind placebo-controlled trial, 52 patients with axial SpA (77% male, disease duration median 10, range 1–35 years) were allocated to adalimumab 40 mg (n = 27) or placebo (n = 25) s.c. e.o.w. for 12 weeks, followed by an open label extension, where all received adalimumab. Patients were included if they had: 1) SpA according to ESSG criteria; 2) sacroiliitis on MRI and/or X-rays; and 3) BASDAI ≥40 mm despite treatment with two NSAIDs. Six patients were excluded before week 12 (adalimumab n = 2; placebo n = 4). At week 24, 43 (83%) patients were BASDAI responders (i.e. reduction of 50% or 20 mm). P < 0.005 was regarded as statistical significant. Plasma sclerostin, plasma DKK-1, serum C-reactive protein (CRP), interleukin-6 (IL-6), YKL-40, plasma vascular endothelial growth factor (VEGF), urinary CTX-II, matrix metalloproteinase 3 (MMP-3), total aggrecan (TA), cartilage oligomeric matrix protein (COMP), CTX-I and total osteocalcin (OC) were measured by ELISAs.

**Results:** Patients with SpA had higher (compared to healthy subjects) baseline levels of IL-6, YKL-40 and CTX-II (p < 0.001) and lower levels of aggrecan (p < 0.0001). Levels of VEGF, MMP-3, COMP, CTX-I, OC, sclerostin and DKK-1 were within the normal levels. The treatment groups did not differ in baseline biomarker levels. At baseline, IL-6 correlated with CRP (0.73, p < 0.001) and CTX-II (0.48, p = 0.0004); VEGF with YKL-40 (0.46, p = 0.001); CTX-II with CTX-I (0.40, p = 0.004) and OC (0.45, p = 0.0008); and OC with CTX-I (0.55, p < 0.0001). From baseline to week 12 significant correlations between the percentage changes in IL-6 and CRP (0.76 and 0.67, p = 0.0002) and OC (−0.67 and −0.54, p = 0.005) were found in both treatment groups. In the placebo group only CRP and OC (−0.62, p = 0.002) correlated and in the adalimumab group only CRP and MMP-3 (0.65, p = 0.0004) and TA and YKL-40 (−0.55, p = 0.004). From baseline to week 12, patients treated with adalimumab had larger percentage decreases in CRP (p = 0.009), IL-6 (p < 0.0001) and YKL-40 (p = 0.04) compared to placebo treated patients. After 12 weeks of adalimumab treatment significant percentage decreases were seen in CRP (p = 0.003), IL-6 (p = 0.001), VEGF (p = 0.006), YKL-40 (p = 0.02) and MMP-3 (0.01). In the placebo group TA (p = 0.01) increased. No significant changes were seen for VEGF, CTX-I, MMP-3, TA (adalimumab), DKK-1, sclerostin, CTX-I and OC after the first 12 weeks of treatment.

**Conclusion:** In patients with SpA treatment with adalimumab significantly reduced biomarkers of inflammation. No significant early changes were seen in sclerostin, DKK-1 and biomarkers of cartilage and bone turnover.

**Disclosure:** S. J. Pedersen, Abbott Laboratories and MSD, 9; J. J. Sorensen, Abbott Laboratories, 2; J. S. Johansen, None; P. Garnero, None; A. G. Loft, None; J. Skoedt, None; G. Thamsborg, None; K. Asmussen, None; E. Kluger, None; J. Norregaard, None; T. G. Christensen, None; M. Østergaard, Abbott Immunology Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 8, Centocor, Inc., 5, Merck Pharmaceuticals, 5, Merck Pharmaceuticals, 8, Mundipharma, 8, Novo, 8, Pfizer Inc, 5, Pfizer Inc, 8, Roche Pharmaceuticals, 5, UCB, 5, UCB, 8.

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**Examining a Role for Th17 Regulation and Toll-Like Receptor Signaling in Psoriatic Arthritis.** Fatima Abji, Remy Pollock, Fawnda Pellet, Vinod Chandran and Dafina D. Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

**Background/Purpose:** Psoriatic arthritis (PsA) is a seronegative inflammatory arthritis that develops in 30% of patients with cutaneous psoriasis (PsC). Joint inflammation in PsA is mediated in part by natural killer (NK) cells which are an important arm of the innate immune system. We have previously shown that PsA is associated with activating ligands of NK cell receptors, including the killer cell immunoglobulin-like receptors (KIRs) and NKG2D. Toll-like receptors (TLRs) and Th17 cells are components of the innate immune response which have been implicated in other inflammatory arthritides such as rheumatoid arthritis and ankylosing spondylitis. We sought to determine whether a dysregulation in these pathways is also found in PsA.

**Methods:** Total RNA was isolated from peripheral blood of 20 PsA, 17 PsC, and 19 control subjects. Quantitative RT-PCR arrays (SABiosciences) were used to profile expression of 155 genes related to the Th17 regulatory and toll-like receptor signaling. Expression was quantified using the ΔΔCT method and fold change differences between groups was determined by Student’s t-test (p < 0.05 cutoff).

**Results:** Out of 30 genes significantly dysregulated in psoriatic disease patients (PsA & PsC), two (TLR9 and IL13) were dysregulated greater than 1.5-fold (a 50% increase), 6 genes were significantly dysregulated less than 1.5-fold in PsC patients compared to controls, and one gene (IL23R) was increased 1.6-fold (p = 0.049). In PsA patients compared to controls, 9 out of 45 significant genes were dysregulated greater than 1.5-fold: CLEC7A, CLEC4E, CXCL10, CXCL6, IL2, IL15, LY96, TBK1 and TLR9. Comparing PsA to PsC patients, 4 out of 50 significant genes were dysregulated greater than 1.4-fold (LY96, TBK1, CXCL10 and TLR4) and 13 of 50 significant genes were dysregulated less than 1.5-fold, including CD4, CD8A, CXCL5, NFATC2, SVK, TBX21, IRAK2 and RELA.

**Conclusion:** A majority of the changes observed in PsA were related to TLR signaling. LY96 dysregulation was previously identified in microarray analyses of PsA compared to PsC patients and controls. Over-expression of TLR3 and TLR4 in synovial tissue from patients with early RA has also been reported. Future studies will validate these results, examine the role of TLR signaling pathways in PsA, and determine whether they can serve as biomarkers of PsA susceptibility in patients with PsC.

**Disclosure:** F. Abji, None; R. Pollock, None; F. Pellet, None; V. Chandran, None; D. D. Gladman, None.
Proteomic Analysis of Synovial Tissue: A Unique Tool to Predict Response to Anti-TNF Alpha Therapy in Patients with Inflammatory Arthritis. Opeyemi S. Ademowo1, Emily S. Collins1, Cathy Rooney1, A. W. van Kuijk2, Danielle M. Gerlag2, Paul P. Tak2, Oliver M. FitzGerald2 and Stephen R. Pennington3. UCD Conway Institute of Bimolecular and Biomedical Research, University College Dublin, Dublin 4, Ireland, 2Academic Medical Centre/University of Amsterdam, Amsterdam, Netherlands, 3St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: Inflammatory arthritis, which includes rheumatoid arthritis (RA) and psoriatic arthritis (PsA), is a leading cause of joint deformity, disability and reduced quality of life with a high economic cost [1]. A common target for therapeutic intervention is TNF-α, a key cytokine that drives the inflammatory and destructive processes of these diseases. However, due to common drug failure, diverse degree of response to therapy, cost of treatment as well as adverse drug events [2, 3] there is an urgent need for personalised medicine [4]. We hypothesized that there are distinct proteins or peptides within the synovial tissue that may predict the degree of response to anti TNF-α therapy in patients with inflammatory arthritis. Hence we aim to discover, develop and validate potential predictive biomarkers of treatment outcomes and map the protein changes to potential pathways.

Methods: Baseline protein expressions were investigated and compared in the synovum of 20 PsA patients with diverse responses to adalimumab (a monoclonal antibody against TNF-α) [5]. The EULAR responder classification system used to classify patients’ treatment response categories at 3 months follow-up. Synovial proteins were extracted, subjected to digestion with trypsin and the resulting peptides were analysed by label free liquid chromatography-mass spectrometry (LC-MS) on an Agilent 6520 QTOF with HPLC chip cube source attached. Progenesis LC-MS software (version 2.6) was used for the differential protein expression analysis. The potential biomarkers discovered were targeted by multi reaction monitoring (MRM) technique in a triple quadrupole mass spectrometer for quantitative measurement with the aid of skyline software for instrument method optimization.

Results: The protein profile of the different response categories varied. 313 proteins were differentially expressed between responders and non-responders; a cut off p-value<0.05 and fold change>2 were used to select the biomarker panel. The majority of these proteins have been found to be associated with inflammation. 54 proteins were successfully targeted with the MRM and quantified in synovial tissue. Of the 54 proteins, 25 were significantly over expressed in good responders and 30 were over expressed in non responders.

Conclusion: Label-free LC-MS of synovial tissue is a robust approach to the discovery of differentially expressed proteins that might predict response to anti-TNF-α therapy in PsA patients. These proteins are potential candidate synovial biomarkers of response to anti-TNF-α therapy and will be validated on a larger cohort of patients. The possibility of detecting and measuring these candidate markers in the serum will be explored.

References
3. Bennett et al; Rheumatology, 44(8), 1026(2005)

Disclosure: O. S. Ademowo, None; E. S. Collins, None; C. Rooney, None; A. W. van Kuijk, None; D. M. Gerlag, None; P. P. Tak, None; O. M. FitzGerald, None; S. R. Pennington, None.

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Familial Aggregation and Heritability of Ankylosing Spondylitis in Taiwan: A Nationwide Population Study. Chang-Fu Kuo1, Matthew J. Grange1, Lai-Chu See2, Kuang-Hui Yu2, Shue-Fen Luo1, Ana M. Valdes1, I-Jun Chou1, Weiya Zhang1 and Michael Doherty1. 1University of Nottingham, Nottingham, United Kingdom, 2Chang Gung University, Taoyuan, Taiwan, 3Chang Gung Memorial Hospital, Taoyuan, Taiwan, 4St. Thomas’ Hospital, King’s College London, London, United Kingdom

Background/Purpose: To estimate the risk of ankylosing spondylitis (AS) among individuals with affected first-degree relatives and to assess the magnitude of genetic contribution to the susceptibility of AS in the general population of Taiwan.

Methods: Using data from the National Health Insurance Research Database in Taiwan, we conducted a nationwide cross-sectional study in 11,770,921 men and 11,697,080 women in 2004. The case definition of AS was based on physician diagnosis. The relative risk (RR) was calculated as the prevalence of AS among individuals with affected first-degree relatives, divided by the prevalence of AS among individuals with no affected first-degree relatives. The identification of first-degree relatives of each individual was determined using the NHIRD registry for beneficiaries. The marginal Cox proportional hazard model with an equal follow-up time for all subjects was used to estimate RR and the 95% confidence interval (CI). This model was used to account for shared environment and case clustering within families with robust variance, and to adjust for age, sex, place of residence, income levels and occupation. Heritability was calculated based on multifactorial polygenic model.

Results: There were 82,618 men (0.70%) and 58,445 women (0.50%) who had AS diagnosis in 2004. The prevalence of AS was higher in individuals with affected first-degree relatives (3.28%) than those without (0.58%). The overall familial relative risk (RR) was 7.95 (95% CI, 7.68–8.24). The RR (95% CIs) for an individual with an affected twin, sibling, parent and offspring were 21.70 (18.75–25.11), 13.07 (14.78–16.13), 6.98 (6.66–7.32) and 6.77 (6.50–7.06) respectively. The RR (95% CI) increased with the number of affected first-degree relatives from 7.35 (7.10–7.62), 43.00 (38.77–47.70) and 141.85 (103.50–194.41) for one, two or three, or more affected relatives, respectively. The heritability of AS was 0.95 (95% CI, 0.92–0.98). Among individuals with AS, only 4.16% had a family history. The population attributable risk associated with familial aggregation in Taiwan was 3.73% (95% CI, 4.24%–4.59%).

Conclusion: The risk of AS is higher among individuals with affected first-degree relatives. In addition, the heritability of AS is very high in the general population in Taiwan, confirming that genetic predisposition plays a major role in AS susceptibility.

Disclosure: C. F. Kuo, None; M. J. Grange, None; L. C. See, None; K. H. Yu, None; S. F. Luo, None; A. M. Valdes, None; I. J. Chou, None; W. Zhang, None; M. Doherty, None.

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Association of Platelet Endothelial Cell Adhesion Molecule-1 and integrin Gene Polymorphisms with Uveitis Development in Ankylosing Spondylitis. Seung Cheol Shin, Donghyuk Sheen, Mi Kyong Lim and Hyo Park. Eulji University Hospital, Daejeon, South Korea

Background/Purpose: Genetic factors provide over 90% of the susceptibility to ankylosing spondylitis (AS) and recent studies have focused on non-major histocompatibility complex genes. The etiology of uveitis in AS has been suggested to involve two adhesion molecules including intercellular adhesion molecule and leukocyte functional antigen.

Platelet-endothelial cell adhesion molecule 1 (PECAM1), a member of the immunoglobulin superfamily, may be an important regulator of antigen induced cell activation of lymphocytes. The β1 integrin (ITGB1) can associate with different membrane proteins and cause signal transduction by interactions in the extracellular and trans-membrane domain. Therefore, we examined the association of PECAM1 and ITGB1 gene polymorphisms with development of uveitis in patients with AS.

Methods: We conducted a case–control study where 223 AS patients who met the Modified New York criteria and 239 ethnically matched controls were genotyped for 9 single nucleotide polymorphisms (SNPs) in the PECAM-1 promoter and gene. Genomic DNA was isolated from peripheral blood leukocytes by a standard phenol–chloroform method and a GoldenGate assay (Illumina, http://www.illumina.com) was used for genotyping.

Results: Conditional logistic regression was used to evaluate the association between the PECAM1 or ITGB1 SNPs with susceptibility to AS, and no significant association was found on both genes. However, in the subgroup analyses between AS patients with uveitis and those without seven SNPs in PECAM1 gene were associated with the presence of uveitis, including rs1050382 (dominant model (DM), p=0.022), rs2812 (recessive model (RM), p=0.013), rs4968721 (DM, p=0.016), rs6808
Table 1. Logistic analysis of PECAM1 polymorphisms and the risk of uveitis among AS patients

<table>
<thead>
<tr>
<th>Polymorphism</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value (adj. P)</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value (adj. P)</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value (adj. P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rs7079624</td>
<td>1.403 (0.538–3.662)</td>
<td>0.488 (0.536)</td>
<td>2.560 (1.335–4.909)</td>
<td>0.004 (0.008)</td>
<td>1.830 (1.109–3.021)</td>
<td>0.017 (0.030)</td>
</tr>
<tr>
<td>rs3780871</td>
<td>0.268 (0.081–0.888)</td>
<td>0.031 (0.042)</td>
<td>0.745 (0.390–1.424)</td>
<td>0.374 (0.514)</td>
<td>0.662 (0.398–1.103)</td>
<td>0.113 (0.139)</td>
</tr>
<tr>
<td>rs2503997</td>
<td>1.278 (0.659–2.477)</td>
<td>0.466 (0.540)</td>
<td>1.308 (0.586–2.920)</td>
<td>0.511 (0.562)</td>
<td>1.205 (0.778–1.865)</td>
<td>0.401 (0.441)</td>
</tr>
<tr>
<td>rs2230396</td>
<td>0.436 (0.226–0.839)</td>
<td>0.012 (0.020)</td>
<td>0.712 (0.273–1.858)</td>
<td>0.488 (0.565)</td>
<td>0.582 (0.353–0.960)</td>
<td>0.034 (0.044)</td>
</tr>
<tr>
<td>rs17468</td>
<td>0.436 (0.226–0.839)</td>
<td>0.012 (0.019)</td>
<td>0.563 (0.249–1.272)</td>
<td>0.167 (0.245)</td>
<td>0.589 (0.377–0.918)</td>
<td>0.019 (0.030)</td>
</tr>
<tr>
<td>rs11009147</td>
<td>0.436 (0.226–0.839)</td>
<td>0.012 (0.021)</td>
<td>0.712 (0.273–1.858)</td>
<td>0.488 (0.596)</td>
<td>0.582 (0.353–0.960)</td>
<td>0.034 (0.046)</td>
</tr>
</tbody>
</table>

Table 2. Logistic analysis of ITGB1 polymorphisms and the risk of uveitis among AS patients

<table>
<thead>
<tr>
<th>Polymorphism</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value (adj. P)</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value (adj. P)</th>
<th>Odds Ratio (95% CI)</th>
<th>P Value (adj. P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rs8065316</td>
<td>1.124 (0.490–2.578)</td>
<td>0.781 (0.822)</td>
<td>1.774 (0.908–3.468)</td>
<td>0.093 (0.155)</td>
<td>1.360 (0.848–2.180)</td>
<td>0.201 (0.268)</td>
</tr>
<tr>
<td>rs6809</td>
<td>2.354 (1.193–4.641)</td>
<td>0.013 (0.020)</td>
<td>0.456 (0.129–1.611)</td>
<td>0.223 (0.297)</td>
<td>1.364 (0.852–2.184)</td>
<td>0.195 (0.279)</td>
</tr>
<tr>
<td>rs4968721</td>
<td>2.302 (1.167–4.541)</td>
<td>0.016 (0.022)</td>
<td>0.412 (0.117–1.446)</td>
<td>0.166 (0.237)</td>
<td>1.304 (0.820–2.075)</td>
<td>0.261 (0.290)</td>
</tr>
<tr>
<td>rs2812</td>
<td>2.190 (0.673–7.736)</td>
<td>0.223 (0.247)</td>
<td>0.424 (0.215–0.837)</td>
<td>0.013 (0.024)</td>
<td>0.732 (0.459–1.173)</td>
<td>0.195 (0.300)</td>
</tr>
<tr>
<td>rs11079538</td>
<td>1.623 (0.745–3.537)</td>
<td>0.222 (0.261)</td>
<td>1.289 (0.568–2.924)</td>
<td>0.543 (0.571)</td>
<td>1.345 (0.821–2.202)</td>
<td>0.238 (0.297)</td>
</tr>
<tr>
<td>rs1050382</td>
<td>2.170 (1.116–4.219)</td>
<td>0.022 (0.027)</td>
<td>0.456 (0.129–1.611)</td>
<td>0.223 (0.262)</td>
<td>1.314 (0.824–2.095)</td>
<td>0.250 (0.294)</td>
</tr>
<tr>
<td>rs11009147</td>
<td>0.436 (0.226–0.839)</td>
<td>0.012 (0.019)</td>
<td>0.563 (0.249–1.272)</td>
<td>0.167 (0.245)</td>
<td>0.589 (0.377–0.918)</td>
<td>0.019 (0.030)</td>
</tr>
</tbody>
</table>

Conclusion: This is the first analysis of the PECAM1 and ITGB1 gene polymorphisms in AS, demonstrating a clear association with uveitis in AS. Given the functional role of PECAM-1 and ITGB1 variants in the immune system, larger studies are now warranted to elucidate the association of PECAM-1 and ITGB1 in the pathogenesis of uveitis in AS.

Disclosures: S. C. Shim, None; D. Sheen, None; M. K. Lim, None; H. Park, None.

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High Prevalence of Anti-CD-74 Antibodies with Specificity for the Class II-Associated Invariant Chain Peptide in Patients with Axial Spondyloarthritis but Not in Controls. Xenofon Baraliakos1, Niklas T. Baerlecken, Frank Heldmann, Torsten Witte2 and Jürgen Braun1. Rheumazentrum Ruhrgebiet, Herne, Germany, 2MD, Hannover, Germany, 3Rheumazentrum Ruhrgebiet, Herne, Ghana, Hannover Medical School, Hanover, Germany.

Background/Purpose: The pathogenesis of axial spondyloarthritis (axSpA) is still unclear. Based on the strong association with HLA-B27 and ERAF-1, T cells are believed to play a major role but a role of B cells seems also possible. Autoantibodies have not been frequently found in axSpA but recently anti-CD74 antibodies with specificity to a class II-associated invariant chain peptide (CLIP) have been detected. We studied the prevalence of antibodies against CLIP (anti-CLIP-ABs) in patients with axSpA in comparison to controls and determine their sensitivity and specificity.

Methods: Sera of patients with axSpA and non-SpA were analyzed for IgG-antibodies against CLIP (anti-CLIP-ABs) in patients with axSpA in comparison to controls. The laboratory workers were completely blinded for the cooperation with AESKU Diagnostics (Germany). A cut-off of >4 standard deviations of arbitrary units (AU) from the mean serum level was used to differentiate results. The laboratory workers were completely blinded for the clinical data.

Results: A total of 145 sera from 94 patients with axSpA and 51 with other diseases were analyzed. The patient demographics differed: axSpA patients were more often male and younger. The HLA-B27 status was available in 72 patients. Anti-CLIP-ABs were detected in 85.1% in axSpA but in only 7.8% in non-SpA patients (p=0.0001). Higher levels of anti-CLIP-ABs were found in axSpA vs. non-SpA: mean 14.5 vs. 0.8 AU (p=0.0001). The sensitivity of anti-CLIP-ABs for a diagnosis of axSpA was 85.1% and the specificity 92.2%, with a positive likelihood ratio (LR) of 10.8 and a negative LR of 0.08. The relative contribution of anti-CLIP-ABs and HLA-B27 was largely similar: 87.5% of the patients with axSpA were positive for both, but only 14.9% were anti-CLIP-negative while 23.6% were HLA-B27-negative.

Conclusion: Anti-CLIP antibodies were strongly associated with axSpA including AS. The LR for diagnosing AS was even higher than for HLA-B27. More studies using this promising new method in patients with non-radiographic axial SpA or peripheral SpA are needed to establish its usefulness in clinical practice.

Disclosures: X. Baraliakos, None; T. Baerlecken, None; F. Heldmann, None; T. Witte, None; J. Braun, None.
Brain MRI and Psychophysics Analysis Demonstrate Neuropathic Pain to Be a Component of Back Pain in Ankylosing Spondylitis. Q. Wu, R. D. Inman and Karen Davis. 1Toronto Western Research Institute, Toronto, ON, 2Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON

Background/Purpose: The mechanisms underlying pain in ankylosing spondylitis (AS) are unclear. The aim of this study was to investigate whether there is a neuropathic component in AS pain and to delineate gray matter brain abnormalities associated with AS.

Methods: Seventeen patients with back pain secondary to AS (12M/5F; 34.4 +/- 12.4y0) and age/sex-matched controls consented to the approved study. Mean BASDAI scores in the AS patients were 6.6 +/- 2.1, and none were on biologic agents at the time of the study. Patients were assessed with the PainDETECT (scores <12 indicate low probability of neuropathic pain) and McGill Pain Questionnaires. Mechanical and thermal pain thresholds were determined. 3T MRI scans obtained for all subjects. Brain gray matter was measured with cortical thickness analysis (Freesurfer) and voxel based morphology (FSL-VBM) for subcortical structures with age included as a covariate.

Results: The mean painDETECT score in AS patients was 15.1 +/- 7.08 (eleven scored >12). Compared to controls, AS patients had significantly decreased mechanical and cold sensitivity on their dorsal feet but pain thresholds were not abnormal. The gray matter analysis identified that AS patients had significant cortical thinning in left primary sensory (S1), insular, and anterior mid-cingulate cortices (MCC), and right supplemental motor area and ACC. Furthermore, painDETECT scores correlated with cortical thinning in the left S1 and thickening in the left motor cortex, right anterior cingulate and prefrontal cortex. All cortical findings were significant at p < 0.05 image-wise, corrected for multiple comparisons.

Conclusion: Our psychophysical testing and self-reports identified signs of neuropathy. The imaging results of abnormal brain gray matter linked to neuropathic pain are concordant with the clinical picture of AS having sensorimotor and mood deficits as well as neuropathic pain. These data suggest that back pain in AS is a mixed pain condition that includes a neuropathic pain component.

Disclosure: Q. Wu, None; R. D. Inman, None; K. Davis, None.

NGF and TrkA: A Novel Therapeutic Target in Chronic Inflammation. Siba P. Raychaudhuri1, Ananya Datta Mitra2 and Smriti K. Raychaudhuri3.

1VA Sacramento Medical Center/UC Davis School of Medicine, Mather, CA, 2VA Sacramento Medical Center, Mather, CA

Background/Purpose: Outside the nervous system, several studies have established the regulatory role of nerve growth factor (NGF) and its high affinity receptor, TrkA. A clinical trial showed that NGF monoclonal antibody reduced osteoarthritic pain. We have reported regulatory role of NGF/TrkA in chronic inflammatory diseases, e.g., psoriasis, psoriatic arthritis (PsA) and rheumatoid arthritis (RA). These observations suggest the functional significance of NGF and its high affinity receptor, TrkA in pain and inflammation. We are reporting the role of NGF and TrkA on two key pathological events of inflammatory cascade: angiogenesis and T cell proliferation.

Methods: Human dermal microvascular endothelial cells (HD-MEC) tube formation (angiogenesis) was assessed using bovine type I collagen. HDMECs (40000 cells/ml) were incubated in presence or absence of NGF, K252a for 6 hours at 37°C. Tube formation was checked under microscope (20x). Magnetically sorted CD3+ T cells from psoriasis, PsA and RA were stimulated with CD3/CD28 cocktail and cultured in presence or absence of NGF, TrkA inhibitor K252a. Cell proliferation was measured by MTT and CFSE dilution assay.

Results: Angiogenesis was markedly increased with NGF (68.39+2.10% compared to media (15.57+0.80%, p<0.001). K252a (20.42+0.98%) significantly inhibited NGF induced angiogenesis (68.39+2.10%, p<0.001) (Figure 1). CD3+ T cells proliferation was significantly increased by NGF (OD: 1.2+0.09) compared to media (OD: 0.73+0.07, p<0.05). In presence of physiological stimulus (CD3/CD28), NGF induced more proliferation (OD: 2.17+0.23) of CD3+ T cells compared to only physiological stimulus (1.62+0.23, p<0.01). Potent TrkA inhibitor, K252a significantly blocked the NGF induced CD3+ T cells proliferation (1.33+0.16 vs. 2.17+0.23, p<0.01). Similar results were observed in CFSE assay too (Figure 2).

NGF + K252a

K252a

NGF

Media

Conclusion: We provide evidence that there is a distinctive set of shared clonotypes in the T cell repertoire in AS patients. This sheds light on the immunological role of HLA B27 in AS and demonstrates promising specificity for potential diagnostic utility.

Disclosure: M. Faham, Sequenta, Inc; 3. V. Carlton, Sequenta, Inc; 3. R. D. Inman, None.
Conclusion: This study suggests the regulatory role of NGF/TrkA interaction on two major events of inflammatory cascade: angiogenesis and T cell proliferation. Thus inhibition of NGF/TrkA interaction either by NGF monoclonal antibody or TrkA inhibitor could be a new therapeutic approach for chronic inflammatory diseases.

Disclosure: S. P. Raychaudhuri, None; A. Datta Mitra, None; S. K. Raychaudhuri, None.

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The Association Between KIR3DL1 Alleles and Psoriatic Arthritis.

Remy Pollock, Jeffrey Berinstein, Arane Thavaneswaran, Fawnda Pellett, Dafna Gladman and Vinod Chandran. Toronto Western Hospital and University of Toronto, Western Hospital and University of Toronto, ON

Background/Purpose: Killer-cell immunoglobulin-like receptors (KIRs) are activating and inhibitory receptors that regulate NK and NK-T cells, which have been found in psoriatic plaques and synovial fluid of patients with psoriatic disease (PsD). The inhibitory KIR3DL1 receptor binds to HLA-B alleles with the Bw4 motif. Binding of KIR3DL1 to HLA-Bw4 alleles with isoleucine at codon 80 (Bw4–80I) results in stronger inhibition than Bw4 alleles with threonine at codon 80 (Bw4–80T). KIR3DL1 alleles can be classified according to their expression levels on NK cells as High, Low, Null or KIR3DS1 (an activating allele of 3DL1). We examined the association of KIR3DL1 alleles and the Bw4 dimorphism with PsD.

Methods: Genomic DNA was available on 656 Caucasian patients with PsD (395 PsA patients: mean age 42 years, males 58%, age at psoriasis 28 years, age at PsA 36 years, PASI 5.4) and 377 Caucasian controls (mean age 41 years, males 48%). A nested quantitative PCR assay was designed to selectively amplify the KIR3DL1 locus and High, Low, Null, and KIR3DS1 alleles using custom Taqman SNP genotyping assays. DNA from the UCLA International KIR Exchange program was used for assay validation and optimization. Chi-squared test and tests for interaction were conducted and KIR3DL1 low/null allele categories were grouped together.

Results: The genotype frequencies across the 3 groups are given in Table 1. We observed statistically significant differences in the frequency of KIR3DL1 low/null alleles, and between Bw4–80I and –80T alleles. The frequencies of KIR3DL1 low/null alleles were lower in psoriatic disease and PsA compared to controls (Table 2). No significant differences between PsA and PsC could be demonstrated. We also investigated the interaction between KIR3DL1/3DS1 alleles and Bw4–80I and –80T and observed a trend towards significant interaction between KIR3DL1 low/null and Bw4–80T when comparing PsA to controls (p=0.1). The association between KIR3DL1 low/null was present only in the absence of Bw4–80T alleles (OR=0.86, 95% CI 0.78, 0.94, p=0.002).

Table 1. Differences in allele frequencies between the three groups.

<table>
<thead>
<tr>
<th>Allele</th>
<th>Controls (n=377)</th>
<th>PsC (n=261)</th>
<th>PsA (n=395)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIR3DL1 null</td>
<td>225 (60%)</td>
<td>140 (54%)</td>
<td>199 (50%)</td>
<td>0.03</td>
</tr>
<tr>
<td>KIR3DL1 High</td>
<td>194 (52%)</td>
<td>126 (48%)</td>
<td>198 (50%)</td>
<td>0.73</td>
</tr>
<tr>
<td>KIR3DS1</td>
<td>126 (33%)</td>
<td>98 (38%)</td>
<td>150 (38%)</td>
<td>0.37</td>
</tr>
<tr>
<td>HLA-B Bw4</td>
<td>233 (62%)</td>
<td>177 (68%)</td>
<td>292 (74%)</td>
<td>0.002</td>
</tr>
<tr>
<td>HLA-B Bw4–80I</td>
<td>101 (27%)</td>
<td>93 (36%)</td>
<td>140 (35%)</td>
<td>0.02</td>
</tr>
<tr>
<td>HLA-B Bw4–80T</td>
<td>151 (40%)</td>
<td>102 (39%)</td>
<td>191 (48%)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Table 2. Association between KIR3DL1 low/null alleles and disease groups.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psoriatic disease vs. controls</td>
<td>0.72 (0.56,0.93)</td>
<td>0.01</td>
</tr>
<tr>
<td>PsA vs. controls</td>
<td>0.69 (0.52,0.91)</td>
<td>0.01</td>
</tr>
<tr>
<td>PsC vs. controls</td>
<td>0.78 (0.57,1.08)</td>
<td>0.13</td>
</tr>
<tr>
<td>PsA vs. PsC</td>
<td>0.88 (0.64,1.20)</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Conclusion: In PsA patients, there was a significantly decreased expression of the KIR3DL1 Low/Null alleles particularly in the absence of HLA-B Bw4–80T. The results support the role of KIR genes and their interaction with HLA-B alleles in susceptibility to PsA.

Disclosure: R. Pollock, None; J. Berinstein, None; A. Thavaneswaran, None; F. Pellett, None; D. Gladman, None; V. Chandran, None.

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Structural Progression of Ankylosing Spondylitis Associated with Elevation in Two NOVEL, Inflammatory Biomarkers; Matrix Metalloproteinase and Cathepsin-Derived.

Anne C. Bay-Jensen, Morten Asser Karstad, Stephanie Wichuk, Zheng Zhao, Robert GW Lambert, Per Qvist, and Walter P. Maksymowych. 1Nordic Bioscience A/S, Herlev, Denmark, 2University of Alberta, Edmonton, AB, 3Department of Rheumatology, University of Alberta and PLA General Hospital, Beijing, PR China, Beijing, China, 4Nordic Bioscience, Herlev, Denmark

Background/Purpose: Current inflammatory biomarkers, such as CRP, have insufficient sensitivity and specificity to be broadly accepted for diagnosis and prognosis of AS. We hypothesized, that quantification of inflammation markers derived from the affected tissue might have improved clinical utility compared to the systemic markers. We developed two novel biomarker assays detecting MMP and cathepsin-derived CRP (MMP-CAT and CAT-CRP) and aimed to determine their diagnostic utility and association with radiological progression.

Methods: Serum samples (n=134) from AS patients, mean disease duration (SD) 18.0 (11.4) years were assessed. Within this cohort, samples from 16 AS patients with structural progression over two years and 29 without were selected for prognostic evaluation (sub-cohort 1A). A progres- sor was defined as having a baseline mSASSS of ≥10 units and progression of ≥5 units plus ≥1 new syndesmophyte over two years. Non-progressors were defined as disease duration at baseline of >10 years, baseline mSASSS <5 units, and no change in mSASSS over 2 years. Sub-cohort 1B comprised samples from 53 AS patients pre- and post- anti-TNF treatment. We also included samples (n=39) from healthy controls.

Results: CRP-MMP and CRP-CAT were both elevated in AS compared to controls; mean (SD) 9.84 (4.40) ng/ml vs. 4.82 (1.49) ng/ml (p<0.05), respectively, for CRP-MMP, and 299.6 (137.6) ng/ml vs 178.6 (54.03) ng/ml (p<0.05), for CRP-CAT. AUC according to ROC analysis was 0.94 (p<0.0001) and 0.85 (p<0.0001) for CRP-MMP and CRP-CAT, respectively. In AS patients with progression CRP-MMP and CRP-CAT were significantly elevated compared to non-progressors. Both CRP-related markers decreased significantly after short term (2–3 months) anti-TNF treatment.

Conclusion: Both MMP and Cathepsin-derived fragments of CRP are significantly elevated in AS patients. These markers, but not CRP, were significantly elevated at baseline in patients having structural progression defined by a composite index including mSASSS and syndesmophyte quantification.

Disclosure: A. C. Bay-Jensen, None; M. A. Karstad, Nordic Bioscience Diagnostic, 4; S. Wichuk, None; Z. Zhao, None; R. G. Lambert, None; P. Qvist, None; W. P. Maksymowych, None.
Two Novel Diagnostic Biomarkers of Cartilage Degradation and Connective Tissue Inflammation Are Predictive of Disease Progression in Ankylosing Spondylitis. Anne C. Bay-Jensen1, Stephanie Wichuk1, Inger Bjyrjalsen1, Zheng Zhao2, Robert GW Lambert3, Morten Asser Karsdal4 and Walter P. Maksymowycz5.

1Nordic Bioscience A/S, Herlev, Denmark, 2Department of Rheumatology, University of Alberta and PLA General Hospital, Beijing, PR China, Beijing, China

Background/Purpose: Cartilage degradation and inflammation of synovial and connective tissue are key events in inflammatory arthropathies such as SpA. Presently there are no diagnostic tools available for monitoring tissue related processes. Inflammation induces an increase in collagenases which lead to increased degradation of cartilage and synovial tissue. Type II collagen is the primary protein component of cartilage and type III collagen is one of the major proteins of synovial membrane. We aimed to investigate the diagnostic and prognostic utility of cartilage and synovial turnover biomarkers in AS.

Methods: Serum samples from patients with AS (n=124), RA (n=47), and controls (n=56) were assessed for type II and III collagen degradation using the C2M competitive ELISA and the C3M ELISA, respectively. Standard AS clinical outcome scores were collected: BASDAI (health questionnaire), hsCRP, and mSASSS. Progressors were defined as having new vertebral syndesmophytes over a two year period. Logistic regression and CART were used to analyze the prognostic value of the markers individually or in combination.

Results: Both cartilage and connective tissue degradation fragments, C2M and C3M, were significantly elevated in serum samples from AS patients compared to healthy controls (P<0.0001). The area under the curves in C2M and C3M, respectively, were 70% and 81% for AS, C2M and C3M were also significantly elevated in RA patients compared to controls (P<0.0001). Diagnostic utility analyzed by ROC and AUCs were 72% and 89%, respectively. C3M correlated significantly with AS score BASDAI and mSASSS (p<0.01). C2M did not show the same correlations. A combination of the two markers could identify 80% of those who were defined as progressors and 61% of the non-progressors.

Conclusion: This study is the first to show that the novel biomarkers of cartilage and synovial tissue degradation add additional information to the understanding of the diagnosis and progression of SpA.

Disclosure: A. C. Bay-Jensen, None; S. Wichuk, None; I. Bjyrjalsen, None; Z. Zhao, None; R. G. Lambert, None; M. A. Karsdal, Nordic Bioscience Diagnostic, 4; W. P. Maksymowycz, None.

DKK1 Serum Level Is Increased in Recent Spondyloarthritis and Is Associated with Higher Prevalence of Syndesmophytes. Sclerostin Is Highly Correlated with Age. Data From The DESIR Cohort. Gaetane Nocturne1, Stephanie Finzel1, Jürgen Reich2, Matthias Englbrecht3, Silke Winkler1, Isabel Schmid1, Roula Saïd-Nahal1, Maxime A. Breban1 and Georg A. Schett1.

1Univeristé Paris Descartes, Paris, France, 2Université Paris Sud, Le Kremlin Bicêtre, France, 3Leiden University Medical Center, Leiden, Netherlands, 4Hospital Troussseau, Tours, France, 5Paris Descartes University, APHP, Cochin Hospital, Paris, France, 6Paris Descartes University, Paris, France, 7Université Paris 6, 8Université Paris Sud, Le Kremlin Bicêtre, France

Background/Purpose: Dickkopf-1 (DKK-1) and sclerostin (SOST) are 2 inhibitory proteins of the Wnt signalling pathway that could rationally be involved either in AS osteoporosis or in the osteoblastogenesis associated with syndesmophyte construction. We aimed to investigate serum levels of DKK-1 among patients with recent inflammatory back pain fulfilling ASAS criteria for spondyloarthritis (SpA) and to investigate the parameters associated or correlated with DKK-1 and SOST serum levels.

Methods: The DESIR cohort is a prospective, multicenter French cohort of patients with early IBP (Cadin or Berlin criteria) (>3 months and <3 years of duration) suggestive of SpA, including 708 patients. DKK-1 and SOST serum levels were assessed at baseline on the whole cohort by sandwich ELISA (Biomedica, Vienna). DKK-1 and SOST serum levels were further analyzed in the subgroup of patients fulfilling ASAS criteria for SpA (N=479; 68.9%) and compared with serum levels from 71 controls (without autoimmune or chronic inflammatory disease). 461 SpA patients (94.8%) were treated with NSAIDs, 62 with corticosteroids (less than 10 mg per day) and 67 with DMARDs (35 SSZ and 32 MTX) at inclusion in the study. All SpA patients were naive of any TNF blocker at inclusion in the study. Univariate and multivariate analyses were performed in order to identify the main predictors of DKK-1 and SOST serum levels in SpA patients.

Results: Serum DKK-1 levels were available for 695 patients with IBP (472 of them fulfilling ASAS criteria for axial SpA) and were significantly increased in SpA patients (mean ± SD 30.7 ± 0.7 pmol/L) compared with controls (10.8 ± 1.1 pmol/L, P<0.0001). DKK-1 serum levels were significantly correlated with ESR (r = 0.04; r = 0.10), CRP (P<0.015; r = 0.11), ASDAS-ESR (P<0.03; r = 0.10), ASDAS-CRP (P=0.016; r = 0.11). A significant positive correlation between DKK-1 serum levels and lumbar spine BMD was observed (0.04; r = 0.13). DKK-1 serum levels were significantly higher among SpA patients with syndesmophytes (mSASSS>0; N=131) (mean ± SD 35.4 ± 1.6 pmol/L) compared with patients with normal X-Rays (N=334) (mean ± SD 28.6 ± 1.1 pmol/L, P<0.0001). Multivariate analysis led to a significant association of DKK-1 serum levels with the presence of syndesmophytes at baseline. SOST was not significantly increased among SpA patients compared with controls. SOST serum levels were significantly correlated with US CRP (r = 0.20; P<0.0001). DKK-1 and SOST were not significantly associated with each other (P=0.03; r=0.13). Neither clinical severity and treatment nor BMD measurements were associated or correlated with SOST serum levels. Multivariate analysis led to a significant association of SOST serum levels with age, DKK-1 and us-CRP.

Conclusion: This study conducted in a large cohort of patients presenting with early axial SpA clearly showed an increase in DKK-1 serum levels, such increase being even more important in the sub group of patients with axial structural lesions. SOST was mainly correlated with age and to a lesser extend with DKK-1 serum levels and us-CRP. Their respective role in SpA pathogenesis needs further investigation.

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594 Evidence of Human Leucozyte Antigen-B27 in Healthy Individuals and Patients with Uveitis Is a Risk Factor for Alterations in Bone Metabolism. Sarah Schmidt1, Stephanie Finzel1, Jürgen Reich2, Matthias Englbrecht3, Silke Winkler1, Isabel Schmid1, Roula Saïd-Nahal1, Maxime A. Breban1 and Georg A. Schett1.

1University of Erlangen-Nuremberg, Erlangen, Germany, 2Ambroise Paré Hospital (AP-HP), and Versailles Saint Quentin en Yvelines University, Bobigny-Billancourt, France, 3Department of Internal Medicine III and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

Background/Purpose: To test whether positivity for HLA-B27 per se is associated with changes of biomarkers of the Wnt pathway.

HLA-B27 is strongly associated with the development of spondyloarthritits (SpA), a disease characterized by new bone formation and ankylosis of joints and intervertebral spaces. We have recently shown the role of the two Wnt antagonists, dickkopf 1 (DKK1) and sclerostin in new bone formation in SpA. We therefore hypothesized that HLA-B27 itself may be associated with alterations in expression of DKK1 and sclerostin.

Methods: 31 patients with HLA-B27 positive SP, 30 patients with HLA-B27 positive uveitis as well as 30 healthy carriers of HLA-B27 were included. Furthermore, we assessed 32 HLA-B27 negative healthy controls comparable for age and gender. We evaluated total DKK1 and sclerostin levels in sera of all individuals by enzyme-linked immunosorbent assays (ELISA). Statistical analysis was done by t-tests using SPSS version 18.0.

Results: Healthy HLA-B27 positive individuals showed significant lower levels of DKK1 compared to negative controls (T (60) = -4.615, p < 0.001). Moreover, DKK1 levels were significantly reduced in HLA-B27 positive SP patients (T (61) = -3.670, p = 0.001) and in HLA-B27 positive uveitis patients (T (60) = -2.445, p = 0.017). Lowest levels of DKK1 were found in HLA-B27 positive healthy carriers. Serum levels of sclerostin were significantly lower in HLA-B27 positive SP patients compared to HLA-B27 negative individuals (T (61) = -3.130, p = 0.003). Additionally, serum levels of sclerostin were distinctly reduced in HLA-B27 positive uveitis patients and in HLA-B27 positive healthy carriers.

Conclusion: HLA-B27 positivity is associated with low levels of DKK1 and sclerostin independent from the presence of clinical symptoms of SpA. Both HLA-B27 healthy carriers as well as HLA-B27 associated uveitis without SPA
show lower levels of these two Wnt antagonists than normal HLA-B27 negative
controls. These data suggest that alterations in bone metabolism even occur in the
absence of clinical SPA and are associated with HLA-B27 carriage.

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A Genomewide Association Study of Anterior Uveitis, Dorith Claushuis1, Adrian Cortes2, Linda A. Bradbury1, Tammy M. Martin1, James T. Rosenbaum1, John D. Revelle5, Paul Wordsworth6, Jennifer Pointon6, Australo-Anglo-American Spondyloarthritis Consortium7, David Evans8, Paul Leo9, Pamela Mukhopadhyay2 and Matthew A. Brown2. 1The University of Queensland Diamantina Institute, Brisbane, Australia, 2The University of Queensland Diamantina Institute, Brisbane, Australia, 3Oregon Health & Science Univ, Portland, OR, 4Oregon Health & Science University, Portland, OR, 5Univ of Texas Health Science Center at Houston, Houston, TX, 6Australo-American Spondyloarthritis Consortium, 7University of Texas Health Science Center at Houston, Houston, TX, 8Oregon Health & Science University, Portland, OR, 9Univ of Texas Health Science Center at Houston, Houston, TX.

Background/Purpose: Anterior uveitis (AU) is the most common extra-articular manifestation of ankylosing spondylitis (AS), occurring in up to 30–40% of AS cases. The aim of the current study was to investigate clinical associations of AS, and to identify genes associated with the risk of developing AU.

Methods: 972 AS cases with AU (AS+AU+) and 1404 AS cases without AU (AS+AU−) were available for study. All cases were of white European descent. A genomewide association study was performed using SNP data from the TASC and TASC-WTCC2 AS studies, 291,537 SNPs being available in the merged dataset. Case-control analysis comparing the AS+AU+ and AS+AU− cohorts was performed using Eigenstrat to control for population stratification effects.

Results: Male and female AS cases were equally likely to develop AU. As expected, AU complicating AS was strongly associated with AS disease duration (beta=0.027, P<10−5). No association was seen with age, independent of AS disease duration. Considering AS+AU+ cases in comparison with AS+AU− cases, no SNP achieved genomewide significance. Three loci showed suggestive association with AU. At chromosome 6q26, two SNPs in the PARK2 gene achieved P<10−5 (rs2849576, p=7.6x10−5; rs13202587, p=2.0x10−5). Five SNPs (rs379796, rs419519, rs445890, rs4521186, rs452118) in an intergenic region on chromosome 4q33 achieved P=9.0x10−6–9.5x10−6. Association was noted with HLA-B27 (antigen carriage, odds ratio 2.58, P=5.6x10−5). There was a marginal association of B27-homozygosity in this analysis (odds ratio 2.1, P=0.06). No known AS locus was differentially associated in AS+AU+ cases in comparison with AS+AU− cases.

Conclusion: This analysis found that with the exception of HLA-B27, no differences were identified between AS+AU+ and AS+AU− cases. The study was adequately powered to identify moderately large genetic effects, but not small/moderate genetic effects for which larger studies will be required. Further, as all patients studied have AS, whether genetic associations of AS+AU+ cases are different to those of AS+AU− remains unclear. Nonetheless, these findings suggest that AU has very similar genetic risk factors to AS, and therefore that they likely share similar aetopathogenisis.

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Evolution of Atherosclerosis in Psoriatic Arthritis: Is the Former an Independent Inflammatory Process? Roberta Ramonda1, Massimo Puato2, Valentina Modesti2, Mariangaza Lorenzo3, Paola Frallonardo1, Augusto Ortolin1, Carla Campana1, Alessandro Lo Nigro1 and Leonardo Punzi1. 1Unit of Rheumatology, University of Padova, Padova, Italy, 2Unit of Rheumatology, University of Padova, Padova, Italy, 3Department of Internal Medicine, University of Padova, Padova, Italy.

Background/Purpose: A non-invasive study focusing on the structural and functional properties of the carotid arteries was carried out in patients with psoriatic arthritis (PsA) patients. Increased cardiovascular morbidity and mortality and accelerated atherosclerosis were observed in patients with several rheumatic diseases, including PsA. The impact of the two years of Tumor Necrosis factor alpha (TNF-a) blockade treatment on vascular structure and function was assessed.

The aim of this study was to evaluate the presence of subclinical atherosclerosis in PsA patients before and after 24 months of TNF blockade therapy and to investigate the efficacy of treatment not only with regard to disease activity but also in improving atherosclerotic indexes.

Methods: Thirty-two PsA patients were studied before and after 24 months of TNF blockade therapy. Subclinical atherosclerosis was investigated on the basis of B-mode ultrasound measurements of the carotid intima-media thickness (IMT) expressed as the mean IMT value (the mean IMT measured bilaterally at 3 levels: the common carotid artery, the carotid artery bulb and the internal carotid artery,) and as the MMax (the mean maximum IMT). Post-occlusion flow mediated dilation (FMD) of the brachial artery was evaluated by high-sensitivity brachial ultrasonography and endothelial independent dilatation (GUT) using carotid duplex scanning. Response to therapy was studied by evaluating the tender and swollen joints (Tj and Sj), DAS 28, ESR and CRP. Patients’ lipid profiles before and after the 24 month treatment period were also evaluated. Differences in parameters over the observation period were assessed using the Wilcoxon test.

Results: After a 24 month treatment period there was no improvement in ultrasonographic parameters with respect to baseline values. Indeed, there was a significant deterioration in both mean IMT and MMax (respectively 0.75±0.20 vs 0.96±0.40 and 0.91±0.25 vs 1.09±0.44, p<0.01), while no changes were observed in the FMD (5.8±1±2.07 ± 5.2±2.64, ns) or the GUTN (7.76±2.96 vs 7.84±3.08, ns). There was instead a good response to therapy with significant reduction in the Tj (8.10±5.56 vs 2.0±2.32, p<0.01), the Sj (3.85±3.84 vs 0.25±0.72, p<0.01), the DAS 28 (4.16±0.66 vs 3.20±0.82, p<0.01), the ESR (26.3±16.4 vs 14.88±13.99, p<0.01) and the CRP (11.25±9.16 vs 2.91±1.72, p<0.01). There were no significant alteration with regard to lipid profile after the two year treatment period.

Conclusion: PsA per se implies a pro-atherogenic remodelling of carotid arteries that did not seem to be affected by the 2 years anti-TNF blockade therapy despite clinical improvement. There was in fact a slight progression in subclinical atherosclerosis as assessed by ultrasonography. Both the mean IMT and the MMax showed a slight worsening over the two year period, while FMD, which we expected to be improved, was instead stable. Other inflammatory mechanisms not related to TNF may be responsible for the progression in atherosclerotic disease and the possible role of a genetic predisposition should not be underestimated. PsA patients seem, in fact, to have a higher risk of atherosclerosis compared to subjects with other inflammatory rheumatic diseases.

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Investigating the Genetic Association Between ERAPI and Spondyloarthritis, Amir Kadi1, Brigitte Izac2, Rauta Said-Nahal3, Aranle Leborne4, Kurt Lampe5, Dirk Elewaut6, Gilles Chiocchia1 and Maxime A. Breban1. 1Institut Cochin - INSERM U1016 - CNRS (UMR 8104), Paris, France, 2Ambroise Paré Hospital (AP-HP), and Versailles Saint Quentin en Yvelines University, Boulogne-Billancourt, France, 3University Hospitals Leuven, Leuven, Belgium, 4Ghent University Hospital, Ghent, Belgium.

Background/Purpose: A robust association was recently identified between polymorphisms in the non-major histocompatibility complex gene ERAPI and ankylosing spondylitis (AS) in several populations. The aim of the current study was to determine the level of association of ERAPI polymorphisms with spondyloarthritis (SpA) in French/Belgian population with a particular attention to genotype-phenotype correlations.

Methods: We studied 734 independent SpA cases and 632 controls from 2 European cohorts. Five single nucleotide polymorphisms (SNPs), rs27044, rs17482078, rs10050860, rs30187 and P combined was 0.005, respectively). A similar trend was observed with other SNPs. The rs17482078/rs10050860/rs30187-CCT haplotype was significantly associated with increased risk of SpA in both cohorts.

Results: Consistent with previous studies conducted in AS, rs30187 was the most significantly associated SNP with SpA (P=0.008 in the French and P=6.46x10−4 in the Belgian cohorts). In the combined cohort, this SNP was associated with both AS and non-AS (Pcombined=3.39x10−3 and Pcombined=0.005, respectively). A similar trend was observed with other SNPs. The rs17482078/rs10050860/rs30187-CCT haplotype was significantly associated with increased risk of SpA in both cohorts.

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The Non-Synonymous Polymorphism IL23R Arg381Gln Is Associated with Ankylosis in Spondyloarthritides, Amir Kadi1, Felicie Costantino1, Brigitte Izac1, Ariane Leboime1, Roula Said-Nahal1, Gilles Ghiozica1 and Maxime A. Breban1.8104), Paris, France, 2Ambroise Pare Hospital (AP-HP), and Versailles Saint Quentin en Yvelines University, Boulogne-Billancourt, France

Background/Purpose: Spondyloarthritides (SpA) is a group of articular disorders sharing genetic background. Single-nucleotide polymorphisms (SNP) of the interleukin-23 receptor (IL23R) gene have been reproducibly reported as associated with ankylosing spondylitis (AS) as a subset of SpA, defined by advanced radiographic sacroiliitis. Here, we examined the association between several SNPs in the IL23R gene and SpA as a whole. A particular attention was devoted to genotype-phenotype correlations.

Methods: Eight single-nucleotide polymorphisms (SNPs) located in the IL23R gene were genotyped in a collection of 414 independent French SpA patients and 264 healthy controls. In addition, the most significantly associated polymorphism rs11209026 (Arg381Gln) was genotyped in 156 multiplex families of SpA and in 136 independent trios. Association analyses were carried using UNPHASED, in SpA as a whole group, and then separately in AS and non-radiographic SpA (non-AS) patients.

Results: Strong association with AS was observed in the 3 datasets (case/control, familial and trios) with the non-synonymous polymorphism rs11209026 Arg381Gln (P = 2.86 × 10−3, Pcombined=0.61 × 10−3 and Pcombined=0.049, respectively), whereas the -576CTC haplotype was associated with reduced risk of SpA, including AS and non-AS (Pcombined=2.36 × 10−7, Pcombined=5.69 × 10−6 and Pcombined=2.13 × 10−4, respectively).

Conclusion: This is the first study to show an association between several polymorphisms located in ERAP1 and SpA as a whole. Our findings demonstrate consistent association of the same SNPs and haplotypes with both AS and non-AS subtypes of SpA.

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Conclusion: Our data suggest that an IL-10/IL-17 imbalance observed in Treg from B27-rats may contribute to disease development and reveal a critical role for ICOS signaling in the generation and maintenance of IL-17 producing T cells in this animal model of SpA.

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Bath Ankylosing Spondylitis Functional Index (BASFI) Is a Better Indicator of Poor Quality of Life Than Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) in Ankylosing Spondylitis: Results From SIRAS – the Scotland and Ireland Registry for Ankylosing Spondylitis. Gareth T. Jones1, Linda E. Morton1, Gary J. Macfarlane2 and Scotland and Ireland Registry for Ankylosing Spondylitis1. 1University of Aberdeen, Aberdeen, United Kingdom, 2Aberdeen

Background/Purpose: Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Functional Index (BASFI) are validated instruments used to determine disease activity and function amongst ankylosing spondylitis patients. BASDAI is more commonly collected in clinic due, in part, to its use as a clinical criterion for commencing biologic therapy, however the relationship between both BASDAI and BASFI, and quality of life (QoL), is not well established. The aim of this study was to investigate this relationship in the context of other QoL markers.

Methods: The Scotland and Ireland Registry for Ankylosing Spondylitis (SIRAS) collects data on clinically diagnosed ankylosing spondylitis patients in Scotland. Various clinical measures including BASDAI, BASFI are obtained from medical records, and postal questionnaires provide various demographic and patient-reported data, including pain, fatigue, extra spinal manifestations and QoL as determined by the Ankylosing Spondylitis Quality of Life (ASQoL) instrument. In addition, patient postcodes were used to determine a deprivation score from 1 (most affluent) to 20 (most deprived) using the Scottish Index of Multiple Deprivation scale. Factors associated with poor QoL (characterised by an ASQoL score $\geq 11$) were examined using Poisson regression, and results are given as risk ratios with 95% confidence intervals.

Results: As of the 26th March 2012, 311 patients had been recruited and provided complete data on BASDAI, BASFI and QoL. (75% male; median age 51yrs inter-quartile range: 42–61yrs; median ASQoL: 6.0; 1–11). Poor QoL was associated with both high disease activity (BASDAI $\geq$4: risk ratio: 3.7, 95%CI 2.3–6.0) and poor function (BASFI $\geq$4: risk ratio: 6.0; 3.4–10.9). However, these were not independent of each other. After mutual adjustment only poor function (BASFI) remained an independent predictor of QoL (4.8; 2.4–9.6). The relationship with disease activity (BASDAI) was greatly reduced and no longer statistically significant (1.4; 0.8–2.4).

Other factors independently associated with poor QoL were: female gender (1.6; 1.1–2.4), reporting either chronic widespread body pain (2.7; 1.5–4.8) or moderate/severe fatigue (1.8; 1.2–2.8), ever receiving anti-TNF therapy (1.5; 1.0–2.2), and social deprivation (RR most versus least deprived: 2.0; 1.1–3.5). No other clinical measures, including markers of inflammation (CRP or ESR), any peripheral joint involvement, or co-morbid disease of the eyes, skin or gut, were associated with poor QoL.

Conclusion: As it is integral to anti-TNF prescribing guidelines, disease activity (BASDAI) is considered as the important clinical indicator in AS. However, clinicians should be aware that function (BASFI) is a stronger predictor of poor QoL. Patients with a high BASFI were almost five times more likely to report poor QoL than other patients. In addition, after adjusting for BASFI, few other clinical variables were independently associated with QoL.

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Sexual and Reproductive Health Counseling Among Adolescents with Systemic Lupus Erythematosus. Xue Tian, Murray H. Passo, Janice D. Key, Thomas C. Hulse and Natasha M. Ruth. The Medical University of South Carolina, Charleston, SC

Background/Purpose: Systemic Lupus Erythematosus (SLE) is an autoimmune disease that is known to target young adults, especially women of child-bearing age. Although it is well-accepted that teratogenic SLE medications can cause negative pregnancy outcomes, there has been little research conducted to examine sexual health and contraceptive counseling among young adults with SLE, specifically teens and adolescents. The purpose of this study is: 1) to determine how many female adolescents with SLE know about their disease, SLE medications, how SLE relates to their sexual health, and how SLE symptoms can be impacted by pregnancy, STDs and contraceptives containing estrogen. 2) to educate the same group of patients about sexual and reproductive health using a face-to-face counseling session. 3) to reassess their knowledge after the intervention.

Methods: Female adolescents with SLE were recruited from the MUSC Pediatric Rheumatology clinic. Information on age, race, gender, medications, previous pregnancies, and length of diagnosis with SLE was obtained. The questionnaire (31 items regarding SLE medications, contraceptives, and STD’s) was completed by all subjects before and after the intervention, which was a face to face educational session. The resulting data was analyzed by using a paired t-test.

Results: 13 female SLE patients, ages 12–21, were studied (11 African Americans, 1 Caucasian, 1 other). The average percent correct on the pretest questions was 30.8% on questions regarding the effects of SLE medications on pregnancy, 38.8% on questions regarding contraceptives, and 78.8% on questions regarding sexual health and STD’s. The average percent correct on post-tests for those 3 categories of questions were 88%, 77%, and 99% respectively. The average improvement between pre- and post-tests for the 3 categories were 57.7% with a p-value of 0.0001, 46.2% with p-value of 0.0001, and 20.2% with p-value of 0.0006 respectively.

Conclusion: The low scores on the initial baseline assessment show that SLE adolescents are under-educated about contraceptives and the effects of SLE medications on pregnancy. After the counseling session, the average percent correct scores on the post-test significantly improved in all 3 categories. The issues surrounding contraceptives and pregnancy are important for this population, and it is imperative to advise SLE adolescents and teens on effective contraceptives in order to avoid unplanned pregnancies with unfavorable outcomes. This study demonstrates the need to establish routine counseling on contraceptives and reproductive health for women with SLE.

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Cell Bound Complement Activation Products Are Associated with Disease Activity in Systemic Lupus Erythematosus. Kenneth C. Kalunian1, W. Wini Chatham2, Elena M. Massarotti2, Joyce Reyes-Thomas2, Richard Furie3, Jill Buyon4, Emily C. Somers4, Chaim Putterman5, Rachel L. Gross3, Kyriakos A. Kirou5, Rosalind Ramsey-Goldman1, Christine Hsieh2, Thierry Dervieux7 and A. Weinstein1. 1UCSD School of Medicine, La Jolla, CA, 2University of Alabama at Birmingham, Birmingham, AL, 3Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 4Albert Einstein College of Medicine, Bronx, NY, 5North Shore-LIJ Health System, Lake Success, NY, 6New York University School of Medicine, New York, NY, 7University of Michigan, Ann Arbor, MI, 8Albert Einstein College of Medicine, Bronx, NY, 9Albert Einstein College of Medicine, New York, NY, 10Hospital for Special Surgery, New York, NY, 11Northwestern University Feinberg School of Medicine, Chicago, IL, 12University of Chicago, Chicago, IL, 13Exagen Diagnostics, Alburquerque, NM, 14Washington Hospital Center, Washington, DC

Background/Purpose: Elevated cell-bound complement activation products (CBCAPs) and decreased erythrocyte complement receptor 1 (eC1R) expression may correlate with disease activity in systemic lupus erythematosus (SLE). As it is integral to anti-TNF prescribing guidelines, disease activity (BASDAI) is considered as the important clinical indicator in AS. However, clinicians should be aware that function (BASFI) is a stronger predictor of poor QoL. Patients with a high BASFI were almost five times more likely to report poor QoL than other patients. In addition, after adjusting for BASFI, few other clinical variables were independently associated with QoL.
Methods: The CAPITAL study was cross-sectional and enrolled SLE patients who met the ACR classification criteria. ECR1 as well as complement C4d levels on erythrocytes (EC4d), platelets (PC4d), and B cells (BC4d) were determined using flow cytometry. Disease activity was measured at the time of the study visit using the Safety of Estrogens in Lupus Erythematosus National Assessment (SELENA) version of the SLE Disease Activity Index (SLEDAI). Disease activity was dichotomously stratified by SELENA-SLEDAI scores <6 (low disease activity) or ≥6 (high disease activity). Statistical analyses utilized Wilcoxon rank-sum tests, area under receiver operating characteristic (ROC) curves, Fisher Exact tests and multivariate logistic regression.

Results: Among 209 SLE evaluable patients (90% females, mean age 41 years), a total of 41 (19.6%) had high disease activity at the time of sample acquisition. As presented in Table 1, high disease activity was associated with elevated levels of EC4d, BC4d, PC4d and reduced levels of ECR1 (p<0.004). ROC analyses indicated that EC4d above 14.8 units (ROC AUC=0.646) was associated with a 3.4-fold (95% CI: 1.6–7.4) higher likelihood of high disease activity. Similarly, BC4d above 71.5 units (ROC AUC=0.643) and PC4d above 6.3 units (ROC AUC=0.718) were associated with a 4.3-fold (95% CI: 1.9–10.8) and 5.3-fold (95% CI: 2.3–13.5) greater likelihood of high disease activity, respectively. Conversely, ECR1 levels below 10 net MFI (AUC=0.694) were associated with a 4.2-fold (95% CI: 1.9–9.3) higher likelihood of high disease activity. By multivariate logistic regression analysis only elevated EC4d and low ECR1 were associated with high disease activity.

Among patients presenting with both elevated PC4d (>6.3 net MFI) and reduced ECR1 (<10.2 net MFI), 45% had high disease activity compared to 5% of those having PC4d and ECR1 below 6.3 and above 10.2 net MFI respectively (p<0.001).

Conclusions: These hypothesis generating data suggest that elevated EC4d, BC4d, PC4d and reduced ECR1 levels are associated with high disease activity. Prospective longitudinal studies will be essential to establish the predictive value of CBCAPs and ECR1 measurements for determining SLE disease flares.

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Comparing the ACR and the SLICC Criteria for the Classification of SLE Patients Using Data from an Existing Multi-Ethnic Cohort. Graciela S. Alarcon1, Gerald McGown Jr.1, Larry Madger1 and Michelle Petri2. 1University of Alabama at Birmingham, Birmingham, AL, 2University of Maryland, Baltimore, MD, 3Johns Hopkins University School of Medicine, Baltimore, MD

Background/Purpose: The SLICC group has proposed a modification of the revised/updated SLE ACR classification criteria; it has comparable metric properties but is felt to be clinically more relevant (Arthritis Rheum 2012, May 2, ePub ahead of print). We have now compared both sets of criteria in a well-characterized SLE cohort.

Methods: At cohort entry (V0), all patients had met 4 updated/revised ACR criteria. Using the data up to V0, we determined the dates at which the ACR and SLICC criteria were first met. Some SLICC criteria could not be applied (some acute and chronic forms of cutaneous lupus, non-scarring alopecia, mononeuritis multiplex and complement values). We compared groups of patients based on whether the SLICC criteria were met before, at the same time or after the ACR were met.

Results: Of 640, using the SLICC criteria 319 (49.8%) were classified at the same time using either criteria set, 78 earlier (12.2%, mean 0.7 years) and 225 (35%) later (mean 4.4 years) compared to the ACR criteria; 18 patients (2.8%) did not meet the SLICC criteria despite a mean of 1.2 years from the time the ACR criteria were met and V0. Five of the 78 earlier patients (6.4%) met the SLICC rule of lupus nephritis (LN) plus 1 immunologic criterion. Of the patients diagnosed later, the majority did so because of the combination of malar rash and photosensitivity into the Acute Cutaneous Lupus criterion. There were no differences in terms of age, gender and disease activity between the groups, but African Americans and Texan-Hispanics were more likely to be in the no difference group and Caucasians and Puerto Rican-Hispanics in the later or in the no diagnosis groups. Tables 1 and 2 show the distribution of the ACR and SLICC criteria among all 4 groups; only those criteria which differ between the 2 sets are shown in Table 2.

Table 1. Patients who met ACR Criteria at V0

<table>
<thead>
<tr>
<th>Clinical</th>
<th>ACR criteria</th>
<th>SLICC criteria met earlier, %</th>
<th>SLICC criteria met later, %</th>
<th>SLICC criteria not met, %</th>
<th>SLICC criteria met at the same time, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute cutaneous lupus or SLE</td>
<td>419</td>
<td>57.7</td>
<td>72.4</td>
<td>60.0</td>
<td>65.0</td>
</tr>
<tr>
<td>Neurologic</td>
<td>76</td>
<td>11.5</td>
<td>4.9</td>
<td>11.1</td>
<td>16.9</td>
</tr>
<tr>
<td>Hemolytic anemia</td>
<td>59</td>
<td>10.3</td>
<td>5.3</td>
<td>5.6</td>
<td>11.9</td>
</tr>
<tr>
<td>Leukopenia</td>
<td>464</td>
<td>85.9</td>
<td>62.2</td>
<td>27.8</td>
<td>79.0</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>108</td>
<td>12.8</td>
<td>7.1</td>
<td>0.24</td>
<td>44.0</td>
</tr>
<tr>
<td>Anti-DNA</td>
<td>427</td>
<td>83.3</td>
<td>52.9</td>
<td>5.6</td>
<td>75.9</td>
</tr>
<tr>
<td>Anti-Sm</td>
<td>290</td>
<td>73.1</td>
<td>24.0</td>
<td>0</td>
<td>56.1</td>
</tr>
<tr>
<td>Anti-phospholipid</td>
<td>186</td>
<td>47.4</td>
<td>14.2</td>
<td>0.36</td>
<td>37.6</td>
</tr>
</tbody>
</table>

Conclusion: Despite the lack of data for some of the items on the SLICC criteria, we have shown that some patients could be classified earlier with them than with the ACR criteria (major organ involvement or LN plus 1 immunologic criterion); however, a relatively high proportion of patients could not be classified until later (malar rash/photosensitivity combination in 1 criterion, main reason) or not at all. Longitudinally complete data collection is needed to better define the role of the SLICC criteria in the clinical and research settings.

Disclosure: G. S. Alarcon, None; M. McGown Jr., None; L. Madger, None; M. Petri, HGS, 5; GlaxoSmithKline, 5; Medimmune, 5; UCB, 5; Anthera, 5; Pfizer Inc, 5.

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Increased Incidence of Herpes Zoster Among Patients with Systemic Lupus Erythematosus. Eliza F. Chakravarty1, Kaleb Michaud2, Robert S. Katz3 and Frederick Wollheim4. 1Oklahoma Medical Research Foundation, Oklahoma City, OK, 2Rush University Medical Center, Chicago, IL, 3National Data Bank for Rheumatic Diseases & University of Nebraska Medical Center, Omaha, NE, 4National Data Bank for Rheumatic Diseases, Chiwita, KS

Background/Purpose: Herpes zoster (HZ) is the painful reactivation of latent vescella zoster virus infection. The incidence of HZ may be increased in some autoimmune diseases including systemic lupus erythematosus (SLE). We examined the incidence and risk factors for HZ in a prospective cohort of patients with physician-diagnosed SLE compared to those diagnosed with non-inflammatory musculoskeletal conditions (MSK).

Disclosure: E. C. Somers, None; J. Buyon, None; W. W. Chatham, None; E. C. Somers, None; W. W. Chatham, None; E. C. Somers, None; W. W. Chatham, None; E. C. Somers, None; W. W. Chatham, None; E. C. Somers, None; W. W. Chatham, None.
Methods: Study subjects were participants in the National Data Bank for Rheumatic Diseases (NDB) longitudinal study of rheumatic disease outcomes. Participants are followed prospectively with semi-annual detailed questionnaires collecting data on medication use, comorbid conditions, infections (including specific questions on HZ), hospitalizations, and standard patient reported outcomes. After excluding 808 participants with a history of prior HZ at enrollment, we followed 1,485 SLE patients and 2,775 MSK for incident HZ between 2001 and 2010. Reports of HZ were validated by confirmation of a physician diagnosis. Age adjusted incidence rates were calculated for each group. Cox proportional hazard regression models were used to identify predictors of HZ for the entire cohort as well as for specific predictors for SLE patients. Zostavax vaccination rates for individuals ≥ 60 years old were compared between groups.

Results: SLE patients were younger than MSK (48.3 vs. 64.9 years), but had a similar disease duration of 13–14 years at enrollment. Health Assessment questionnaire at baseline was similar between groups (0.90 SLE vs. 0.87 MSK), although 25% of SLE patients were disabled from work compared to 9% of MSK. SLE patients had increased incidence of HZ at all ages, with an age-adjusted incidence of 12.0/1000 person-years compared to MSK (8.7/1000 person-years) and a hazard ratio of 1.7 (95% CI 1.0–2.71) for SLE (Figure). Increasing age (HR 1.01, 95%CI 1.00–1.02 per year) and increased HAQ (HR 1.26, 95% CI 1.10–1.44) were independent predictors of HZ. Among SLE patients, prednisone (HR 2.29, 95% CI 1.24–4.23) and mycophenolate mofetil (HR 5.00, 95% CI 1.40–17.6) conferred additional risk. SLE had the lowest HZ vaccination rates among age-eligible subjects; 7.1% SLE vs. 13% MSK, p<0.001.

Conclusion: The incidence of HZ is increased in SLE at all ages when compared to MSK, while vaccination rates remain low. Prednisone and mycophenolate mofetil are associated with increased risk.

Disclosure: E. F. Chakravarty, None; K. Michaud, None; R. S. Katz, None; F. Wolfe, None.

606 Risk Factors Associated with Cervical Human Papillomavirus Infection in Women with Systemic Lupus Erythematosus: The Role of Rituximab. Mario Garcia-Carrasco1, Claudia Mendoza Pinto1, Alejandro Taboada-Cole1, Verónica Vallejo-Ruiz2, Julio Reyes-Leyva2 and Aurelio Lopez-Colombo1. 1HGR 36 CMN Manuel Ávila Camacho, Instituto Mexicano del Seguro Social, Puebla, Mexico; 2Centro de Investigación Biomédica de Oriente, Instituto Mexicano del Seguro Social, Hospital General de Zona No. 5, Puebla, Mexico.

Background/Purpose: Systemic lupus erythematosus (SLE) is a chronic, autoimmune, multisystemic disease that affects women of reproductive age. Women with SLE have an increased risk of cervical abnormalities and cervical human papillomavirus (HPV) infection. Studies have investigated risk factors for cervical infection with HPV, with contradictory results. The role of biological therapy on the risk of HPV infection in women with SLE has not been explored. The objective of our study was to identify the prevalence and factors associated with cervical infection by HPV in women with SLE.

Methods: In this cross-sectional study, we investigated 148 women with SLE. A structured questionnaire was administered to identify traditional and SLE-related disease risk factors. A gynecological evaluation and cervical cytology was made. Polymerase chain reaction for viral DNA was performed for HPV determination.

Results: The mean (± SD) age and disease duration of SLE patients were 42.5 ± 11.8 years and 9.7 ± 5.3 years, respectively. The prevalence of squamous intraepithelial lesions was 6.8%. The prevalence of HPV infection was 29%, with HPV 18 being the most frequent type (found in 25.5% of patients without multiple infections). HPV (+) patients were younger than HPV (−) patients (38.2 ± 11.2 vs. 44.2 ± 11.5; p = 0.05) and were receiving a higher daily dose of prednisone (12.8 ± 6.8 mg vs. 9.7 ± 6.7 mg; p = 0.01). In the multivariate logistic analysis, only age at the time of the study was associated negatively with HPV infection (B = 0.04, OR 0.95, 95% CI: 0.95–0.98). There was a non-significant trend to more-frequent administration of immunosuppressive and biologic therapy with rituximab in HPV (+) patients.

Table. Sociodemographic, clinical and treatment characteristics of systemic lupus erythematosus patients with and without cervical human papillomavirus infection

<table>
<thead>
<tr>
<th>Variable</th>
<th>VPH + (n=43)</th>
<th>VPH − (n=105)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD DE years</td>
<td>38.2 ± 11.2</td>
<td>44.2 ± 11.5</td>
<td>0.05</td>
</tr>
<tr>
<td>Current smoker, n (%)</td>
<td>4 (9.3)</td>
<td>12 (11.4)</td>
<td>0.4</td>
</tr>
<tr>
<td>Age at first intercourse, mean ± SD</td>
<td>20.4 ± 3.4</td>
<td>20.5 ± 3.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Number of sexual partners, mean ± SD</td>
<td>1.65 ± 1.0</td>
<td>1.42 ± 0.8</td>
<td>0.16</td>
</tr>
<tr>
<td>Oral contraceptive use, n, (%)</td>
<td>1 (2.3)</td>
<td>0 (0)</td>
<td>0.29</td>
</tr>
<tr>
<td>Disease duration, mean ± SD years</td>
<td>9.5 ± 6.2</td>
<td>9.8 ± 6.1</td>
<td>0.77</td>
</tr>
<tr>
<td>Current medication</td>
<td>36 (83.7)</td>
<td>81 (77.1)</td>
<td>0.5</td>
</tr>
<tr>
<td>Antimalarials, n, (%)</td>
<td>12.8 ± 6.8</td>
<td>9.7 ± 6.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Prednisone (mg/d), mean ± SD</td>
<td>25 (58.1)</td>
<td>57 (54.1)</td>
<td>0.7</td>
</tr>
<tr>
<td>Immunosuppressive therapy, n, (%)</td>
<td>16 (37.2)</td>
<td>30 (28.5)</td>
<td>0.33</td>
</tr>
<tr>
<td>Azathioprine, n, (%)</td>
<td>5 (11.6)</td>
<td>23 (23.8)</td>
<td>0.17</td>
</tr>
<tr>
<td>Methotrexate, n, (%)</td>
<td>5 (11.6)</td>
<td>6 (6.7)</td>
<td>0.28</td>
</tr>
<tr>
<td>Leflunomide, n, (%)</td>
<td>4 (9.3)</td>
<td>1 (0.9)</td>
<td>0.02</td>
</tr>
<tr>
<td>Mycophenolic acid, n (%)</td>
<td>7 (16.2)</td>
<td>9 (8.5)</td>
<td>0.24</td>
</tr>
<tr>
<td>Rituximab</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Women with SLE, and especially younger patients, had an increased prevalence of cervical HPV infection. Conventional and biologic therapy with rituximab may not influence HPV infections. Screening for HPV infection is recommended in patients with SLE.

Disclosure: M. Garcia-Carrasco, None; C. Mendoza Pinto, None; A. Taboada-Cole, None; V. Vallejo-Ruiz, None; J. Reyes-Leyva, None; A. Lopez-Colombo, None.

607 Activity Index After Renal Failure in a Cohort of 32 Patients with Lupus Nephritis. Cristina Gonzalez-Pulido1, Sara Croca2 and D.A. Isenberg3.1University Hospital Virgen del Rocío, Seville, Spain; 2University College London, London, United Kingdom; 3University College of London, London, United Kingdom.

Background/Purpose: Most published studies that have measured activity in patients with lupus nephritis suggest the disease is relatively quiescent after renal failure.

Purpose: To analyze retrospectively the activity index of 32 patients in end-renal stage disease (ESRD) from a cohort of 182 patients with lupus nephritis during dialysis and/or post renal transplant.

Methods: We used the BILAG index, levels of complement C3 (n = 0.9–1.8 g/L) and anti-DNA antibodies (n = 0–50 IU/ml) to measure the lupus activity every 6 months after the beginning of dialysis and after renal transplant. Inactive disease was defined as no BILAG A/B both C3 and DNA level within the normal range. Mild-moderate disease was defined as at least 1 B in BILAG and/or mild serological involvement (C3 levels = 0.89–0.73 g/L and/or DNA levels = 51–149 IU/ml). We considered patients to be severely active when at least 1 A or 2 B were present in BILAG and/or major serological abnormality (C3 levels < 0.73 g/L and/or DNA levels >149 IU/L).

Results: We followed up a cohort of 182 patients with lupus nephritis from January 1978 to February 2012. 32 patients went into ESRD defined as the need of haemodialysis (HD) or peritoneal dialysis (CAPD). Ethically, 37.5% were...
Afrocaribbean, 25% from the Indian subcontinent, 28% Caucasian and 9.4% others. The duration of follow up during ESRD dialysis ranged from 1 to 144 months (median 24, IQR 12–54). 14 of them had a renal transplant. We divided our cohort in two groups: 1) all patients in ESRD (n=32), 2) Transplant patient (n=14).

**Group 1:** 15.1% of the measurements showed completely inactive disease and 84.9% had at least mild-moderate activity at some time. 12 patients died. **Group 2:** 42.3% of the measurements showed inactive disease and 57.7% had at least one flare in this period. 42.3% were BILAG and serologically, 32.14% serologically, 17.9% serologically, 32.14% BILAG and serologically, 33.3% by BILAG. Severe activity markers were present in only 26.92% (50% BILAG and serological, 32.14% BILAG, 17.9% serologically). The BILAG involvement in this group was due to renal alteration (34%), haematological (30%), constitutional (10%), neurological and cardiovascular (8% each), mucocutaneous (6%), musculoskeletal (19.7%), gastrointestinal (1.4%), and dermatological (0.4%). 1.4% of the measurements showed completely inactive disease and 98.6% had at least mild-moderate activity at some time (58.5% had both BILAG index and serological involvement, 26.3% only serological involvement, 15.8% only BILAG activity. The BILAG involvement was haematological (29.6%), musculoskeletal (19.7%), mucocutaneous (15.5%), constitutional (11.3%), neurological (8.4%) and gastrointestinal (1.4%). 12 patients died.

**Conclusion:** We report a 34 years follow-up of a cohort of 32 patients with SLE nephritis in renal failure. The activity after ESRD was much lower in the group of transplant patients. Serological activity was the main finding in both groups.

**Disclosure:** C. Gonzalez-Pulido, None; S. Croca, None; D. A. Isenberg, None.

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**Association of Discoid Lupus with Other Clinical Manifestations Among Patients with Systemic Lupus Erythematosus.** Joseph F. Merola, Christina Iversen, Jose A. Gomez-Puerta, Tabatha Norton, Hsun Tsao, Peter H. Schur, Elena M. Massarotti, Bonnie L. Bernas and Karen H. Costenbader. Brigham and Women’s Hospital, Harvard Medical School, Boston, MA

**Background/Purpose:** Prior studies suggest that cutaneous discoid lupus (DLE) is a marker for less severe disease with a low frequency of nephritis and end-stage renal disease among SLE patients. These past studies have not included diagnostic confirmation of DLE by expert dermatologists and did not adjust for medication use. We investigated associations of validated cases of DLE with other specific SLE manifestations in a large validated SLE cohort.

**Methods:** Our academic hospital SLE registry contains data on 5,030 patients seen at a potential SLE clinic at the S. Croca lab from 1970-2011. Inclusion criteria for this study were: definite SLE per treating rheumatologist and an SLE expert, 4/11 of 1997 ACR classification criteria for SLE, ≥2 visits and >3 months of follow-up, and a documented year of SLE diagnosis. The presence of DLE was validated by an expert dermatologist with review of multispecialty notes, pathology and digital images, when available. We collected SLE manifestations, medication and serologic data from review of electronic medical records. We tested for associations between DLE and each of the ACR SLE criteria, as well as end-stage renal disease (ESRD), using multivariable-adjusted logistic regression analyses.

**Results:** Of 1,043 SLE patients included, 92% were female and 51% White. 36% were anti-dsDNA positive. Mean age at diagnosis was 32 years (±13) and mean duration of follow-up was 10 years (±6.5). DLE (n=117) was significantly associated with the presence of photosensitivity, leukenopaenia and anti-Smith antibodies (Table). DLE was inversely associated with both arthritis and pleuritis. We found no significant associations between DLE and nephritis or ESRD.

**Table.** Associations between Discoid Lupus (n=117) and other ACR Criteria for SLE and End-Stage Renal Disease

<table>
<thead>
<tr>
<th>SLE Manifestation</th>
<th>Number with DLE</th>
<th>Number without DLE</th>
<th>OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-Smith (n=248)</td>
<td>45</td>
<td>201</td>
<td>2.41 (1.58–3.69)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Photosensitivity (n=434)</td>
<td>60</td>
<td>374</td>
<td>1.63 (1.09–2.44)</td>
<td>0.02</td>
</tr>
<tr>
<td>Leukenopaenia (n=351)</td>
<td>50</td>
<td>301</td>
<td>1.55 (1.03–2.32)</td>
<td>0.04</td>
</tr>
<tr>
<td>Pleuritis (n=380)</td>
<td>31</td>
<td>349</td>
<td>0.56 (0.36–0.87)</td>
<td>0.01</td>
</tr>
<tr>
<td>Arthritis (n=817)</td>
<td>79</td>
<td>738</td>
<td>0.49 (0.31–0.76)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

No significant associations between discoid lupus and the following were found: malar rash, oral ulcers, pericarditis, proteinuria, casts, lupus nephritis, seizure, psychosis, anemia, thrombocytopenia, antiphospholipid antibodies, end-stage renal disease.

*OR = odds ratio, adjusted: Multivariable logistic regression analyses modeling the odds ratio of DLE associated with each SLE manifestation or laboratory finding separately, adjusted for age at diagnosis, sex, race/ethnicity, disease duration, ever medication use (azathioprine, cyclophosphamide, hydroxychloroquine, methotrexate, mycophenolate mofetil, systemic corticosteroids)

**Conclusion:** In this large cohort of SLE patients, we have found an increased frequency of photosensitivity, leukenopaenia and anti-Smith antibodies among SLE patients with DLE and an inverse association of DLE with both pleuritis and arthritis. We did not observe the inverse associations of DLE with anti-dsDNA antibodies, lupus nephritis, or ESRD that have been noted in other studies. These findings have important implications for prognosis among patients with DLE and possibly for different underlying pathophysiologies of SLE subtypes.

**Disclosure:** J. F. Merola, None; C. Iversen, None; J. A. Gomez-Puerta, None; T. Norton, None; H. Tsao, None; P. H. Schur, None; E. M. Massarotti, None; B. L. Bernas, None; K. H. Costenbader, None.

### 609

**Peripheral Neuropathy in Systemic Lupus Erythematosus.** Amin Ooama1, Hong Fang2, Michelle Petri3 and Julius Birnbaum1. University of Cambridge, Cambridge, United Kingdom, 2Johns Hopkins University School of Medicine, Baltimore, MD, 3Johns Hopkins University, Baltimore, MD

**Background/Purpose:** Whilst Neurological disorders are a common manifestation of systemic lupus erythematosus (SLE), peripheral neuropathies have received little attention. The literature consists mostly of small case series with very few studies investigating larger samples. Consequently, various features of SLE-associated peripheral neuropathies such as prevalence, symptoms, severity, chronicity, clinical and serological associations, and electrophysiological and biopsy findings, are poorly described. Small fibre neuropathies are almost entirely un-reported. The aim of this study is to determine the prevalence, clinical features, electrophysiological and biopsy findings of peripheral neuropathies in systemic lupus erythematosus to identify clinical and laboratory correlations.

**Methods:** We performed a retrospective study of 2,097 SLE patients seen at a single Center since 1987, and ascertained for the presence of neuropathy according to diagnostic criteria laid down by the American Academy of Neurology. We categorized subtypes of peripheral neuropathies on the basis of symptoms, examination, electrophysiological studies, and punch skin biopsy features. We excluded patients with co-morbid features associated with neuropathies. We evaluated for an association of demographic, SLE-related clinical features, antibodies, and other immunological data in SLE patients with neuropathies versus without neuropathies by student’s t-test or chi-squared test, with p-values <0.05 considered statistically significant.

**Results:** The prevalence of neuropathies was 4.4%, present in 82 of 2,097 patients. Of these 82 patients, the most common neuropathy was a large fiber neuropathy (68.3%): including neuropathological assessment demonstrating 36 (44%) symmetric axonal neuropathies and 42 (51%) patients with a pure axonal loss, 18 patients had small-fiber neuropathies, characterized by decreased intra-epidermal nerve fiber density and/or morphological changes of unmyelinated fibers on skin biopsy. Altogether, patients with neuropathies at a single time of SLE diagnosis (39.16 versus 32.05, p<0.0001), had an increased risk of Zoster infection, but otherwise had similar profile of SLE-related clinical and laboratory features.

**Conclusion:** Our characterization of small-fiber neuropathy in patients, has never been systematically evaluated and reported in unselected SLE cohorts, and suggests that this neuropathy may be an unrecognized cause of mortality in SLE patients. SLE patients with neuropathies versus without neuropathies shared similar clinical and immunological features. Given the tropism of VZV for peripheral neuronal structures, prospective studies are warranted to evaluate whether re-activation of VZV is a risk factor for SLE neuropathies.

**Disclosure:** A. Ooama, None; H. Fang, None; M. Petri, None; J. Birnbaum, None.

### 610

**B Lymphocyte Stimulator Levels Are Higher in Caucasian SLE patients Earlier in Disease Course and Predict Damage Accumulation.** Eoghan M. McCarthy1, Ruth Lee2, Joan Ni Gabhann3, Siobhan Smith4, Michele Doran5, Gaye Cunnane1, Donough G. Howard3, Paul G. O’Connell1, Grainne M. Keams6 and Caroline Jeffries7. 1Beaumont Hospital, Dublin 9, Ireland, 2Royal College of Surgeons in Ireland, Dublin, Ireland, 3St. James Hospital, Dublin, Ireland

**Background/Purpose:** B Lymphocyte Stimulator (BLyS) plays an important role in the pathogenesis of Systemic Lupus Erythematosus (SLE). Whilst trials of anti BLyS-targeted therapy have shown promise, the optimal timing and benefits of anti BLyS therapy remain undetermined. We sought to assess the relationship
between BLyS levels, disease activity, damage scores and clinical profiles in Caucasian SLE patients.

Methods: BLyS levels were determined by ELISA. Elevated BLyS levels were defined as values above the 95% percentile in a cohort of healthy controls. Patients were enrolled only if they could confirm three generations of their family were of Irish descent. Patients with SLE were divided into two groups; those with elevated BLyS levels (Group 1) or normal BLyS levels (Group 2). Demographic data, disease activity as per SLEDAI and damage scores (SLICC) at 5 year follow-up were recorded. Categorical variables were analyzed using Fisher’s exact test and continuous variables by impaired t-tests. The Mann-Whitney test was used in instances of non-normality.

Results: 45 patients were recruited. In this homogenous Caucasian population BLyS levels were higher in those with malar rash (920pg/ml v 594pg/ml, p <0.05), musculoskeletal involvement (930pg/ml v 519pg/ml, p <0.04), immunologic activity (1041pg/ml v 646pg/ml, p <0.005) and renal disease (1127pg/ml v 574pg/ml, p <0.009).

In keeping with previous reports BLyS levels showed significant correlation with disease activity as measured by SLEDAI (r = .682, p<0.001). Twenty three SLE patients (51%) fell above the defined cutoff in healthy controls and were therefore classified as having “elevated” BLyS levels with the remaining twenty two patients having “normal” BLyS levels, the difference between groups being significant (1173 pg/ml v 558pg/ml, p<0.001).

Patients with elevated BLyS levels at time of enrolment were found to be significantly younger at time of study visit (32.97 v 44.32 years, p<0.0019) with a shorter disease duration (4.96 v 9.23 years, p<0.0124). They also accrued significantly more damage over the subsequent five year period with a mean increase in damage score of 0.53 compared to 0.13 for patients with normal BLyS levels (p<0.012). The odds ratio (OR) was 5.8 (p=0.025 by Fisher’s exact test). The change in SDI correlated significantly with plasma BLyS levels (r = .399, p<0.007). There was no difference in BLyS levels between those requiring steroid therapy to control their disease versus those steroid free. However, BLyS levels were higher in those patients requiring additional immunosuppression (Azathioprine or greater) to control their disease (926pg/ml v 642pg/ml, p<0.005).

Sm antibodies (OR 13.4, p=0.049), low C4 (OR 8, p=0.16) and dsDNA positivity (OR 6.1, p=0.007) predicted BLyS elevation.

Conclusion: BLyS levels are higher in younger patients and those with a shorter disease duration. Although further validation of these clinical and immunological associations are warranted in larger cohorts of genetically homogenous populations our study suggests BLyS blockade may be most beneficial if introduced early in disease in young patients in an effort to prevent damage. BLyS levels remain elevated despite the use of additional conventional immunosuppressive agents.

Disclosure: E. M. McCarthy, None; R. Lee, None; J. Ni Gabhann, None; S. Smith, None; M. Doran, None; G. Cunnane, None; D. G. Howard, None; P. G. O’Connell, None; G. M. Kearns, None; C. Jeffereys, None.

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Impaired Diffusion Tensor Imaging Findings in the Corpus Callosum and Cingulum May Underlie Impaired Learning and Memory Abilities in Systemic Lupus Erythematosus. Daphna Paran1, Elissa Ash1, Iri Litinsky1, Valerie Aloush1, Marina Anouk1, Dan Caspi1, Talma Hen德尔2 and Inti Shapira-Lichter1. 1Tel Aviv Sourasky Medical Ctr, Tel-Aviv University, Tel Aviv, Israel, 2Tel Aviv, Israel, 3Tel-Aviv Sourasky Medical Ctr, Tel-Aviv University, Tel Aviv, Israel.

Background/Purpose: Memory impairment is prevalent in systemic lupus erythematosus (SLE), however the pathogenesis is unknown. In a previous functional Magnetic Resonance Imaging (MRI) study we demonstrated altered brain activity dynamics and less brain deactivation in patients with SLE without overt neuropsychiatric manifestations as compared to healthy controls, when performing a learning and memory task. Our findings localized this impairment to the anterior medial prefrontal cortex of the default mode network (DMN). In addition altered networking of the hippocampal subsystem of the DMN was seen in patients with SLE when performing this task. These findings may reflect compensatory mechanisms to overcome memory impairment. The purpose of the present study is to search for a structural substrate for the abnormal recruitment pattern observed in the functional MRI studies using Diffusion Tensor Imaging (DTI).

Using a DTI sequence in a 3.0T MRI scan, we characterized brain diffusivity in ten SLE patients and nine healthy controls. We examined two tracts associated with the DMN: the corpus callosum and the cingulum.

Results: In the left cingulum fibers higher apparent diffusion coefficient (ADC, F(1,16)= 4.9, p<0.05) and radial diffusivity (Dr, F(1,16)=4.6, p<0.05) values were seen in SLE patients as compared to controls. Similarly, in the corpus callosum, higher ADC values (F(1,16)=13, p<0.005), radial diffusivity (Dr (F(1,16)=7.4, p<0.05) and longitudinal diffusivity (Da) (F(1,16)=14.4, p<0.005) were evident in SLE patients.

Conclusion: Higher diffusion coefficients in the corpus callosum and the left cingulum may indicate impaired organization/reduced integrity of these tracts which may underlie the abnormal pattern of brain activity recruitment of the DMN observed during a verbal learning and memory task. The abnormal findings in the left cingulum are in line with the central role of the left hippocampus in verbal memory and suggests that these findings may contribute to the impairment seen in patients with SLE on performance of a verbal memory task.

Disclosure: D. Paran, None; E. Ash, None; I. Litinsky, None; V. Aloush, None; M. Anouk, None; D. Caspi, None; T. Hendler, None; I. Shapira-Lichter, None.

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Thrombosis Recurrence in Systemic Lupus Erythematosus Patients with and without Antiphospholipid Antibodies. Ibrahim AlHomood, D. D. Gladman, Dominique Ibanez and Murray B. Urowitz. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: To determine the outcome of thrombotic events in the presence and absence of antiphospholipid antibodies (aPL) in patients with systemic lupus erythematosus (SLE).

Methods: Patients with SLE and thrombotic events followed prospectively at the Lupus clinic were divided into two groups: 1) those with one event (no recurrence) and 2) those with recurrent events.

Demographic and clinical data collected at time of thrombosis included age, race, gender, aPL status (anticardiolipin antibodies &/or lupus anticoagulant), disease duration, disease activity (SLEDAI-2K), hypertension, diabetes mellitus (DM), hypercholesterolemia, smoking and use of aspirin (ASA). Thrombotic events (TE) were divided into arterial TE (ATE) and venous TE (VTE). ATE was defined as angina, myocardial infarction, stroke, or peripheral arterial thrombosis, and VTE was defined as deep vein thrombosis or pulmonary emboli. Comparison between patients with and without recurrence was done using descriptive statistics. Time to recurrence was compared using Kaplan-Meier curves and stepwise Proportional hazard models.

Results: 613 TE were identified in 400 patients. 213 recurrences were observed in 132 patients. The aPL status is known in 367 patients of whom 118 (32.2%) have had a recurrence. The mean time to recurrence in these 118 patients is 5.0 ± 5.1 years.

Kaplan-Meier curve for the prediction of Recurrence by aPL +ve ever at time of 1st TE
Conclusions: Recurrent TE occurs in 32.2% of lupus patients with TE. ATE recurs more often than VTE. Patients with high cholesterol level at time of thrombosis or antiphospholipid antibodies have an increased risk of recurrence.

Disclosure: I. Alhumood, None; D. D. Gladman, None; D. Ibanez, None; M. B. Urowitz, None.

613 Serum Level of Syndecan-1 Is Associated with Disease Activity in Patients with Systemic Lupus Erythematosus. In-Woon Baek1, Ki-Jo Kim1, Ji-Young Kim1, Su-Jung Park1, Chong-Hyeun Yoon1, Wan-Uk Kim1 and Chul Soo Cho1.

Background/Purpose: Syndecan-1(SDC1), a transmembrane heparan-sulfate glycoprotein, is predominantly expressed by plasma cells and is a receptor for a proliferation-inducing ligand (APRIL). SDC-1 is readily shed and released into plasma under certain pathologic conditions and remains biologically active to affect cellular behaviour of plasma cells. Plasma cells are effector cells producing pathogenic autoantibodies in systemic lupus erythematosus (SLE). The purpose of this study are to evaluate serum SDC1 concentration and to determine the association between its levels and certain clinical manifestation in patients with SLE.

Methods: Serum samples from 127 patients with SLE and 24 normal healthy controls were assayed for SDC1 and APRIL by enzyme linked immunosorbent assay. Medical records were thoroughly reviewed for clinical features and serologic values. Disease activity was assessed using the Systemic Lupus Erythematosus Disease Activity Index (SLEDAI). Sympathetic naloxone injection led to a significant increase in the SLEDAI score in symptomatic patients.

Results: Serum SDC1 levels were significantly elevated in patients with SLE compared to controls (61.2 ± 6.5 versus 31.4 ± 4.5 ng/ml, P<0.001). The level was correlated positively with anti-double stranded DNA (dsDNA) antibody titer and SLEDAI score (r=0.263, P=0.04, and r=0.231, P=0.012, respectively), but negatively with C3 and CH50 levels associated with the presence of active proteinuria (>0.5 g/m/day) in SLE patients with lupus nephritis. Moreover, serum SDC1 levels had significant correlation with level of APRIL, which was known as surrogate marker of disease activity (r=0.507, P=0.001).

Conclusion: Serum SDC1 levels are elevated and correlated with markers of disease activity in patients with SLE, suggesting that serum SDC1 could be used as a potential marker of disease activity in patients with SLE.

Disclosure: I. W. Baek, None; K. J. Kim, None; J. Y. Kim, None; S. J. Park, None; C. H. Yoon, None; W. U. Kim, None; C. S. Cho, None.

614 Predictors of Systemic Lupus Erythematosus Flares: Baseline Disease Activity and Demographic Characteristics From the Combined Placebo Groups in the Phase 3 Belimumab Trials. Ronald F. van Vollenhoven1, Michelle A. Petri2, Roger A. Levy3, Sandra V. Navarra1, Jill P. Buyon1, Z. John Zhong6, William W. Freimuth6 and Ricard Cervera7.

Background/Purpose: Identifying patients at risk for clinically meaningful flares may be useful in making management decisions. The purpose of this analysis was to identify demographic and disease-related predictors of flares.

Methods: Baseline demographic and SLE-related disease activity characteristics were evaluated for their ability to predict new SLE flares by treatment wk 52 in the combined dataset of 562 patients receiving placebo + standard SLE therapy from the phase 3 belimumab BLISS-52 (NCT00244476) and BLISS-76 (NCT00410384) trials. Flares were defined as the development of 1 new British Isles Lupus Assessment Group (BILAG) A or 2 new B organ domain scores; or a BILAG A score; or according to the modified severe SLE Flare Index (SSEI). Baseline variables included race, age, gender, BMI, SELENA-SLEDAI (mean score, range, and 24 items with ≥30 group), PGA, BILAG A–E scores, ACR diagnostic criteria, Systemic Lupus International Collaborating Clinics Damage Index, SLE duration, and concurrent medications. Baseline disease characteristics associated with a ≥10% absolute difference (% flare - % no flare) or ≥50% increase (% flare - % no flare)% no flare in flare rate were considered predictors of flare.

Results: By wk 52, 180 patients (32%) receiving placebo had 1 new BILAG A or 2 new B scores; 130 (23%) had a BILAG A score; and 133 (24%) had a severe SFI flare. By all 3 flare indices, SELENA-SLEDAI≥12, and moderate–severe disease activity involving renal and hematologic domains were predictors of flare (see table). Serologic markers were predictors of severe SFI flare and 1 BILAG A or B scores. Use of corticosteroids, immunosuppressives, antimalarials, and other concomitant medications did not predict flare.

Predictors of Flare

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% New BILAG A or 2 New B Scores</th>
<th>% Any BILAG A Score</th>
<th>% Severe SFI Flare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With</td>
<td>Without</td>
<td>With</td>
</tr>
<tr>
<td>SS ≥12</td>
<td>38.9</td>
<td>24.1</td>
<td>39.2</td>
</tr>
<tr>
<td>proteinuria</td>
<td>20.6</td>
<td>11.3</td>
<td>20.8</td>
</tr>
<tr>
<td>vasculitis</td>
<td>10.0</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>low complement</td>
<td>70.0</td>
<td>56.8</td>
<td>67.7</td>
</tr>
<tr>
<td>SS DNA binding</td>
<td>75.0</td>
<td>64.1</td>
<td>73.1</td>
</tr>
<tr>
<td>renal (A/B2/C2)</td>
<td>53.3</td>
<td>31.7</td>
<td>56.0</td>
</tr>
<tr>
<td>BILAG vasculitis (A/B)</td>
<td>14.4</td>
<td>6.8</td>
<td>14.6</td>
</tr>
<tr>
<td>BILAG hematologic (A/B)</td>
<td>22.8</td>
<td>12.3</td>
<td>27.7</td>
</tr>
</tbody>
</table>

Conclusion: SLE patients on standard therapy alone with moderate–severe renal, vasculitic, hematologic, or serologic disease activity, or SELENA-SLEDAI≥12 were at increased risk of having a clinically meaningful flare over 52 wk.

Disclosure: R. F. van Vollenhoven, Abbott, BMS, GSK, HGS, MSD, Pfizer, Roche, UCBI, 2, Abbott, BMS, GSK, HGS, MSD, Pfizer, Roche, UCBI, 5, M. A. Petri, HGS, GSK, 5; R. A. Levy, HGS, GSK, 8; S. V. Navarra, HGS, GSK, 8; J. P. Buyon, HGS, 2, HGS, GSK, 5; Z. J. Zhong, HGS, 1, HGS, 3; W. W. Freimuth, HGS, 1, HGS, 3; R. Cervera, HGS, GSK, 2, HGS, GSK, 5.

615 Baseline Laboratory Characteristics From the Combined Placebo Groups in the Phase 3 Belimumab Trials Are Predictive of Severe Flare At 52 Weeks. Michelle A. Petri, Ronald F. van Vollenhoven, Roger A. Levy, Sr., Sandra V. Navarra, Ricard Cervera, Z. John Zhong, William W. Freimuth and Jill P. Buyon. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2Karolinska University Hospital, Stockholm, Sweden, 3Hospital Universitario Pedro Ernesto, Rio de Janeiro, Brazil, 4University of Santo Tomas Hospital, Manila, Philippines, 5Hospital Clinic, Barcelona, Spain, 6Human Genome Sciences, Inc., Rockville, MD, 7New York University School of Medicine, New York, NY.
in clinical practice and trials. The purpose of this analysis was to evaluate biomarker predictors of SLE flares at baseline in the combined placebo groups from the phase 3 belimumab BLISS-52 (NCT00424476) and BLISS-76 (NCT00410384) trials.

**Methods:** The BLISS trials enrolled patients with active SLE (SELENA-SLEDAI ≥6) who were autoantibody positive (antinuclear antibody or anti-double-stranded DNA [anti-dsDNA]), on stable standard SLE therapy for 30 d, and without severe organ involvement. Subjects were randomized to placebo, or belimumab 1 or 10 mg/kg, plus standard therapy. Changes in prednisone were allowed early in the trials, but had to be within 25% or 5 mg of baseline dose. Flare was defined as the development of new BILAG A or 2 new B organ domain scores; any new prednisone was allowed early in the trials, but had to be within 25% or 5 mg of baseline dose. Subjects received 4 weekly injections of belimumab 2 mg/kg.

**Results:** By wk 52 in the placebo group (n = 562), 32% of patients (n = 180) had 1 new BILAG A or 2 new B scores; 23% (n = 130) had a BILAG A score; and 24% (n = 133) had a severe SFI flare. Predictors of wk-52 flare (% with vs without flare) are shown in the table.

### Univariate Analysis of Predictors of 52-Wk Flare

<table>
<thead>
<tr>
<th>Univariate Analysis of Predictors of 52-Wk Flare</th>
<th>% New BILAG A or 2 New B Scores With</th>
<th>% New BILAG A or 2 New B Scores Without</th>
<th>% Any BILAG A Score With</th>
<th>% Any BILAG A Score Without</th>
<th>% Severe SFI Flare With</th>
<th>% Severe SFI Flare Without</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline Laboratory Value</strong></td>
<td>(n = 130)</td>
<td>(n = 382)</td>
<td>(n = 130)</td>
<td>(n = 432)</td>
<td>(n = 133)</td>
<td>(n = 429)</td>
</tr>
<tr>
<td>Low C3 &lt; 0.03 g/dL</td>
<td>52.0</td>
<td>41.5</td>
<td>41.9</td>
<td>59.4</td>
<td>39.4</td>
<td></td>
</tr>
<tr>
<td>Low C4 &lt; 0.16 mg/dL</td>
<td>61.7</td>
<td>50.5</td>
<td>60.8</td>
<td>63.2</td>
<td>51.0</td>
<td></td>
</tr>
<tr>
<td>CRP &gt; 3 mg/L</td>
<td>34.3</td>
<td>34.9</td>
<td>46.0</td>
<td>35.2</td>
<td>44.6</td>
<td>35.5</td>
</tr>
<tr>
<td>Proteinuria ≥2 g/dL</td>
<td>29.5</td>
<td>17.3</td>
<td>32.3</td>
<td>17.7</td>
<td>32.3</td>
<td>17.7</td>
</tr>
<tr>
<td>Positive anti-dsDNA (&gt;200 IU/mL)</td>
<td>44.0</td>
<td>28.0</td>
<td>46.2</td>
<td>29.4</td>
<td>49.6</td>
<td>28.2</td>
</tr>
<tr>
<td>Serum Crithidia luciliae (≤2 ng/mL)</td>
<td>58.0</td>
<td>20.1</td>
<td>37.8</td>
<td>21.3</td>
<td>41.7</td>
<td>19.9</td>
</tr>
</tbody>
</table>

* p < 0.001; *p < 0.01; **p < 0.05

**Conclusion:** SLE patients on standard therapy with low C3 or C4, elevated CRP, proteinuria >0.5 g/dL, positive anti-dsDNA, or serum Crithidia luciliae <2 ng/mL were at increased risk for SLE flare over 52 wk. The 3 flare definitions had high concordance regarding predictors; univariate risk factors, with the exception of C3/C4, were the same for all flare definitions at 52 wk. The data suggest serologic tests predict clinically meaningful flare over 52 wk of standard SLE therapy, and may be useful in the identification of patients at greater risk for flares in clinical practice and trials.

**Disclosure:** M. A. Petri, HGS, GSK, S; R. F. van Volkenhoven, Abbott, BMS, GSK, HGS, MSD, Pfizer, Roche, UCB, 2 Abbott, BMS, GSK, HGS, MSD, Pfizer, Roche, UCB, 3KBio, 1, Strongwell, 2Covance Clinical Research Unit, Inc., Dallas, TX, 1Covance Clinical Research Unit, Inc., Daytona Beach, FL.

**Background/Purpose:** Belimumab is a recombinant, human Ig-G1A monoclonal antibody that binds and antagonizes the biological activity of soluble B-lymphocyte stimulator protein, a member of the tumor necrosis factor ligand superfamily that promotes the survival of B lymphocytes. This study (NCT01583530) evaluated the absolute bioavailability, PK, tolerability, and safety of belimumab (200 mg/mL) administered SC to healthy subjects as a single dose and as multiple doses up to 240 mg.

**Methods:** In all, 118 healthy subjects (aged 18–55 y; body weight 51–115 kg) were enrolled. Seventy-eight subjects received a single dose of belimumab 240 mg IV, or 2 × 120, 1 × 240, or 1 × 200 mg SC. Forty subjects received 4 weekly injections of belimumab 2 × 120 or 1 × 200 mg SC. Randomization was stratified by weight (< vs ≥ 75 kg) and, for SC administration, by injection site (abdomen vs thigh), with a target enrollment of 50% women/treatment group. Serial blood samples were collected and the serum belimumab concentrations measured by a validated electrochemiluminescence-based assay. Belimumab PK parameters were derived by noncompartmental or compartmental analysis.

**Results:** The bioavailability and PK parameters of belimumab following single SC and IV administration are summarized in the table. Following 4 weekly SC belimumab doses, bioavailability values (90% CI) were 75% (63%–89%) and 78% (67%–91%) for the 2 × 120- and 1 × 200-mg SC groups, respectively. Four subjects had persistent positive immune responses; neutralizing antibodies in these subjects were not detected and there was no apparent impact on PK. Single and multiple dosing of belimumab was generally safe and well tolerated, with no severe/serious injection-site reactions, eg, rash, edema, erythema, and pruritus.

**PK and Bioavailability of Belimumab**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>240 mg IV</th>
<th>2 × 120 mg SC</th>
<th>1 × 240 mg SC</th>
<th>1 × 200 mg SC</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>No. of subjects</th>
<th>19</th>
<th>18</th>
<th>18</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmax, d4 (h)</td>
<td>0.09 (0.05–0.30)</td>
<td>3.9 (0.9–9.8)</td>
<td>4.9 (2.9–13.9)</td>
<td>5.9 (1.9–13.9)</td>
</tr>
<tr>
<td>Cmax, µg/mL</td>
<td>86.2 (20.2)</td>
<td>32.7 (29.0)</td>
<td>31.6 (27.9)</td>
<td>24.3 (40.3)</td>
</tr>
<tr>
<td>AU(0–24 h), µg/mL</td>
<td>1030 (32.1)</td>
<td>788 (36.1)</td>
<td>812 (36.2)</td>
<td>612 (37.9)</td>
</tr>
<tr>
<td>t1/2, term (h)</td>
<td>18.2 ± 6.3</td>
<td>15.9 ± 5.3</td>
<td>18.2 ± 6.0</td>
<td>16.0 ± 5.1</td>
</tr>
</tbody>
</table>

**Conclusion:** Following single belimumab SC doses, bioavailability was 74%–82%, indicating that belimumab SC was well absorbed, and bioavailability was similar among the 3 SC groups. Bioavailability after 4 weekly SC doses was similar to that following single SC administration. Belimumab was generally safe and well tolerated after single and multiple SC dosing.

**Disclosure:** W. Cai, HGS, 1, HGS, 3; C. Chen, HGS, 1, HGS, 3; Z. J. Zhong, HGS, 1, HGS, 3; W. W. Freimuth, HGS, 1, HGS, 3; W. Lewis, None; D. Subich, None.

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Solute Urokinase Plasminogen Activator Receptor (suPAR) Levels Reflect Organ Damage in Systemic Lupus Erythematosus. Helena Enoosson1, Jonas Wetterö2, Thomas Skogh3 and Christopher Sjowall1. Linköping University, Linköping, Sweden, 2Linköping University, Linköping, Sweden

**Background/Purpose:** Disease activity assessment in systemic lupus erythematosus (SLE) remains a challenge due to lack of reliable biomarkers and disease heterogeneity. Ongoing tissue inflammation can be difficult to distinguish from irreversible damage caused by previous flares or side effects of medication. Solute urokinase plasminogen activator receptor (suPAR) is a part of the plasminogen activation system and is involved in inflammation, tissue remodelling and cancer metastasis. Cell-surface expression of suPAR on endothelial cells, megakaryocytes, monocytes, neutrophils and activated T cells is up-regulated upon stimulation with growth factors and cytokines, such as IL-1β and TNF. suPAR is released by protease-mediated shedding of cell-bound suPAR, and has emerged as a useful biomarker in disparate conditions (e.g. sepsis, malignancies, and focal segmental glomerulosclerosis). Herein, we evaluated suPAR as a marker of disease activity and organ damage in lupus.

**Methods:** Cross-sectional sera from 100 healthy blood donors and 198 SLE patients fulfilling the 1982 American College of Rheumatology (ACR) classification criteria (81%) and/or the 'Fries criteria' (a clinical ACR diagnosis based upon a history of abnormal ANA titre and ≥2 typical organ manifestations) were analyzed for suPAR by enzyme immunoassay. Patients were recruited consecutively; most were prevalent cases (91%), but a few (9%) had recent-onset disease at the time of sampling. Disease activity was assessed by SLE disease activity index-2K (SLÉDAI) and the physician’s global assessment (PGA). Organ damage was evaluated by SLE international collaborating clinics (SLICC)/ACR damage index (DI). Routine analyses included blood cell counts, erythrocyte sedimentation rate, C-reactive protein (CRP), C3 and C4, creatinine, creatine kinase, urinalysis and anti-dsDNA (Crithidia luciliae IF test, CLIFT). Informed consent was obtained from all subjects and the research protocol was approved by the Regional Ethics Committee in Linköping (M75-08).

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Results: No significant difference was found comparing suPAR in healthy controls and patients. In SLE, suPAR levels were highly associated with leukocyte count; and thus, this was adjusted for, as well as for age, sex and glucocorticoid dose in further analyses. Yet, no associations were recorded between suPAR levels and disease activity reflected by SLEDAI or PGA. However, a highly significant association was observed between suPAR and global SLICC/ACR DI (p = 0.0005), and a borderline significant association was found between CRP and SLICC/ACR DI (p = 0.05). Dissecting SLICC/ACR DI into organ systems in a multiple regression analysis, we found renal, ocular, neuropsychiatric, skin and peripheral vascular damage to have a significant positive impact on suPAR levels, whereas no separate organ system had significant impact on CRP.

Conclusion: This study demonstrates a strong association between suPAR and organ damage, but not with disease activity, in lupus. The high association between suPAR and leukocyte count could possibly explain why no difference in suPAR was found between patients and healthy blood donors. Analysis of suPAR may be a valuable clinical tool to assess disease outcome in SLE.

Disclosure: H. Enocsson, None; J. Wetterholm, None; T. Skogh, None; C. Sjöwall, None.

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BAFF/BLYS Gene Expression Predicts Disease Activity in Systemic Lupus Erythematosus Over One Year. Eric Zollar1, Hong Fang1, Jadwiga Bienkowska2, Norm Allaire2, Susan Kalled2 and Michelle Petri1, 1Johns Hopkins University School of Medicine, Baltimore, MD, 2Biogen Idec Inc., Cambridge, MA

Background/Purpose: The search for a marker of SLE disease activity has included inflammatory markers, chemokines and gene signatures. We explored the ability of the BAFF gene expression to predict SLE disease activity in the subsequent year after measurement.

Methods: 292 patients (59% Caucasian, 34% African-American, 9% female, mean age 46 ± 12 years) were enrolled in a prospective observational study. At baseline, BAFF gene expression level was determined in healthy controls and patients. In SLE, suPAR levels were highly associated with leukocyte count; and thus, this was adjusted for, as well as for age, sex and glucocorticoid dose in further analyses. Yet, no associations were recorded between suPAR levels and disease activity reflected by SLEDAI or PGA. However, a highly significant association was observed between suPAR and global SLICC/ACR DI (p = 0.0005), and a borderline significant association was found between CRP and SLICC/ACR DI (p = 0.05). Dissecting SLICC/ACR DI into organ systems in a multiple regression analysis, we found renal, ocular, neuropsychiatric, skin and peripheral vascular damage to have a significant positive impact on suPAR levels, whereas no separate organ system had significant impact on CRP.

Conclusion: This study demonstrates a strong association between suPAR and organ damage, but not with disease activity, in lupus. The high association between suPAR and leukocyte count could possibly explain why no difference in suPAR was found between patients and healthy blood donors. Analysis of suPAR may be a valuable clinical tool to assess disease outcome in SLE.

Disclosure: H. Enocsson, None; J. Wetterholm, None; T. Skogh, None; C. Sjöwall, None.

Elevated Plasma Levels of CXCL2 and CXCL10 Have Distinct Predictive Value in Systemic Lupus Erythematosus. Felipe Andrade1, Ehtisham Akhter2, Hong Fang3 and Michelle Petri1, 1The Johns Hopkins University School of Medicine, Baltimore, MD, 2Johns Hopkins University School of Medicine, Baltimore, MD

Background/Purpose: Serum levels of chemokines have been previously used as downstream markers of the interferon (IFN) pathway in SLE. CXCL2 (GROB) and CXCL10 (IP-10) have been found to be elevated in SLE (over controls) and in SLE with high type I IFN gene signature over controls (Bauer et al, 2006). CXCL2, however, may be an IFN-independent marker, in contrast to previous reports. We compared CXCL2 with CXCL10 (which is IFN-induced) over time in SLE, and determined the relationship with disease activity.

Methods: 25 SLE patients (84% female, 72% Caucasian, 28% African-American, mean age at baseline 48 ± 10 yrs) had CXCL10 and CXCL2 levels measured in plasma by ELISA at baseline and at follow-up visit 0.7 years (mean) later. Chemokine levels were defined as low (<150 ng/ml for CXCL10 and <100 ng/ml for CXCL2) or high (>150 ng/ml for CXCL10 and >100 ng/ml for CXCL2).

Results: Baseline high CXCL2 levels were associated with a history of proteinuria. High CXCL10 was associated with low C5 (p = 0.007), low C4 (p < 0.0001) and anti-dsDNA (p = 0.0094). The high CXCL10 group had a significant increase in SLEDAI at the second visit (2.4 to 4.5, p = 0.021). The high CXCL2 group had an increase in activity by both PGA (p = 0.02) and SLEDAI (p = 0.011), as well as lower C3 (p = 0.023) and lower C4 (p = 0.096) at the second visit. Urine prcr went up (0.3 to 0.7), but was not statistically significant.

Changes in Measures of Disease Activity by Chemokine High/Low

<table>
<thead>
<tr>
<th>CXCL10</th>
<th>Mean at baseline</th>
<th>p-value for change between groups</th>
<th>Mean at followup</th>
<th>Mean Change between baseline and followup</th>
<th>p-value for change within group</th>
<th>p-value for change between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>LG</td>
<td>Med (10.7–11.4)</td>
<td>0.48</td>
<td>0.14</td>
<td>0.04</td>
<td>0.44</td>
<td>0.05</td>
</tr>
<tr>
<td>HG</td>
<td>Med (10.7–11.4)</td>
<td>0.70</td>
<td>0.15</td>
<td>0.04</td>
<td>0.45</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Conclusion: We have previously shown that the BAFF gene expression correlates with same-day disease activity. We now can prove that BAFF gene expression predicts disease activity over the ensuing year. This supports BAFF/BLYS as a target for clinical intervention.

Disclosure: E. Zollar, None; H. Fang, None; J. Bienkowska, Biogen Idec; 3, N. Allaire, Biogen Idec; 3, S. Kalled, Biogen Idec; 3, M. Petri, HGS, 5, GlaxoSmithKline, 5, Medimmune, 5, UCB, 5, Anthera, 5, Pfizer Inc, 5, TEVA, 5.

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Conclusion: The ISM test accurately quantifies the bimodal blood Interferon Signature in SLE subjects. ISM high status was not associated with increased BILAG and SELENA-SLEDAI-defined disease activity. ISM status was observed to be stable over 36 weeks of longitudinal assessment. The ISM test may provide useful information in clinical trials of targeted therapies and in the understanding of disease heterogeneity in SLE.

Disclosure: B. C. Richardson, None; W. P. Kennedy, Genentech, Inc, 3, Roche Pharmaceuticals, 1, Merck, co.; J. C. Davis Jr, Roche Pharmaceuticals, 1, Genentech, Inc., 3; R. Maciuca, Roche Pharmaceuticals, 1, Genentech, Inc., 3; A. Morimoto, Roche Pharmaceuticals, 1, Genentech, Inc., 3; J. M. McBride, Roche Pharmaceuticals, 1, Genentech, Inc., 3; A. R. Abbas, Genentech, Inc, 3, Roche Pharmaceuticals, 1; T. W. Behrens, Roche Pharmaceuticals, 1, Genentech, Inc., 3; M. J. Townsend, Roche Pharmaceuticals, 1, Genentech, Inc., 3.

Background/Purpose: We report sustained improvement in 15 patients with corticosteroid dependent SLE who received a systematic regimen of rituximab and cyclophosphamide administered at months 0, 6, and 18. All patients had active SLE despite prior therapy. Five patients were male and 10 were female. Seven patients had biopsy proven DPGN. Three patients were Hispanic, 5 were Asian, 1 African American, and 6 Caucasian. All experienced a marked and sustained reduction in their corticosteroid dose with improvement in SLE, C4, HB, ESR, Cr, serum albumin and SLEDAI which persisted at month 60 following initiation of therapy (42 months following the last dose of these medications).

Methods: All patients received rituximab 750 mg/m² (max 1 gram) on day 1 and cyclophosphamide 750 mg/m² on day 2. This regimen was repeated on days 15 and 16. All patients received a further two doses of rituximab and cyclophosphamide at month 6 and two doses at month 18. Patients with active DPGN received additional doses of cyclophosphamide (750 mg/m²) at 6, 10, 14, and 18 weeks. The prednisone dosage was gradually decreased at the discretion of the treating physician. Because the data were nonparametric Wilcoxon signed rank tests were used for all statistical comparisons.

Results: Significant improvement occurred in prednisone dose, C3, C4, HB, ESR, Cr, serum albumin and SLEDAI which persisted (see chart). No patient experienced a disease flare requiring hospitalization. The mean SLEDAI score decreased from 8.929 to 1.917 after the first six months of therapy and remained low thereafter. Four patients are known to be ANA negative at month 36 following the initiation of treatment.

Conclusion: A specific 18 month regimen of systematically administered cyclophosphamide and rituximab led to sustained improvement in prednisone dosage, C3, C4, HB, ESR, Cr, serum albumin and SLEDAI which persisted at 60 months following initiation of therapy which was maintained 42 months following the completion of therapy.

Disclosure: T. J. A. Lehman, Genentech and Biogen IDEC Inc., 5; E. Baird, None; A. Ramanathan, None; R. Alperin, None; E. J. MacDermott, None; A. B. Adams, None; L. V. Barniestein, None; L. N. Moorthy, None.
Headache in Systemic Lupus Erythematosus (SLE): Results From a Prospective, International, Inception Cohort Study

John G. Hanly1 and Systemic Lupus International Collaborating Clinics. 1Dalhousie University and Capital Health, Halifax, NS, 2(SLICC)

Background/Purpose: Headache is common in SLE patients and in the general population. We examined the frequency, characteristics and attribution of headaches in a large, prospective, inception cohort of SLE patients and determined the association with global disease activity and health related quality of life.

Methods: An international network of 31 academic medical centers enrolled patients within 15 months of SLE diagnosis. Assessments occurred annually for up to 10 years for headache (5 types) and other neuropsychiatric (NP) events as per the ACR case definitions for 19 NP syndromes. Additional data were demographic and clinical variables, SLE global disease activity (SLEDAI-2K), SLICC/ACR damage index (SDI) and self-reported mental (MCS) and physical (PCS) component summary scores of the SF-36. Statistical analyses of time to first headache (all headaches and migraine only) were examined by linear regression models with generalized estimating equations to account for within patient correlation.

Results: Of the 1732 enrolled patients 89% were female with the following racial/ethnic distribution: Caucasian (48%), African (16%), Asian (16%), Hispanic (16%) and other (4%). At enrollment the mean (± SD) age was 34.6 ± 13.4 years, disease duration was 5.6 ± 4.8 months and followup was 3.8 ± 3.1 years. Mean SLEDAI-2K at enrollment was 4.0 ± 5.3 and SDI was 0.32 ± 0.78. Within the enrollment window (6 months pre-diagnosis to the enrollment visit) the proportion of patients with headache was 17.8% subdivided into: migraine (52.2%), tension (35.1%), intractable non-specific (6.5%), cluster (2.4%) and intracranial hypertension (0.9%). The estimated proportion of patients ever reporting a headache increased to 57% after 10 years (Kaplan-Meier estimate) with similar subset distribution. Only 2% of patients in 0.6% of assessments had “lupus headache” in SLEDAI-2K scores over the study. Headache was associated with other NP events as indicated by Hazard Ratio (HR) estimates (95% CI) for: aseptic meningitis 3.8 (1.2, 12.0), autonomic disorder 13.3 (3.3, 53.6), cerebrovascular disease 2.3 (1.5, 3.6), anxiety disorder 2.2 (1.5, 3.2) and mood disorder 2.1 (1.6, 2.7). Headache increased with rising SLEDAI-2K (excluding “lupus headache” variable). The estimated risk for any 5 unit increase in SLEDAI-2K corresponded to an increased with rising SLEDAI-2K (excluding “lupus headache” variable).

Conclusion: Headaches, particularly migraine and tension types, occur frequently among SLE patients and are associated with other types of NP events. Although the majority of headaches are not attributable to active lupus, they are associated with higher global SLE disease activity and lower self-reported health-related quality of life.

Disclosure: J. G. Hanly, None;

Endothelial Microparticles As a Biomarker for Endothelial Dysfunction in Active Systemic Lupus Erythematosus

Ben Parker1, Awal Zak2, M. Yvonne Alexander3 and Ian N. Bruce1. 1Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 2Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 3The University of Manchester, Manchester, United Kingdom, 4Arthritis Research UK Epidemiology Unit and NIHR Manchester Musculoskeletal Biomedical Research Unit, Manchester, United Kingdom

Background/Purpose: Systemic Lupus Erythematosus (SLE) is associated with an increased risk of clinical and subclinical cardiovascular disease (CVD) including endothelial dysfunction, in part due to systemic inflammatory disease activity. Endothelial microparticles (EMP) are membrane-bound subcellular particles produced by endothelial cells in response to a variety of activation triggers, including inflammatory cytokines and classic CVD risk factors. EMPs reflect endothelial damage and may correlate with measures of endothelial function, such as flow-mediated dilatation (FMD) of the brachial artery. EMPs may therefore serve as a biomarker for endothelial dysfunction in SLE. We aimed to: 1) compare EMP levels and FMD in patients with active SLE compared to controls; 2) assess change over time in EMP and FMD following improved disease control and 3) assess the correlation between EMPs and FMD.

Methods: Patients with active SLE (≥4 ACR criteria) were recruited and assessed at baseline and 4 months after a change in therapy. Disease activity (BILAG 2004 and SLEDAI 2K) and clinical features were recorded at each visit. Healthy age-matched controls were assessed once. FMD (%) of the brachial artery was measured using 2D ultrasound and automated edge-tracking software. EMPs were quantified (number/ml) using flow cytometry after incubating platelet- poor-plasma with the cell surface markers CD31, CD42b and Annexin-V. Events positive for annexin-V and CD31, and negative for CD42b, were classified as EMPs. Continuous data were compared using Mann-Whitney test, and Spearman’s Rank was used to correlate EMP levels with FMD.

Results: 27 patients with SLE (mean (SD) age 41.5 (14.1) yrs) and 22 controls (mean age (SD) 38.5 (9.3) yrs) underwent assessment of endothelial function. In SLE patients the mean (SD) SLEDAI-2K and total BILAG scores were 8.2 (5.5) and 16.9 (10.6) respectively. Endothelial-dependent FMD was significantly reduced in the SLE group compared to controls at baseline (median (IQR) FMD 1.63% (1.12, 3.32) vs. 5.40% (3.02, 8.57); p = 0.05). EMPs (n/ml) were significantly elevated in the SLE cohort compared to controls at baseline (median (IQR) 157,548/ml (59,906, 272,643) vs. 41,025 (30,179, 98,082); p = 0.003). In patients with paired results, disease activity significantly improved 4 months after a change in therapy (SLEDAI-2K 3.8 (3.4); BILAG 2004 score 6.9 (5.4); p = 0.001 and 0.003 vs. baseline respectively). The median (IQR) FMD improved over time (0.33% (–2.31, 4.1) vs. 3.19% (0.98, 5.09); p = 0.1), as did median (IQR) EMP levels (166,982/ml (59906, 278,775 vs. 55655 (29475, 188,659); p = 0.02). In the whole cohort, EMPs demonstrated a significant negative correlation with %FMD (correlation coefficient –0.42; p = 0.008). In SLE patients with paired data the correlation coefficient was –0.51 (p = 0.005).

Conclusion: Endothelial function is significantly impaired and EMPs are significantly elevated in young patients with active SLE compared to healthy controls. Both EMPs and FMD improve over time, following a reduction in disease activity. EMPs also correlate with FMD, and may serve as a useful biomarker of endothelial damage/dysfunction and CVD risk in SLE.

Disclosure: B. Parker, None; A. Zak, None; M. Y. Alexander, None; I. N. Bruce, None.

Excess Health Care Utilization Prior to Diagnosis of Systemic Lupus Erythematosus in England

Amy Steffy1, Trung N. Tran1, Jie Li1 and Herve Caspard2. 1Medimmune, Gaithersburg, MD, 2Medimmune LLC, Gaithersburg, MD

Background/Purpose: Systemic Lupus Erythematosus (SLE) is a chronic auto-immune disease resulting in significant excess morbidity and health care utilization. Since time of disease onset is often unknown, we hypothesized that there is an excess of health care utilization prior to diagnosis of SLE cases (but after disease onset).

Methods: We identified a cohort of incident cases of SLE among individuals documented in the Clinical Practice Research Datalink (CPRD) and linked with Hospital Episode Statistics (HES). CPRD is a database of anonymized longitudinal medical records from primary care from over 600 practices in the United Kingdom. HES is a database documenting all admissions to the National Health System hospitals in England that can be linked with CPRD since 1997. All individuals documented in CPRD and HES prior to October 1st, 2010 and aged 18 years or older were retained in the analysis.

Patients with SLE were identified as individuals with at least one relevant diagnosis code in CPRD or HES (list of codes available upon request).

Incident cases were defined as patients with at least 12 months of registration in CPRD prior to the date of first diagnosis. All incident SLE cases were matched with up to 5 controls registered in CPRD and linked with HES at the time of and during the one year prior to first diagnosis of the SLE case, and matched by age, gender, and practice. The index date for the controls is the index date (or date of first diagnosis) of the matched case.

Results: The proportions of individuals in the controls group who were ever hospitalized at least once, had an encounter with a health care practitioner (HCP) or were treated with corticosteroids during each 6 month period over the 3 years prior to the index date remained relatively stable (Table 1).

Disclosure: None;
The proportions of SLE cases who were hospitalized at least once or were treated with corticosteroids per 6 month period grew from 14% to 26% and from 20% to 33%, respectively, over the 3 years prior to the date of incident diagnosis. The proportion of patients who had at least one encounter with a HCP grew also from 73% to 81%.

There is a significant excess of health care utilization in SLE cases versus matched controls during the 3 years prior to the date of incident diagnosis. The excess was still significant between M.-36 and M.-31, when the proportions of individuals hospitalized at least once and treated with corticosteroids were twice as high among SLE cases than in matched controls: 14% versus 7% and 20% versus 10%, respectively.

**Conclusion:** Excess health care utilization prior to incident diagnosis of SLE should be taken into account to assess the total burden of disease. This analysis suggests that there is an excess health care utilization for at least 3 years prior to diagnosis.

Disclosure: A. Steffey, None; T. N. Tran, None; J. Li, None; H. Caspard, None.

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Control of Hypertension and Hypercholesterolemia Is Not Associated with a Decreased Rate of Atherosclerotic Vascular Events in Patients with Systemic Lupus Erythematosus

Joanna Ueng, D. D. Gladman, Dominique Ibanez and Murray B. Urowitz. Toronto Western Hospital and University of Toronto, Toronto, ON

**Background/Purpose:** Systemic lupus erythematosus (SLE) is a chronic autoimmune disease of unknown etiology. It has been shown that patients with SLE are at a higher risk for premature atherosclerosis because of their disease and its treatment. Hypertension and hypercholesterolemia are treatable risk factors for the prevention of coronary artery disease in these patients. The purpose of this study was to determine if controlling hypertension and hypercholesterolemia is associated with a decreased rate of atherosclerotic vascular disease in patients with SLE who have been followed prospectively in a long term study.

**Methods:** SLE patients registered in the Lupus Clinic within 1 year of diagnosis between 1985 and 2002 were studied. Thirty-one patients with atherosclerotic vascular events (AVEs), defined as myocardial infarction, angina, pacemaker insertion, coronary artery bypass surgery, transient ischemic attack, stroke, or peripheral vascular disease, were identified from the computerized database. AVEs were subsequently confirmed by a detailed chart review. Controls, defined as having no history of AVEs, were matched to cases based on age at SLE diagnosis, gender, decade of diagnosis. The proportion of patients who had at least one encounter with a HCP was 6.9%

**Table 1.** Health care utilization three years prior to diagnosis of SLE or prior to index date of the matched controls

<table>
<thead>
<tr>
<th>Matched Controls</th>
<th>M.-36/M.-31</th>
<th>n=3,954</th>
<th>M.-30/M.-25</th>
<th>n=4,344</th>
<th>M.-24/M.-19</th>
<th>n=4,752</th>
<th>M.-18/M.-13</th>
<th>n=5,139</th>
<th>M.-12/M.-7</th>
<th>n=5,557</th>
<th>M.-6/M.0</th>
<th>n=5,687</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalization</td>
<td>7%</td>
<td>8%</td>
<td>9%</td>
<td>8%</td>
<td>9%</td>
<td>9%</td>
<td>8%</td>
<td>9%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Treatment with</td>
<td>10%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Encounter with</td>
<td>HCP</td>
<td>75%</td>
<td>74%</td>
<td>75%</td>
<td>75%</td>
<td>74%</td>
<td>75%</td>
<td>75%</td>
<td>73%</td>
<td>73%</td>
<td>73%</td>
<td>73%</td>
</tr>
<tr>
<td>SLE Cases</td>
<td>M.-36/M.-31</td>
<td>n=973</td>
<td>M.-30/M.-25</td>
<td>n=1,824</td>
<td>M.-24/M.-19</td>
<td>n=1,996</td>
<td>M.-18/M.-13</td>
<td>n=1,126</td>
<td>M.-12/M.-7</td>
<td>n=1,159</td>
<td>M.-6/M.0</td>
<td>n=1,159</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>14%</td>
<td>16%</td>
<td>16%</td>
<td>17%</td>
<td>20%</td>
<td>26%</td>
<td>20%</td>
<td>28%</td>
<td>26%</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Treatment with</td>
<td>corticosteroids</td>
<td>20%</td>
<td>21%</td>
<td>25%</td>
<td>21%</td>
<td>27%</td>
<td>23%</td>
<td>33%</td>
<td>26%</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>Encounter with</td>
<td>HCP</td>
<td>73%</td>
<td>73%</td>
<td>73%</td>
<td>75%</td>
<td>76%</td>
<td>81%</td>
<td>81%</td>
<td>75%</td>
<td>76%</td>
<td>77%</td>
<td>78%</td>
</tr>
</tbody>
</table>

**Results:** 30 patients with AVEs and 60 matched controls without a history of AVEs were included. Average disease duration at time of AVE for cases was 6.9 ± 4.8 years, and matched disease duration for controls was 6.1 ± 4.2 years (p=0.045). Successful control of hypertension and hypercholesterolemia are shown in Table 1, according to risk factor profile.

**Table 1.** Number of patients with successful control of hypertension and hypercholesterolemia

<table>
<thead>
<tr>
<th>Risk factor profile</th>
<th>Cases (n=30)</th>
<th>Controls (n=60)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypertension and hypercholesterolemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both success</td>
<td>7 (24%)</td>
<td>4 (6.7%)</td>
<td>0.001</td>
</tr>
<tr>
<td>BP only success</td>
<td>6 (20%)</td>
<td>4 (6.7%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Cholesterol only success</td>
<td>3 (10%)</td>
<td>2 (3.3%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Neither success</td>
<td>6 (20%)</td>
<td>4 (6.7%)</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Hypertension only</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BP success</td>
<td>4 (13%)</td>
<td>2 (3.3%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Unsuccessful</td>
<td>6 (20%)</td>
<td>4 (6.7%)</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Hypercholesterolemia only</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol success</td>
<td>1 (3.3%)</td>
<td>0 (0%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Unsuccessful</td>
<td>5 (17%)</td>
<td>4 (6.7%)</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Neither hypertension nor hypercholesterolemia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M.6–to D.0</td>
<td>3 (10%)</td>
<td>4 (6.7%)</td>
<td>0.18</td>
</tr>
</tbody>
</table>

**Conclusion:** Hypertension and hypercholesterolemia are infrequently controlled in patients with SLE. Inadequate control of these risk factors is seen in both patients who have had an AVE and those who have not, suggesting that other risk factors or protective factors must play a role in the development of AVEs.

Disclosure: J. Ueng, None; D. D. Gladman, None; D. Ibanez, None; M. B. Urowitz, None.

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The Interferon Alpha Gene Signature Is Not Associated with Nor Does It Predict Progression of Coronary Artery Calcium (CAC) or Carotid Intima-Media Thickness (IMT) in Systemic Lupus Erythematosus (SLE)

Adnan Kiani, Hong Fang, Jie Xu, Ehtisham Akhter and Michelle Petri. Johns Hopkins University School of Medicine, Baltimore, MD

**Background/Purpose:** Accelerated atherosclerosis is the major cause of late mortality in SLE. Interferon alpha plays a role in atherosclerosis by deleting endothelial progenitor cells and causing endothelial dysfunction. NZM and Apo E –/– mice exposed to IFN-alpha develop platelet activation and thrombosis. Loss of Type I interferon receptor signaling improves endothelium dependent vasorelaxation, endothogenous progenitor cell numbers and function and neangiogenesis. We investigated whether the interferon alpha gene signature would predict changes in subclinical measures of atherosclerosis in human SLE over 2 years.

**Methods:** 70 SLE patients, 91% female, 60% Caucasian, 34% African-American, 6% others, mean age 43 ± 10 yrs had coronary artery calcium (CAC) measured by helical CT and carotid intima-media thickness (IMT) in Systemic Lupus Erythematosus (SLE). Interferon alpha gene signature was determined in peripheral blood RNA using Affymetrix chips.

**Results:** At baseline, there was no difference in coronary calcium or IMT progression with low vs. high interferon gene signature. Patients with high interferon signature had lower CAC scores at baseline and 2 years but the difference between the 2 groups was not statistically different.

**Table 1.** Changes in coronary artery calcium (CAC) and carotid intima-media thickness (IMT)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean at baseline</th>
<th>Mean after 2 years</th>
<th><em>p</em>-value for change within group*</th>
<th><em>p</em>-value for change between groups*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(CAC score)</td>
<td>3.15 (1)</td>
<td>3.15 (1)</td>
<td>0.88</td>
<td>0.88</td>
</tr>
<tr>
<td>Low IFN</td>
<td>1.48</td>
<td>1.69</td>
<td>0.21</td>
<td>0.38</td>
</tr>
<tr>
<td>High IFN</td>
<td>0.90</td>
<td>0.81</td>
<td>-0.09</td>
<td>0.68</td>
</tr>
<tr>
<td>Carotid IMT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low IFN</td>
<td>0.58</td>
<td>0.67</td>
<td>0.10</td>
<td>0.52</td>
</tr>
<tr>
<td>High IFN</td>
<td>0.56</td>
<td>0.63</td>
<td>0.07</td>
<td>0.0008</td>
</tr>
</tbody>
</table>

*P-value when age, gender, and ethnicity are controlled
Conclusion: In contrast to in vitro and murine studies which clearly show a role of interferon alpha in atherosclerosis, our study failed to find any difference in coronary calcium progression or carotid IMT progression over 2 years, comparing low vs. high signature patients. In fact, the high interferon gene signature group had no progression in coronary calcium over 2 years. Although interferon could still be acting locally at the level of the coronary artery, our study suggests that we must look elsewhere to identify a genetic biomarker of atherosclerosis in SLE.

Disclosure: A. Kiani, None; H. Fang, None; J. Xu, None; E. Akhter, None; M. Petri, None.

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Zostavax Vaccine Is Safe in Lupus Patients with Low Disease Activity.

Eliza F. Chakravarty1, Joel M. Guthridge2, Joann T. Merrill3, Abigail Cogman4, Tiny Powe1, Virginia C. Roberts1 and Judith A. James2. Oklahoma Medical Research Foundation, Oklahoma City, OK, 3OMRF, Oklahoma City, OK, 4Oklahoma Medical Research Foundation and Oklahoma University Health Sciences Center, Oklahoma City, OK

Background/Purpose: The Zostavax vaccine was FDA approved in 2006 for the prevention of herpes zoster in healthy adults over age 50. Because it is a live-attenuated vaccine, concerns exist regarding the safety of vaccination in individuals with autoimmune diseases and those on immunosuppressive therapies. We sought to evaluate the safety and immunogenicity of Zostavax vaccination in a group of SLE patients compared to healthy control subjects.

Methods: Ten SLE patients and ten healthy control subjects, all older than 50 years, were recruited to receive Zostavax vaccination followed by 12 weeks of follow-up for safety and immunogenicity. All study subjects had serologic confirmation of primary varicella infection before vaccination. SLE patients had mild, stable disease, with SLEDAI ≤ 4 at enrollment. SLE medications were restricted to azathioprine, methotrexate, anti-malarials, and biologic therapies within 6 months of enrollment.

Each subject received Zostavax subcutaneously in the deltoid region during the baseline visit. Follow-up visits were scheduled at 2, 6, and 12 weeks following vaccination for safety and efficacy assessments. The primary safety endpoint was development of herpetiform or bullous lesions at the injection site at any time. Exclusion criteria included history of any varicella vaccination, herpes zoster within 5 years, and use of mycophenolate mofetil, cyclophosphamide or biologic therapies within 6 months of enrollment.

Results: All study participants were women. Baseline demographics are outlined in Table 1. Among SLE patients, mean baseline SLEDAI was 1.1 (range 0–2). Four patients were receiving prednisone (range 2.5–10 mg daily), two, methotrexate, and seven hydroxychloroquine. All subjects received Zostavax vaccination and have completed at least 6 weeks of follow-up, and 13 have completed the 12 week study. No episodes of herpes zoster, bulliform lesions at the injection site, serious AEs, or SLE flares occurred during the study. The SLEDAI score at six weeks was 0.2. Proportions of leukocyte subsets or plasmacytoid dendritic cells were not significantly changed following vaccination in either group. Functional varicella response cellular assays will be performed on batches samples once all 12-week visits have been completed.

Table 1. Demographic and Safety Outcomes

<table>
<thead>
<tr>
<th>SLE</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>10</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>60.5 (5.4)</td>
</tr>
<tr>
<td>European American</td>
<td>7</td>
</tr>
<tr>
<td>African American</td>
<td>3</td>
</tr>
<tr>
<td>IVDU</td>
<td>4</td>
</tr>
<tr>
<td>Taking prednisone</td>
<td>4</td>
</tr>
<tr>
<td>mean daily dose</td>
<td>6.9 mg</td>
</tr>
<tr>
<td>Taking HCO</td>
<td>7</td>
</tr>
<tr>
<td>Taking MTX</td>
<td>2</td>
</tr>
<tr>
<td>Baseline SLEDAI</td>
<td>1.1 (0.99)</td>
</tr>
<tr>
<td>BSR (any), n</td>
<td>3</td>
</tr>
<tr>
<td>Erythema, tenderness</td>
<td>3</td>
</tr>
<tr>
<td>Vascular</td>
<td>0</td>
</tr>
<tr>
<td>6 week SLEDAI</td>
<td>1.3 (1.2)</td>
</tr>
<tr>
<td>mean Δ SLEDAI</td>
<td>0.2 (1.5)</td>
</tr>
<tr>
<td>SLE flare</td>
<td>0</td>
</tr>
</tbody>
</table>

Conclusion: Zostavax vaccination appears to be well tolerated in this cohort of patients with mild SLE on mild to moderate immunosuppressive therapy.

Disclosure: E. F. Chakravarty, None; J. M. Guthridge, None; J. T. Merrill, None; A. Cogman, None; T. Powe, None; V. C. Roberts, None; J. A. James, None.

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Urinary Heparanase Activity Is Elevated in Patients with Lupus Nephritis and Correlate with Protein Excretion.

Ki-Jo Kim1, In-Woon Baek1, Chong-Hyun Yoon3, Wan-Uk Kim1 and Chul-Soo Cho1. 1College of Medicine, The Catholic University of Korea, Seoul, South Korea, 3College of Medicine, The Catholic University of Korea, Seoul, South Korea, 1College of Medicine, The Catholic University of Korea, Suwon, South Korea

Background/Purpose: The heparan sulphate proteoglycans (HSPGs) in the glomerular basement membrane (GBM) play an important role in the charge-selective permeability of the glomerular filter. The b-D-endolygosidase heparanase has been proposed to be important in the pathogenesis of proteinuria by selectively degrading the negatively charged side chains of HSPGs within the GBM in various forms of glomerulonephritis. We evaluated plasma and urinary activity of heparanase and determined association between its levels and proteinuria in patients with lupus nephritis.

Methods: Plasma from 86 patients with systemic lupus erythematosus (SLE) and 24 normal healthy subjects were collected. The clinical and laboratory data of the patients were obtained at the time of sampling. Forty six patients had a history of lupus nephritis and their urine was also collected. Proteinuria was defined as more than 500 mg/24h or spot urine protein/creatinine ratio > 0.5. Heparanase activity of plasma and urine was determined by a commercially available kit.

Results: Plasma heparanase activity was significantly elevated in SLE patients compared to healthy controls (734.9 ± 91.1 vs. 203.6 ± 87.1 mIU/ml, p = 0.038), but its activity was not different between patients with lupus nephritis and those without (743.3 ± 105.3 vs. 722.3 ± 166.1 mIU/ml, p = 0.915). However, urinary heparanase activity was significantly elevated in SLE patients with lupus nephritis compared to those without lupus nephritis and healthy controls (1297.7 ± 200.5 vs. 337.5 ± 35.2 and 203.6 ± 87.1 mIU/ml, p = 0.046 and 0.026, respectively). Thirty six patients with lupus nephritis showed significant proteinuria and urinary heparanase activity of them was significantly elevated compared with those of patients without proteinuria (397.0 ± 245.3 vs. 194.6 ± 122.0 mIU/ml, p = 0.006). Importantly, urinary heparanase activity was positively correlated with protein excretion (r = 0.381, p = 0.003). Moreover, urinary heparanase activity showed an inverse correlation with C3 complement level and complement haemolytic activity (CH50) (r = −0.495, p = 0.002 and r = −0.565, p < 0.001) and had a tendency to associate negatively with C4 complement levels (r = −0.299, p = 0.072).

Conclusion: Urinary heparanase activity was elevated in patients with lupus nephritis and reflect the urinary protein excretion, suggesting a potential role in the pathogenesis of proteinuria in lupus nephritis.

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Inflammatory Biomarkers of Atherosclerosis and Oxidative Stress Are Associated with Disease Flare in SLE.

Maureen A. McMahon1, Jennifer M. Grossman1, Brian Skaggs1, Elaine Lourenco1, Cheryl Lee1, Lori Sahakian1, Grossman1, Brian Skaggs1, Elaine Lourenco1, Cheryl Lee1, Lori Sahakian1, John D. FitzGerald2, Christina Charles-Schoeman3, Alan H. Gorn1, George A. Karpouzas4, Michael H. Weissman1, Michael J. Wallace1, Weiting Chen1 and Bevra H. Hahn1. 1UCLA David Geffen School of Medicine, Los Angeles, CA, 2Harbor-UCLA Medical Center, Torrance, CA, 3Cedars-Sinai Medical Center, Los Angeles, CA

Background/Purpose: Although our current serologic measures of disease activity are useful for predicting flare in some patients, other patients experience disease flare in the absence of fluctuations in complement or antibody titers. We previously reported that novel inflammatory biomarkers of oxidative stress and endothelial activation, including pro-inflammatory HDL (pHDL), elevated leptin, and soluble tumor necrosis factor-like weak inducer of apoptosis (sTWEAK), independently confer increased risk for carotid artery plaque (ATH). We hypothesized that biomarkers of ATH are reflective of alternate pathways driving inflammation and disease activity in SLE, and will also be associated with increased non-ATH disease flares.
**Methods:** We retrospectively calculated longitudinal disease activity and flare measurements for 204 SLE women from our “Biomarkers of Atherosclerosis in SLE” cohort. SELENA-SLEDAI disease activity measures were calculated for each patient visit in the 12 month period following their baseline ATH biomarker assessment. Mild/moderate and severe flares were categorized at each visit using the SELENA flare tool. Antioxidant function of HDL was measured as the change in fluorescence quenching of Rose Bengal by oxidation of HDL by LDL in the presence or absence of test HDL. Plasma leptin, sTWEAK, and Lp(a) were measured in the baseline blood samples using ELISA (R&D Biosystems). Homocysteine was measured in the UCLA clinical labs by Fluorescence Polarization Immunoassay.

**Results:** 57.4% of SLE subjects experienced a mild to moderate flare and 22.5% experienced a severe flare in the 12 months following study entry. In univariate analysis, high sTWEAK and Lp(a) were positively associated and C3 levels were inversely associated with mild to moderate SLE flares. High leptin and high homocysteine were positively associated with severe SLE flares. In multivariate analysis controlling for lupus medications and other potential confounders, high levels of sTWEAK were associated with 2.3 fold increased odds ratio (OR) for mild to moderate disease flare (p=0.02), and high leptin (OR 5.4, p=0.04), homocysteine (OR 5.8, p=0.02), and baseline prednisone dose (OR 1.1, p=0.001) were associated with severe flare (TWEAK trended towards association, OR 2.3, p=0.08). When we substituted our combined ATII biomarker variable for individual biomarkers, patients with baseline high risk scores had 6.7 fold increased odds for experiencing a severe flare in the subsequent year, and a shorter time to severe flare (Hazard ratio for high PREDICTS score 3.1, p=0.01).

**Conclusion:** In conclusion, many of our biomarkers of interest for the progression of ATH in SLE may also have implications for overall progression of disease flares. A panel of atherosclerosis biomarkers may help identify SLE patients at risk for both cardiovascular and lupus disease related flares.

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**Risk Factors Associated with Early Central Nervous System Damage Detected Through Diffusion Tensor Imaging (DTI) in Patients with Systemic Lupus Erythematosus.** Paola Tomietto1, Federica Casagrande2, Maja Ukmar3, Luca Weis2, Pia Morassi4, Rita Moretti2, Gianni Biolo2, Carlo Ospedali Riuniti di Trieste, Trieste, Italy

**Methods:** 20 consecutive SLE patients underwent a clinical evaluation and neuropsychological battery and pychiatric tests (HADS). All the patients and 14 healthy controls underwent MRI examination on a 1.5T magnet with a standard protocol for cMRI and DTI sequences. Region of interest (ROI) were placed symmetrically on normal appearing white matter (NAWM) in 12 areas (frontal and parietal WM, amygdala, corpus callosum, middle cerebellar peduncles). Mean diffusivity (MD) and fractional anisotropy (FA) were calculated bilaterally. ROI relevant to distinguish patients with NPSLE vs patients without and controls were selected on the basis of the receiver operating characteristic (ROC) curve analysis. SLEDAI, SLICC-DI, generic cardiovascular risk factors, positivity for Raynaud’s phenomenon, livado reticularis, cutaneous vasculitis, aPL, anti-RNP and anti-DNA were determined for all the patients and included as independent variables in several stepwise regression analysis to determine which of them affected changes in FA/MD in NAWM in an independent way.

**Results:** Measured of MD at the level of frontal right WM, corpus callosum and right middle cerebellar peduncle and of FA in left middle cerebellar peduncle showed moderate accuracy (AUC=0.71) in distinguishing SLE patients and healthy controls, while MD and FA of right corpus callosum and FA in right amygdala in differentiating patients with and without NPSLE, according to the clinical classification (AUC=0.73). Among cardiovascular risk factors, diabetes, smoking and hypertension resulted as independent factors affecting MD and FA in corpus callosum bilaterally; hypertension was associated also to changes in FA and MD of corpus callosum. Among SLE-related factors, aPL, anti-DNA, SLEDAI, SLICC-DI, cutaneous vasculitis, previously reported as related to NPSLE, are associated to changes of MD and FA in the corpus callosum as well as in the amygdala. These data, if confirmed, suggest a probable multifactorial pathogenesis of white matter abnormalities in SLE and underline the possible role of DTI in detecting early SNC damage.

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Peripheral Neuropathy Due to Systemic Lupus Erythematosus (SLE) Itself: Incidence, Disease Risk Factors and Outcome. Simone Fargetti1, Samuel G. Shinji1, Sandra G. Pasoto1, Ana L. Calich1, Eloisa Bonfa3 and Eduardo F. Borba1. University of Sao Paulo, Sao Paulo, Brazil, 2Faculdade de Medicina da Universidade de Sao Paulo, Sao Paulo, Brazil, 3University of Sao Paulo, Sao Paulo, Brazil

**Background/Purpose:** Peripheral neuropathy (PN) solely attributable to SLE itself is difficult to define since most of these patients are exposed to several other conditions that may cause this manifestation. The aim is to determine characteristics and outcome of PN attributed exclusively to SLE and its possible association with clinical/laboratorial features in a large cohort.

**Methods:** SLE patients (ACR 1997) with PN were identified from our Lupus Outpatient Clinic computerized database of 1038 patients. Only patients with definitive PN proved by electroneuromyography were included. Exclusion criteria were conditions related to PN: diabetes mellitus, alcohol consumption, use of any drug related to neuropathy (thalamidines, statins, etc.), thyroid disease, infection, cancer, vitamin B12 deficiency, renal or hepatic failure, and other autoimmune disease (antiphospholipid syndrome, Sjogren’s syndrome, etc.). Medical records were extensively reviewed and included clinical/laboratorial data, treatment, and evolution. Each SLE patient with PN [n=44] was compared with 2 SLE patients without PN (controls) that were age- and sex-matched and had similar disease duration.

**Results:** PN exclusively attributed to SLE was identified in 22 patients (2.1%). The mean age (34.4±11.6 vs. 33.9±9.6 years, p=0.85) and disease duration (9.2±7.7 vs. 9.9±6.8 years, p=0.73) of PN were similar to controls. The interval between SLE onset and PN diagnosis was 4.9±5.7 years and the mean SLEDAI scores was higher in PN patients (5.4±7.6 vs. 1.8±2.9, p=0.001). The most common pattern on electroneuromyography was sensorimotor polyneuropathy of lower limbs (50%), followed by mononeuropathy (26.9%), and polyradiculoneuropathy (15.3%). PN was associated to hematological involvement (72.7% vs. 43.2%, p=0.036), leukopenia (50% vs. 20.5%, p=0.022), lymphopenia (68.2% vs. 29.5%, p=0.004), cutaneous vasculitis (54.5% vs. 22.7%, p=0.014), and anti-Sm (50% vs. 15.9%, p=0.007). Multivariate analysis revealed that PN was related to anti-Sm (OR=5.36; 95%CI 1.37–20.99) and cutaneous vasculitis (OR=4.97; 95%CI 1.23–20.08). All SLE patients received corticosteroids, most of them associated with immunosuppressive drug (59% cyclophosphamide; 31.8% azathioprine). After immunosuppressive therapy, 63.6% improved of neurological symptoms and 31.8% remained stable.

**Conclusion:** Our study suggested that PN attributed to SLE itself is rare in the absence of other conditions and seems to be strongly associated to anti-Sm antibodies and cutaneous vasculitis. A favorable outcome with immunosuppressive therapy is observed in most of SLE patients with this neurological manifestation.

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The Effects of Co-Existing Proliferative Histopathology On Membranous Lupus Nephritis. Jennifer L. Graybill, Catarina Vila-Inda, Chaim Putterman and Irene Blanco. Albert Einstein College of Medicine, Bronx, NY

Background/Purpose: Lupus nephritis (LN) affects up to 60% of SLE patients and is worse in minority communities. Traditionally membranous LN confers a better prognosis than proliferative, but a significant number of patients do develop renal failure. Moreover, mixed membranous and proliferative histology is not uncommon. To determine if co-existing proliferative lesions worsen the prognosis of membranous disease, we studied SLE patients who underwent renal biopsy at a large tertiary center.

Methods: We analyzed all biopsies with classes: III–V, IV–V and V from January 1997–December 2011, and confirmed that all patients met ≥4/11 ACR SLE criteria. We collected baseline demographic and laboratory information at the time of biopsy as well as medications given. Our composite endpoint was the development of end stage renal disease (ESRD) requiring dialysis and/or death.

Results: Of the 202 patients included, 81.3% were female and the median age was 30.5y. The predominant race was black (54.5%), followed by Hispanic (37.1%) and 8.4% were another race/ethnicity. There was no significant difference between the groups in age, gender or disease duration.

123 patients had proliferative LN (Class III or IV), 55 had membranous LN (Class V, M), and 24 had mixed disease (P+M). Black patients were more likely to have class V (p=0.02). Creatinine was higher in P (p<0.01) but there was no difference between M or P+M (p=0.12). There was no difference in median protein to creatinine ratios, serum albumin, and BP between groups.

62/202 (31%) patients reached the composite end point: 41.5% P, 14.6% M, and 12.5% P+M. Black patients were Hispanic (37.1%) and 8.4% were another race/ethnicity. There was no difference in median protein to creatinine ratios, serum albumin, and BP between groups.

In multivariate models, M as compared to P had improved survival (HR=0.31, p=0.02) but there was no longer a significant difference between P and P+M (p=0.18) As in the univariate analysis, age (p=0.03), protein to creatinine ratio (p=0.03), and creatinine at biopsy (p<0.01) were all associated with a decreased risk of survival.

Conclusion: At first glance membranous with or without proliferative lesions on histology have a similar prognosis. However, in multivariate models the difference between proliferative and mixed disease was no longer seen when adjusted for age, protein to creatinine ratio and creatinine at biopsy. Therefore proliferative lesions alone on biopsy do not confer a worse prognosis for membranous disease rather it is likely disease severity itself that drives prognosis.

Disclosure: J. L. Graybill, None; C. Vila-Inda, None; C. Putterman, None; I. Blanco, None.

Missed Work Days in Systemic Lupus Erythematosus. Jie Xu, Hong Fang and Michelle Petri. Johns Hopkins University School of Medicine, Baltimore, MD

Background/Purpose: Indirect costs are part of the medical and financial burden of SLE. These costs are easy to understand because a significant portion of this economic loss results from lost productivity in the workforce (Clarke A, et al. Am J Manag Care, 2001; 7(16):S496-S501.). This effect is magnified by the population typically affected by SLE, young women, who may suffer disabilities that affect the most productive years of life (Panopalis P, et al. Arthritis & Rheumatism, 2008; 59(12):1768–1795.). We attempted to identify both demographic and disease variables that may serve as predictors of this loss in work-related activities.

Methods: The medical resource use questionnaire was distributed to SLE patients in the Hopkins Lupus Cohort that covered the last 3 months before the baseline visit and then at the following two quarterly clinic visits. 199 SLE patients (89% female, 58% Caucasian, 31% African-American, 11% other ethnicities, mean age at baseline 44±11 years) were included in the analysis. Exclusion criteria were diagnosis with lupus less than 6 months ago, age younger than 18 or older than 75, pregnant at baseline, and active HIV patients. Those who were unemployed were also excluded.

Results: The mean number of missed work days over 6 months was 2.6 days (range 0 to 39). Predictors of missed work days are shown in Table 1. The two significant predictors were low family income (p=0.019) and a history of missed work days in the 3 months before the study year (p<0.0001). A multivariate linear regression model for number of missed work days was then constructed (Table 2). In the multivariate model, disease activity (mean SLEDAI) was not associated with the number of missed work days. Renal activity (urine protein/cre ratio) had a borderline association. Family income was not predictive.

Table 1. Predictors of missed work days (any vs none) - univariate analysis.

<table>
<thead>
<tr>
<th>predictor</th>
<th>number of missed work days</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at baseline (years)</td>
<td>≤ 40 (n=66)</td>
<td>36 (41.9)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male (n=22)</td>
<td>71 (40.1)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>African-American (n=61)</td>
<td>29 (47.5)</td>
</tr>
<tr>
<td>Family income ($)</td>
<td>$&lt; 50K (n=75)</td>
<td>38 (50.7)</td>
</tr>
<tr>
<td>Education (years)</td>
<td>&lt; 12 (n=77)</td>
<td>42 (33.9)</td>
</tr>
<tr>
<td>Use of prednisone at baseline</td>
<td>No (n=126)</td>
<td>46 (35.6)</td>
</tr>
<tr>
<td>PGA at baseline</td>
<td>≤ 1 (n=176)</td>
<td>67 (38.1)</td>
</tr>
<tr>
<td>Mean PGA over year</td>
<td>≤ 1 (n=170)</td>
<td>65 (38.2)</td>
</tr>
<tr>
<td>Mean SLEDAI over year</td>
<td>≤ 2 (n=140)</td>
<td>54 (38.6)</td>
</tr>
<tr>
<td>Anti–dsDNA at baseline</td>
<td>Negative (n=148)</td>
<td>58 (39.2)</td>
</tr>
<tr>
<td>C3 or C4 at baseline</td>
<td>Low (n=40)</td>
<td>15 (37.5)</td>
</tr>
<tr>
<td>Increased ESR at baseline</td>
<td>No (n=117)</td>
<td>46 (39.3)</td>
</tr>
<tr>
<td>Urine Pr-Cr ratio at baseline</td>
<td>≤ 0.5 (n=178)</td>
<td>70 (39.3)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>No (n=187)</td>
<td>72 (35.8)</td>
</tr>
<tr>
<td>BMI at baseline</td>
<td>&lt; 30 (n=55)</td>
<td>27 (49.1)</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>&lt; 32 (n=57)</td>
<td>26 (45.6)</td>
</tr>
<tr>
<td>Baseline history of missed work days</td>
<td>No (n=108)</td>
<td>22 (20.4)</td>
</tr>
</tbody>
</table>

1PGA: Physician’s global assessment (0-3 scale)
Table 2. Multivariate Linear Regression Model

<table>
<thead>
<tr>
<th>Effect on number of missed work days</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at baseline (per 10 years)</td>
<td>0.03 ± 0.04</td>
</tr>
<tr>
<td>Ethnicity (African–American)</td>
<td>0.19 ± 0.91</td>
</tr>
<tr>
<td>Family income (&lt;$50K)</td>
<td>0.29 ± 0.85</td>
</tr>
<tr>
<td>Mean SLEDAI (per unit)</td>
<td>0.05 ± 0.20</td>
</tr>
<tr>
<td>Urine Pr.Cr ratio at baseline (per unit)</td>
<td>1.23 ± 0.66</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.81 ± 1.88</td>
</tr>
<tr>
<td>Vitamin D at baseline</td>
<td>-0.04 ± 0.03</td>
</tr>
<tr>
<td>Number of missed work days at baseline</td>
<td>0.67 ± 0.11</td>
</tr>
</tbody>
</table>

Conclusion: This study found that disease activity (either by physician’s global assessment or SLEDAI) is not predictive of missed work days. However, renal lupus had a borderline association. Demographic factors (sex, ethnicity, income) were not significant in the multivariate model. The most important factor remains a pattern of past history of missed work days.

Disclosure: J. Xu, None; H. Fang, None; M. Petri, HGS, 5, GlaxoSmithKline, 5, Medimmune, 5, UCB, 5, Anthera, 5, Pfizer Inc, 5, TEVA, 5.

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Adherence to Adult Treatment Panel III Guidelines for Systemic Lupus Patients. Matthew Basaga and Lisabeth Scalzi. Penn State Univ/Hershey, Hershey, PA

Background/Purpose: The National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) has provided education and guidance for decades on the management of hypercholesterolemia. Systemic lupus erythematosus (SLE) patients are in an intermediate risk category for cardiovascular disease. We examined a SLE cohort to examine whether patients were being treated according to ATP III guidelines.

Methods: Data from 133 patients with SLE was examined to see whether ATP III guidelines were being adhered to. All patients were free of any known clinical heart disease. Available information that was used included traditional CVD risk factors (a history (or present use) of cigarettes, hypertension (HTN) (BP ≥ 140/90 mmHg or on an antihypertensive agent for the purpose of lowering blood pressure), HDL cholesterol < 40 mg/dL, family history of premature CVD, diabetes (self reported history or a fasting blood glucose of >126 mg/dL), fasting cholesterol profiles, and age (men ≥ 45 years; women ≥ 55 years). We then compared the proportion of SLE patients who met ATP III criteria for initiation of lipid therapy and who reported ever having been/or were presently on therapy to those who had never been on a lipid lowering medication. We evaluated group differences between those patients who have been treated versus those who have not using t-tests and chi-square analyses.

Results: The mean age of the cohort was 50.7 ± 8.8 years, 96% were female, and 78% were Caucasian. Thirty-four of the 133 (26%) participants met ATP III criteria for the initiation of lipid lowering therapy. Only 9 (26%) in this group had ever been on any lipid lowering medication and only 4 (12%) were currently being treated. Significant variables associated with lipid lowering therapy versus no therapy included, the mean number of ATP III risk factors (4.8 versus 4.0; p=0.03), body mass index (35.4 versus 27.8; p=0.001), age (50.2 vs. 57.3 years; p=0.02), cholesterol level (249 versus 187 mg/dL; p<0.0001), LDL (163 vs. 109 mg/dL; p<0.0001), and HTN (78% vs. 40%; p=0.03). Race, SLICC scores, diabetes, HDL, family history, and smoking were not significant variables as to whether a patient was treated.

Conclusion: ATP III guidelines are standard guidelines for assessing whether patients should have interventions, including drug therapy, to treat hyperlipidemia and decrease CVD risk. More than a quarter of our SLE participants met ATP III guidelines for lipid lowering therapy and only 12% of those who fulfilled ATP III criteria were being treated. Younger patients who met criteria were not treated, while older, obese, and those with a higher number of ATP III risk factors were treated. Given that SLE patients are already at an intermediate CVD risk, similar to diabetes, more awareness is needed in addressing the needs of this at-risk population. This is an excellent area for quality improvement for rheumatologists and highlights the need for communication between rheumatologists and primary physicians regarding treatment and/or referral to cardiology for primary preventative care. Future studies addressing obstacles in initiation and maintenance of therapy are needed in SLE patients.

Disclosure: M. Basaga, None; L. Scalzi, None.

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Elevated Transglutaminase Levels On Microparticles From Systemic Lupus Erythematosus Patients. Leslie Harris, Ratnesh Chopra, Ann K. Rosenthal and Mary E. Cronin. Medical College of Wisconsin, Milwaukee, WI

Background/Purpose: Systemic Lupus Erythematosus (SLE) is characterized by the formation of autoantibodies, and over-exuberant antigen presentation may account for some of this pathology. Circulating microparticles (MP) are membrane-bound 100–1000 nm sized vesicles derived from platelets, leukocytes, endothelial cells and red cells. They are immunomodulatory and participate in antigen presentation. The protein crosslinking enzymes, transglutaminases (TGases), are involved in antigen presentation. Evidence from mouse studies supports a potential role for excess Tgase activity in SLE and TGase inhibitors have been shown to ameliorate murine lupus. Interestingly, we also noted a single report of Tgase inhibition with hydroxychloroquine (HCQ), a commonly used drug for SLE. Previous studies have shown increased numbers of circulating MPs in SLE patients. We sought to characterize the cell sources of MPs and determine protein levels of the Tgase enzymes (type II Tgase and factor XIIIa) on MPs from SLE patients and controls. We also measured Tgase activity on MPs from several normal donors and investigated the effect of HCQ on MP-associated Tgase activity.

Methods: We obtained 12 ml of blood from 25 SLE patients and 25 age and sex-matched normal controls after IRB approval. SLE patients satisfied ACR criteria for SLE and were excluded if they had anti-phospholipid antibody syndrome. MPs were isolated from platelet rich plasma according to published protocols. Flow cytometry was used to enumerate MPs and determine the percent of MPs from each cell source. Cell markers included CD45 for leukocytes, CD41 (GPIX) + CD42 (GPIba+GPIc) for platelets, CD144 (Vecladherin) for endothelial cells, CD235a (glycoporphrin A) for red cells, as well as the Tgase enzymes, type II Tgase and factor XIIIa. Tgase activity was measured with a standard radiometric assay detecting crosslinking activity in the presence and absence of 10 mM HCQ. The Mann-Whitney test was used to determine statistically significant differences between groups.

Results: Numbers of MPs were similar in SLE patients and controls. SLE patients had higher numbers of MPs derived from red cells 1448 (CI 908–2640) positive particles (PP)/μL compared to 2570 (CI 1069–9035) PP/μL in SLE patients (p=0.0027). Type II Tgase enzyme levels were significantly higher in the SLE cohort, which had 1531 (CI 854–4907) PP/μL compared to the control group with 951 (CI 402–1526) PP/μL (p=0.007). Factor XIIIA levels were slightly higher in the SLE group, but did not reach statistical significance (p=0.068). Tgase activity on a random sample of MPs from controls demonstrated an average Tgase activity level of 163 ± 75 nU/mg protein (n=3). Activity levels fell to 112.8 ± 14.9 nU/mg protein with HCQ (p=0.05).

Conclusion: Type II Tgase enzyme levels are significantly higher on MPs from SLE patients than controls, and activity is inhibited with HCQ. Because Tgase enzymes may have active roles in antigen presentation as well as platelet aggregation, the ability of HCQ to suppress Tgase activity may be an additional mechanism of action for this effective SLE drug. Further studies of the role of Tgase in SLE and on MPs are warranted.

Disclosure: L. Harris, None; R. Chopra, None; A. K. Rosenthal, None; M. E. Cronin, None.

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Retrospective Study of Allogeneic Mesenchymal Stem Cells Transplantation in Active and Refractory Lupus Nephritis for Induction Therapy. Lingyun Sun, Dandan Wang, Xia Li and Huayong Zhang. Department of Rheumatology and Immunology, the Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China

Background/Purpose: Allogeneic mesenchymal stem cells (MSCs) transplantation demonstrated significant clinical efficacy on various autoimmune diseases. Here we retrospectively analyzed the role of allogeneic MSCs transplantation in renal remission in patients with active and refractory lupus nephritis (LN).

Methods: Eighty-one patients with active and refractory lupus nephritis in China from 2007 to 2010 were enrolled in the study. Allogeneic bone marrow or umbilical cord derived MSCs were administered intravenously at the dose of one million cells per kilogram of bodyweight. Then all the patients were followed up for 12 months to evaluate renal remission as well as possible adverse events. The primary outcomes were renal complete remis-
sion (CR) and partial remission (PR) at each visit times, as well as renal flares. The secondary outcomes included renal activity score, total disease activity score, renal function and serologic index. Rates of overall survival, renal remission, as well as relapse at different visit times were calculated by using the Kaplan-Meier method and were statistically tested with the log-rank test. We calculated the HR and their 95% CIs using the univariate Cox proportional hazards model.

**Results:** The overall survival rate during 12 months follow-up was 95% (77/81). The probability of renal remission was 41% (18% CR and 23% PR) at 3 months, 45% (18% CR and 27% PR) at 6 months and 44% (23% CR and 21% PR) at 12 months after allogenic MScs transplantation. Renal remission was not correlated with age, disease duration, MScs source and baseline SLEDAI score, but was significantly correlated with baseline proteinuria (P = 0.003, 95% CI 0.336–0.794) and serum creatinine levels (P = 0.047, 95% CI 0.224–0.990) by COX regression analysis. Eleven in 81 (14%) patients underwent renal flare in 12 months follow up after a prior complete or partial remission. Renal activity evaluated by BILAG score significantly declined after MSCT, in parallel with the obvious amelioration of renal function. Total disease activity evaluation (COX score) significantly declined after MSCT, in parallel with the obvious amelioration of renal function.

**Conclusion:** Allogenic MScs transplantation resulted in renal remission within 12 months visit, which could be used early as a potential induction therapy for active and refractory lupus nephritis.

**Disclosure:** L. Sun, None; D. Wang, None; X. Li, None; H. Zhang, None.

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Anti-Mullerian Hormone and Ovarian Reserve in Systemic Lupus Erythematosus. Chi Chiu Mok1, Pak To Chan1 and Chi Hung To1. 1Tuen Mun Hospital, Hong Kong, Hong Kong, 2Hong Kong, Hong Kong

**Background/Purpose:** To study the level of anti-mullerian hormone (AMH) and its relationship with age and previous cyclophosphamide (CYC) exposure in patients with systemic lupus erythematosus (SLE).

**Methods:** Consecutive female patients aged 18–52 years who had menstruation in the preceding 12 months and fulfilled 24 ACR criteria for SLE were recruited. AMH was assayed by an ELISA kit (Beckman Coulter, Inc., USA). Serum AMH level was compared between patients with and without previous use of immunosuppressive agents. The relationship of AMH level to age and CYC exposure was studied by linear regression.

**Results:** 216 female SLE patients were studied. The mean age of patients at the time of venepuncture was 35.1 ± 10.1 years and the mean SLE duration was 7.6 ± 5.9 years. Immunosuppressive drugs ever received by these patients were: prednisolone (90%), AZA (69%), MFZ (30%), tacrolimus (21%), cyclosporin A (17%), CYC (22%) and HCQ (67%). Prednisolone was exclusively used in combination with one or more of the other immunosuppressive drugs. Of the 48 CYC users, 29 (40%) received daily oral treatment and 19 (40%) received monthly intravenous pulse therapy. The median total duration of CYC exposure was 20 weeks (inter-quartile range [IQR] 12.3–32.8). Fifty-four (25%) patients had undetectable AMH level (78% aged <40 years). These patients were significantly older than those with measurable AMH level (median age 47 [IQR 42–51] vs 31 [IQR 25–38.3] years; P < 0.001). Significantly lower levels of AMH were observed for past users of CYC than non-users, after adjustment for age (1.58 ± 2.92 vs 1.73 ± 2.11 ng/mL; P = 0.04 by ANCOVA). The mean time interval between AMH assay and last dose of CYC administered was 6.28 ± 3.8 years. AMH levels were not statistically different between users and non-users of other immunosuppressive agents that included prednisolone, mycophenolate mofetil, azathioprine and the calcineurin inhibitors. Linear regression revealed age (Beta = −0.32; p = 0.02) and each 5g of CYC exposure (Beta = −0.28; p = 0.047) were independently associated with lower AMH level. The route of CYC administration, duration of CYC treatment, disease activity score and duration of SLE was not significantly associated with AMH level on univariate regression analyses.

**Conclusion:** AMH is a sensitive marker for ovarian damage due to previous CYC treatment in SLE patients.

**Disclosure:** C. C. Mok, None; P. T. Chan, None; C. H. To, None.

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The Progression of Brain MRI Biomarker of Cognitive Impairment (White Matter Hyperintensity) in Systemic Lupus: A Clinical and Imaging Longitudinal Study. Jamal Mikdashi and Umran Ashruf. University of Maryland School of Medicine, Baltimore, MD

**Background/Purpose:** SLE patients are at high risk for accumulation of white matter hyperintensity (WMH) on brain MRI which has been correlated with cognitive impairment. Our goal is to determine whether the progression of WMH in newly diagnosed SLE patients predicts increased risk of cognitive impairment.

**Methods:** Brain MR T2 weighted images were compared at baseline and annually for 5 years among newly diagnosed SLE patients, presenting with neuropsychiatric SLE (NPSLE), (n = 30), [mean age 37.6 years, 73% African American, and 90% women], and age- and gender-matched non NPSLE patients (n = 25), and healthy controls (n = 20) to assess WMH burden (mild, moderate or severe). Standard cognitive tests were examined at enrollment and at end of study. Demographic and clinical manifestations were compared among the groups. Significant variables in the analyses, depression, cardiovascular risk factors and worsening of WMH grade using dichotomous measures were entered into multivariable and Cox proportional hazard analyses to determine their contribution to cognitive impairment.

**Results:** At baseline, 59 MRI were normal and16 had WMH lesions (NPSLE = 9, non NPSLE = 4 and controls = 3). The WMH burden was higher among NPSLE patients compared to non NPSLE patients (OR = 3.1, 95% CI: 0.7–13.2, p = 0.09). At baseline, frontal and parieto-occipital lesions were more frequent among NPSLE patients, whereas periventricular lesions were more frequent among non NPSLE patients or controls. At end of study, 24 patients had normal MRI findings and 21 had new and increased WMH burden (NPSLE = 13, non NPSLE = 6). The rate of WMH burden progression was variable across the groups. NP SLE patients had a faster rate of accumulation of WMH lesions, as compared to non NPSLE (OR = 3.5, 95% CI: 1.1–10.7; p = 0.03). The median number of impaired cognitive domains increased, regardless of the presence of baseline WMH lesions particularly among NPSLE compared to non NPSLE or controls.

Ischemic strokes and MRI-defined incident infarcts (OR = 5.8; 95% CI = 1.2–29.4; p value = 0.04), and worsened WMH grade (OR = 4.3; 95% CI = 2.1–16.3; p value = 0.03), were associated with increased risk of cognitive impairment in the areas of attention, processing speed and executive function. Hydroxychloroquine use was associated with reduced risk for WMH progression (OR = 0.3, 95% CI: 0.1–0.7; p value = 0.02), but not cognitive impairment.

**Conclusion:** The progression of WMH has prognostic relevance for long-term cognitive outcome in newly diagnosed SLE. Strategic preventive measures are needed to optimally target individuals at highest risk of cognitive decline.

**Disclosure:** J. Mikdashi, None; U. Ashruf, None.

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Safety and Efficacy of Epratuzumab in an Open-Label Extension Study (SL0006). K. Hobbs1, D.J. Wallace1, V. Strand2, K. Kalunian4, B. Kilgallen5, S. Bongardt6, W.A. Wegener 7 and D.M. Goldenberg 7. 1Denver Arthritis Clinic, Denver, CO, 2Cedars-Sinai Medical Center, Los Angeles, CA, 3Stanford University, Palo Alto, CA, 4UCSD School of Medicine, La Jolla, CA, 5UCB Pharma, Smyrna, GA, 6UCB Pharma, Brussels, Belgium, 7Immunomedics Inc, Morris Plains, NJ

**Background/Purpose:** Epratuzumab, a monoclonal antibody targeting CD22, is in development for the treatment of systemic lupus erythematosus (SLE). Two randomized, double-blind trials (ALLEVIATE-1 and 2) were prematurely terminated due to interruption of drug supply. SL0006 was an open-label extension study in which patients previously enrolled in the ALLEVIATE trials received epratuzumab. This abstract reports final long-term safety and efficacy data from SL0006 in patients with moderately-to-severely active SLE.

**Methods:** Patients (n = 29) in SL0006 received 12-week cycles of epratuzumab 360 mg/m² (2 infusions, at days 1 and 8 of each cycle). Ten were from ALLEVIATE-1 and had severe (BILAG A) SLE activity in ≥ 2 body/organ system, while 19 were from ALLEVIATE-2 with moderate (BILAG B) activity in ≥ 2 body/organ systems. All patients were eligible for enrollment in SL0006, subject to investigator’s judgment of treatment benefit. There was a median delay in epratuzumab dosing of 165 days (range 1–400)

**Disclosure:** C. C. Mok, None; P. T. Chan, None; C. H. To, None.
between premature termination of the ALLEVITIE studies and entry into SL0006. Assessments were every 4 weeks from screening (Visit 1; V1).

Results: Patients were aged 22–61 years; almost 90% were women, and 72% were of European descent (79% Caucasian). Median study duration was 4 years (0.3–5.3). Median corticosteroid dose (range) at the start of ALLEVITIE (baseline) was 21 mg/day (10–80), and by the start of SL0006 (V1) dose reduced to 7.5 mg/day (0–30). Lower levels of corticosteroid were maintained to the last visit (0–105). Median (range) total BILAG scores decreased throughout the study from baseline of 17 (12–30) (last visit 12 1–34). BILAG improvement from baseline was maintained from SL0006 V1 to end of study, with most V1 BILAG A/B grades improving to C/D at least once during the study (Table). Median (range) total SLEDAI scores also decreased throughout the study from baseline of 10 (4–26) (last visit 8 [0–16]). SLEDAI improvement from baseline was also maintained from V1 to end of study. Median patient and physician global assessments of disease activity each improved from 3.0 and 2.8, respectively, at baseline by a median of 1.0 categories. Median reductions in absolute B-cell (CD19 +) counts were observed throughout the study, from screening (34.0% reduction) until the last visit (45.0% reduction). All patients reported at least 1 AE, with 14 patients (48.3%) experiencing at least one SAE. Four patients (13.8%) discontinued because of AEs. The most frequent AEs, occurring in at least 5% of subjects, were infections and infestations (upper respiratory tract infections 58.6%, and sinuses, nasopharyngitis, urinary tract infections [all 37.9%], anxiety, and nausea [both 34.5%]).

Table.

<table>
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¹Per 1000 person years

Conclusion: Obesity (BMI 30–34.9 kg/m²) is associated with the highest rate of adverse cardiovascular events in SLE. Interestingly, the CV event rate in severe obesity (BMI ≥35 kg/m²) was lower than in overweight and obese patients, suggesting the presence of a unique obesity paradox in SLE that differs from the one described in the general population.

Disclosure: G. Stojan, None; H. Timlin, None; H. Fang, None; L. S. Magder, None; M. Petri, None.

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Study of Anti-Müllerian Hormone and Probability of Pregnancy in 112 Systemic Lupus Erythematosus Patients Exposed or Not to Cyclophosphamide. Nathalie Morel¹, Anne Bachelot², Zena Chakhtoura³, Zahir Amoura³, Olivier Amiaire³, Jean-Emmanuel Kahn³, Du Boulin⁴, Pierre Duhaut⁴, Dominique Farge⁵, Camille Francès⁶, Lionel Gallicier⁶, Gaëlle Guettrot-Illumett⁶, Jean-Robert Harlé⁷, Olivier Lambotte⁸, Véronique Le Guen⁹, Jean-Charles Piette⁹, Jacques Pourrat⁹, Karin Sacré⁹, Damien Sene¹, Salim Trad¹, Elisabeth Vidal¹, Laima Graimaldi¹, Christiane Cousséau¹, Nathalie Cóstedoat-Châtelaine¹ and PLUS¹⁵. Groupe Hospitalier Pitié-Salpêtrière, Paris, France, ²Centre Hospitalier de Clermont-Ferrand, Clermont-Ferrand, France, ³Internal Medicine, Foch Hospital, Suresnes, France, ⁴CHU Nord, Amiens, France, ⁵CHU Toulouse, Toulouse, France, ⁶Hopital Kremlin Bicêtre, Kremlin Bicêtre, France, ⁷Cochin Hospital, Paris, France, ⁸Bichat Hospital, University Paris 3, APHP, Paris, France, ⁹Hopital Lariboisière, Paris, France, ¹⁰Hopital Ambroise Pare, Paris, France, ¹¹Hopital de Limoges, Limoges, France, ¹²Société Laser, Paris, France, ¹³Paris, France

Background/目的: Cyclophosphamide (CYC), a drug commonly used in systemic lupus erythematosus (SLE), is associated with a risk of ovarian failure resulting in infertility. In the general population, anti-Müllerian hormone (AMH) level is correlated with ovarian reserve in adult women. We compared AMH serum levels in SLE patients with and without previous cyclophosphamide treatment (exposed and unexposed group).

For the first time, we analyzed their subsequent probability of pregnancy.

Methods: This ancillary study was done on serum bank collected during the PLUS study by 70/07 and 11/2009 (ClinicalTrials.gov: NCT00413361). SLE women included in the PLUS study, below 40 years and who had been exposed to CYC were compared to SLE patients unexposed to CYC and matched for age at 6 months. AMH concentration was determined by ELISA using Immunotech kit (Beckman-Coulter). All patients were contacted by phone in May 2012, and provided information regarding their pregnancies following the date of sample.

Results: 112 patients (56 exposed and 56 not exposed) were included. Mean age was 31.6 ± 5.8 years.

The mean AMH serum level was 1.21 ± 0.11 ng/ml. 82% of the patients had AMH < 2 ng/ml and 50% had AMH ≤ 1 ng/ml. The mean AMH serum level was significantly lower in patients exposed to CYC than in unexposed (1.02 ± 0.97 vs 1.41 ± 1.01 ng/ml, p = 0.03) and in patients older than 30 years-old (1.02 ± 0.97 versus 1.43 ± 0.22 mg/ml, p = 0.02).

Conclusion: Obesity (BMI 30–34.9 kg/m²) is associated with the highest rate of adverse cardiovascular events in SLE. Interestingly, the CV event rate in severe obesity (BMI ≥35 kg/m²) was lower than in overweight and obese patients, suggesting the presence of a unique obesity paradox in SLE that differs from the one described in the general population.

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Study of Anti-Müllerian Hormone and Probability of Pregnancy in 112 Systemic Lupus Erythematosus Patients Exposed or Not to Cyclophosphamide. Nathalie Morel¹, Anne Bachelot², Zena Chakhtoura³, Zahir Amoura³, Olivier Amiaire³, Jean-Emmanuel Kahn³, Du Boulin⁴, Pierre Duhaut⁴, Dominique Farge⁵, Camille Francès⁶, Lionel Gallicier⁶, Gaëlle Guettrot-Illumett⁶, Jean-Robert Harlé⁷, Olivier Lambotte⁸, Véronique Le Guen⁹, Jean-Charles Piette⁹, Jacques Pourrat⁹, Karin Sacré⁹, Damien Sene¹, Salim Trad¹, Elisabeth Vidal¹, Laima Graimaldi¹, Christiane Cousséau¹, Nathalie Cóstedoat-Châtelaine¹ and PLUS¹⁵. Groupe Hospitalier Pitié-Salpêtrière, Paris, France, ²Centre Hospitalier de Clermont-Ferrand, Clermont-Ferrand, France, ³Internal Medicine, Foch Hospital, Suresnes, France, ⁴CHU Nord, Amiens, France, ⁵CHU Toulouse, Toulouse, France, ⁶Hopital Kremlin Bicêtre, Kremlin Bicêtre, France, ⁷Cochin Hospital, Paris, France, ⁸Bichat Hospital, University Paris 3, APHP, Paris, France, ⁹Hopital Lariboisière, Paris, France, ¹⁰Hopital Ambroise Pare, Paris, France, ¹¹Hopital de Limoges, Limoges, France, ¹²Société Laser, Paris, France, ¹³Paris, France

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Mean follow-up (interval between sample and phone interview) was 3.9 ± 0.6 years. During this follow-up, 36 of the 112 patients wished to become pregnant, and 30 succeeded (83.3%). In univariate analysis, the risk of failure was associated with exposure to CYC (5 failure in 15 versus 1 failure in 21, p = 0.023), older age (35.5 ± 4.8 years old at sample in failure versus 30 ± 4.3 years old in success, p = 0.024) and lower AMH serum level (0.64 ± 0.68 ng/ml in failure versus 1.6 ± 1.15 ng/ml in success, p = 0.052).

Interestingly, pregnancy occurred in 6 out of 10 women who had very low AMH serum level (≤ 0.05 ng/ml), and in 10 out of 14 who had AMH serum level ≤ 1 ng/ml.

**Conclusion:** As previously reported, we confirm that the AMH level is low in many SLE patients, and that this level decreases significantly with age and with exposition to CYC. However, and despite this, we show for the first time that the risk of failure to become pregnant was low with pregnancy obtained in 83.3% of the patients who were willing to become pregnant. Successes were observed even in the patients with the lowest level of AMH. Preliminary results show that failure was associated with older age and CYC exposition. Additional analyses (multivariate analyses) are ongoing.

**Disclosure:** N. Morel, None; A. Bachelot, None; Z. Chakhtoura, None; Z. Amoura, None; O. Aumaitre, None; J. E. Kahn, None; D. Boutin, None; P. Duhamel, None; C. Franceschi, None; L. Galierie, None; G. Guettrot-Insbert, None; J. R. Harlé, None; O. Lambotte, None; V. Le Guern, None; J. C. Piette, None; J. Pourrat, None; K. Sacre, None; D. Sene, None; S. Trad, None; E. Vidal, None; L. Grimaldi, None; C. Coussie, None; N. Costedoat-Chalumeau, None.


**Background/Purpose:** Several candidate biomarkers for Systemic Lupus Erythematosus (SLE) have been reported including STAT1, ADAR, CCL2, CXCL10, and miR-146a. This study examines the effects of treatment on their levels.

**Methods:** Leukocytes were collected from 103 SLE patients (59 had 2 or more visits) fulfilling ACR criteria and 65 healthy donors (HD). Gene expression of type I-interferon (I-IFN) signature genes (ISGs) and chemokines was analyzed by Taqman qPCR and determined by ΔΔCt method. IFN score was calculated from Mx1, OAS1, and Ly6e. Biomarkers expression, multiple comparisons of therapies, linear correlations, and slope comparisons were analyzed by Wilcoxon, None; C. Franceschi, None; L. Galierie, None; G. Guettrot-Insbert, None; J. R. Harlé, None; O. Lambotte, None; V. Le Guern, None; J. C. Piette, None; J. Pourrat, None; K. Sacre, None; D. Sene, None; S. Trad, None; E. Vidal, None; L. Grimaldi, None; C. Coussie, None; N. Costedoat-Chalumeau, None.

**Results:** STAT1, ADAR, CCL2, and CXCL10, but not miR-146a, were significantly elevated (p < 0.0001) in SLE patients. STAT1, ADAR, CCL2, and CXCL10 showed significant correlations (p < 0.003) to IFN score in both HD and SLE. Next, therapies were analyzed for significant effects on the biomarkers. The effects of interest would be those that reduce the biomarkers levels below untreated (UTX) SLE and that are not significantly elevated above HD. As a further measurement, the slopes of biomarkers that significantly correlated to IFN score were compared to determine if the therapy was capable of reducing (directly or indirectly) the biomarkers response to I-IFN. A lack of correlation and/or decreased slope may indicate disruption of the relationship between biomarkers and I-IFN by the therapy. Alone or in combination, prednisone (PD), hydroxychloroquine (HCQ), and mycophenolate mofetil (MMF) did not have significant effects on IFN score, STAT1, or miR-146a. Both CCL2 and CXCL10 were affected by the therapy (see figure). CCL2 was significantly higher (p < 0.0009) in UTX SLE and in HD, and HCQ+MMF-treated SLE and CXCL10 was significantly higher (p < 0.009) in UTX SLE, SLE treated with HCQ, HCQ+MMF, PD, and PD+MMF compared to HD. CCL2 and CXCL10 maintained a significant correlation (p < 0.009; p > 0.35) with IFN score in UTX SLE, HCQ, and HCQ+MMF SLE. Furthermore, comparing CCL2 and CXCL10 vs IFN score, UTX SLE patients display a significantly higher slope (p < 0.009) than HD, HCQ, and HCQ+MMF. CCL2 in HCQ-, PD-, and PD+HCQ-treated SLE was significantly lower (p < 0.038) than UTX SLE, nor significantly correlated with IFN score, except for HCQ. But only PD and PD+HCQ had significantly lower CXCL10 than UTX SLE. When comparing CXCL10 vs IFN score, UTX SLE display a significantly higher (p < 0.02) slope than PD-, PD+MMF-, and PD+HCQ-treated SLE patients.

**Conclusion:** CCL2 and CXCL10 levels were significantly lower for several treatments compared to UTX. Therapies appear to attenuate the response of CCL2 and CXCL10 to I-IFN. Overall, CCL2 and CXCL10 are candidate markers of response to treatment for SLE.

**Disclosure:** P. R. Dominguez-Gutierrez, None; A. Ceribelli, None; M. Satoh, None; E. S. Sobel, None; W. H. Reeves, None; E. K. L. Chan, None.

**Clinical Characteristics for Future Development of Systemic Lupus Erythematosus in Korean Patients with Idiopathic Thrombocytopenic Purpura.** Yeon-Ah Lee1, Somi Kim1, Ran Song2 and Sang-Hoon Lee3.

1Kyung Hee University, Seoul, South Korea, 2Hospital at GANGDONG, Kyung Hee University, Seoul, South Korea

**Background/Purpose:** Systemic lupus erythematosus (SLE), a chronic inflammatory autoimmune disease capable of exhibiting virtually any clinical symptoms, occasionally presents itself with thrombocytopenic purpura as an initial manifestation. Some patients with initial diagnosis of idiopathic thrombocytopenic purpura (ITP) develop symptoms of SLE as time goes by. Our aim was to investigate the prevalence of SLE in patients with the initial diagnosis of ITP and recognize the salient characteristics of these patients, thereby identifying early diagnostic clues.

**Methods:** We retrospectively analyzed the clinical and laboratory features of 337 (203 females, 134 males) patients initially diagnosed with ITP between January 1993 and April 2012 at a single center, Kyung Hee University Hospital. At the time of diagnosis of ITP, patients with autoimmune diseases were excluded and ITP was classified into chronic, acute, and recurrent acute types. The following data were obtained for every patient: age at diagnosis, sex, presence of ANA and anti-platelet antibody, bone marrow findings, and bleeding manifestations. The patients were followed-up for development of symptoms indicative of SLE and clinical events including immune hemolytic anemia, splenectomy, infections and thrombosis.

**Results:** Fifteen of the 337 patients (4.5%) developed SLE; 14 were females while all 15 showed ANA positivity. The patients who eventually developed SLE were more likely to have chronic type ITP, higher ESR, and speckled type ANA, irrespective of its titer (p < 0.05, respectively). The mean incubation period turned out to have SLE was 33.3 months (range: 2–159). For these patients, the median age at initial diagnosis of ITP was 26.6 years (range: 13–65), and the mean age at diagnosis of SLE was 29.4 years (range: 15–66). Splenectomy was performed in 4 patients, and 3 of them suffered from at least one event of infection. Six of the 15 ITP patients with later development of SLE had been diagnosed as having Evan’s syndrome (ITP with immune hemolytic anemia). The most notable SLE manifestations were thrombotic complications such as deep vein thrombosis or cerebral infarction (40%), and accordingly, high positivity of anti-phospholipid antibody (6/13, 46.2%). Contrary to previous reports, renal involvement appeared to be quite frequent (7/15, 46.6%).

**Conclusion:** SLE was developed in 4.5% of patients with initial diagnosis of ITP during follow-up. ITP patients with later development of SLE are associated with adverse clinical course, therefore early recognition and accurate interventions are imperative. The presence of speckled type ANA,
elevated ESR or immune hemolytic anemia in ITP patients warrant careful monitoring, as they are prone to develop other manifestations of SLE or thrombotic complications. With increased clinical attention, unnecessary invasive procedures, such as splenectomy, can be avoided and timely initiation of disease-specific treatment possible.

Disclosure: Y. A. Lee, None; S. Kim, None; R. Song, None; S. H. Lee, None.

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Pulmonary Hypertension in Systemic Lupus Erythematosus: A 6-Year Follow-up Study Cohort. Claudia Hübte-Tena, Selma Gallegos-Nava, Rafael Bojalil and Luis M. Amezcua-Guerra, Instituto Nacional de Cardiología Ignacio Chávez, Mexico City, Mexico

Background/Purpose: Systemic lupus erythematosus (SLE) may present hemodynamic alterations including pulmonary hypertension (PH). Echocardiography (ECHO) is a noninvasive imaging technique useful to classify pulmonary hypertension (PH) as improbable (sPAP ≤36 mmHg), possible (37–50 mmHg), or probable (>50 mmHg).

Methods: Study cohort with 6-year follow-up including 139 SLE patients. At baseline, demographics, organ involvement, disease activity (SLEDAI-2K), cumulated organ damage (SLICC/ACR), and laboratory analyses including antibody profile were obtained. Serum samples were stored in standard conditions. Clinical follow-up was performed at 6 months. SLE patients who had an ECHO for any reason by the time of recruitment (≥6 months) were included. From stored sera, levels of endothelin 1 (ET1), monocyte chemotactic protein 1 (MCP1), and interferon gamma (IFNg) were measured by ELISA. Discrete variables are described as percentages and continuous variables as medians (interquartile range). Analyses were performed by either chi-square test for trends or Kruskal-Wallis with Dunn’s post-test. Spearman’s rank correlation coefficient (r) was used to assess associations. Survival was assessed by the Kaplan-Meier method with log-rank test for trends.

Results: 53 SLE patients were included. Patients were classified in 3 groups by ECHO: improbable PH (n=26, 98% female, age 34.5, 24–46 years); possible (n=16, 81% female, age 49, 38–53 years); probable (n=13, 100% female, age 41, 38–56 years). No differences in demographic or serologic features between groups, whereas organ damage was higher in patients with PH (SLICC/ACR index of 1 (1–2), 3 (1.7–4), and 3 (2–6), respectively; P=0.0009). Active arthritis was present in 12%, 13%, and 38% (P=0.0005). Serum levels of ET1, MCP1 and IFNg were similar between groups. The sPAP showed a positive correlation with age (r=0.29), disease duration (r=0.32), serum creatinine (r=0.26), SLEDAI-2K (r=0.26), SLICC/ACR (r=0.25), left atrium diameter (r=0.45), interventricular septum thickness (r=0.33), and right ventricular diastolic diameter (r=0.71). An inverse correlation with C3 (r=−0.25) and CHS50% (r=−0.25) was found. Main causes of PH (sPAP >37) were: connective tissue disease (32%), intrinsic cardiac disease (26%), pulmonary thromboembolism (26%), and pulmonary disease (16%). Rates of survival in the first year were: improbable PH 92%, possible PH 94% and probable PH 99%. After three years, these were 92%, 89% and 77%, respectively. After six years 88%, 87% and 68%, respectively.

Conclusion: In SLE, PH (sPAP >35 mmHg) is associated with decreased survival in the medium term. Also, it is related to cumulated organ damage and history of pulmonary thromboembolism. Validated biomarkers in idiopathic PH such as ET1, MCP1 and INFγ as well as SLE- and scleroderma-related autoantibodies are not useful to distinguish PH in patients with SLE.

Disclosure: C. Hübte-Tena, None; S. Gallegos-Nava, None; R. Bojalil, None; L. M. Amezcua-Guerra, None.

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Altered Soluble Inflammatory Mediators Mark Impending Systemic Lupus Erythematosus Disease Flare in European-American Lupus Patients Who Receive Influenza Vaccination. Melissa E. Munroe1, Jordana R. Anderson1, Joan T. Merrill1, Joel M. Guthridge1, Virginia C. Roberts1, Gillian M. Air1, Linda F. Thompson1 and Judith A. James2, Oklahoma Medical Research Foundation, Oklahoma City, OK, 1Oklahoma Medical Research Foundation; University of Oklahoma Health Sciences Center, Oklahoma City, OK

Background/Purpose: SLE is a multifaceted autoimmune disease denoted by immune dysregulation that contributes to increased morbidity and mortality in part due to infectious complications. Vaccination against common infections, such as influenza, is recommended for SLE patients to decrease infection risk. Using a unique resource of SLE patients participating in an influenza vaccination protocol with samples available before and at the time of clinically-defined disease flare, this study seeks to identify biomarkers of disease flare.

Methods: Over 6 flu seasons, 101 unique SLE patients and 101 healthy controls (HC) were enrolled in the SLE Influenza Vaccination Cohort. Plasma samples were obtained on the day of vaccination (BL) and at 6 and 12 weeks post-vaccination (FU). Demographics, detailed clinical information (disease activity, medication use), serum autoantibody profiles, and antibody response to influenza were collected at each visit. BL and FU samples from 29 European American (EA) SLE patients who exhibited SELENA-SLEDAI defined disease flare at 6 (n=14) or 12 (n=15) weeks post-vaccination were tested. Each SLE patient was matched by race/ethnicity/age (<45 years)/time of sample procurement/ANA status at BL to a unique SLE patient who did not exhibit disease flare (NF), as well as to a HC. Samples from 14 (n=7 each at 6 and 12 weeks at FU) of 29 SLE patients with flare were compared to samples from the same SLE patients from another year where disease flare did not occur (self nonflare, SNF). Plasma samples were tested for 52 soluble inflammatory mediators, including cytokines, chemokines, and soluble receptors using xMAP multiplex bead-based assay or sandwich ELISA (BLYs and APRIL).

Results: SLE patients who exhibited disease flare had significant (p ≤0.01) alterations in 23 soluble mediators at BL compared to unique NF/SNF patients and HC. Altered BL mediators were also seen at time of disease flare, usually with no significant change in analyte levels compared to BL. SLE patients who exhibited disease flare had significantly (p ≤0.01) higher levels of BL pro-inflammatory cytokines, including IL-12, IL-17, IFNγ, IL-6, and IL-17 compared to NF/SNF SLE patients and HC. Of particular interest were increased TNFR family members at BL in flare SLE patients, including TNFRI, TNFRII, Fas, Fasl, and CD40L. Regulatory cytokines, including IL-10 and TGF-β were significantly increased (p ≤0.01) at BL in SLE patients not exhibiting disease flare (NF/SNF) compared to flare SLE patients and HC. A number of analytes, including MIP-1α and BLYs, were significantly higher in SLE patients compared to HC, but no difference was seen between flare and NF/SNF in this cohort.

Conclusion: Shed TNF receptors and proinflammatory adaptive cytokines representing Th1, Th2 and Th17 pathways are elevated in lupus patients who flare within the next 6–12 weeks. These remain unaffected by influenza vaccine, suggesting their utility as resilient, predictive biomarkers of flare and that influenza vaccination itself does not further promote risk for flare.

Disclosure: M. E. Munroe, None; J. R. Anderson, None; J. T. Merrill, None; J. M. Guthridge, None; V. C. Roberts, None; G. M. Air, None; L. F. Thompson, None; J. A. James, None.

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Comparison of the LupusQol and SF-36 Scores As Valid Measures of Change in Health Related Quality of Life. Zahi Touma, Murray B. Urowitz, Dominique Ibanez, Shahrazad Taghavi-Zadeh and D. D. Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: The LupusQol questionnaire is a disease-specific instrument for adults with lupus while the short form-36 (SF-36) is a generic questionnaire.

We aimed to compare the LupusQol and the SF-36 questionnaires to determine if they are comparable measures of change in patients with SLE on standard of care therapy.

Methods: We analyzed the results of SF-36 and LupusQol questionnaires available from a group of lupus patients who were followed at the Lupus Clinic. Patients were studied if they had at least one follow-up visit within 6 month period while receiving standard of care therapy.

Each of the questionnaires, SF-36 and LupusQol, includes 8 domains and its scores ranges from 0 (worst possible) to 100 (best possible) quality of life. The SF-36 subscales can be further summarized into 2 component scores: the physical component summary (PCS) and the mental component summary (MCS).

The mean change in the domains scores for both questionnaires was determined by subtracting the scores of the follow-up visits from the score of the baseline visit.

We determined the correlation (Pearson) of the change in scores of LupusQol and the change in scores of SF-36. The correlation of the comparable domains of LupusQol was determined with the corresponding domains of SF-36. For each of the non-comparable domains of the LupusQol questionnaire the correlation was determined with PCS and MCS individually.

Results: 99 patients (91% F) had baseline and at least one follow-up visit available. 44% were Caucasian, 33% Black, 10% Asian and 12% others. For the 99 patients 251 observations were identified for which both SF-36 and LupusQol questionnaires were available. Age at lupus diagnosis and lupus duration at first
visit were 27.2 ± 12.4 and 11.9 ± 7.7 years. The mean SLEDAI-2K on all visits was 7.49 ± 5.21.

The correlation of the change in scores of the comparable LupusQol and SF-36 domains ranged from 0.38–0.65. The correlation between LupusQol Pain and SF-36 Bodily Pain was 0.65, LupusQol Physical Health and SF-36 Physical Functioning was 0.38, LupusQol Emotional Health and SF-36 Mental Health was 0.56 and LupusQol Fatigue and SF-36 Vitality was 0.48 (all p were significant). For the non-comparable domains the correlation of the LupusQol domains with SF-36 MCS and PCS ranged from 0.02–0.33 (Table 1).

**Table 1.** Correlation of change in SF-36 and LupusQol for comparable and non-comparable domains

<table>
<thead>
<tr>
<th>Lupus Qol domains</th>
<th>SF-36 domains</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparable domains</strong></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>Bodily Pain</td>
</tr>
<tr>
<td>Physical Health</td>
<td>Physical Functioning</td>
</tr>
<tr>
<td>Emotional Health</td>
<td>Mental Health</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Vitality</td>
</tr>
<tr>
<td><strong>Non-comparable domains</strong></td>
<td></td>
</tr>
<tr>
<td>Body Image</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>MCS</td>
</tr>
<tr>
<td>Planning</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>MCS</td>
</tr>
<tr>
<td>Intimate</td>
<td>PCS</td>
</tr>
<tr>
<td>Relationships</td>
<td>MCS</td>
</tr>
<tr>
<td>Burden to others</td>
<td>PCS</td>
</tr>
<tr>
<td></td>
<td>MCS</td>
</tr>
</tbody>
</table>

**Conclusion:** The correlation of the change in the scores of comparable domains of Lupus Qol and SF-36 ranged from moderate to large. The correlation of the change in the scores of non-comparable domains of Lupus Qol and SF-36 was insubstantial to small. Thus these questionnaires measure different aspects of quality of life and both questionnaires might be used together.

**Disclosure:** Z. Touma, None; M. B. Urowitz, None; D. Ibanez, None; N. Taghavi-Zadeh, None; D. D. Gladman, None.

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**Adjusted Framingham Risk Factor Scoring for Systemic Lupus Erythematosus: Results from an Inception Cohort Followed for Eight Years.**

Murray B. Urowitz1, Dominique Ibanez1, D. D. Gladman1, SLICC2 and Systemic Lupus International Collaborating Clinics (SLICC)2. 1Toronto Western Hospital and University of Toronto, Toronto, ON, 2Toronto, ON

**Background/Purpose:** There is a high prevalence of premature atherosclerosis among patients with SLE, with a risk 7–9 times that of the general population. The traditional Framingham risk factor underestimated the risk for coronary artery disease (CAD) in patients with SLE. It has been suggested that a modified Framingham risk score (FRS) where each item is multiplied by 2 more accurately identifies patients at Moderate/High risk of CAD, and that a modified Framingham risk score (FRS) where each item is multiplied by 2 more accurately identifies patients at Moderate/High risk of CAD. It provides higher sensitivity with little loss in specificity. Therefore the mFRS could be used to identify SLE patients for more intensive risk factor modification.

**Disclosure:** M. B. Urowitz, None; D. Ibanez, None; D. D. Gladman, None;

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Of the 140 patients 14 subsequently developed CAD, 8 of which are attributed to AS. The sensitivity of the FRS for CAD due to AS was 25.0 (3.2, 65.1) and specificity 97.7 (93.5, 99.5), whereas for the mFRS the sensitivity rose to 50.0 (15.7, 84.3) while the specificity decreased slightly to 86.4 (79.3, 91.7).

**Conclusion:** The mFRS, where each item is multiplied by 2, more accurately identifies patients at Moderate/High Risk of CAD. It provides higher sensitivity with little loss in specificity. Therefore the mFRS could be used to identify SLE patients for more intensive risk factor modification.

**Disclosure:** M. B. Urowitz, None; D. Ibanez, None; D. D. Gladman, None;

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**Atherosclerotic Vascular Events in a Multinational Inception Cohort of Systemic Lupus Erythematosus: Incidence Over a Ten Year Period.**

D. D. Gladman1, Dominique Ibanez1, Murray B. Urowitz1 and SLICC2.

1Toronto Western Hospital and University of Toronto, Toronto, ON, 2Toronto, ON

**Background/Purpose:** A large multicentre multinational inception cohort was established to study risk factors for atherosclerosis (AS) in SLE. The purpose of this study was to determine the incidence of vascular events during a 10 year follow-up and their attribution to AS.

**Methods:** An inception cohort of SLE patients from 31 centres from 12 countries has been assembled according to a standardized protocol between 2000 and 2012 to study risk factors for atherosclerosis. Patients enter the cohort within 15 months of SLE diagnosis (≥4 ACR criteria). Clinical and laboratory features of SLE and comorbidities are gathered in a standardized protocol at yearly intervals. Vascular events (VE) are described and attributed to SLE and AS on a specialized form. Events recorded include myocardial infarction (MI), angioplasty, congestive heart failure (CHF), interventional catherization (PVD), stroke, transient ischemic attack (TIA). Diagnosis of an event was confirmed using standard clinical criteria, relevant laboratory data and imaging where appropriate. Attribution to AS was made on the basis of lupus disease being inactive at the time of the event, and/or the presence of typical AS changes on imaging or pathology and/or evidence of AS elsewhere. The incidence of VE was calculated on the 10 years for all VE occurring after diagnosis, and then for atherosclerotic VE (AVE). Kaplan-Meier curves were used to estimate the cumulative incidence rates since SLE diagnosis.

**Results:** Since 2000 1844 patients have been entered into the cohort (88.9%F, age at SLE 34.7y). Caucasian 49.2%, Black 16.5%, Asian 14.9%, Hispanic 15.3%, other 4.1%. Thus far there have been 157 VE in 115 patients after the diagnosis of SLE. These include: MI (14), angina (26), CHF (36), PVD (11), TIA (27), stroke (38), pacemaker insertion (5). 64 of the events were attributed to active lupus and 44 to other causes or missing. 49 events in 37 patients were attributed to AS including: MI (8), angina (19), CHF (6), PVD (6), TIA (5), pacemaker (3), stroke (2).

**Table.** Cumulative incidence of 1st vascular events since diagnosis of SLE

<table>
<thead>
<tr>
<th>Years since SLE Dx</th>
<th>Number</th>
<th>VE N=115</th>
<th>AVE N=37</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1844</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>1</td>
<td>1479</td>
<td>3.0%</td>
<td>0.7%</td>
</tr>
<tr>
<td>2</td>
<td>1305</td>
<td>4.0%</td>
<td>0.9%</td>
</tr>
<tr>
<td>3</td>
<td>1097</td>
<td>5.4%</td>
<td>1.4%</td>
</tr>
<tr>
<td>4</td>
<td>948</td>
<td>6.2%</td>
<td>1.9%</td>
</tr>
<tr>
<td>5</td>
<td>768</td>
<td>7.3%</td>
<td>2.4%</td>
</tr>
<tr>
<td>6</td>
<td>600</td>
<td>7.7%</td>
<td>2.5%</td>
</tr>
<tr>
<td>7</td>
<td>459</td>
<td>8.9%</td>
<td>2.9%</td>
</tr>
<tr>
<td>8</td>
<td>342</td>
<td>9.4%</td>
<td>3.2%</td>
</tr>
<tr>
<td>9</td>
<td>233</td>
<td>10.1%</td>
<td>3.9%</td>
</tr>
<tr>
<td>10</td>
<td>138</td>
<td>11.2%</td>
<td>4.4%</td>
</tr>
</tbody>
</table>

**Conclusion:** Over the follow-up of an inception cohort with SLE there were 157 vascular events of which 49 were attributable to AS. The incidence of AVE increased by 0.5% per year reaching a total of 4.4% at 10 years.

**Disclosure:** D. D. Gladman, None; D. Ibanez, None; M. B. Urowitz, None;
Increased Male-to-Female Ratio in Children Born to Women with Systemic Lupus Erythematosus, Evelyne Vinet1, Sasha Bernatsky2, Mohammad Kauache2, Emil P. Nashi3, Christian A. Pineau3, None; A. Cicerò-Casarrubias1, None; M. C. Ocampo-Torres1, None; J. Romero-Díaz3, None; J. Sánchez-Guerrero, None.

Background/Purpose: Recent experimental evidence suggests that anti-DNA antibodies, cross-reacting with brainstem neuronal receptors, induce apoptosis and cause a marked preferential loss of female foetuses in SLE murine models. Observational studies assessing the sex of offspring born to women with SLE are scant and limited by their sample size. In a large population-based study, we aimed to determine the sex ratio of children born to women with SLE and to compare with children born to women without SLE.

Methods: We identified all women who had at least one hospitalization for a delivery (either for a stillbirth or live birth) after SLE diagnosis using Quebec’s physician billing and hospitalization databases (from 01/01/1989 to 31/12/2009). Women were defined as SLE cases if they had any of the following: 1) at least one hospitalization with a diagnosis of SLE prior to the delivery, 2) a diagnosis of SLE recorded at the time of their hospitalization for delivery, or 3) at least 2 physician visits with a diagnosis of SLE, occurring 2 months to 2 years apart, prior to the delivery. We randomly selected a general population control group, composed of women matched at least 4:1 for age and year of delivery, who did not have a diagnosis of SLE prior to or at the time of delivery. We obtained information on sex for all births occurring in both groups of women, and calculated the respective male-to-female ratio. We performed a multivariate logistic regression, with the offspring’s sex as the dependent variable, adjusting for the potential effect of preclampsia (previously shown to increase the male-to-female ratio in the general population).

Results: 507 women with SLE had a total of 731 births after diagnosis, while 5862 matched control women had 8631 births. The prevalence of preclampsia was 5.5% (95% CI 4.0, 7.6) in children born to women with SLE and 2.2% (95% CI 1.9, 2.5) in children born to control women. The unadjusted male-to-female ratio was increased in children born to women with SLE (1.26, 95% CI 1.09,1.46) compared with controls (1.06, 95% CI 1.02,1.11). In multivariate analysis adjusting for the effect of preclampsia, mothers with SLE had substantially increased odds of having male offspring than mothers without SLE (OR 1.19, 95% CI 1.02, 1.38).

Conclusion: Compared to children from the general population, there is a substantial increase in the male-to-female ratio in children born to women with SLE. These results should prompt further research on the male predominance in children born to women with SLE.

Disclosure: E. Vinet, None; S. Bernatsky, None; M. Kauache, None; E. Nashi, None; C. A. Pineau, None; R. W. Platt, None; M. C. Mackay, None; C. Aranow, None.

Suicidal Ideation in Patients with Systemic Lupus Erythematosus: Incidence and Relationship with Anxiety/Depression Score, Disease Activity and Organ Damage. Chi Chiu Mok1, Kelly Chan1 and Paul Yip2,3. Tuen Mun Hospital, Hong Kong, Hong Kong, University of Hong Kong, Hong Kong, Hong Kong

Background/Purpose: To study the incidence of suicidal ideation in patients with SLE and its relationship with anxiety/depression score, disease activity and organ damage.

Methods: Consecutive patients who fulfilled the ACR criteria for SLE were recruited for a questionnaire study on suicidal ideation, which was assessed by (1) 3 standard questions on suicidal thoughts and suicidal plans in the past 1 month; and (2) the validated Chinese version of the Beck Scale for Suicidal Ideation (BSSI) for Suicidal Ideation (19 questions). Disease activity of SLE was assessed by SLEDAI and physical exam, clinical variables, SLE characteristics, SLE activity (SLEDAI-2K), modified damage index (SLICC/DI), autoantibodies, laboratory tests, homocystein and high-sensitivity C-reactive protein (hs-CRP).

Results: During 1269 patient-years of follow-up, thrombosis occurred in 35 patients (16%), incidence rate 25.6 per 1000 patient-years. Most of the events (57%) occurred at onset or during the first year of diagnosis of SLE. At baseline, patients with thrombosis had lower body mass index (BMI) (p = 0.03), smoking (p = 0.02), vascular insufficiency (p = 0.05), immobilization (p < 0.0001), recent surgery (p = 0.004), anti-RNP (p = 0.04), lupus anticoagulant (LA) (p = 0.016), and higher modified SLICC/DI (p = 0.03). Since only 8/35 thromboses were associated to LA, we identified those variables associated with thromboses in patients with LA negative: smoking (p = 0.004), vascular insufficiency (p = 0.03), immobilization (p < 0.0001), serositis (p = 0.04), and hs-CRP (p = 0.02). In the multivariate analysis, BMI (OR 0.79 95% CI 0.65–0.95, p = 0.016), anti-RNP (OR 1.02 95% CI 1.00–1.03, p = 0.003) and LA + (OR 8.05 95% CI 1.75–36.88, p = 0.007) were independent risk factors for thrombosis in the general cohort. After excluding patients with LA, smoking (OR 6.1, 95% CI 1.7–21.8, p = 0.006), vascular insufficiency (OR 28.7 95% CI 2.4–342.9, p = 0.008), and immobilization (OR 313.95% CI 2.6–381.4, p = 0.007) were independent risk factors for thrombosis.

Conclusion: Patients with SLE are at an increased risk of thrombosis, particularly during the first year of diagnosis. Although LA is a strong risk factor, most thrombotic events occur in patients without LA; in this subset, smoking, immobilization and vascular insufficiency are the most important. All of them are potentially modifiable.

Disclosure: A. Hinojosa-Aazaola, None; A. Cicerò-Casarrubias, None; M. C. Ocampo-Torres, None; J. Romero-Díaz, None; J. Sánchez-Guerrero, None.

Clinical Variables Associated With Thrombosis At Systemic Lupus Erythematosus Diagnosis. Differences Between Patients with Positive/ Negative Lupus Anticoagulant. Andrea Hinojosa-Aazaola1, Alba Cicerò-Casarrubias1, Mario César Ocampo-Torres1, Juanita Romero-Díaz1 and Jorge Sánchez-Guerrero1. Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico, 2Mount Sinai Hospital and University Health Centre, Montreal, QC, 3Research Institute of the McGill University Health Ctre, Montreal, QC, 4McGill University, Montreal, QC, 5The Feinstein Institute, Manhasset, NY, 6Fein

Background/Purpose: Thrombosis in patients with Systemic Lupus Erythematosus (SLE) is a major cause of morbidity, it occurs in 9–37%, at younger age, and it represents 27% of mortality. Lupus anticoagulant (LA) is strongly associated with thrombosis; however, most events occur in patients who are negative for LA. The aim of our study was to determine the baseline characteristics associated with thrombosis in an inception cohort of SLE patients and in the subset of patients without LA.

Methods: A longitudinal inception cohort of 223 SLE patients (less than 12 months of accrual ≥4 criteria), predominantly female (90%), mean age 27.2 years at diagnosis, was studied. Baseline evaluation included medical history, physical exam, clinical variables, SLE characteristics, SLE activity (SLEDAI-2K), modified damage index (SLICC/DI), autoantibodies, laboratory tests, homocystein and high-sensitivity C-reactive protein (hs-CRP).

Thrombotic events were diagnosed on clinical manifestations and confirmed by appropriate studies. Statistical analyses: Descriptive statistics, Student T-test, Mann-Whitney U-test, Chi-square, Fisher exact test, Logistic Regression.

Results: During 1269 patient-years of follow-up, thrombosis occurred in 35 patients (16%), incidence rate 25.6 per 1000 patient-years. Most of the events (57%) occurred at onset or during the first year of diagnosis of SLE. At baseline, patients with thrombosis had lower body mass index (BMI) (p = 0.03), smoking (p = 0.02), vascular insufficiency (p = 0.05), immobilization (p < 0.0001), recent surgery (p = 0.004), anti-RNP (p = 0.04), lupus anticoagulant (LA) (p = 0.016), and higher modified SLICC/DI (p = 0.03). Since only 8/35 thromboses were associated to LA, we identified those variables associated with thromboses in patients with LA negative: smoking (p = 0.004), vascular insufficiency (p = 0.03), immobilization (p < 0.0001), serositis (p = 0.04), and hs-CRP (p = 0.02). In the multivariate analysis, BMI (OR 0.79 95% CI 0.65–0.95, p = 0.016), anti-RNP (OR 1.02 95% CI 1.00–1.03, p = 0.003) and LA + (OR 8.05 95% CI 1.75–36.88, p = 0.007) were independent risk factors for thrombosis in the general cohort. After excluding patients with LA, smoking (OR 6.1, 95% CI 1.7–21.8, p = 0.006), vascular insufficiency (OR 28.7 95% CI 2.4–342.9, p = 0.008), and immobilization (OR 313.95% CI 2.6–381.4, p = 0.007) were independent risk factors for thrombosis.

Conclusion: Patients with SLE are at an increased risk of thrombosis, particularly during the first year of diagnosis. Although LA is a strong risk factor, most thrombotic events occur in patients without LA; in this subset, smoking, immobilization and vascular insufficiency are the most important. All of them are potentially modifiable.
revealed that the total BSSI scores (suicidal intention) correlated significantly with HAD-depression (Beta 0.52; p<0.001), HAD-anxiety (Beta 0.47; p<0.001), age (Beta 0.15; p=0.009), male sex (Beta -0.13; p=0.02), previous suicidal attempts (Beta 0.17; p=0.003) and SDI score (Beta 0.21; p<0.001) but not with SLEDAI (Beta 0.05; p=0.44). In a multivariate regression model, only HAD-depression score (Beta 0.30; p=0.001) and significantly with the total BSSI score.

**Conclusion:** In this cross-sectional study, suicidal ideation in the preceding month occurred in 9% of patients with SLE, whereas previous suicidal thoughts/Attempts were present in 12% of participants. The suicidal intention was stronger in older patients, men, and those with more organ damage, anxiety or depressive symptoms. Suicidal intention was stronger in older patients, men, and those with more organ damage, anxiety or depressive symptoms. Suicidal intention did not correlate with disease activity. Further study on the contribution of socioeconomic factors to suicidal ideation in SLE patients is in progress.

**Disclosure:** C. C. Mok, None; K. Chan, None; P. Yip, None.

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**Serum Rituximab Levels and Efficiency of B-Cell Depletion: Differences Between Patients with Systemic Lupus Erythematous and Rheumatoid Arthritis.** Venkat Reddy1, Sara Croca1, Delia Gerona1, Imanacudala De La Torre Ortega2, David A. Isenberg1, Maria Leandro1 and Geraldine Cambridge1, 1University College London, London, United Kingdom, 2Gregorio Marañon Hospital, Madrid, Spain

**Background/Purpose:** Variability in rituximab-induced B-cell depletion (BCD) occurs in a significant number of patients with Systemic Lupus Erythematous (SLE) and to a lesser extent in patients with Rheumatoid Arthritis (RA). A failure to adequately deplete (CD19+ B cells <5%/μl) probably underlies poor clinical response in many patients with SLE. In this prospective study, we investigated whether the levels of rituximab influence the degree of peripheral BCD.

To determine the serum levels of rituximab at 1 and 3 months post-rituximab in SLE and RA in conjunction with the measurement of absolute number of peripheral CD19+ B cells.

**Methods:** A total of 16 patients with SLE were included and 23 with RA. All were treated with rituximab (2 × 1 g doses given 2 week apart). Rituximab levels at 1 and 3 months post treatment was measured with a capture ELISA using sera diluted at a concentration of 1/40,000. CD19 counts were determined by flow cytometry. Adequate depletion was defined as CD19+ count below 5 cells/μl. Data were compared using the Mann Whitney U test for non-parametric data and the Spearman Rank correlation for correlation.

**Results:** At 1 month, 6 of 15 (40%) patients with SLE and 6 of 23 (26%) patients with RA had CD19 counts >5 cells/μl. The median CD19 count in these patients was 0.02cells/μl and 0.008cells/μl for SLE and RA, respectively. The levels of rituximab were significantly lower in SLE when compared with RA, at both 1 and 3 months after rituximab treatment. The median rituximab level at 1 month for SLE was 43.07 μg/ml (range 0–777) and for RA, 391.9 μg/ml (range 1.3–2500) (p=0.0008). The minimal rituximab level at 3 months were <10μg/ml (range 0–54) for SLE and 2.6μg/ml (range 0–1153) for RA (p=0.008). Amongst patients who had depleted well, rituximab levels were significantly lower in patients with SLE when compared with patients with RA at 1 month (p=0.003) and also at 3 months (p=0.008). No such difference was found in patients who did not deplete well. Six patients with SLE had lupus nephritis (LN) and the presence of LN did not influence the levels of rituximab or the degree of BCD, in this small group of patients. The levels of rituximab correlated inversely with the absolute numbers of CD19+ B cells in patients with RA at 1 month (r² = 0.69) and in patients with SLE at 3 months (r² =0.51).

**Conclusion:** Our data indicated that patients with SLE had markedly (>9 fold at 1 month) lower serum levels than RA patients at both 1 and 3 months. A higher proportion of patients with SLE depleted less well with significantly higher residual CD19+ B cells due to factors involved in clearance of rituximab such as impaired recycling through FcRn, internalisation and destruction by target B cells.

**Disclosure:** V. Reddy, None; S. Croca, None; D. Gerona, None; I. De La Torre Ortega, None; D. A. Isenberg, None; M. Leandro, None; G. Cambridge, None.

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**Longitudinal Analysis of Plasma Factors and Disease Activity Identifies Von Willebrand Factor As A Biomarker of LUPUS FLARE.** Mikhail Oflieriev1, Krynakos A. Kirou2, Elena Grkouzman3, Dorte Lundsgaard4, Henrik S. Frederiksen5, Jan Fleckner6 and Mary K. Crowe1, 1Mary Kirkland Center for Lupus Research, Hospital for Special Surgery, New York, NY, 2Hospital for Special Surgery, New York, NY, 3Mary Kirkland Center for Lupus Research, Hospital for Special Surgery, New York, New York, NY, 4Novo Nordisk A/S, Måløv, Denmark, 5NovoNordisk, Copenhagen, Denmark

**Background/Purpose:** Lupus, a chronic autoimmune disease, is characterized by a variable clinical course, with periods of active disease termed flares. The severity of flares can be measured using clinical scores [SELENA-SLEDAI (SS); BILAG], but those scores do not define or suggest underlying pathophysiologic mechanisms of flare. Identification of a biomarker associated with clinical lupus flare would be useful for disease management, for assessment of response to therapeutic intervention in practice or clinical trials, and might suggest cellular or molecular targets for future therapies. To identify biomarkers that reflect lupus flare, we assessed longitudinal clinical and proteomic data from SLE patients.

**Methods:** One hundred sixty-nine plasma samples were collected longitudinally (up to 3 years) from 23 SLE patients and 5 healthy donors (HD), and SS and BILAG scores recorded. All SLE patients fulfilled ACR criteria for the disease. A panel of pro-inflammatory cytokines was evaluated using Multi-Analyte Profiling (MAP) technology (Rules-Based Medicine, Austin, TX). Longitudinal data analysis was performed using R (R Development Core Team) and the R packages limex and languageR. Data were analyzed using Linear Mixed Effects models (LME). A second validation set of 15 patients (175 visits) was used to confirm changes in the level of selected mediators in relation to clinical flare.

**Results:** Thirteen plasma factors were identified as significantly increased in SLE patients compared with HD, and 14 plasma factors were significantly deregulated during flaring compared with non-flaring visits, based on LME. However, in paired t-test analysis only von Willebrand factor (vWF) was significantly increased during severe flares compared to both first non-flaring visit before (p<0.02) and first non-flaring visit after (p<0.01) the identified flare. The association of changes in vWF with lupus flare was confirmed in the validation cohort.

**Conclusion:** vWF is produced by endothelial cells and is required for normal hemostasis and vascular function. Levels of circulating vWF are increased during severe flares compared to both blinded non-flaring flares and healthy visits, based on LME. vWF is thus a key mediator in lupus flare.

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**Incidence Studies of Systemic Lupus Erythematous in Southern Swe- den. Have the Tides Turned?** Ragnar Ingvarsson1, Andreas Jönsen2, Ola Nived1, Gunnar Sturfelt3 and Anders Bengtsson1, 1Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden, 2Section of Rheumatology, Lund, Sweden, 3University Hospital - Lund, Lund, Sweden, 4University Hospital Lund, Lund, Sweden

**Background/Purpose:** The main objective was to study the incidence of Systemic Lupus Erythematous (SLE) within a defined area in Southern Sweden over a period of more than 25 years. By prospectively identifying all new cases within this region using validated retrieval methods. A secondary objective was to investigate whether the phenotypic expression of SLE has changed during the study period.

**Methods:** The health care district of Lund-Orup had a mean population during 1981–2006 of 176.460 persons (>15 yrs of age). SLE cases were identified from multiple sources including diagnosis registries and from central laboratory databases using a previously validated “capture-recapture” methodology (Jonsson et al). The patients were observed prospectively within a structured follow-up program. Diagnosis of SLE was based on the presence of two clinical manifestations typical for SLE together with immunological
abnormalities. Other causes for these manifestations were excluded and the diagnosis was continuously re-evaluated during the follow-up.

Results: One-hundred seventy-five new cases were diagnosed with SLE from 1981–2006. There were 148 women and 27 male patients that received the diagnosis of SLE, with a mean age of diagnosis at 44.3 years. In the first half of the study, from 1981–1993, the incidence of SLE was 5.0/100,000 inhabitants compared to the second half of the study, 1994–2006, where it had decreased to an annual incidence of 2.3/100,000 inhabitants. During the first half of the study period the highest incidence was among females between the ages 45–54 was it 15.1/100,000 inhabitants whereas in the second half of the study the incidence was reduced to 3.8/100,000 in this age group (p=0.0001). Between the years 1994–2006 the highest age and sex specific incidence was amongst women between 25–34 years of age (6.6/100,000 inhabitants), unchanged from the prior period. During the whole period the age and sex specific was highest among women between the ages 45–54 (8.9/100,000 inhabitants). The point prevalence of SLE on 31st of December 1993 was 55/100,000 inhabitants compared to the 31st of December 2006 where it was 66/100,000 inhabitants. 163 of the 175 patients fulfilled 4 or more ACR classification criteria SLE giving the criteria a sensitivity of 93% for diagnosing SLE in our cohort. The disease phenotype did not vary over time.

Conclusion: The incidence rate of SLE in Southern Sweden remains stable in younger females over a 26 year period from 1981–2006. However, the incidence was reduced significantly in the older patient groups in the later period of the study.

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Non-White Race, Younger Age, and Use of Primary and Gynecologic Care Are Associated with Higher Rates of Cervical Cancer Screening in Systemic Lupus Erythematosus Patients At a Public Hospital. Jennifer Stichman1, Angela Keniston1, JoAnn Zell1, Innoo Yazdany2, Izzar Quinanzos3 and Joel M. Hirsh1. 1Denver Health Med Ctr, Denver, CO, 2National Jewish Health, Denver, CO, 3University of California San Francisco, San Francisco, CA

Background/Purpose: Patients with Systemic Lupus Erythematosus (SLE) are at increased risk of cervical dysplasia and persistent Human Papilloma Virus (HPV) infection. There are few prior studies looking at cervical cancer screening in patients with SLE, and these have relied upon self-report to document if screening was done appropriately. These studies have also not measured race and ethnicity, or years of education. Using data from the DH electronic health record (EHR), we identified rheumatology clinic patients with initial encounters between July 2004 and December 2006 where in 3 years, in contrast to 81% of patients age 21–29 (p = 0.0235). In unadjusted analyses, White women were less likely to have screening in 3 years compared to non-White women in the 21–29 age group (p = 0.0147). Women in the 21–29 age group with a history of gynecologic care were had a higher likelihood of screening at 3 years (p = 0.019). In the 30–50 age group, having seen a primary care physician was associated with a higher likelihood of screening at 1 and 3 years (p = 0.0013 and 0.0003 respectively) and history of gynecology care was associated with increased likelihood of having a screening test at 1 and 3 years (p = 0.0013 and 0.0003 respectively). Patients receiving immunosuppressive medications were no more likely to receive cervical cancer screening than other SLE patients.

Conclusion: We identified a gap in care in large subsets of the SLE patients at DH. White women age 21–29 and patients age 30–50 were less likely than the general primary care DH population to have appropriate cervical cancer screening. Rheumatologists need to help connect female SLE patients of all races and ethnicities with primary or gynecology care services as well as patients who limit physician visits to rheumatology are at risk of not being screened for cervical cancer.

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Effects of Nelfinavir On Anti-dsDNA Antibody Binding and Pro-Inflammatory Cytokine Gene Expression. Maria Espinosa1, Julisa Patel2, Meggan Mackay3, Cynthia Aranow4 and Betty Diamond5. 1Cohen Children’s Hospital-North Shore LIJ, New Hyde Park, NY, 2Cohen Children’s Hospital, New Hyde Park, NY, 3The Feinstein Institute for Medical Research, Manhasset, NY, 4Feinstein Institute for Medical Research, Manhasset, NY, 5Feinstein Institute Med Rsch, Manhasset, NY

Background/Purpose: The hallmark of SLE is pathogenic autoantibody (aab) production that is closely associated with organ damage. Anti-dsDNA aab are specific to SLE; their deleterious effects are mediated by direct binding of aab to DNA or anti-dsDNA containing immune complexes, as well as through TLRs leading to stimulation of inflammatory pathways. Current therapies include immunosuppressive/cytotoxic drugs with significant potential toxicities. Protease inhibitors (PIs) such as nelfinavir, in addition to direct anti-viral properties, are safe and well-tolerated and have been shown to have immunomodulatory effects. Previous studies have shown that nelfinavir inhibits murine anti-dsDNA aab binding by ELISA. We hypothesized that nelfinavir would similarly inhibit binding of human anti-dsDNA antibodies from SLE subjects, decrease pro-inflammatory cytokine gene expression in stimulated peripheral blood mononuclear cells (PBMC) and inhibit anti-DNA aab binding to mouse glomeruli ex-vivo.

Methods: Sera from 4 SLE subjects with elevated serum anti-DNA aab and increased disease activity (SLEDAI of ≥4) were incubated with increasing concentrations of nelfinavir (1 μM, 10 μM, and 100 μM) and added to the ELISA plate followed by spectrophotometric analysis. Healthy PBMC were stimulated with lipopolysaccharide (LPS) (5 μg/mL) or high-mobility group box 1 protein (HMGB1) (10 μg/mL) and incubated with nelfinavir (1 μM, 10 μM, and 100 μM). Cytokine gene expression (IL-6, IL-12a, TNFα, INFα, IL-1β) and IFN inducible gene expression (IFIT1, MX1, IFI44, and OAS1) were measured in the PBMC by PCR. The glomerular binding assay was used to measure inhibitory effects of nelfinavir on murine anti-DNA aab binding to glomerular antigen(s) with and without DNase treatment.

Results: Nelfinavir at 1, 10 and 100 μM concentrations resulted in 59%, 60% and 56% inhibition of DNA binding by ELISA respectively (p = 0.01, p = 0.02, p = 0.01). Increasing concentrations of nelfinavir incubated with LPS-stimulated PBMC resulted in decreased gene expression of IL-12α (99%, 99%, and 99%), TNFα (90%, 90%, and 90%), INFα (99%, 99%, and 99%) and IL-1β (64%, 51%, and 24%). IL6 gene expression was decreased with 1 and 10μM concentrations but increased with 100 μM concentration. HMGB1 stimulated PBMC demonstrated increased expression of TNFα, IL12α, IFNα, IL1β and the IFN inducible genes IFIT1, MX1, IFI44, and OAS1 that was inhibited by nelfinavir with no clear dose response. IL6 gene expression was not increased by HMGB1 although addition of nelfinavir inhibited the expressed levels. The 100 μM concentration of nelfinavir abrogated glomerular binding of murine anti-DNA aab to glomerular antigens.

Conclusion: Nelfinavir inhibits human anti-dsDNA binding to dsDNA and murine anti-DNA aab binding to glomerular antigen. Additionally, nelfinavir decreases expression of pro-inflammatory cytokines and IFN inducible genes in LPS and HMGB-1 stimulated PBMC suggesting that the mechanism for inhibition may be interference with the antigen binding site of the anti-dsDNA aab. We plan to use these measures as biologic outcome measures for a phase Ila clinical trial exploring the in-vivo inhibitory effects of nelfinavir in SLE patients.

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Serial Screening Shows That 28% of Systemic Lupus Erythematosus Adult Patients Carry an Underlying Primary Immunodeficiency. Sandro F. Perazzio¹, Reinaldo Salomao¹, Neusa P. Silva², Magda Cameiro-Sampaio³ and Luis Eduard C. Andrade⁴.¹Federal University of Sao Paulo, Sao Paulo, Brazil; ²Escola Paulista de Medicina - Universidade Federal de Sao Paulo, Sao Paulo, Brazil, ³Instituto da Criança da Faculdade de Medicina da Universidade de Sao Paulo (FMUSP), Sao Paulo, Brazil, ⁴Universidade Federal de Sao Paulo, Sao Paulo, Brazil.

Background/Purpose: Systemic Lupus Erythematosus (SLE) is known to be associated with deficiency of C1q, C4, and C2. There is high frequency of discoid lesions (2.7%) and SLE (0.5%) in Chronic Granulomatous Disease (CGD). Selective IgA Deficiency (SlaID) has been associated with juvenile (5.2%) and adult (2.6%) SLE. About 25% of patients with Common Variable Immunodeficiency (CVI) develop autoimmune manifestation, including SLE. Although there are reports of individual primary immunodeficiency (PID) in SLE, there is no systematic study estimating the fraction of SLE adult patients presenting any form of PID. This study aimed to estimate the prevalence of overall PID in a cohort of SLE patients and healthy controls, and to compare the clinical characteristics of the SLE patients with and without PID.

Methods: 300 SLE patients (ACR criteria) and 301 controls (blood donors) underwent clinical examination and were evaluated for total hemolytic complement (CH50), C2, C3, C4A and C4B gene copy number, immunoglobulin isotypes and IgG subclasses, as well as quantification of the oxidative burst in neutrophils. Patients who presented any laboratory indication of PID underwent a novel examination after 60 days for confirmation. Patients with active disease and abnormal results were followed and underwent novel tests after the end of the flare or excluded if no remission was attained up to the end of the study. Cases with low C2 serum levels underwent C2 gene analysis by PCR for confirmation. Those who presented altered unexplained CH50 underwent C1q determination. Those with C4A and/or C4B low copy number had C4 serum levels determined. Diagnosis of PID was established according to “2009 International Union of Immunological Societies Expert Committee on PID.”

Results: There were 84 SLE patients (28%) and 10 controls (3.3%) with established diagnosis of PID (p<0.001). SLE patients had a significantly higher frequency of IgG₃ deficiency (n=37; 12.3%), IgG₄ deficiency (n=24; 8%), IgM deficiency (n=24; 8%) as compared to HC (0.3%, 0%, 0%, and 1.6%, respectively). One female patient presented neutrophil oxidative burst profile compatible with CGD gene carrier status (0.33%). There were no cases of C2, C3, C4 or C1q deficiency, CVID, CGD, Hyper-IgM and Hyper-IgL-syndromes. Patients with IgG₃ or IgG₄ deficiency presented higher frequency of lupus nephropathy and those with IgM deficiency presented higher prevalence of oral ulcers. Overall PID was not associated with most SLE clinical manifestations, infection rate, immunosuppressant use, age at disease onset, disease duration, comorbidity, SLEDAI and SLE-DI.

Conclusion: Over one quarter of SLE patients presented some form of PID, largely represented by immunoglobulin deficiency. Due to the important role of immunoglobulins in the clearance of immunocomplex, apoptotic bodies and pathogens, low levels of these components might induce a state of frequent and persistent immunological stimulation, which may foster autoimmune development in genetically predisposed individuals. Our results suggest that an underlying immunodeficiency state may be involved in the disease pathophysiology in a substantial fraction of SLE patients.
Moreover, the interacting alteration of between ACE2 and IgG by XNT was examined by ELISA and western blot analysis.

Results: ACE2 activity was reduced by IgG purified from sera of 12 of 13 AID patients (92.3 %) with vasculopathy, but not that of 10 of 11 non-vasculopathy patients (90.9 %) and healthy subjects. Furthermore, in 2 of 12 samples retained ACE2 inhibitory effects, XNT overcame the inhibitory effects when added to IgG-ACE2 complex mixture. Moreover, XNT cancelled the binding of anti-ACE2 to ACE2.

Conclusion: The ACE2 activator, XNT increased ACE2 activity suppressed by IgG of AID patients. Our results suggested that XNT cancelled antigen-antibody reaction inducing a dynamic conformation change of ACE2. We propose that it is important to identify the activator which has the inducible capability of structural change against ACE2 and such compound is sufficiently expectable as candidate of therapeutic agent.

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Abnormal Neutrophil Development in Human Systemic Lupus Erythematosus.

Namrata Singh1, Martana J. Kaplan1, Philip L. Cohen1 and Michael F. Denny1. 1Temple University, Philadelphia, PA, 2University of Michigan, Ann Arbor, MI

Background/Purpose: Recent research has increased the appreciation of the contributions of neutrophils to systemic lupus erythematosus (SLE). An abnormal circulating pool of granulocytes has been associated with certain disease manifestations, and we previously developed techniques to isolate these low-density granulocytes (LDGs) from the blood of SLE patients. While LDGs express surface markers consistent with mature neutrophils, their nuclear morphology suggests an immature phenotype. This pattern of mature neutrophils possessing an abnormal nuclear morphology is frequently observed in patients with alterations in granulocyte development, suggesting that neutrophil differentiation may be disrupted in SLE patients.

Methods: Because disrupted neutrophil development is frequently associated with genomic alterations, we compared genomic alterations in autologous pairs of LDGs and normal-density neutrophils. Somatic alterations were detected by cytogenetic microarray analysis of genomic DNA extracted from LDGs and neutrophils from 13 female SLE patients, as well as neutrophil samples from 9 age-matched healthy female donors. The Affymetrix 2.7M Cytogenetics Microarray chip was used to assess the copy number state and heterozygosity across the genome. For each SLE patient we compared genomic DNA from LDGs to DNA from autologous neutrophils. Variations present in both samples are inherited, while alterations found exclusively in the LDG sample represent the acquisition of additional somatic alterations.

Results: The SLE normal density neutrophils and healthy donor neutrophils had similar levels of copy number variations, most of which corresponded to known variants. In contrast, the LDG samples from SLE patients had a two-fold increase in copy number alterations relative to either autologous normal-density neutrophils or healthy controls. The elevation in genomic copy number variations in the LDG samples included an increased incidence of both duplications and deletions. These LDG somatic alterations were found in 6 of the 13 patients. Thus, the LDGs isolated from a subset of SLE patients displayed evidence of genomic instability as determined by alterations in copy number. Moreover, these genomic alterations occurred preferentially on certain chromosomes, as opposed to random distribution across the genome. No correlation between genomic instability and the use of immunosuppressive drugs, disease activity or manifestations was observed.

Conclusion: In a subset of SLE patients, the LDGs show an elevated level of genomic alterations that is consistent with genetic damage or instability. These alterations occur in discrete chromosomal intervals, suggesting these regions reflect an increased propensity for damage or that the alteration confers a selective advantage to the affected cell. Whether the inflammatory environment present in SLE patients promotes these genetic alterations, or whether it is an intrinsic property of the SLE genome, remains to be determined.

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Christopher Sjöwall1, Anders J. Ofin1, Thomas Skogh1, Jonas Wetterö1, Mattias Mörgelin2, Ola Nived2, Gunnar Sturfelt1 and Anders A. Bengtsson3. 1Linkoping University, Linkoping, Sweden, 2Infection Medicine, Department of Clinical Sciences, Lund University, Lund, Sweden, Lund, Sweden, 3Linköping University, Linköping, Sweden, 4University Hospital Lund, Lund, Sweden, 5Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden

Background/Purpose: The pattern recognition molecules C-reactive protein (CRP) and complement protein 1q (C1q) are pivotal parts of the innate immune system and display relevant biological functions in the pathogenesis of systemic lupus erythematosus (SLE). Circulating autoantibodies directed against CRP and C1q are frequently found in SLE patients with active disease, especially those with lupus nephritis, and raised serum autoantibody levels reportedly relate to both disease activity and prognosis. This study was performed to assess glomerular localization of IgG, CRP and C1q as a reflection of nephritogenic immune complexes (ICs) in patients with active diffuse proliferative lupus nephritis.

Methods: Renal specimens from five well-characterized patients with active diffuse proliferative lupus nephritis were examined by immunogold electron microscopy to pinpoint glomerular localization of CRP, C1q, C3c and double-stranded (ds) DNA in relation to IgG. Renal biopsies from patients with Henoch-Schönlein purpura, pauci-immune nephritis and renal cancer served as controls. In addition, serum IgG class antibodies against CRP, C1q, and nucleosomes were analyzed by ELISA in the lupus nephritis patients before, during and after renal flares. Informed consent was obtained from all subjects and the research protocol was approved by the Regional Ethics Committee in Lund (H4 207/2005).

Results: Tissue CRP, C1q, C3c and dsDNA were found to co-localize with IgG in renal subendothelial electron dense deposits. Disease controls only showed negligible staining for the tissue markers as compared with lupus nephritis and none had detectable anti-C1q, anti-CRP or anti-nucleosome antibodies. All SLE patients had circulating anti-nucleosome antibodies, and four of five were anti-CRP, anti-dsDNA, and anti-C1q antibody positive at the time of biopsy/flare. Using accumulated data (pre-post nephritis), one could observe that anti-nucleosome and anti-C1q antibody levels were more interrelated (r = 0.42, p = 0.046) than were the levels of anti-CRP versus anti-C1q or anti-nucleosome antibodies, respectively.

Conclusion: The results support the notion of a pathogenic role not only for antibodies directed against dsDNA, but also for anti-CRP and anti-C1q in lupus nephritis. The glomerular ICs may have been generated by deposition of circulating ICs or by in situ IC formation. The demonstrated correlation between anti-C1q and anti-nucleosome antibodies, but not between these autoantibodies and anti-CRP, indicate that the latter may reflect an independent role in the pathogenesis of lupus nephritis.

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Increased C1q, C4 and C3 Deposition On Platelets in Patients with Systemic Lupus Erythematosus – A Possible Link to Venous Thrombosis?

Christian Lood1, Sam Eriksson1, Birgitta Gullstrand2, Andreas Jönsen1, Gunnar Sturfelt1, Lennart Traedsson1 and Anders A. Bengtsson3. 1Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden, 2Department of Laboratory Medicine, Section of Microbiology, Immunology and Glycobiology, Lund, Sweden

Background/Purpose: Patients with systemic lupus erythematosus (SLE) are at increased risk of developing vascular diseases (VD), such as myocardial infarction, stroke and venous thrombosis, which can only partly be explained by traditional risk factors. The role of platelets in this process has not been extensively studied. Platelet activation support complement binding to the platelet surface, and increased C4d has been seen on platelets in SLE patients as well as in non-rheumatic patients with stroke. In this study we investigated in vivo platelet deposition of the classical complement pathway components C1q, C4d and C3d in relation to VD in SLE patients. Furthermore, the ability of serum to support in vitro complement deposition on fixed heterologous platelets was analyzed.
Methods: Blood from 69 SLE patients and age- and sex-matched healthy individuals was collected in sodium-citrate tubes and platelets isolated by centrifugation. Complement deposition on platelets was detected by flow cytometry.

Results: We could demonstrate that SLE patients had increased C1q, C3d and C4d deposition on platelets as compared to healthy controls (p<0.0001). SLE patients with a history of venous thrombosis had increased complement deposition on platelets as compared to SLE patients without this manifestation (p<0.05). In vitro studies demonstrated that serum from patients with lupus anticoagulant, venous thrombosis or the antiphospholipid antibody syndrome supported increased platelet C4d deposition in vitro as compared to SLE patients without these manifestations (p<0.05). Our data support the hypothesis that platelet activation and the subsequent complement deposition on platelets are central in development of venous thrombosis in SLE.

Conclusion: Altogether we suggest that complement deposition on platelets could reflect important pathogenetic events related to the development of venous thrombosis in SLE and might be used as a marker for venous thrombosis in SLE.

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The Clinical Significance and Expression of P2X7 Purinergic Receptor in Peripheral Blood from Patients with New-Onset Systemic Lupus Erythematosus.

Xiangpei Li, Meiyun Wang, Jiahui Tao, Xiaomei Li and Ning Yu. Anhui Medical University Affiliated Provincial Hospital, Hefei, Anhui, China.

Background/Purpose: P2X7 purinergic receptor (P2X7R) is encoded by a gene within the human SLE locus SLEB4. Extracellular adenosine triphosphate (ATP) regulates inflammatory cells by activating this pro-inflammation receptor. Our aim was to describe the expression of the P2X7R on peripheral blood lymphocytes in patients with SLE and explore its significance in the pathogenesis and clinical features of SLE.

Methods: Surface expression of P2X7R on total lymphocytes, CD4T cells, and CD19B cells in peripheral blood from 29 SLE patients were determined by flow cytometry. As controls, 28 age and sex-matched healthy subjects (HC) were used. ELISA was performed to detect P2X7R-related serum cytokines IL-1β, IL-6, TNF-α level.

Results: Compared to HC, SLE patients had higher expression of P2X7R on CD4+ T cells (2.21(3.55) vs 0.89(1.15) p=0.015) and CD19+B cells (11.53(20.01) vs 6.66(6.27), p=0.037). The same result was also observed in total lymphocytes (1.85(5.75) vs 1.19(0.74), p=0.082), though it was not statistically significant. As reported before, increase of IL-1β, IL-6 and TNF-α were observed in patients with SLE. Meanwhile, the percentage of P2X7R+ cells in lymphocytes was positively correlated with the serum IL-6 level in SLE patients (r=0.449, p=0.015). Regarding the clinical manifestations, patients with arthritis showed higher expression of P2X7R on total lymphocytes compared to patients without arthritis (p=0.006). Neurropsychiatric lupus (NPSLE) patients had increased P2X7R expression on CD19+B cells. In addition, the percentage of P2X7R+ cells in total lymphocytes and CD19B cells were both positively correlated with the SLEDAI score (r=0.374, p=0.005 5; r=0.274,p=0.041) and so was that in total lymphocytes with anti-β2GPI.

Conclusion: These preliminary results suggest that an increased expression of P2X7R may contribute to the flare and organ damage of SLE by reducing the secretion of IL-6, which suggests that therapeutic targeting of P2X7R might be beneficial for treatment of human SLE.

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Estrogen Upregulates Interleukin-21 Production of Clusters of Differentiation 4 Positive T Lymphocytes in Patients with Systemic Lupus Erythematosus.

Jennifer Lee, Jae Hun Kim, Jae Ho Lee, Seung Min Jung, Mi-La Cho, Seung-Ki Kwook, Ji Hyeon Ju, Kyung-Su Park, Sung-Hwan Park and Ho-Youn Kim. 1Division of Rheumatology, Department of Internal Medicine, School of Medicine, The Catholic University of Korea, Seoul, South Korea, 2Rheumatic research center, Catholic University of Korea, Seoul, South Korea.

Background/Purpose: Systemic lupus erythematosus (SLE) is an autoimmune disease in which various organs and tissues are damaged through abnormal immune responses mediated by tissue-binding autoantibodies and immune complex deposition. As the majority of SLE patients are women of child-bearing age, estrogen has been suggested to play an important role in the pathogenesis of SLE. One of the proposed roles of estrogen is to induce B cell activation culminating in increased autoantibody production. IL-21, a cytokine by chain cytokine, has been shown to be crucial in the differentiation of activated B cells into plasma cells. Based on these concepts, we hypothesized that estrogen contributes to pathogenesis of SLE via IL-21 dependent pathway and investigated the effect of estrogen on the production of IL-21 by T cells and subsequent B cell activation in SLE patients.

Methods: Peripheral blood mononuclear cells (PBMCs) were obtained from peripheral blood of 23 SLE patients and 16 healthy controls. CD4+ T cells, non CD4+ T cells and B cells were isolated using microbeads. Isolated cells were treated with 17-β estradiol at various concentrations for 48hrs (up to 72hrs in some experiments). The expression of IL-21 and its receptor was assessed by measuring the level of protein and mRNA using ELISA and RT-PCR, respectively. The level of immunoglobulin G secreted by activated B cells were measured with specific ELISA.

Results: The expression of IL-21 and its receptor in serum, PBMCs, and CD4+ T cells were higher in the patients with SLE compared to healthy controls. Exposure of CD4+ T cells from SLE patients to 17-β estradiol leads to a dose-and time-dependent increase in the IL-21 expression. The increase was abolished in the presence of MAP kinase (MEK, p38, JNK) inhibitors. B cells of healthy controls showed an increased antibody production when they were co-cultured with estrogen treated CD4+ T cells of patients with SLE. Treatment with anti-IL-21 antibody abrogated the increased antibody production of the co-culture systems, suggesting the increase was mediated by IL-21 dependent manner.

Conclusion: This study revealed the association of estrogen and IL-21 in the pathogenesis of SLE. Estrogen upregulates IL-21 expression of CD4+ T cells via MAPK dependent pathways in SLE patients, which in turn induces increased antibody production by B cells.

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Cytokines and Their Relation to Autoantibodies Before Disease Onset in Systemic Lupus Erythematosus.

Catharina Eriksson1 and Solbritt Rantapää-Dahlqvist1. 1Department of Clinical Immunology/clinical microbiology, Umeå, Sweden, 2Umeå University Hospital, Umeå, Sweden.

Background/Purpose: Cytokines and autoantibodies are involved in the pathogenesis of systemic lupus erythematosus (SLE). The presence of autoantibodies preceding disease onset by years has been reported both in SLE and in other rheumatic diseases, and changes in cytokine levels have been shown before disease onset in rheumatoid arthritis. The cytokine group interferons and interferon-related molecules are considered to be of importance in SLE pathogenesis. Therefore, we intended to measure cytokine levels, and relate them to autoantibodies, in a northern European population before the onset of symptoms of SLE.

Methods: The register of patients fulfilling the American College of Rheumatology criteria for SLE and with a given date of the onset of symptoms was coanalysed with the register of the Medical Biobank, Umeå, Sweden. Thirty-six patients were identified as having donated blood samples prior to symptom onset. A nested case-control study (1:4) was performed with 144 age- and sex-matched controls identified from the Medical Biobank register (Umeå, Sweden). The cytokines interferon alpha (IFN)-α, interleukin (IL)-4, IL-9, IL-10, interferon inducible protein 10 (CXCL10/IP-10) and monocyte chemotactic protein-1 (CCL2/MCP-1), were analysed before and after onset of symptoms of SLE using a multiplex kit from Millipore on a Bio-Plex Array Reader (Luminex236). The associations of these cytokines to autoantibodies (ANA, ENA, anti-dsDNA och anti-histone antibodies), from the same blood samples, before disease onset was estimated.

Results: The IP-10 levels were significantly higher in the individuals who later developed SLE (“prepatients”) than in the controls (median value 12.0; interquartile range 1.2-73.0 vs 3.5; p=0.01 and 0.03, respectively) and also to autoantibody
positivity over all (p < 0.001). MCP-1 was related to SSA and SSB positivity (p = 0.009 and 0.047) and with antibody positivity over all (p = 0.015), IFN-α with anti-SSB and antibody positivity over all (p = 0.027 and 0.025), IL-4 to anti-ssDNA (p = 0.019) and IL-10 to anti-RNP positivity (p = 0.041). IL-10, IL-10 and MCP-1 increased significantly between the pre-patient sample, 7.44 pg/mL ± 8.93, 372 pg/mL ± 293 and 278 pg/mL ± 475 respectively, and after SLE was diagnosed, 12.3 pg/mL ± 20.1, 666 pg/mL ± 602 and 1068 pg/mL ± 765, respectively. The IFN-α0.029 and <0.0001 and <0.0001 respectively. The cytokines showed no significant changes in relation to time before disease onset or to the debut SLE-symptom.

Conclusion: IL-10, MCP-1 and IFN-α had the clearest relationships with autoantibody formation before disease onset of SLE. Since IFNs and IL-10 were strongly correlated with each other these findings support previous theories that the IFN-system is important in the early SLE pathogenesis and autoantibody formation.

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Leukadherin 1, a CR3 Mimetic, Negatively Regulates Toll Like Receptor (TLR) Dependent Inflammatory Responses via Degradation of an Adapter Protein

Kristen Lee1, Joanne H. Reed1, Vineet Gupta2, Tejaskumar Patel3, Jill P. Buyon4 and Robert M. Clancy5
1 New York University School of Medicine, New York, NY, 2Division of Nephrology and Hypertension, Department of Medicine, University of Miami, Miami, FL 33136, U.S.A., Miami, FL, 3NYU School of Medicine, New York, NY

Background/Purpose: Systemic Lupus Erythematosus is characterized by continuous and cyclic stimulation of the innate immune system by endogenous nucleic acids. Immune complexes of R60, ssRNA and anti-Ro60 have been shown to engage TLR7 and promote secretion of inflammatory mediators. Recent evidence demonstrates that activation of the integrin, CR3, negatively regulates TLR signaling in dendritic cells. Leukadherin (LA1), a novel small molecule, allosterically activates CR3 and suppresses inflammation. This study was initiated to molecularly address whether, and by what mechanism, LA1 downregulates ssRNA-induced TLR7 signaling in macrophages.

Methods: THP-1 cells and PBMC derived CD14+ macrophages from healthy human donors were incubated with TLR7/8 agonists (hY3 (2.5 µg) or R848 (1 µM)) with and without LA1 (7.5 µM) added 30 minutes pre or post stimulation. Quantification of TNFα secretion, the readout of TLR7/8 activation, was assessed by ELISA and MyD88 was evaluated by immunoblot. IFN-α0.029, IL-6, IL-8, IL-10 and IP-10, MCP-1 and IFN-γ were evaluated by immunoassays.

Results: Exposure of healthy human macrophages to hY3 resulted in a significant release of TNFα compared to unstimulated cells (348 ± 45 vs 4 ± 2 pg/ml, respectively P = 0.0001, N = 9). Stimulated TNFα release was markedly decreased by pre-treatment with LA1 but not post-treatment (35 ± 47 and 1275 ± 467 pg/ml, respectively, P = 0.035, N = 6). In parallel with the results for isolated macrophages, TNFα was induced after exposure of THP-1 macrophages to hY3 (315 ± 59 vs 15 ± 13 pg/ml, stimulated vs. unstimulated respectively P = 0.0015, N = 7). Pre-treatment with LA1 profoundly decreased hY3-induced secretion (18 ± 9 pg/ml, P = 0.0013 vs hY3) and exceeded the inhibition observed with a TLR7 inhibitor (117 ± 16 pg/ml, P = 0.004 vs hY3). Moreover, R848 stimulated TNFα release was also significantly decreased by pre-treatment with LA1 (1113 ± 218 vs 55 ± 47 pg/ml, respectively P = 0.0006, N = 11). To identify the potential mechanism for downregulation of TLR7 signaling, adaptor protein degradation was studied. LA1-mediated inhibition of both hY3 and R848 stimulated TNFα release was accompanied by degradation of MyD88 (immunoblot, N = 3 for each stimuli, an effect not seen with a TLR7 antagonist, oligonucleotide IRS661 (inhibits at level of TLR9/13 downstream)). Reproduction of this blot demonstrated that the expression of actin did not vary with treatment condition. Evidence against cytoxicity of LA1 was provided by the absence of LDH in culture supernatants. The ITGAM Assignment of THP-1 cells and all the donor macrophages was homozygous common at rs1143679 supporting that the inhibitory effect of LA1 was applicable to the dominant genotype.

Conclusion: The data suggest that activation of CR3 downregulates macrophage TLR7 signaling via degradation of MyD88. These findings may be particularly relevant in disease states such as SLE and neonatal lupus in which inflammatory cells are triggered by ssRNA containing immune complexes.

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Interferon-Alpha Impairs the Survival and Function of Circulating Angiogenic Cells in Vitro: A Model of Failed Endothelial Repair in SLE

John A. Reynolds1, David W. Ray2, Terence O’Neill3, M. Yvonne Alexander4 and Ian N. Bruce5
1 University of Manchester, Manchester, United Kingdom, 2Arthritis Research UK Epidemiology Unit and NIHR Manchester Musculoskeletal Biomedical Research Unit, Manchester, United Kingdom

Background/Purpose: Patients with Systemic Lupus Erythematosus have an increased risk of cardiovascular disease (CVD). No specific targeted therapies for CVD in lupus exist and there are no in vitro models to study potential novel agents. Endothelial dysfunction, the earliest stage of vascular damage, is associated with interferon-alpha (IFNα) expression. It has been proposed that IFNα may act by impairing endothelial repair mechanisms. When compared to healthy controls, lupus patients have fewer circulating angiogenic cells (CAC) and endothelial progenitor cells (EPCs). Mixed IFNα/CAC populations have been shown to be dysregulated in apoptosis and change in phenotype. We aimed to investigate the effects of IFNα2b on an in vitro model of angiogenesis/vascular repair.

Methods: Peripheral blood mononuclear cells were obtained from healthy subjects and cultured on human fibroconnect in endothelial growth media. Myeloid phenotype was confirmed by LDL uptake/lectin binding and expression of cell surface markers by RT-PCR. Cell survival in response to IFNα2b (0.01–10 ng/ml) was determined by the number of LDL-uptake-positive cells at 7 days. An angiogenesis assay was used to study CAC function. Supernatant from CACs cultured for 7 days ± 10 ng/ml IFNα2b was added to human aortic endothelial cells cultured on growth factor reduced Matrigel. Tubule formation was assessed at 14 hours using an automated computer algorithm. Mean values of the calculated network parameters were compared using 2-tailed t-tests.

Results: CACs expressed markers of both endothelial (CD31) and myeloid lineage (CD14, CD45). In addition, CACs strongly expressed the macrophage markers CD68, CD163 and CD206 suggesting an alternatively-activated (M2) macrophage phenotype. IFNα2b significantly reduced the number of CACs at day 7 in a dose-dependent manner (r² = -0.769, p < 0.0001).

In co-culture with endothelial cells on Matrigel, CACs co-localised to the endothelial tubules but did not form tubule networks alone. CAC supernatant significantly increased the density of the tubule network when in terms of: total pixel area (27781 vs 36283, p = 0.0048), branch points (1292 vs 664, p = 0.0001) and number of branches (340.2 vs 510.6, p = 0.0434), number of junctions (162.4 vs 241.1, p = 0.0104) and number of closed loops within the network (21.8 vs 38.3, p = 0.005). IFNα2b significantly reduced the number of closed loops (38.2 vs 24.1, p = 0.0094). All other network parameters were reduced by IFNα2b but did not reach statistical significance.

Conclusion: CACs are of myeloid lineage and have angiogenic capacity in vitro. CAC supernatant contains potent angiogenic factors which augment endothelial tubule networks. IFNα2b dramatically reduces the survival of CACs in vitro, resulting in reduced tubule network formation and may be a potential mechanism by which IFNα promotes vascular damage in SLE. Quantification of the angiogenic nature of CACs and the effects of IFNα2b, using a tubule formation assay, offers a potential in vitro model in which to study the effects of novel vasculoprotective agents in this patient population.

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Markers of Nitric Oxide and Hydroxyld Radical Formation Are Increased In Proliferative Lupus Nephritis and May Emanate From Increased Nitric Oxide Synthase and NADPH Oxidase Production and Reduced Endothelial Nitric Oxide Synthase-Derived NO Scavenging

Jim Oates, Ahmad Mashmouushi, Thomas Fleury, Ann Hofbauer and Gary S. Gilkeson
Medical University of South Carolina, Charleston, SC

Background/Purpose: The role of redox regulation of cell function in the different International Society of Nephrology/Renal Pathology Society (ISN/RPS) classes of lupus nephritis (LN) is not known. Different reactive intermediate (RI) species lead to different changes in proteins that are important in transcriptional regulation and signal transduction. There are unstable species that can be measured indirectly by their ability to modify protein tyrosines (Tyr) and phenyalanines to form nitroTyr (NTyr, via peroxynitrite), metaTyr (mTyr, via hydroxyl radicals (OH), usually
metabolized from SO and $H_2O_2$, and chloroTyr (CTyr, via HOCl). This study was designed to address the hypothesis that different classes of LN have distinct profiles of RI production.

**Methods:** 62 patients with active LN had a renal biopsy with ISN/RPS classification at screening. Serum and urine samples were collected before induction therapy for active LN. Serum (n = 62) was analyzed for nitrate and nitrite ($NO_3^-$, a marker of nitric oxide (NO) production) by chemiluminescence analyzer. In a random subset of patients (n = 34), serum proteins were analyzed for NTyr, mTyr, and CTyr by HPLC with electrochemical detection and reported as the ratio of modified Ty to unmodified Ty * 1000. Snap frozen murine renal cortical tissue lysates from MRL/lpr and MRL/lpr NOS3 −/− (endothelial NO synthase or eNOS) mice with active proliferative LN were analyzed for superoxide (SO) production by lucigenin assay with and without inhibitors of NOS and NADPH oxidase. **Results** were normalized to untreated MRL/lpr wildtype control tissue. Groups were compared by Wilcoxon rank sum or Student t test, and p < 0.05 was significant.

**Results:** Those with class IV LN had significantly higher levels of serum $NO_3$, mTyr was elevated in those with class III and IV LN. In class V LN, NTyr and CTyr were increased (differences not significant). SO production was increased (to 160%) in MRL/lpr NOS3 −/− kidney cortex. This increase was reduced by both L-NMMA (a nonspecific NO synthase inhibitor, 70% of control) and DPI (a nonspecific NADPH oxidase inhibitor, 40% of control).

**Table.** Levels of markers of RI production in patients with LN by ISN/RPS class

<table>
<thead>
<tr>
<th>ISN/RPS Class</th>
<th>nitrate ± nitrite</th>
<th>mTyr/Tyr*1000</th>
<th>CTyr/Tyr*1000</th>
<th>NTyr/Tyr*1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure I</td>
<td>39 (n = 1)</td>
<td>0.6 (n = 1)</td>
<td>0.1 (n = 1)</td>
<td>0.2 (n = 1)</td>
</tr>
<tr>
<td>Pure II</td>
<td>30.2 ± 7.2 (n = 9)</td>
<td>0.2 ± 0.1 (n = 4)</td>
<td>0.1 ± 0.1 (n = 4)</td>
<td>0.3 ± 0.1 (n = 4)</td>
</tr>
<tr>
<td>Pure and mixed III</td>
<td>30.4 ± 5.3 (n = 9)</td>
<td>9.0 ± 5.5 (n = 12)</td>
<td>0.1 ± 0.1 (n = 12)</td>
<td>0.7 ± 0.3 (n = 12)</td>
</tr>
<tr>
<td>Pure II</td>
<td>58 ± 17.8 (n = 12)</td>
<td>7.8 ± 4.2 (n = 9)</td>
<td>0.6 ± 0.3 (n = 9)</td>
<td>1.1 ± 0.3 (n = 9)</td>
</tr>
<tr>
<td>Pure V</td>
<td>24.9 ± 6.3 (n = 10)</td>
<td>0.7 ± 0.4 (n = 4)</td>
<td>13.9 ± 13.7 (n = 5)</td>
<td>21.2 ± 20.1 (n = 5)</td>
</tr>
</tbody>
</table>

Values reported as means ± standard error. Bolded values are significantly different from other classes.

**Conclusion:** These results suggest increased NO$S$ activity in class IV LN. In those with proliferative LN, increased OH$D$ production or reduced antioxidant scavenging appears to be occurring. OH$D$ indirectly come from NADPH oxidase and NO synthase. Higher levels of SO in MRL/lpr cortical tissue from NOS3 −/− mice suggests that eNOS-derived NO can scavenge SO. Reduction of SO with both a NO synthase inhibitor and an NADPH oxidase inhibitor suggests that both enzymes produce SO perhaps in a synergistic fashion, in proliferative LN. Therefore, effective therapy for SO-mediated redox signaling in proliferative LN may need to induce increases in the scavenging effect of eNOS-derived NO or target SO directly with scavengers. Myeloperoxidase (forms NTyr and CTyr) may be an important enzyme target in class V disease.

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**Serum Anti N-Methyl-D-Aspartate Receptor Subunit 1 Antibodies Are Elevated in SLE.** Ogawa Eisuke, Nagai Tatsuo, Arinuma Yoshiyuki and Hirohata Shunsei. Kitasato University School of Medicine, Kana-gawa, Japan

**Background/Purpose:** Previous studies have demonstrated that the presence of autoantibodies against N-methyl-D-aspartate (NMDA) receptor subunit 2 (NR2) is closely associated with brain damages leading to the development of diffuse neuropsychiatric SLE (NP-SLE). NR1 is another subunit forming functional NMDA receptor with NR2. However, it is not clear whether anti-NR1 antibodies (anti-NR1) might be expressed in SLE. NR1 has its role in the pathogenesis in NP-SLE been clarified. The present study therefore explored the serum levels of anti-NR1 in SLE.

**Methods:** Sera were obtained from 108 patients with SLE, 36 various rheumatic diseases other than SLE (7 patients with RA, 8 with Behçet’s disease, 3 with vasculitis syndromes, 6 with SSc, 6 with PM/DM and 6 with MCTD) and 91 healthy individuals. Among the 108 SLE patients, 67 showed neuropsychiatric manifestations. IgG anti-NR1 antibodies were measured by ELISA, using the N-terminal 100-amino acid of murine NR1, which is more than 90% homologous to human NR1. The results were reported as arbitrary units determined using a positive serum. Some sera positive for anti-NR1 were further analyzed for the fine epitopes they recognize, using 4 different preparations of synthetic 25 amino-acid sequences within the N-terminal 100 amino-acid sequence of human NR1.

**Results:** The mean ± SEM values for serum anti-NR1 in 91 healthy individuals were 4.48 ± 2.19 units/ml. Serum anti-NR1 levels were significantly elevated in SLE (52.18 ± 15.22 units/ml) compared with healthy individuals or with non-SLE rheumatic diseases (4.50 ± 2.23 units/ml). There was no significant difference in serum anti-NR1 between non-SLE rheumatic diseases and healthy individuals. Of note, serum anti-NR1 were significantly higher in NP-SLE (74.60 ± 23.96 units/ml) than those in SLE without neuropsychiatric manifestations (15.54 ± 5.62 units/ml) (p = 0.0441). Anti-NR1 bound most efficiently to the sequence of amino acids between position 57 and position 81 from the N-terminus of human NR1.

**Conclusion:** The results indicate that anti-NR1 were specifically elevated in SLE patients. Moreover, the data also suggest that anti-NR1 might be involved in the pathogenesis of NP-SLE, presumably through transudation through blood-brain barrier into CNS.

**Disclosure:** O. Eisuke, None; N. Tatsuo, None; A. Yoshiyuki, None; H. Shunsei, None.

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**Prolidase Deficiency Induces Antibodies to Sm, Ro60 and Double Stranded DNA.** Biji T. Kurčič, Anil D’souza², Skyler P. Dillon¹, Benjamin F. Bruner³, Timothy Gross², Judith A. James¹, Ira N. Targoff¹, Jacen S. Maier-Moore¹, Isaac T.W. Harley², Heng Wang³ and Robert H. Scofield¹.

¹Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation; Department of Medicine, University of Oklahoma Health Sciences Center; US Department of Veterans Affairs Medical Center, Oklahoma City, OK, ²University of Oklahoma Health Sciences Center, Oklahoma City, OK, ³Harding University, Searcy, AR, ⁴Oklahoma Medical Research Foundation, Oklahoma City, OK, ⁵Oklahoma Medical Research Foundation and Oklahoma University Health Sciences Center, Oklahoma City, OK, ⁶Oklahoma Medical Research Foundation, University of Oklahoma Health Sciences Center, Oklahoma City, OK, ⁷Oklahoma Medical Research Foundation, Oklahoma City, OK, ⁸Das Deutsch Center Clinic for Special Needs Children, Middlefield, OH.

**Background/Purpose:** Prolidase is a ubiquitous enzyme found in the cytoplasm. The enzyme specifically cleaves dipeptides containing C-terminal proline or hydroxyproline, in one of the last steps of collagen metabolism. Prolidase deficiency is a rare inborn error of metabolism characterized by the secretion of dipeptides in the urine and a variety of clinical manifestations. Only about 50 patients have been reported with the deficiency, of which approximately 10% have systemic lupus erythematosus.
**Methods:** A large extended Amish pedigree, having four patients deficient for prolidase, three individuals with heterozygous prolidase activity and eight unaffected individuals, was studied for lupus-associated autoimmunity. Prolidase genetics and enzyme activity were confirmed. Antinuclear antibody was measured using indirect immunofluorescence. Antibodies against extractable nuclear antigens were determined by double immunodiffusion, immunoprecipitation, and BioRad 2200 multiplex bead assay. Serum C1q levels were determined by ELISA.

**Results:** Two of the four homozygous prolidase deficient patients had a positive ANA. One had anti-dsDNA antibodies, while another had precipitating anti-Ro/SS antibodies. Three of the four patients had anti-Sm and anti-chromatin by the BioRad 2200 multiplex bead assay. One of the three heterozygous subjects had a positive ANA and immunoprecipitation of a 75,000 MW protein. Serum C1q levels were not changed in the prolidase deficient patients. The unaffected controls had normal prolidase activity and were negative for autoantibodies.

**Conclusion:** Prolidase deficiency leads to a loss of immune tolerance to lupus-associated autoantigens even without classical systemic lupus erythematosus.

Disclosure: B. T. Kurien, None; A. D’ouza, None; S. P. Dillon, None; B. F. Bruner, None; T. Gross, None; J. A. James, None; I. N. Targoff, None; J. S. Maier-Moore, None; I. T. W. Harley, None; H. Wang, None; R. H. Scalford, None.


**Methods:** A total of 2,564 SLE patients were evaluated. The mean (± standard deviation, SD) age at diagnosis in each of three age strata was 14.3±3 years, 32.9±9 years and 58.7±7 years for pedSLE, adult SLE and late onset SLE, respectively and the mean (±SD) disease duration was 10.9±8.7 years, 5.7±5.8 years and 3.8±3.4 years for each of the respective groups. Across each age of onset group, the majority were female (78%) and slightly more pedSLE patients were of African American (38%) or Hispanic (13%) ancestry. We confirm that compared to SLE patients with adult onset, pedSLE patients are more likely to present with acute and severe disease features including discoid rash (27% vs. 18%), serositis (48% vs. 44%), renal involvement (62% vs. 41%), neurologic involvement (18% vs. 10%), hematologic involvement (73% vs. 68%) and immunological involvement (89% vs. 79%). In contrast, SLE patients with late onset were significantly less likely to present with serositis (34%), renal involvement (20%), neurological involvement (8%) and immunological involvement (67%) compared to each of the pedSLE and adult onset SLE groups. Consistent with increasing age, the late onset SLE group demonstrated more damage associated with ocular, neuropsychiatric, pulmonary, cardiovascular, musculoskeletal, diabetes and malignancy domains than did the pedSLE or adult SLE groups, whereas the pedSLE group had significantly more renal damage.

**Conclusion:** These findings confirm more aggressive disease, particularly renal involvement, in SLE patients presenting in childhood. They further suggest SLE disease manifestations decrease with age of onset throughout adulthood. These results will inform future studies aimed at delineating the etiology and natural history of the more aggressive clinical phenotype observed in children.

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**672 Immune Complexes and Autoantibodies to Oxidized Lipids in Systemic Lupus Erythematosus.** Yujin Ye, Tianfu Wu and Chandra Mohan. University of Texas, Southwestern Medical Center at Dallas, Dallas, TX

**Background/Purpose:** SLE is a chronic autoimmune inflammatory disease. Increasing evidence suggests that excess production of reactive oxygen species (ROS) may cause oxidative stress and favor the development of immune cell dysfunction, autoantigen production and autoantibody development. Oxidized-lipids have chemotactic, immune-stimulatory, and toxic properties and play an important role in the pathogenesis of atherosclerosis and kidney injury in SLE. In the current study, we evaluated the serum levels of oxidized-lipids and their autoantibodies in SLE patients and identified the relationships between oxidized-lipids, auto-antibodies and disease.

**Methods:** Serum MDA was measured by a colorimetric method and HODE was assayed by mass spectrometry. Serum levels of specific oxidized-LDL immune complex (ox-LDL-IC), autoantibodies to dsDNA, ox-LDL, MDA-LDL, 9-HODE (9-hydroxy-10,12-octadecadienoic acid), 13-HODE (13-hydroxy-9,11-octadecadienoic acid), POVC (1-palmitoyl-2-oxovaleroyl-sn-glyco-3-phosphorylcholine) were detected by ELISA in 64 SLE patients (37 with active SLE, SLEDAI > 6) and 9 healthy controls.

**Results:** (1) Active SLE patients exhibited increased serum levels of anti-DNA-IgG (0.349±0.039 vs 0.115±0.018; p=0.0001), anti-MDA-LDL-IgG (1049.0±116.2 kU/L vs 486.7±103.6 kU/L; p=0.003), anti-LDL-IgG (1368.0±183.6 EU/mL vs 654.0±87.17 EU/mL; p=0.004), anti-9-HODE-IgG (0.632±0.044 vs 0.298±0.058; p=0.001), anti-13-HODE-IgG (0.542±0.047 vs 0.251±0.048; p=0.0003), anti-POVC-IgG (0.429±0.030 vs 0.297±0.030; p=0.001) and ox-LDL-IC (0.375±0.018 vs 0.270±0.022; p=0.003) compared to healthy controls, but decreased serum levels of anti-9-HODE-IgM (0.257±0.016 vs 0.335±0.02; p=0.019) and anti-13-HODE-IgM (0.336±0.025 vs 0.441±0.042; p<0.029). (2) Serum HODE levels were positively correlated with proteinuria (r=0.68/p=0.002), CRP (r=0.51/p=0.03) and ox-LDL-IC (r=0.45/p=0.04). Serum anti-ox-LDL-IgG was positively correlated with SLEDAI (r=0.34/p=0.02), and negatively with C3 (r=-0.39/p=0.01). Anti-9-HODE-IgG was positively correlated with SLEDAI (r=0.27/p=0.02), and negatively with C4 (r=-0.3/p=0.01). Anti-POVC-IgG was positively correlated with SLEDAI (r=0.23/p=0.04), and negatively with C4 (r=-0.27/p=0.01).

**Conclusion:** Active SLE patients exhibit significantly increased serum levels of IgG anti-oxidized-lipid autoantibodies. Taken together with our recent metabolic screen indicating that oxidized lipids are also elevated in SLE sera (PLOS ONE, June 2012), the current findings suggest that coordinate elevation of oxidized lipids, autoantibodies to these lipids, and immune complexes of these antigen-antibody components could serve as potential serum markers of disease activity in SLE.

Disclosure: Y. Ye, None; T. Wu, None; C. Mohan, None.
Background/Purpose: SLE is a complex autoimmune disease marked by autoantibody production and immune dysregulation. Identification of at-risk populations is essential to minimize morbidity and mortality from early inflammatory reactions and to identify appropriate individuals for prevention trials. A number of patients have autoantibodies and some clinical features of SLE, but do not meet the required ≥ 4 ACR criteria (or incomplete lupus, ILE). Healthy blood levels of lupus patients are known to have significantly increased risk of SLE development. Using a unique resource of family members with samples available before and after transition to SLE, we initially found that blood relatives (FDRs) who transition to SLE have altered inflammatory mediators compared to those who remain unaffected. This study seeks to determine potentially pathogenic inflammatory mediators in blood relatives classified with ILE, compared to those who have transitioned to SLE, and matched blood relatives who remain unaffected.

Methods: This study has initially re-enrolled 375 FDRs of known SLE patients with samples available from previous genetist studies for follow-up evaluation; 22 previously unaffected FDRs have transitioned to SLE (≥4 ACR criteria) and 17 are classified as ILE (cumulative ACR criteria = 3). Individuals provided detailed clinical and demographic information, and completed the Connective Tissue Disease Screening Questionnaire (CSQ) at baseline (BL) and follow-up (FU). Medical records were obtained and reviewed for ACR classification criteria. BL and FU serum samples were tested for autoantibody production, including ANA, anti-dsDNA, aCLs and precipitating levels of Ro, La, Sm, nRNP, and ribosomal P autoantibodies. We assessed 52 soluble inflammatory mediators, using either eXMAP multiplex technology or sandwich ELISA (BLys and APRIL). Samples from ILE participants were compared to FDRs who transitioned to SLE, as well as random gender/age (+/- 5 years)/ANA status matched FDRs who remain unaffected.

Results: ILE FDRs had BL and FU CSQ scores similar to those who transitioned to SLE classification (n.s.), yet ≥ 2 fold higher than matched, unaffected FDRs (p < 0.001). Both ILE and SLE had similar BL and FU levels of a number of chemokines, including MIP, MIP-1α, MIP-1β, MCP-3, and eotaxin. Of particular interest were shed TNFR family members (TNFR, TNFR1, TNFR2, TNFR3) that were increased in ILE FDRs and those who transitioned to SLE than matched, unaffected FDRs (p ≤ 0.01). Compared with FDRs who transitioned to SLE or remained unaffected, ILE FDRs had significant (p < 0.05) BL and FU alterations in 22 (of 52) soluble mediators, most notably innate and adaptive cytokines, including a >2-fold increase in Th2-type cytokines IL-4, IL-5, and IL-13 and regulatory cytokines IL-10 and TGF-β.

Conclusion: FDRs of known SLE patients classified with ILE or transition to SLE demonstrate significantly altered levels of soluble inflammatory mediators. These alterations suggest that multiple perturbations in immune-mediated inflammatory processes occur with accumulation of ACR criteria and potentially allow for identification of individuals at high risk for development of SLE.

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CEC is strengthened by recent evidence of an impact of cholesterol efflux on inflammatory and immune functions of macrophages and endothelial cells. We measured the four main CEC pathways in rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE) patients.

**Methods:** aqueous diffusion (AD), SR-BI-, ABCG1- and ABCA1-mediated CEC was measured by validated radioisotopic ex vivo systems in 30 AR and 30 SLE patients, and in 30 age and sex-matched healthy subjects.

**Results:** ABCG1-mediated CEC (mean = ±SEM % efflux) was increased in SLE patients (3.84 ±0.19) as compared to controls (3.20 ±0.20) and RA patients (2.78 ±0.17). ABCG1-mediated CEC was reduced in RA and more markedly in SLE (6.04 ±0.25 and 4.36 ±0.34, respectively) as compared to controls (7.13 ±0.2%). ABCA1-mediated CEC was impaired in SLE (2.35 ±0.16) as compared to controls and RA patients (3.14 ±0.19 and 3.54 ±0.30, respectively). AD-mediated CEC did not differ between the three populations studied. ABCG1-mediated CEC inversely correlated with the disease activity score DAS28 in RA patients. SLE patients as a group showed the lowest ABCG1-mediated CEC in spite of the highest HDL serum level. The correlation between ABCG1-mediated CEC and serum HDL, detected in controls and in SLE patients, was absent in RA. The correlation between ABCG1-mediated and SR-BI-mediated CEC detected in controls and RA patients was absent in SLE.

**Conclusion:** We report here for the first time a marked and differential CEC impairment in patients with RA and SLE, independent of HDL serum levels, that not only demonstrates a dysfunction and loss of atheroprotective activity of HDL with respect to cholesterol metabolism, but also points to the existence of specific underlying mechanisms in each disease, possibly beyond inflammation. Moreover, the impairment of ABCG1-mediated cholesterol efflux in autoimmune patients, that correlated with disease activity in the RA group, might also have an impact in inflammatory and immune reaction involving macrophages and endothelial cells.

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**A Novel Biomarker: Nucleotide-Binding Oligomerization Domain 27 in Systemic Lupus Erythematosus.** Amnna Cutinha, Yangsheng Yu, Kaihong Su, James R. O’Dell, Lynell W. Klassen, Amy C. Cannella, Ted R. Mikuls, Alan R. Erickson, Gerald F. Moore and Micheline Heath-Holmes. University of Nebraska Medical Center, Omaha, NE, 2University of Nebraska Med Center, Omaha, NE, 3University of Nebraska Medical Center, Omaha, NE, 4University of Nebraska Medical Center, Omaha, NE, 5University of Nebraska Med Center, Omaha, NE, 6University of Nebraska Medical Center, Omaha, NE.

**Background/Purpose:** Systemic Lupus Erythematosus (SLE) is a complex autoimmune disease in which a variety of autoantibodies contribute to the diversified disease phenotypes. In our previous studies, we generated more than 300 recombinant antibodies from B cells of SLE patients using the single-cell RT-PCR approach. We found that over 20% of SLE-derived antibodies tend to activate neutrophils. One of the antibodies recognizes a novel pattern recognition receptor Nucleotide-binding Oligomerization Domain 27 (NOD27), which is recently shown to be involved in anti-viral interferon responses. Administration of this antibody in lupus-prone mice accelerated lupus progression, suggesting a role of anti-NOD27 in lupus pathogenesis. The purpose of this study is to determine if anti-NOD27 autoantibodies are detectable in sera from SLE patients and if the serum levels of anti-NOD27 are elevated in SLE patients with active disease.

**Methods:** 59 SLE patients who met at least four of the 1982 ACR criteria and 92 healthy volunteers with no known rheumatic diseases were enrolled into the prospective study. The SLEDAI disease activity index was obtained in all patients. Patients with a SLEDAI score of 6 or higher were considered to have active disease. Enzyme-linked immunosorbent assay (ELISA) was performed to determine the serum levels of anti-NOD27 antibodies. Serum titers of complements C3 and C4 and anti-dsDNA antibodies were obtained in each patient. The control group, SLE group and the SLE inactive and active groups were compared with each other for the serum titers of anti-NOD27 using the Mann Whitney test (two-tailed). A pvalue of <0.05 was considered significant. The respective correlation of anti-NOD27 titers with anti-dsDNA, C3, C4, or SLEDAI in SLE patients was calculated using Pearson’s correlation test.

**Results:** The mean anti-NOD27 level in the SLE group was 0.518 (in optical density units; SD 0.26, 95% CI 0.45–0.587), which is significantly higher than that in the control group (mean: 0.398; SD 0.15, 95% CI 0.36–0.45; p=0.0019). The mean anti-NOD27 level of the active SLE cohort was found to be higher than that of the inactive SLE cohort (mean: 0.617 versus 0.496) although the difference was not statistically significant, likely related to the limited number of active patients in our cohort (11 of 59). The anti-NOD27 titers were significantly correlated with anti-dsDNA titers (p=0.0014, Pearson r = 0.38) and demonstrated a marginal inverse correlation with the C3 levels (p =0.047, Pearson r = –0.22). No significant correlation of anti-NOD27 with C4 levels (p=0.118, Pearson r = -0.16) nor SLEDAI scores (p=0.074, Pearson r =0.19) was seen.

**Conclusion:** Anti-NOD27 was found to be significantly elevated in patients with SLE compared to controls in this study and concentrations of anti-NOD27 were significantly correlated with anti-dsDNA titers in our cohort of SLE patients suggesting that anti-NOD27 may be an informative biomarker in SLE. Further studies with larger sample sizes and different cohorts of patients including those with active disease and end organ damage will be needed to evaluate the predictive capacity of NOD27 antibody responses in the future.

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**Antibodies to Oxidized Low Density Lipoprotein or Anti-Lipoprotein Lipase May Lead to More Atherosclerotic Plaque in a Sub-Set of SLE Patients.** Biji T. Kurien, James Fesmire, Skyler P. Dillon, Marianne Reichlin, Morris Reichlin and Robert H. Scalford. University of Oklahoma Health Sciences Center, Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation; US Department of Veterans Affairs Medical Center, Oklahoma City, OK, 2University of Oklahoma Health Sciences Center, Oklahoma City, OK, 3Oklahoma Medical Research Fndn, Oklahoma City, OK, 4Oklahoma Medical Research Fnd, Oklahoma City, OK, 5Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation; Department of Medicine, University of Oklahoma Health Sciences Center, US Department of Veterans Affairs Medical Center, Oklahoma City, OK.

**Background/Purpose:** Premature atherosclerosis is associated with systemic lupus erythematosus (SLE). Oxidized low density lipoproteins (ox-LDL) are important in atherosclerosis and have been reported in SLE in association with anti-phospholipid antibodies. Our earlier work showed increased susceptibility of SLE Patients with anti-Ro 60, La and Ro 52 to develop anti-oxidized LDL. In this study we tested the hypothesis that atherosclerotic plaque will be associated with anti-ox-LDL and anti-lipoprotein lipase in a specific autoantibody sub-set of SLE.

**Methods:** We studied 114 SLE patients and 117 age and sex matched normal controls. Antibodies directed against lipoprotein lipase (ALPL), oxidized low density lipoprotein (anti-ox-LDL), and low density lipoprotein (ALDL) were measured by enzyme-linked immunosorbent assay. Total cholesterol, LDL, HDL, triglycerides and HDL-Trig were also measured. Plaque was measured by bilateral carotid ultrasound. The study was approved by the Institutional Review Board of the Oklahoma Medical Research Foundation and all patients and all subjects signed informed consent forms. The patient population (age range of 16–87 years; average age 43) was 104 females and 10 males.

**Results:** Double immunodiffusion studies showed that sixty three SLE subjects did not have autoantibodies against extractable nuclear antigen (ENA), 14 had antibodies against ribonucleoprotein (RNP), 16 had anti-Ro60, 7 had anti-Ro60/La, 6 had anti-Sm/RNP, 4 had unidentified precipitin lines and 4 had miscellaneous antibodies. The ENA negative group had a significantly higher plaque measured as carotid intimal thickening (0.9 ± 1.71; p< 0.05) compared to normal controls (0.54 ± 1.26), but did not have significant levels of anti-ox-LDL (OD = 0.41 ± 1.62), ALPL (OD = 0.35 ± 0.18) and ALDL (OD = 0.11 ± 0.08) compared to anti-ox-LDL (0.165 ± 0.13), ALPL (0.39 ± 0.2), ALDL (0.09 ± 0.1) in normal controls. The group with anti-RNP antibodies had significant levels of anti-ox-LDL (0.29 ± 0.27; p<0.005) compared to control group. However, the anti-RNP group did not have significant levels of ALPL (0.39 ± 0.19), ALDL (0.14 ± 0.139) or plaque (0.79 ± 1.43) compared to control group. The 16 subjects with anti-Ro60 had significant anti-ox-LDL level (0.26 ± 0.15; p<0.003) and plaque (1.29 ± 0.25; p<0.02) compared to controls, but no differences in ALPL (0.36 ± 0.16) or ALDL (0.11 ± 0.11). The 7 SLE subjects with anti-Ro60/La had significantly higher levels of ALPL antibodies (0.56 ± 0.246; p=0.05) compared to control group. This group had the highest levels of ALPL antibodies compared to all other SLE groups. The anti-Sm/RNP group did not behave significantly different from normal controls with respect to plaque (0.5 ± 0.55), anti-ox-LDL (0.265 ± 0.15), anti-LDL (0.14 ± 0.12) or ALPL (0.471 ± 0.27). There was no significant difference in plaque when
anti-oxLDL+/ALPL− or anti-oxLDL+/ALPL− SLE subjects were compared to either anti-oxLDL+/ALPL+ or anti-oxLDL+/ALPL− normal controls.

Conclusion: Plaque appears to segregate in anti-Ro/La, anti-Ro and ENA negative groups either with or without anti-oxLDL or ALPL.

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Estrogen Modulation of ZAS3 Is Mediated Through Estrogen Receptor α: An Underlying Mechanism of Gender-Bias in Systemic Lupus Erythematosus? Nicholas Young, Alexandra Friedman, Lai-Chu Wu, and Wael N. Jarjour. 1The Ohio State University Medical Center, Columbus, OH, 2Ohio State University, Columbus, OH

Background/Purpose: Global population data has indicated that post-pubertal females have decreased rates of infectious diseases when compared to male counterparts and preadolescent or postmenopausal females. In contrast, many autoimmune diseases like Systemic Lupus Erythematosus (SLE) have a significant bias towards post-pubertal women. ZAS3 is an important immuno-regulatory transcription factor involved in both B and T cell maturation and function. We hypothesized that post-puberal females have more robust immune responses in part through estrogen’s regulation of ZAS3. In this study, we examine the influence of estrogen over ZAS3 expression and the functional implication of ZAS3 deficiency on the immune response.

Methods: Wild type (WT) mice were injected subcutaneously with estrogen (E2) daily for 5 days and lymphoid tissues were harvested. Transgenic mice with a luciferase reporter under the control of kB binding sites were bred into ZAS3 knockouts and luciferase activity in males and females was measured by IVIS. Peripheral blood mononuclear cells (PBMCs) isolated from healthy subjects and SLE patients were subjected to experimental analyses of gene expression and assayed for proliferation or cytokine production in the presence of either anti-CD3 or tetanus toxoid with or without estrogen. Nuclear extracts were isolated for EMSA analysis from E2-treated lymphocyte cell lines.

Results: Estrogen treated mice had elevated ZAS3 expression in the spleen, thymus, bone marrow, and lymph nodes when compared to PBS-injected controls. NFkB-mediated luciferase reporter activity in female ZAS3 knockout mice was significantly lower than WT controls, whereas males exhibited no significant differences. Further, ZAS3 knockout mice expressed significantly lower peroxisome-proliferator activated receptor gamma (PPARγ) expression. ZAS3 was also found to be significantly elevated at baseline in SLE patients when compared to age and sex-matched healthy controls. PBMCs from healthy females incubated in vitro with estrogen or estrogen receptor alpha (ERα) agonist showed significant upregulation of ZAS3. Similarly, ZAS3 expression was upregulated in response to estrogen both on the protein and RNA level in T Cells, B Cells, monocytes, and NK cell lines. EMSA analysis with intrinsic estrogen receptor response element probes within the ZAS3 region revealed that ERα binds directly and that E2 stimulation enhanced complex formation. Furthermore, estrogen significantly enhanced the cellular proliferation responses in primary PBMCs cultured with anti-CD3 or Tetanus toxoid. When these cells were stimulated with E2, we also demonstrated significant production of MIP-1β.

Conclusion: Primary human PBMCs display a heightened ZAS3 response to E2 and this effect is mediated at least in part through NFkB and leads to PPARγ upregulation. Furthermore, The E2/ERα-mediated stimulation of ZAS3 expression occurs through direct, genomic interactions with intragenic enhancing elements. Taken together, this data suggests that E2 lowers the threshold of activation by priming the immune system of females. While this may be beneficial in the defense against foreign antigens, it can be detrimental in the development of autoimmunity.

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ZAP70+ B Cells and Plasmablasts As Markers of Disease Activity and Remission in Systemic Lupus Erythematosus Nephritis. Elsa Gremse, Barbara Tolusso, Laura Messuti, Maria Rita Gigante, Gianfranco Ferraccioli. Division of Rheumatology, Institute of Rheumatology and Affective Sciences, Catholic University of the Sacred Heart, Rome, Italy

Background/Purpose: To analyze differences in B cells subsets distribution in patients with renal systemic lupus erythematosus (SLE). To define possible cellular biomarkers of active nephritis and of remission in renal disease in SLE patients.

Methods: 60 SLE patients with renal involvement 49 females (82%); mean age 36.9±11.0 years; 37 with active disease and 23 with remission (71%) were analyzed for the distribution of circulating peripheral blood B cells subsets by staining for surface markers CD45, CD19, CD38, IgD, CD27 (CD27/IgD classification (Sanz et al. SeminImmunol 2008) and intracellular marker ZAP-70 (Tolusso et al. ClinImmunol 2009) by flow cytometry. All patients had a WHO class III or IV nephritis diagnosed by renal biopsy. Patients with active nephritis were recruited at the renal disease onset, while patients in remission were recruited if the nephritis was in stable remission for at least 12 months. Fourteen patients with active disease at the study entry were reassessed for PB B cell subpopulations at the time of renal remission (nephritis remission criteria in at least two consecutive observations and on an oral steroid dosage<7.5 mg/day).

Results: The 37 subjects with active renal involvement showed higher percentages of CD19+/ZAP70+ cells compared to 23 patients with nephritis remission (13.1±10.5% vs 5.4±4.5%, respectively; p=0.002), as well as of plasmablasts (CD27/CD38− cells; 10.6±7.4% vs 6.3±5.8%, respectively; p=0.03). There was no differences in other B cells subpopulations between active and inactive lupus nephritis.

In the 60 SLE renal patients, the percentage of CD19+/ZAP70+ cells directly correlated with disease activity index (SLEDAI) (r=0.44, p=0.002), inversely with complement fractions C3 and C4 (C3: r=−0.44, p=0.001; C4: r=−0.55, p=0.001) and of the CD19+ B cells (r=−0.61, p<0.001). Moreover, the pool of ZAP70+ B cells directly correlated with the memory cells subsets (CD27+/IgD−: r=0.41, p=0.002, CD27+/IgD: r=0.34, p=0.01) and with plasmablasts (r=0.39, p=0.004) and inversely with naive B cells (CD27+/IgD+: r=−0.48, p<0.001). The 14 patients evaluated in the follow-up showed a significant reduction of the percentage of ZAP70+ B cells at remission (4.3±2.8%) with respect to nephritis onset (14.2±11.6%, p=0.002), as well as of the plasmablasts (CD19+/CD27+/CD38+: 10.7±8.0% at baseline vs 5.7±2.9% at remission; p=0.05).

Conclusion: The pool of CD19+/ZAP70+ cells is associated with SLE activity parameters (SLEDAI, low complement, low lymphocytes and CD19+ count) and with the B cell memory compartment in SLE patients with renal involvement. The expansion of ZAP70+ B cells and plasmablasts characterizes active renal disease and their reduction is associated with the remission state, suggesting their possible role as biomarker in SLE nephritis.

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Plasma Level of Galectin-3 Binding Protein Reflects Type I Interferon Activity and Is Highly Increased in Patients with Systemic Lupus Erythematosus Christoffer T. Nielsen, Ole Østergaard, Line V. Iversen, Christian Løod, Anders A. Bengtsøn, Anne Voss, Søren Jacobsen and Niels H. H. Heegaard. 1Statens Serum Institute, Copenhagen S, Denmark, 2Statens Serum Institute, Copenhagen S, Denmark, 3Statens Serum Institute, Copenhagen S, Denmark, 4Department of Clinical Sciences Lund, Lund, Sweden, 5Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden, 6Odense University Hospital, Odense C, Denmark, 7Copenhagen University Hospital, Copenhagen, Denmark

Background/Purpose: Ongoing production of type I interferon (IFN) is a key element in the pathogenesis of systemic lupus erythematosus (SLE). Type I IFNs trigger the over-expression of IFN-regulated genes, including galectin-3-binding protein (G3BP). G3BP serves as a scavenger receptor and is a potent immune stimulator. It mediates cellular adhesion and binding to the extracellular matrix of the basement membrane. Thus G3BP may serve as a measure of type I IFNs and has potentially important pathogenic roles in cell-cell interaction and immune complex trafficking in SLE. We here explore the relationship between type I IFN activity and plasma G3BP, compare plasma concentrations of G3BP in two cohorts of SLE patients to patients with systemic sclerosis (SSc) and healthy controls (HCS), and correlate G3BP concentrations with clinical and serological parameters.

Methods: Plasma and serum concentrations of G3BP were quantified using a commercially available ELISA. Type I IFN activity was assessed by
an Mx-1-driven luciferase reporter gene assay. Gene expression scores from 12 genes in peripheral blood mononuclear cells from 26 SLE patients and 10 HCś were compared to plasma concentrations of G3BP. Plasma and serum concentrations were compared in 4 SLE and 4 SSc patient samples. G3BP concentrations in 70 SLE patients were compared to HCs (n = 51) and patients with systemic sclerosis (SSc, n = 111). Additionally, G3BP levels were validated in an independent cohort of SLE patients (n = 67) and HCs (n = 50). Non-parametric correlation analyses were used to explore associations between G3BP concentrations and clinical and serological parameters in the two SLE cohorts. In 14 SLE patients consecutive serum samples (3 or 4 per patient, >6 months apart) were analysed and correlated to disease activity (SLEDAI).

Results: G3BP plasma concentrations correlated significantly with the Mx-1 driven luciferase reporter gene assay (r = 0.56, p = 0.0005) and INF-α gene expression scores (r = 0.34, p = 0.0002). No significant difference between serum and plasma levels of G3BP was observed (p = 0.17). Plasma concentrations were similar in the two SLE cohorts (p = 0.42) and highly significantly increased compared to HCs and SSc patients (p < 0.0001 and 0.009, both those with diffuse and limited cutaneous disease). Significant associations (p < 0.05) with SLEDAI, cell counts, anti-dsDNA, and active nephritis could not be confirmed in the validation cohort. Temporal variations in serum concentrations were observed in the consecutive SLE-samples but were not associated with disease activity (SLEDAI).

Conclusion: The levels of circulating G3BP are elevated in SLE patients compared with HCs and SSc patients. The SLE-specific elevated levels of G3BP correlated with type I IFN activity. G3BP could thus serve as an easily accessible measure of type I IFN gene activation. Additionally, this study highlights G3BP as an IFN-inducible effector molecule that may have a central role in SLE pathogenesis and thus putatively is a possible new target for therapeutic intervention.

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681 Interferon Alpha Decreases Endothelial Nitric Oxide Synthase Function and Expression in Human Umbilical Vein Endothelial Cells. Joy Buie and Jim Oates. Medical University of South Carolina, Charleston, SC

Background/Purpose: Premenopausal SLE patients have a devastating increase in cardiovascular disease (CVD) and major associated cardiovascular events (MACE) that are not fully explained by Framingham risk factors. Recent in vitro studies suggest that Type I interferons promote endothelial progenitor cell dysfunction and apoptosis while others have shown that Type I interferon gene signature correlates with increased endothelial dysfunction (ED) in SLE. Although causes of ED are likely multifactorial, all pathways converge on the diminished activity of endothelial nitric oxide synthase (eNOS). The low levels of nitric oxide (NO) produced by eNOS has anti-inflammatory, anti-thrombotic, and anti-vasoconstrictive properties all important in preventing atherosclerosis. We examined the effects of IFN-alpha on eNOS gene expression and phosphorylation.

Methods: Human umbilical vein endothelial cells (HUVECs) were cultured and treated as described below. Changes in eNOS expression in response to IFN-α (100, 1000 IU) were quantified by real-time PCR. Functional changes in response to vascular endothelial growth factor (VEGF) 50ng/ml, 30 minutes) were assessed by immunoblot. We also evaluated the effect of serum from patients that induce a type I IFN signature (induction of two inductive genes (MX1 and IFIT1); IFIGs) from 5 patients and 2 controls on eNOS expression and VEGF mediated function. Gene expression was assessed using RT-PCR and phosphorylated serine 1177 eNOS expression assessed using immunoblot. Type I IFN neutralization studies (IFN-α antibody(Ab), IFN receptor (IFNAR) Ab) were also performed and eNOS expression was assessed.

Results: HUVECs treated with IFN-α at 100IU and 1000IU exhibited a significant reduction in eNOS gene expression at 24 hours (33% and 42%, respectively) and a reduction in VEGF-induced phosphorylation at the serine 1177 site (64% and 50%, respectively) after 24 hours. SLE serum also caused a 40% reduction in eNOS gene expression in human aortic endothelial cells (HAECs) compared to normal serum. However, addition of IFN neutralizing antibodies to serum did not reverse observed effects on eNOS gene changes.

Conclusion: SLE patients are at an increased risk for vascular disease, and 40% of patients present with IFN signature gene expression. Recent studies suggest that Type I IFNs are important for prediction of vascular endothelial function in SLE patients. Endothelial nitric oxide synthase (eNOS) protects the endothelium from damage and our preliminary data suggest that IFNα may have detrimental effects on eNOS expression and function. Thus, a rational target for the effect of IFNα on endothelial function may be the downstream effects of IFNα on eNOS gene expression and protein activation.

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682 IL-12p70 Levels Play a Role in Damage Accrual in SLE Patients. Eoghan M. McCarthy1, Ruth Lee 2, Joan Ni Gabhanni3, Siobhan Smith3, Michele Dona1, Gaye Cunnane1, Donough G. Howard1, Paul G. O’Connell1, Caroline Jeffreys2 and Grainne M. Kearns1. 1Beaumont Hospital, Dublin 9, Ireland, 2Royal College of Surgeons in Ireland, Dublin, Ireland, 3St. James’s Hospital, Dublin, Ireland

Background/Purpose: Whilst the role of cytokines in promoting disease activity in SLE is well established, the relationship between cytokines in those who sustain irreversible damage and those who remain damage free over long term follow up is less well studied. An IL-12 driven Th1 polarisation has been proposed as a promotor of irreversible renal damage in patients with lupus nephritis but studies have not extrapolated these findings to composite all organ damage scores. The primary objective of this is to explore the role of IL-12p70 in the aetiology and pathogenesis of SLE in a homogenous Irish Caucasian population.

Methods: Patients who met at least 4 of the American College of Rheumatology (ACR) criteria for SLE were included. To gain entry all patients had to confirm they were of Irish descent for three generations. Serum levels of the following cytokines - IL-1β, IL-10, IL-12p70 and TNF-α were quantitatively determined by electrochemiluminescence. Demographic data, disease activity as per SLEDAI and damage scores (SLICC) at 5 year follow-up were calculated.

Results: 45 patients were included in the study.

The levels of TNF-α(44.6pg/ml v 5.23pg/ml, p<.001), IL-1(2.8pg/ml v.62pg/ml, p<.001) and IL-10(7.143pg/ml v 2.76pg/ml, p<.001) were significantly higher in patients when compared to controls. IL-12p70 responses were lower in patients than controls, with an IL-12p70 level of 4.6pg/ml recorded in patients and 6.195pg/ml in controls (p=.39).

The ratio of all Th1 cytokines assayed to IL-12 was significantly higher in SLE patients when compared to controls. The levels of IL-1/IL-12 and TNF-α/IL-12 were 5 times and 4.4 times higher respectively in patients than controls (p<.001). A similar result was seen for the Th2 cytokines with the IL-10/IL-12 ratio 3.7 times higher in patients when compared to controls(p<.001).

The IL-1/IL-12 ratio was significantly higher in those patients who suffered new damage compared to those who remained damage free(1.02 v 0.44, p<.005) at five year follow up. A similar difference was seen in the IL-10/IL-12 ratio (3.07 v 1.88, p<.027) and the TNF/IL-12 ratio (8.14 v 5.04, p<.038).

When the Spearman correlation was computed for SLEDAI and the above cytokine ratios no significant correlation was observed with respect to disease activity. Despite this lack of association with disease activity, when a similar analysis was performed for the cytokines ratios and damage accumulation over the follow-up period a significant correlation was seen between damage accrual and the IL-1/IL-12 ratio (r = 0.431,p=0.003), IL-10/IL-12 ratio (r = 0.351,p =0.018) and TNF/IL-12 ratio (r = 0.28,p=0.028), indicating IL-12 plays a key role in damage accrual in concert with both Th1 and Th2 cytokines. When the respective ratios were analysed as per ACR diagnostic criteria significant differences were observed for the IL-1/IL-12 ratio(1.86 v.78, p<.0362), IL-10/IL-12 ratio(3.58 v 2.2, p<.0084) and TNF/IL-12 ratio(30.6 v 6.5,p<.0007) with respect to renal involvement only.

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Conclusion: Our results highlight that increased Th1 and Th2 cytokine levels relative to IL-12p70 in this homogenous Caucasian SLE patient population are seen in patients with renal involvement and are associated with increased accrual of damage at five year follow-up.

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683 Prevalence of Inhibitory or Non-Inhibitory Autoantibodies to Angiotensin Converting Enzyme 2 (ACE2) in Patients with Systemic Lupus Erythematosus

Akio Mimori1. 1National Center for Global Health and Medicine, Tokyo, Japan

Background/Purpose: Using serum IgG fractions from SLE patients with high ACE2 ELISA titers, we previously reported that inhibitory autoantibodies (mean optical density [OD], 0.630.32). Of the 35 non-vasculopathy patients with active SLE, 3 vasculopathy patients with both SLE and PAH, and 44 control patients with rheumatoid arthritis (RA). The sera were assayed for anti-ACE2 antibodies by enzyme-linked immunosorbent assay (ELISA) using purified recombinant human ACE2. Twenty-six sera were positive for anti-ACE2 antibodies. IgG fractions were prepared, using protein G sepharose beads, from the sera of 28 healthy subjects, were classified as positive for anti-ACE2 antibodies. IgG fractions were prepared, using protein G sepharose beads, from the sera of subjects with high ACE2 ELISA scores and were used to evaluate inhibition of ACE2 activity in vitro.

Results: All three PAH patients with SLE were positive for anti-ACE2 antibodies (mean optical density [OD], 0.630.32). The 35 non-vasculopathy patients, 32 (91%) with active SLE were positive for anti-ACE2 antibodies (mean OD, 0.780.42), and the mean ELISA score was significantly higher than that of remitted SLE patients (mean OD, 0.180.15; p < 0.00000001) or RA patients (mean OD, 0.060.05; p < 0.0000000001). Using serum IgG fractions from SLE patients with high ACE2 ELISA titers, statistical significance was achieved for both anti-ACE2 activity in vitro and ADCC activity in vitro for 1/15 non-vasculopathy patients, 3/3 PAH patients (p = 0.0049), and 7/7 vasculopathy (PAH or digital ulcer) patients (p = 0.000047), including four who were described in our previous study.

Conclusion: Most patients with active SLE or vasculopathy were positive for serum anti-ACE2 antibodies, and inhibitory antibodies were associated with vasculopathy, but not with active SLE.

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684 Correlation of Signal Transducers and Activators of Transcription-1 and MiR-146a with Anaemia and Other Clinical Features in Systemic Lupus Erythematosus Patients


Background/Purpose: Anaemia is one of the most common haematological manifestations in SLE patients, occurring in about 50% of active cases. STAT1 is a critical signalling molecule required for the activation of type-1 interferon (IFN), CCL2, and CXCL10, all of which are upregulated in SLE. Overexpression of STAT1 has been described as responsible for anaemia in mouse models. CCL2 and CXCL10 are considered as biomarkers for flares. miR-146 has been reported to be downregulated in peripheral monocytes of SLE patients. The aim of this study is to analyze how these components are involved in anaemia in SLE, and what factors can influence their abnormal expression.

Methods: Blood samples were collected from 30 healthy donors and 100 SLE patients (European Americans [EA] 49; African Americans [AA] 34; Latin Americans [LA] 12; others 5) fulfilling ACR criteria. 58 patients had samples collected from 2 or more visits. Total RNA, isolated from leucocytes, was analysed by Taqman qPCR. miRNA copy number was determined by a standard curve. Expression of 1-IFN signature genes and chemokines were determined by the ∆∆Ct method. Results were correlated with clinical data and analysed by Wilcoxon/Kruskal-Wallis Test and Fisher’s exact test.

Results: Comparing biomarker expression in anaemic vs. non-anaemic SLE, we detected a significant increase of IFN score (p < 0.0001), STAT1 (p < 0.0001), miR-146a (p < 0.0004), CCL2 (p < 0.0004), and CXCL10 (p < 0.0015) in anaemic SLE patients. Lupus Nephritis (LN), one of the most common serious complications in SLE, can be responsible for anaemia. As expected, LN patients are more likely to be anaemic than patients without nephritis (likelihood ratio (LR) = 3.7; p < 0.024). Anaemic SLE patients displayed significantly higher STAT1, miR-146a, CCL2, and CXCL10 than SLE without anaemia, whether or not nephritis was present. The use of prednisone (PND) but not mycophenolate and hydroxychloroquine is consistent with more active SLE in our cohort and thus may explain the association of anaemia with PDN. PDN users were more likely to be anaemic (LR = 10.7; p < 0.0010). However, STAT1, miR-146a, CCL2, and CXCL10 were significantly higher in anaemic SLE patients regardless of PDN therapy when compared to those who were not anaemic, whether or not they were on PDN. According to the clinical literature, lupus in AA tends to be more aggressive than in EA. Similarly, AA were more likely to be anaemic than EA (LR = 8.41; p < 0.0032). Both miR-146a and STAT1 were significantly higher in anaemic AA (p < 0.019 and p < 0.020 respectively) compared to non-anaemic AA. These markers in anaemic EA (p < 0.025 and CXCL10 p < 0.065 respectively) were significantly higher than non-anaemic EA. CCL2 was significantly higher in anaemic EA compared to non-anaemic EA, but this was not observed in AA. No significant trend was observed for CXCL10.

Conclusion: Anaemic SLE patients demonstrated a significant increase of STAT1, miR-146a, CCL2, and CXCL10 vs non-anaemic patients. Further more LN and PDN did not alter STAT1, miR-146a, CCL2, and CXCL10 in anaemic SLE patients. For ethnic analysis, anaemic AA and EA SLE patients were associated with significantly higher levels of miR-146a and STAT1 that could play a prominent role in anaemia.

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685 Using a Library of Synthetic Autoantigen Mimics to Discover Biomarkers of Systemic Lupus Erythematosus

Akshai Lakhanpal1, Jixia Quan1, Sayed Zaman1, Nancy J. Olsen2 and David R. Karp3. 1UT Southwestern Medical Center, Dallas, TX, 2Penn State MS Hershey Medical Center, Hershey, PA

Background/Purpose: The natural history of systemic lupus erythematosus (SLE) is felt to evolve from a state of normal immunity to serologic autoimmunity and then to pathologic autoimmunity. This process may take several years, and can include a time when only one or two clinical features are present. We have used the term incomplete lupus erythematosus (ILE) to describe such individuals. This study was undertaken to search for biomarkers that characterize ILE, specifically autoantibodies that differentiate these subjects from healthy controls (HC) with moderate to high levels of antinuclear antibodies.

Methods: A library of 7-mer peptides (polymers of N-substituted glycine) was synthesized on Tentagel beads using 10 different monomer amides, leading to a theoretical complexity of 10 different species. This bead-coupled library was then depleted of compounds that bound to pooled IgG from HC as well as HC with ANA but no evidence of SLE. The bead library was probed with pooled IgG from individuals with ILE. Peptides from the positively selected beads were purified, identified by tandem MS, re-synthesized and coupled to ELISA plates. Individual serum samples from subjects with ILE, SLE, RA and controls were then tested for peptide reactivity.

Results: Screening 375,000 compounds yielded 100 beads that bound ILE IgG. 12 of these were chosen for further analysis and 8 had appropriate full-length peptide structures. The peptides with the greatest discrimination a pool of HC sera, designated ILE-2, and ILE-7, were chosen for ELISA analyses. Using individual samples from ILE training serum pool, the mean ELISA reactivity for 38 SLE patients was significantly different than all 40 HC sera (2.98 vs. 0.638, p < 0.0001). The area under the ROC curve was 0.96 with a sensitivity of 89% and specificity of 97%. The mean values for individual ILE patients using the
ILE-2 ELISA were also significantly different from HC (1.81 vs. 0.492, p = 0.0025). A validation set of 40 HC, 18 ILE, and 64 SLE subjects was characterized using the mean + 2SD value for HC. Even with a more stringent cut-off, ILE patients were still significantly different than controls (p = 0.0007), although a proportion of ILE patients fell into the ILE negative range. ILE-2 and ILE-7 reactivity was found at a low level in the subset of ANA+ RA patients, but not in ANA- RA patients or other disease controls.

Conclusion: This novel, un-biased cloning library can serve as practical mimics for unknown autoantigens. The ligands can be used immediately in analytic assays. The peptides identified in this screen have excellent ability to identify subjects with lupus-related autoimmunity and discriminate them from ANA-positive control subjects.

Disclosure: A. Lakhanpal, None; J. Quan, None; S. Zaman, None; N. J. Olsen, None; D. R. Karp, None.

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Cell-Type Specific Type I Interferon Signatures in Autologous Stem Cell Transplanted Lupus Patients: Different Molecular Behavior Between CD4+ T Cells and Monocytes. Chieko Kyogoku1, Joachim R. Grün1, Tobias Alexander2, Robert Biesen3, Falk Hippe4, Thomas Häupl2, Andreas Radbruch1 and Andreas Gritzkau1. 1German Rheumatism Research Centre Berlin (DRFZ), an institute of the Leibniz Association, Berlin, Germany; 2Charite University Hospital Berlin, Berlin, Germany.

Background/Purpose: Systemic lupus erythematosus (SLE) is a chronic inflammatory autoimmune disease that affects multiple organs, whose pathology is mainly caused by the augmented interferon (IFN) signaling pathway.

The aim of this study was to analyze the particular contribution of CD4 + T cells and monocytes with respect to cell type-specific IFN signatures detectable in patients with SLE by global gene expression profiling. The major focus was set on the comparison of disease-active and -inactive patients either by standard drug treatment or by autologous stem cell transplantation (ASCT) that is assumed to completely reset the autoreactive immunologic memory.

Methods: Affymetrix Human Genome U133 Plus 2.0 Array were made from purified peripheral CD4 + T cells from 6 active SLE (SLEDAI≥6), 2 inactive SLE (SLEDAI=2) by standard drug treatment and 3 inactive SLE who underwent ASCT as well as 3 healthy donors (ND). In addition, using the same donors, arrays were made from purified peripheral monocytes from 1 active SLE, 1 inactive SLE, 3 ASCT-treated SLE and 3 ND. ASCT-treated patients in this study have achieved long-term remission with SLEDAI 02, whose blood were taken at the time point of 611 years after ASCT. A reference list of 2220 IFN pathway-related genes was obtained from a recent publication on PBMCs and used to estimate IFN imprints in SLE patients.

Results: In CD4 + T cells, inactive SLE showed a marginal IFN-imprint characterized by 233 only weakly expressed probe sets compared to active SLE, while 573 probe sets were characterized by 538 differentially expressed probe sets. In CD4 + T cells, monocytes from ASCT-treated patients who are under long-term remission. However, considering the absolute magnitude of expression of IFN-regulated transcripts, the imprint in ASCT-treated patients was much weaker than in active SLE. For example, significantly up-regulated expression levels of IFI27/IFIT1/IFI44L were greater in active SLE (fold change: FC 41.4/15.8/11.3, respectively) than in ASCT-treated patients (FC 11.8/8.4/8.4), and no significant regulation was observed in inactive SLE. It was obvious that monocytes showed a more complex IFN response characterized by 918 differentially expressed probe sets in active SLE. Marginal IFN-imprint characterized by 652 and 592 probe sets were observed in monocytes respectively from inactive SLE and ASCT-treated patients. Different from CD4 + T cells, monocytes from ASCT-treated patients showed no apparent IFN signatures. For example, significantly up-regulated expression signatures of IFI27/IFIT1/IFI44L were observed in active SLE (FC 125.9/8.8/8.4), but not in ASCT-treated patients and inactive SLE.

Conclusion: We could show for the first time detailed cell type-specific IFN signatures for CD4 + T cells and monocytes isolated from active and inactive SLE patients. Most interestingly, the intriguing question comes up, why only CD4 + T cells, but not monocytes of ASCT-treated patients, are characterized by an apparent IFN imprint although patients are under long-term remission. Our results indicate for a cell type-specific pro-inflammatory cytokine memory in CD4 + T helper lymphocytes even after ASCT-therapy in patients with SLE.

Disclosure: C. Kyogoku, None; J. R. Grün, None; T. Alexander, None; R. Biesen, None; F. Hippe, None; T. Häupl, None; A. Radbruch, None; A. Gritzkau, None.
low expression of CD123. Plasmacytoid dendritic cells were identified by their lack of lineage specific markers, their high expression of CD123, and low expression of CD11c.

**Results:** Merck was detected on dendritic cells (DC) and monocytes from both normal individuals and from SLE patients. There was reduced Merck expression on myeloid dendritic cells from SLE patients compared to controls (p < 0.03), whereas on plasmacytoid dendritic cells there was very low expression in both groups. In monocytes, high levels of Merck expression were observed on the small CD16+ population, whereas the much larger CD16- population of monocytes expressed low levels of Merck. There was no difference in monocyte Merck expression on cells from SLE patients compared to controls. Tyro3 was barely detectable on any peripheral blood leukocytes, and there were no statistical differences on its expression in any of the cell types examined.

**Conclusion:** Myeloid DC from lupus patients express lower levels of Merck than cells from normal individuals. Merck expression on monocytes and plasmacytoid DC from SLE patients is not different from expression on cells from normal controls. Because Merck is an important receptor for clearance of apoptotic cells and because DC Merck expression regulates cytokine production, the observed lower expression of Merck on myeloid DC may lead to a lack of control of their activation and contribute to the hyper activation of immunity in lupus.

Disclosure: B. A. Hilliard, None; G. Zizzo, None; M. K. Linan, None; P. L. Cohen, None.

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**Activation of the Interferon Pathway Is Dependent Upon Autoantibodies in African-American SLE Patients, but Not in European-American SLE Patients.** Chihul Ko, Yelena Koldobskaya, Elizabeth Rosenzweig and Timothy B. Niewold. University of Chicago, Chicago, IL

**Background/Purpose:** Gene expression studies have been instrumental in defining important aspects of the complex immunological pathogenesis in systemic lupus erythematosus (SLE) which is a heterogeneous disease that manifests differently by ancestry, and by the presence of autoantibodies directed at RNA binding proteins (anti-RBP). Moreover, anti-RBP antibodies are associated with high serum interferon (IFN)-α, which plays an important role in pathogenesis of SLE. Our overall hypothesis was that the molecular pathogenesis of SLE differs between African-American (AA) and European-American (EA) SLE patients, and between those with anti-RBP antibodies and those who lack these antibodies. We aimed to explore this hypothesis using peripheral blood gene expression profiling.

**Methods:** Whole blood RNA from 33 female SLE patients and 16 matched female controls from AA and EA ancestral backgrounds was analyzed on Affymetrix Gene 1.0 ST gene expression arrays. Two-tailed t-tests were performed to compare the expression values between cases and controls in each ancestry. Differentially expressed genes with a cutoff P of 0.05 were further explored using Ingenuity Pathway Analysis (IPA) to compare the top canonical pathways amongst the sample groups. An independent replication cohort of more than 100 SLE patient samples and 30 controls was used to test the hypotheses generated by the microarray data, using qPCR to quantify gene expression.

**Results:** Both AA and EA female (AAF and EAF respectively) patients with positive anti-RBP antibodies (RBP+) showed similar IFN-related canonical pathways such as IFN Signaling (P = 1.3 × 10^-7 and 6.3 × 10^-11 in AAF vs. EAF patients respectively), Antigen Presenting Pathway (P = 1.8 × 10^-3 and 2.5 × 10^-1) and a number of pattern recognition receptor pathways. The key pathway difference was shown between AAF and EAF patients in both general gene expression and antigen presentation pathways (P = 1.3 × 10^-11) whereas AAF patients with RBP- did not reveal any IFN-related pathways. A replication study was performed through qPCR on 3 IFN-inducible genes, IFIT1, MX1 and PKR, and showed similar results. All three genes were strongly up-regulated in RBP+ patients in both ancestries, and PKR was up-regulated in EAF patients with RBP- but these findings were completely absent in AAF patients with RBP-.

**Conclusion:** Our data show that IFN-induced gene expression is completely dependent on the presence of autoantibodies in AA SLE patients but not in EA patients. Further studies are needed to explore other novel pathways that may define the heterogeneity in SLE, especially in the RBP- AA group.

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**Molecular Analysis of 9G4+ Antibodies in Systemic Lupus Erythematosus.** Christopher Richardson1, Asiya Seema Chida2, Erin Fox3, Lin Silver4, Diana G. Adlowitz1, Scott Jenks5, Elise Palmer1, Christopher Tipton1 and Ignacio Sanz6. 1University of Rochester, Rochester, NY, 2Emory University, Atlanta, GA

**Background/Purpose:** Elevated titers of serum autoantibodies expressing the 9G4 idiotype are highly specific for SLE and correlate with disease activity and clinical manifestations. 9G4+ antibodies have been shown to be reactive to a wide variety of autoantigens, including B cells, dsDNA, and cardiolipin. In this study we analyze the molecular characteristics that contribute to this autoreactivity.

**Methods:** A panel of 9G4+ monoclonal antibodies was generated from single FACS-sorted naive (CD19+IgD+CD27-CD24+CD38+) and isotype-switched memory (CD19+IgD-CD27+) B cells from SLE patients and healthy controls. Site-directed mutagenesis of the hydrophobic patch and light chain exchange were performed. Monoclonal antibodies were tested by ANA, dsDNA, and cardiolipin ELISA. Reactivity to B cells and apoptotic cells was determined by flow cytometry. The contribution of the hydrophobic patch, the HCDR3, and light chains to binding of the various self-antigens was analyzed.

**Results:** A significant percentage of 9G4+ monoclonal antibodies were reactive to autointoanitgens, including Hep-2 nuclear antigens (65%), B cells (48%), apoptotic cells (22%), dsDNA (9%), and cardiolipin (7%). Strong binding to apoptotic cells, dsDNA, and cardiolipin was more common among antibodies derived from SLE memory cells. Site-directed mutagenesis showed that B cell binding is mediated by the VH4–34–encoded FR1 hydrophobic patch (which also determines the expression of the 9G4 idiotype). By contrast, autoreactivity to the other SLE-related antigens is patch-independent and is actually enhanced by elimination of the 9G4 idiotype. In addition, apoptotic cell and ANA-dsDNA reactivity correlate with the charge of the HCDR3, while B cell binding does not. Finally, light chains can substantially change VH4–34-associated autoreactivity.

**Conclusion:** Our findings show that 9G4+ antibodies are reactive to several antigens important in SLE pathogenesis, and bind antigen in two fundamentally different ways. We also show that the intrinsic autoreactivity imparted by the expression of 9G4+ VH4–34 heavy chains can be substantially modulated by somatic hypermutation and light chain replacement.

Disclosure: C. Richardson, None; A. S. Chida, None; E. Fox, None; L. Silver, None; D. G. Adlowitz, None; S. Jenks, None; E. Palmer, None; C. Tipton, None; I. Sanz, None.

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**Characterization of Pro-Inflammatory Cytokines and Vitamin D Levels in a Lupus Cohort and Correlation with Disease Activity.** Rohan Willis1, Praveen Jajoria1, Brock E. Harper 1, Emilio B. Gonzalez1, Michelle Waszyczki, Eltisham Akhter2, Hong Fang3 and Silvia S. Pierangeli4. 1University of Texas Medical Branch, Galveston, TX, 2Johns Hopkins University School of Medicine, Baltimore, MD

**Background/Purpose:** Multiple cytokines play a role in the immune dysregulation seen in systemic lupus erythematosus (SLE) and the local inflammatory responses that ultimately lead to tissue injury. IL6, TNFα, sCD40L, IFNα and IFN inducible cytokines such as MCP1 and IP10 are correlated with disease activity as measured by the SLEDAI, SLAM-R, ESR and anti-dsDNA antibody titres. Elevated VEGF and IL1β levels have been demonstrated in patients with antiphospholipid syndrome (APS). Low serum 25-hydroxy vitamin D (25OH-VD) levels are found in sera of pts with SLE and have been associated with higher fatigue and pain scores. Studies assessing lupus disease activity and Vit D levels have shown contradictory results. As such we sought to determine the proinflammatory biomarkers elevated in a cohort of SLE patients compared to controls, the correlation with disease activity levels and the prevalence of abnormally low vitamin D levels.

**Methods:** 388 patients with samples from baseline visit were selected from a longitudinal cohort of SLE subjects. IFNα2, IL1α, IL6, IL8, IP10, TNFα, VEGF and sCD40L levels were determined by a multiplexed immune assay [Millipore]. Disease activity was assessed using SLEDAI-2K, SLEDAI scores. 25OH-VD levels were measured using either a chemoluminescence or ELISA assay, and pts classified into 3 groups: normal (25OH-VD >30 ng/mL), insufficient (20–30) and deficient (<20). The
non-parametric two-sample median test was used to compare medians of cytokines in SLE pts vs controls. Pearson correlation was used to identify association of disease activity and physician global assessment (PGA) with cytokine levels.

Results: Most cytokines were significantly elevated in SLE patients vs controls, with the exception of IL8 that was significantly elevated in controls (Table). Of 379 subjects with 25OH-VD results, 36.1% (137/379) had deficiency, 29.3% (111/379) had insufficiency and 34.6% (131/379) had normal 25OH-VD levels. IP10 correlated with PGA and SLEDAI (PGA:0.15, p = 0.0034 and SLEDAI:0.26, p < 0.0001). All other correlations of cytokines and 25OH-VD with PGA and SLEDAI were not significant.

Table 1. Levels of cytokines in SLE patients vs control group

<table>
<thead>
<tr>
<th>Cytokines</th>
<th>Controls/Median (N=30)</th>
<th>SLE/Median (N=388)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFα2</td>
<td>0</td>
<td>10.37</td>
<td>0.012</td>
</tr>
<tr>
<td>IL-6</td>
<td>0</td>
<td>0.63</td>
<td>0.0025</td>
</tr>
<tr>
<td>IL-8</td>
<td>27.4</td>
<td>7.07</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>IL-1β</td>
<td>0</td>
<td>0.02</td>
<td>0.0004</td>
</tr>
<tr>
<td>TNFα</td>
<td>0</td>
<td>7.52</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>VEGF</td>
<td>88.30</td>
<td>158.65</td>
<td>0.0025</td>
</tr>
<tr>
<td>IP-10</td>
<td>96.22</td>
<td>413.48</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>sCD40L</td>
<td>16.39</td>
<td>2163.51</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Conclusion: This study confirms numerous reports of elevated proinflammatory cytokines in SLE patients. Interestingly, over 2/3 of this population of SLE patients had below normal vitamin D levels but no correlation with SLEDAI or PGA was seen. The IFN-inducible cytokine IP10 correlated with increased disease activity as determined by both objective and subjective measures.

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A Placebo-Controlled Phase II Study of Hyperimmune Caprine Serum in Diffuse Cutaneous Systemic Sclerosis: Safety and Potential Efficacy. Niamh P. Quillinan1, Deirdre McIntosh2, Syed Haq2 and Christopher P. Denton.1. UCL Medical School, London, United Kingdom, 2Dalvai International Ltd, Eastbourne, East Sussex, United Kingdom, 3UCL, London, United Kingdom

Background/Purpose: We have performed a study to explore safety and tolerability of hyperimmune caprine serum (AIMSPRO®) prepared under GMP conditions in established diffuse cutaneous systemic sclerosis (dcSSc). Potential measures of efficacy and biological activity were also examined.

Methods: A double-blind parallel group placebo controlled clinical trial was performed under clinical trial authorisation with regulatory authorisation and institutional ethical approval. After informed consent, 20 patients with established dcSSc of greater than 3 years duration not receiving immunosuppressive therapy were randomised to receive either active (n=10) or placebo formulation (n=10) by subcutaneous twice weekly injection over 26 weeks. Clinical assessments evaluated over 26 weeks included modified Rodnan skin score (MRSS), pulmonary function indices and HAQ-DI.

Results: There were no safety concerns during this study. Frequency of adverse events was not different between active and placebo groups; 154 AE occurred in those receiving placebo and 139 AE in the AIMSPRO® treated subjects. The commonest adverse event was minor injection site reaction occurring in 12 subjects. There were 6 SAE in 3 subjects in the placebo group and 4 SAE in 3 subjects receiving active treatment. No SAE was judged treatment related.

Mean (±SD) baseline MRSS for the study cohort was 15.1 ± 7.1, with no significant difference between active and placebo groups. Mean skin score fell by 1.4±2.47 units with active treatment but worsened by 2.1±6.4 units on placebo. This difference did not reach statistical significance (p=0.18, unpaired t-test) but more cases on active treatment showed significant improvement of more than 4 units and over 20% of baseline MRSS (5/10) compared with placebo (1/10; p=0.01, Fisher exact test). HAQ-DI (Mean±SD) at baseline was 1.15±0.07 for active and 1.59±0.63 for placebo group and at 26 weeks was 1.24±0.98 for active and 1.56±0.55 for placebo. These changes were not statistically different (p=0.34, unpaired t-test).

Lung function indices (Table 1) showed a trend of benefit for active treatment compared to the placebo group for those variables that reflect respiratory effort (FVC and FEV1). DLco and TLC did not change during the study.

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Nilotinib (Tasigna™) in the Treatment of Early Diffuse Systemic Sclerosis: A Single Group, Open Label Pilot Clinical Trial. Jessica K. Gordon1, Morgana L. Davids1, Camini Doobay1, Cynthia Magro2, Horatio F. Wildman1, Stephen L. Lyman1, Mary K. Crow1 and Robert F. Spiera2.
1Hospital for Special Surgery, New York, NY, 2Weill-Cornell Medical College, New York

**Background/Purpose:** Tyrosine kinase inhibitors (TKI) which selectively antagonize e-cab1 and PDGFR have been shown in preclinical models to decrease fibrosis. TKIs are therapies of interest for Systemic Sclerosis (SSc) with potential efficacy observed in several, but not all, open label studies of imatinib. Side effects relating to fluid retention were common and led to intolerance in some patients. Nilotinib is a second-generation TKI with increased potency and a different side effect profile compared to imatinib. Side effects relating to fluid retention were common and led to discontinuation in some patients. Nilotinib is a second-generation TKI with increased potency and a different side effect profile compared to imatinib, specifically with less associated fluid retention.

**Methods:** In this single group, open label, pilot trial, we recruited 10 adult patients with diffuse cutaneous (dc) SSc of less than 3 yrs duration since the initial SSc symptom apart from the Raynaud’s Phenomenon. Patients were treated with nilotinib 400 mg po twice daily. Patients were excluded if they had a QTc>450 msec. Concurrent immunosuppressive treatment was not allowed. The primary endpoint was safety as assessed by the number of adverse effects (AEs) and serious (S)AEs, and the primary efficacy endpoint was change in the Modified Rodnan Skin Score (MRSS) after 6 mo. Secondary endpoints include forced vital capacity (FVC), diffusion lung capacity (DLCO) and other measures. After 6 mo patients are offered continued treatment for an additional 24 mo. Skin biopsies are performed at baseline and after 6 and 12 mos.

**Results:** Nineteen patients were initially screened; 5 were excluded due to intolerance to other TKIs and 4 due to Grade 2 adverse events. Nilotinib was well tolerated. One patient withdrew for personal reasons after baseline. At 12 mo 3 patients were lost to follow up and 12 patients completed 12 mo of treatment. Patient characteristics included: 60% male, 40% female, 50% were Caucasian, and disease duration was 0.7 yrs (0.5, 1.7). Nilotinib improved global assessment in the Modified Rodnan Skin Score (MRSS) from a baseline of 61.3 (56.7, 81.3) to 32 (42.3, 55.3), p=0.01.

**Conclusion:** Nilotinib was well tolerated by the majority of patients in this study. The MRSS improved significantly with 6 mo of treatment in this very early and active group of patients. The FVC and DLCO remained stable as did the additional outcome measures. Tolerability was limited primarily by mildly prolonged QTc, which is a known side effect of nilotinib and an exclusion criterion for continuation in this study. Baseline QTc prolongation also limited patient eligibility. Further study of nilotinib is warranted in a randomized controlled manner.
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Risk Factors for EARLY Mortality in Scleroderma Patients: A Report From the EULAR Scleroderma Trials and Research Group (EUSTAR) Database. Patricia E. Carreira1, Loreto Carmona2, Beatriz E. Joven1, Christopher P. Denton3, Yannick Allanore4, Ulrich A. Walker5, Marco Matsu allegi-Cerrini6, Ulf Müller-Ladner6 and Eustar4. Hospital Universitario 12 de Octubre, Madrid, Spain, 2Universidad Carlos III de Madrid, Madrid, Spain, 3Hospital Universitario San Cecilio, Granada, Spain, 4Hospital Universitario 12 de Octubre, Madrid, Spain, 5Universidad Carlos III de Madrid, Madrid, Spain, 6Hospital Universitario San Carlos, Madrid, Spain, 7Hospital Universitario de la Princesa, Madrid, Spain.

Methods: EUSTAR collects prospectively the Minimal Essential Data Set (MEDS), on all sequential patients fulfilling the American College of Rheumatology diagnostic criteria in participating centres, in an annual basis. Patients with disease duration of less than 3 years at the first EUSTAR entry, and with at least one follow-up visit, were selected. Baseline data from the first visit were compared between SSc cases registered as dead up to December 2011, and living patients. Kaplan-Meier analysis was used to estimate survival, and Cox proportional hazards regression analysis, corrected by age at the end of follow-up, was used to identify factors associated with early mortality.

Results: From 1188 patients, 671 (19% men) had at least one follow-up visit. From those, 276 had diffuse and 348 had limited disease. Mean age at entry was 53±15 years, and at first non-Raynaud symptom 50±15 years. Mean disease duration was 19±6 months and time between the onset of Raynaud and first non-Raynaud symptom was 4±7 months. After 43±24 months of follow-up from the first visit and 57±26 months from the first non-Raynaud symptom, 111 patients (17%) were dead. Death occurred after 43±27 months from the first non-Raynaud symptom. Mean survival for the whole group was 116 (95% CI 110–122) months. By Cox proportional hazards regression multivariate analysis, main risk factors for mortality were: higher skin score (HR 1.0–3, 95% CI 1.00–1.05, p=0.02), acute phase reactants elevation (HR 1.8, 95% CI 1.1–2.8, p=0.003), joint contractures (HR 1.8, 95% CI 1.1–2.8, p=0.003), CK elevation (HR 1.9, 95% CI 1.1–3.3, p=0.02), cardiac blocks (HR 2.1, 95% CI 1.3–3.3, p=0.004), diastolic dysfunction (HR 2.1, 95% CI 1.3–3.3, p=0.002) and ischemic ulcers (HR 1.9, 95% CI 1.2–2.9, p=0.007). When only diffuse patients were analyzed, CK elevation, FVC below 80% and pulmonary hypertension were the risk factors for mortality. In the other hand, bad prognostic factors in limited patients were joint contractures, CK elevation, cardiac blocks, proteinuria and renal crisis.

Conclusion: In this large group of SSc patients, risk factors for early mortality are higher skin involvement with more severe vascular disease and cardiac involvement, especially if associated to elevated acute phase response. Muscular and cardiac involvement appear as a risk factor for mortality both in limited and diffuse disease, whereas lung and renal involvement have a major impact in diffuse and limited cases respectively.

Disclosure: P. E. Carreira; None. L. Carmona; None. B. E. Joven; None. C. P. Denton; None. Y. Allanore; None. U. A. Walker; None. M. Matsu allegi-Cerrini; None. U. Müller-Ladner; None.

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Background/Purpose: The epidemiologic literature has identified several demographic, clinical and serologic predictors of mortality in systemic sclerosis (scleroderma). Yet, relatively few cohorts are of sufficient size and racial composition to examine the independent contribution of these parameters to survival. We sought to determine the adjusted risk of mortality in scleroderma associated with gender, race, disease subset, and serologic and socioeconomic status in a large observational cohort study.

Methods: Between January 1, 1990 and December 31, 2009, a total of 2217 patients with scleroderma, either African American (n=409, 18%) or Caucasian (n=1808, 82%), were evaluated at a single university medical center. The vital status of the cohort was ascertained using the Social Security Death Index; cumulative incidence of mortality was estimated using Kaplan-Meier analysis. Next, the independent risk of mortality was estimated using Cox proportional hazards analysis, with adjustment for age at disease onset and disease duration, in addition to each variable depicted in the table below.

Results: This cohort of 2217 patients was 1838 (83%) female; mean age (±SD) at disease onset was 46 (±14) years. Among these patients, 1387 (63%) manifested the limited and 830 (37%) the diffuse cutaneous subtype of disease. Overall, 1846 (83%) fulfilled ACR criteria for scleroderma, whereas 361 (16%) satisfied at least 3 of 5 CREST criteria. Among the 1511 patients whose sera was tested for anti-centromere, and 1393 assays for anti-topoisomerase antibodies, 452 (30%) and 294 (21%) were seropositive, respectively. In addition, 11% of the cohort had medical assistance or no health insurance, whereas 89% had Medicare or private insurance. During a median follow-up period of 4 years, 700 patients died overall. Over, cumulative mortality at 1 and 5 years of follow-up was 8% and 32%, respectively. The relative risk of mortality, in two multivariate models, was as follows:

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male vs Female</td>
<td>1.4 (1.1–1.9)</td>
<td>1.4 (1.1–1.9)</td>
</tr>
<tr>
<td>African American vs Caucasian</td>
<td>1.5 (1.1–2.1)</td>
<td>1.3 (1.0–1.8)</td>
</tr>
<tr>
<td>Diffuse vs Limited</td>
<td>1.4 (1.0–1.8)</td>
<td>1.2 (0.9–1.5)</td>
</tr>
<tr>
<td>Anti-centromere antibody, pos vs neg</td>
<td>0.7 (0.5–1.3)</td>
<td>0.8 (0.6–1.0)</td>
</tr>
<tr>
<td>Health Insurance, MA/no vs Med/yes</td>
<td>1.2 (0.8–1.7)</td>
<td>1.4 (1.0–1.8)</td>
</tr>
</tbody>
</table>

Conclusion: Persons with scleroderma who are male, African American, with diffuse cutaneous disease, and those without private or Medicare health insurance, experienced a heightened risk of mortality. Anti-centromere, but not topoisomerase antibodies, were protective against mortality. These findings imply that demographic, clinical features, serologic and socioeconomic status, each impact upon and contribute to the risk of survival in scleroderma.

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External Validation of a Two-Year Mortality Risk Prediction Rule in Early Diffuse Scleroderma Patients. Robyn T. Domsic1, Svetaana Nihtyanova2, Stephen R. Wisniewski3, Michael J. Fine4, Christopher P. Denton5 and Thomas A. Medsger Jr.6. 1University of Pittsburgh, Pittsburgh, PA, 2Royal Free Hospital, Medical School, London, England, 3University of Pennsylvania, Philadelphia, Graduate School of Public Health, Pittsburgh, PA, 4University of Pittsburgh and Center for Health Equity Research and Promotion, VA Pittsburgh Healthcare, Pittsburgh, PA, 5University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 6UCL, London, United Kingdom, 7Univ of Pittsburgh, Pittsburgh, PA

Background/Purpose: The ability to risk stratify patients for short term mortality is important in SSc patient care and clinical trial design; but there is no externally validated short term mortality model in early diffuse cutaneous systemic sclerosis (dcSSc). We have previously used a prospectively enrolled large American single center SSc databank to develop and internally validate a 4-factor risk stratification model for two year mortality. Our objective was to externally validate this two year mortality model in a European population of early dcSSc Caucasian patients.

Methods: A large European single-center prospectively enrolled SSc databank was used to identify an inception cohort of adult early dcSSc seen for an initial visit between 2000 and 2006 to serve as the external validation cohort. Patients were considered to have early dcSSc if their first visit occurred< 2 years after the first symptom attributable to SSc with skin thickening proximal to the elbows or knees. Vital status was determined using the UK National Care Records Service.

We used a 4-factor model (age at first visit, gastrointestinal severity, skin thickening, progression rate and presence of anemia) to calculate a total sum score (range of ~1 to 8) and risk stratify patients into low, moderate and high risk for two year mortality in the original derivation and external validation cohort. Multiple data imputations were used for missing data in the validation.
Stratification of risk using this model is shown in Table 1. There was no difference in prediction of low or moderate risk groups between the models.

### Table 1. Comparison of risk class specific two-year mortality rates in the derivation and validation cohorts

<table>
<thead>
<tr>
<th>Risk Class (sum of points)</th>
<th>Derivation cohort (n=252)</th>
<th>Validation cohort (n=110)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (&lt;=0)</td>
<td>total n</td>
<td>% who died</td>
<td>total n</td>
</tr>
<tr>
<td>Low (&lt;=0)</td>
<td>66</td>
<td>1.6</td>
<td>33</td>
</tr>
<tr>
<td>Moderate (1–2)</td>
<td>108</td>
<td>14.8</td>
<td>61</td>
</tr>
<tr>
<td>High (3+)</td>
<td>81</td>
<td>49.4</td>
<td>16</td>
</tr>
</tbody>
</table>

Conclusion: We have now validated a two-year mortality risk stratification model for early dcSSc patients in American and European cohorts. In this external validation, the model accurately predicted those at low and moderate risk of death at two years from the first visit. There was a significantly lower rate of death in the validation cohort, possibly related to the inclusion of only recent patients or differences in the underlying populations, which may have affected performance in the high risk group. This model may be used to risk stratify patients for short-term mortality.

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Clinical Correlation of Flow-Mediated Endothelium-Dependent Vasodilation in Systemic Sclerosis, Takehiro Takahashi1, Yoshhide Asano1, Eisuke Amiya2, Masaru Hatano2, Atsuko Ozeki2, Aya Watanabe2, Shuichi Kawarasaki2, Tomoko Nakao2, Zenhiro Tamaki2, Takashi Taniguchi2, Yohei Ichimura1, Tetsuo Toyama1, Masafumi Watanabe2, Yasunobu Hirata2, Ryozo Nagai2 and Shinichi Sato2.1 Department of Dermatology, University of Tokyo Graduate School of Medicine, Tokyo, Japan; 2Department of Cardiovascular Medicine, University of Tokyo Graduate School of Medicine, Tokyo, Japan

Background/Purpose: Systemic sclerosis (SSc) is a multysystem autoimmune disease characterized by initial vascular injuries and resultant fibrosis of skin and certain internal organs. Evidence has shown that vascular impairment in SSc may be a sign of endothelial dysfunction involving both microvascular and macrovascular systems. Ultrasound assessment of brachial artery endothelial-dependent flow-mediated dilation (FMD) is a noninvasive instrumental evaluation that is routinely performed as an index of macrovascular function. We evaluated the association of FMD with clinical features of SSc to assess the possible contribution of endothelial dysfunction to the developmental process of clinical features associated with this disease.

Methods: Twelve healthy controls and thirty-five consecutive patients with SSc (mean age 53 ± 17 years and 57 ± 11 years, respectively) were studied. In patients, clinical symptoms, such as swollen fingers, nailfold bleeding (NFB), pitting scars, digital ulcers, and Raynaud’s phenomenon, were meticulously recorded. Eighteen patients had limited cutaneous SSc (lcSSc) and 17 had diffuse cutaneous SSc (dcSSc). Ultrasound assessment of FMD was performed on all patients. Correlation between FMD value (%FMD) and various typical symptoms, disease duration, and subtype of SSc was studied.

Results: There was significant decrease in %FMD in patients compared to healthy controls (5.72% versus 7.71%, respectively; p = 0.04). Especially, lcSSc patients had significantly lower %FMD values than healthy controls (5.25% versus 7.6%, p = 0.016), while the levels in dcSSc patients (6.8%) were comparable to those of healthy controls. Furthermore, in lcSSc patients group, patients with decreased %FMD had much longer disease duration than those with normal %FMD (p = 0.0088), while the age of these two patient groups was comparable. As for clinical symptoms, lcSSc patients with decreased %FMD showed much higher prevalence of digital ulcers and elevated RVSP than those with normal %FMD (for each, 75% versus 10%, p = 0.040). In addition, there was a trend towards the increase in the prevalence of decreased %DLco, but not decreased %VC, in lcSSc patients with decreased %FMD as compared to those with normal %FMD.

Conclusion: Endothelial function evaluated by %FMD is markedly impaired in SSc patients. lcSSc patients with decreased %FMD exhibited a significantly higher prevalence of clinical symptoms associated with vasculopathy. Furthermore, the values of %FMD greatly and inversely correlated with disease duration in lcSSc patients. Collectively, %FMD is potentially a powerful tool to evaluate the damage of vascular system in SSc, especially in limited cutaneous subtype of this disease.

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Vascular Differences Associated to Genetic Polymorphisms of Endothelial Nitric Oxide Synthase in Mexican Patients with Systemic Sclerosis. A Preliminary Report.  

Maria Pilar Cruz-Dominguez, 1 Maria Angeles Martinez-Godinez, 2 Angel Miliar-Garcia, 2 Daniel Hector Montes-Cortes, 3 Olga Vera-Lastra, 2 Luis J. Jara-Quezada 2 and Anabel Reyes-Salazar 2.

1Hospital de Especialidades Centro Medico Nacional La Raza, Mexico, DF, Mexico, 2Escuela Superior de Medicina. IPN, Mexico, D.F., Mexico, 3Hospital General CMN La Raza, IMSS, Mexico DF, Mexico, 4MD, Mexico City, 5Hospital de Especialidades Centro Medico La Raza, IMSS, Mexico City, 6Hospital de especialidades Centro Medico Nacional “La Raza”, IMSS, Mexico D.F., Mexico.

Background/Purpose: Vascular dysfunction usually is observed before clinically detectable fibrosis of systemic sclerosis (SSc). The ENOS catalyses the synthesis of nitric oxide (NO), which maintains basal vascular tone and endothelial function. Abnormal production of e-NOS and/or iNOS impairs NO availability causing vascular disease. Genetic polymorphism may participate in these alterations.

Objective: To investigate vascular differences associated to polymorphisms T-786C and G894T of the eNOS gene on differential expression of eNOS/iNOS in the skin and vascular Duplex Sonography parameters of SSc patients.

Methods: We included 139 consecutive SSc patients. The genotyping of T-786C and G894T polymorphisms of eNOS gene was performed by Polymerase Chain Reaction Real-Time Assay. The control group included 180 age-matched healthy volunteers. For the eNOS/iNOS skin expression we used the Polymerase Chain Reaction Real-Time Assay.

Results: In lcSSc: T-786C prevalence was TT 65.5%, TC 30.2% and CC 4.3% (OR 1.8, IC 0.4–7.9 associated to SSc); and the G894T prevalence was GT 74.3%, GT 20.3% and TT 5.4% (OR 1.94, IC 0.54–7.04 associated to SSc). In dcSSc: the T-786C prevalence was TT 76.6%, TC 20.9%, and CC 3.5%, and G894T polymorphism was GT 82%, GT 18% and TT 0% without association with SSc. In control group: the prevalence of T-786C polymorphism was TT 65.4%, TC 29.4%, and CC 5.2%; for G894T polymorphism was GG 74.1%, GT 23.02%, TT 2.87%. The mean relative expression of eNOS was 10.17±4.155 and iNOS of 7.6±13.05 in lcSSc. For dcSSc the mean relative expression of eNOS was 1.74±1.16 and iNOS of 2.1±2.5, 7.38±0.3 and 3.16±0.7 in skin of volunteers of control group. Left brachial intima-media thickness was statistically significantly greater in allic variants of eNOS in SSc (p=0.025).

Conclusion: In the skin of both subtypes of systemic sclerosis, the relative expression of eNOS and iNOS is increased. Genetic polymorphisms of eNOS is associated with anormal intima-media thickness in SSc patients.

Disclosure: M. P. Cruz-Dominguez, None; M. A. Martinez-Godinez, None; A. Miliar-Garcia, None; D. H. Montes-Cortes, None; O. Vera-Lastra, None; L. J. Jara-Quezada, None; A. Reyes-Salazar, None.

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Gene-Siew Ngian, 1 Joanne Sahhar, 2 Ian Wicks, 3 and Sharon Van Doornum, 4 1The University of Melbourne, Parkville, Australia, 2Monash Medical Centre, Clayton, Australia, 3Royal Melbourne Hospital, Parkville, Australia, 4The University of Melbourne, The Royal Melbourne Hospital, Melbourne, Australia.

Background/Purpose: Atherosclerosis may be increased in systemic sclerosis (SSc). Increased arterial stiffness is a predictor of cardiovascular and all-cause mortality across a wide range of patient populations. Our aim was to determine if arterial stiffness is elevated in SSc and to evaluate correlates of arterial stiffness in SSc patients.

Methods: We performed two studies: 1) a comparison of arterial stiffness in 40 SSc patients free from cardiovascular disease or significant vascular manifestations of SSc (i.e. pulmonary arterial hypertension or scleroderma renal crisis) and 40 age- and sex-matched healthy controls, and 2) an analysis of determinants of arterial stiffness in a larger, unselected cohort of 80 SSc patients (which included the 40 patients from study 1). Arterial stiffness was measured using the augmentation index (AIx) and carotid-femoral pulse wave velocity (PWV), both of which increase with increasing arterial stiffness.

Results: In study 1 the SSc and control groups were well matched for age (52.2 vs 50 years respectively), sex (80% female in both groups) and cardiovascular risk factors. SSc patients had significantly higher AIx than controls (31.2±8.4 vs 20.9±12.6% respectively, p<0.001), with a non-significant increase in PWV (7.3±1.8 vs 6.8±1.1 m/s respectively, p=0.101). In study 2, univariate analysis of the entire SSc group revealed that higher AIx was significantly associated with age (p<0.001), disease duration (p=0.01), anti-centromere antibodies (p<0.016), calcium channel blocker (CCB) therapy (p=0.004), systolic blood pressure (BP) (p=0.001) and diastolic BP (p=0.029). Higher PWV was significantly associated with age (p<0.001), disease duration (p=0.001), anti-centromere antibody positivity (p=0.022), lack of anti-Scl-70 antibody positivity (p=0.001), lower modified Rodman skin score (p=0.016), angiotensin converting enzyme inhibitor therapy (p=0.035), systolic BP (p=0.001) and diastolic BP (p<0.001). After adjusting for age, CCB therapy remained predictive of higher AIx (p=0.014) and systolic (p<0.001) and diastolic (p=0.005) BP remained predictive of higher PWV.

Conclusion: Compared with healthy controls, SSc patients had increased arterial stiffness, with significantly higher AIx and non-significantly higher PWV. This suggests that patients with SSc may have an increased prevalence of subclinical atherosclerosis. After adjusting for age, CCB therapy was associated with higher AIx, which is paradoxical given that CCB therapy in hypertensive individuals decreases arterial stiffness, if anything. Given that CCBs are first-line therapy for Raynaud’s phenomenon in SSc, this association could reflect generalized vasculopathy rather than atherosclerotic disease.

Prospective studies in large cohorts of patients are warranted to clarify this point and elucidate other determinants of arterial stiffness in SSc.

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Vascular Ischemic Events in Systemic Sclerosis - A Cross-Sectional Comparison with population-Based Controls.  

Annica Nordin, 1 Kerstin Jensen-Urstad, 1 Lena Bjöömdal 2 and Elisabet Svenungsson 2. 1Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden, 2Department of Clinical Physiology, Södersjukhuset, Karolinska Institutet, Stockholm, Sweden.

Background/Purpose: To investigate the occurrence of ischemic vascular events and subclinical atherosclerosis in patients with systemic sclerosis (SSc) and matched population controls.

Methods: 111 SSc patients (74% of the patients in Stockholm County) and 105 controls were investigated in this population-based study. Previous ischemic vascular events were defined as:

- 1. Ischemic heart disease (IHD): myocardial infarction (confirmed by electrocardiography and a rise in plasma creatine kinase, muscle and brain fraction (CK-MB) or troponin T) or angina pectoris (confirmed by exercise stress test)
- 2. Ischemic cerebral vascular disease (ICVD): cerebral infarction (confirmed by computer tomography) or transitory ischemic attacks (TIA, defined as transient focal symptoms from the brain or retina with a maximum duration of 24 hours).
- 3. Ischemic peripheral vascular disease (IPVD): intermittent claudication + ankle-brachial index (ABI) < 0.9 or peripheral arterial thrombosis/embolus (confirmed by angiogram or Doppler flow studies).

As measures of subclinical atherosclerosis intima media thickness (IMT) and plaque occurrence was determined with carotid ultrasound and the ABI was calculated.

Results: Mean age was 62 ± 12 years for patients and controls. In the patient group disease duration was 9.4 (5.6–17.4) years, 78% had limited cutaneous systemic sclerosis (lSSc) and 32% had anti-centromere antibodies (ACA). Ischemic vascular events were more common in the patients (18% vs 7%, p=0.01) due to an increased occurrence of both ischemic heart disease (IHD) and ischemic peripheral vascular disease (IPVD) (12% vs 4% p=0.03 and 8% vs 1% p=0.02 respectively). Ischemic cerebral vascular disease was uncommon in both the patient and control group. On a group level frequency of plaques, IMT or ABI did not differ between SSc patients and controls, but the subgroup of patients with ACA had more plaques in comparison both to other SSc patients (67% vs 39%, p=0.006) and to controls (67% vs 41%,
Adipose Derived Stem Cells As An Alternative Source of Cellular Repair for Vascular Dysfunction in Systemic Sclerosis. Nevin Hammam and Hazem Orabi. Assiut University, Assiut, Egypt, “Knappe Molecular Laboratory, San Francisco, CA

Background/Purpose: Systemic sclerosis (SSc) is an autoimmune disease characterized by autoimmunity, diffuse fibrosis in the skin and internal organs, and vasculopathy in moderate size arteries and arterioles. The vasculopathy associated with SSc is one of the major contributors to the clinical manifestations of the disease and can result in non-healing ulcers, gangrene and digit loss, hypertension and cardiovascular disease and it has a profound impact on the quality of life. Endothelial injury, smooth muscle cells proliferation and fibrosis of the vessel wall result in lumen occlusion and tissue hypoxia that is treated currently with pharmacologic agents. New therapies including stem cells are needed to reconstitute the diseased vascular tissue. Adipose derived stem cells (ADSCs) represent an ideal stem cell source for SSc vasculopathy therapy.

The aim of this study is to investigate if human ADSCs can be differentiated into smooth muscle cells (SMC) and endothelial cells (EC) and if these differentiated cells can be constructed into cell sheets and vascular tissue.

Methods: Human ADSCs were isolated expanded, induced into EC and SMC using endothelial growth medium-2 (EGM-2) and Transforming growth factor (TGF-β1) respectively. The growth and morphology of the cells were followed up for 4 weeks. The phenotype of induced cells were checked for SMC markers: actin, calponin and heavy chain myosin and for endothelial cell markers; CD31 and Von Willebrand factor (vWF) through immunocytochemistry and western blot. The induced SMC and EC cells were used to construct either SMC and EC cell sheets or bilayered vascular structures by culturing them in special culture dishes. Confluent cultured cells were harvested as a contiguous cell sheet only by lowering temperature. The cell sheets and vascular structures were stained with H&E and Masson Trichrome and verified for smooth muscle markers and for endothelial cell markers. The formation of extracellular matrix of the both cell sheets was tested using Picosirius Red staining and collagen IV.

Results: The induced cells showed positive staining for endothelial cell markers after 2 weeks and smooth muscle markers after 3 weeks for SMC cells. The western blot confirmed their phenotype conversion. The cell sheets and vascular structures were detached easily in a consistent manner by lowering the temperature in intact and viable condition. The monolayer cell sheets were formed of 2–5 cell layers that showed positive staining for either SMC or EC markers. They also showed positive staining for Picosirius Red and collagen IV indicating the formation of extracellular matrix. Vascular structures exhibited upper layer of EC and multiple layers of SMC with collagen layer in between.

Conclusion: The results showed the ability of human ADSCs to form SMC and EC and constitute a renewable source for cell therapy. The cell sheets and vascular structures made of ADSCs form new technology for improvement of vascular dysfunction in SSc.

Disclosure: N. Hammam, None; H. Orabi, None.

Excess Mortality From Atherosclerotic Cardiovascular Disease in Systemic Sclerosis Compared to Lupus and Rheumatoid Arthritis. Amish J. Dave, Bharathi Lingula, David Fiorentino, Eswar Krishnan and Lorinda Chung.

Background/Purpose: Patients with autoimmune connective tissue diseases (CTD), including systemic lupus erythematosus (SLE) and rheumatoid arthritis (RA), are at increased risk for atherosclerotic cardiovascular disease (ASCVD) compared with the general population. Recent reports indicate an increased prevalence of ASCVD in patients with systemic sclerosis (SSc), thought to be mediated through inflammatory mechanisms affecting vascular integrity, including endothelial cell damage and increased collagen deposition. Our aim was to utilize the Nationwide Inpatient Sample (NIS) to assess the prevalence of and mortality risk associated with ASCVD among hospitalized patients with SSc.

Methods: The NIS is a national, annual, representative survey of hospitalized patients in the US. We examined the in-hospital frequency and mortality rates of specific diagnoses and procedures associated with ASCVD
among hospitalized adult patients with SSC using data from the NIS from 1993 to 2007. The following diagnoses and procedures were identified by ICD-9 codes: coronary artery disease, myocardial infarction, cerebrovascular accidents, coronary artery bypass grafts, and percutaneous transluminal coronary angioplasty. Analyses were weighted so results are standardized to the US population as a whole. Using logistic regression, we compared the odds of death among hospitalized SSC patients with each ASCVD diagnosis or procedure to patients with SLE or RA, and to a control group that excluded patients with any CTD diagnosis and were matched to cases by age, gender, and race. Multivariate analyses controlled for demographic factors, comorbid diseases using the Charlson comorbidity index, elective vs. emergent hospitalizations, and the number of diagnoses.

**Results:** A total of 308,452 hospitalizations of SSC patients occurred in the US between 1993 and 2007. The mean age was 61.5 years, 84% were female, and 59% were white. 12% of all SSC hospitalizations were associated with an ASCVD diagnosis or procedure, compared with 11% of SLE and 15% of RA hospitalizations. SSC hospitalizations associated with ASCVD were 1.5 times more likely to result in death compared with SSC hospitalizations not associated with ASCVD (OR 1.5, 95% CI 1.4–1.6, p < 0.001). Highest odds of in-hospital death were associated with CAD/MI (OR 1.7, 95% CI 1.6–2.0, p < 0.001) and CVA (OR 1.4, 95% CI 1.2–1.6, p < 0.001). Multivariate analyses showed that SSC hospitalizations associated with ASCVD were more likely to result in death than hospitalizations of SLE (OR 1.6, 95% CI 1.4–1.9, p < 0.001), RA (OR 2.6, 95% CI 2.3–3.0, p < 0.001), and controls (OR 3.1, 95% CI 2.7–3.7, p < 0.001) with ASCVD.

**Conclusion:** Although the frequency of hospitalizations associated with ASCVD in SSC patients is similar to that in SLE and RA patients in the US, there is an increased risk of in-hospital death associated with SSC. Further studies are necessary to determine whether the underlying vasculopathy, which affects the micro- and macrovasculature in SSC patients, contributes to an increased mortality associated with ASCVD.

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**Risk of Cancer in Systemic Sclerosis: Meta-Analysis of Population-Based Cohort Studies.** Akira Onishi1, Daisuke Sugiyma2, Akio Morinobu1 and Shinji Kumagai2. 1Kobe University Graduate School of Medicine, Kobe, Japan, 2School of Medicine, Keio University, Tokyo, Japan, 3Shinko Hospital, Kobe, Japan

**Background/Purpose:** The risk of cancer compared with general population has been elevated in several connective tissue diseases. However, the standardized incidence ratios (SIRs) for overall cancer in patients with systemic sclerosis (SSc) were inconsistent. Moreover, most of existing studies were limited in size and based on hospital case series, with attendant selection and referral biases. We therefore aimed to examine, using meta-analysis, cancer risk in patients with SSc deriving from population-based cohort studies, as compared with the expected risks in age-matched background populations.

**Methods:** We searched five different databases (MEDLINE, Scopus, CINAHL, Web of Science and Cochrane Collaboration databases), reference lists of retrieved studies and review articles from January 1966 until May 2012. Population-based cohort studies relevant for determining cancer risk in patients with SSc were included. All papers fulfilling the strict inclusion criteria were scrutinized for data on population size, time of follow-up and observed to expected cancer rates (standardized incidence ratio (SIR)). Two investigators independently evaluated the quality of the studies by using a scoring system that was created on the basis of a recently used system designed with reference to MOOSE, QUAST and STROBE. Data syntheses were based on random effects model.

**Results:** Seven articles were included. The pooled SIR for overall cancer was 1.50 (95% CI: 1.23–1.83). The pooled SIR of 1.85 (95% CI: 1.49–2.31) for men was significantly higher than that of 1.33 (95% CI: 1.18–1.49) for women (p = 0.009) and stratification on sex eliminated heterogeneity. Stratification based on type of SSc did not produce statistically significant differences in the pooled SIR between limited SSc and diffuse SSc (p = 0.98). The significant increased risk of cancer of the lung (SIR: 3.18; 95% CI: 2.09–4.85), the liver (SIR: 4.36; 95% CI: 2.00–9.51), the hematologic system (SIR: 3.55; 95% CI: 1.70–7.43), non-Hodgkin lymphoma (SIR: 2.71; 95% CI: 1.43–5.14), leukemia (SIR: 2.75; 95% CI: 1.32–5.73) and the bladder (SIR: 2.00; 95% CI: 1.06–3.77) was observed. The pooled SIR for non-melanoma skin cancer was significantly increased only in men, while the pooled SIR for bladder cancer was significantly increased only in women.

**Conclusion:** In conclusion, SSc are associated with an increased risk of cancer, particularly lung, liver, hematological and bladder cancer. Men with SSc are at higher cancer risk than women.

**Disclosure:** A. Onishi, None; D. Sugiyma, None; A. Morinobu, None; S. Kumagai, None.

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**Histological Features of Localized Scleroderma en Coup De Sabre: A Study of 16 Cases.** Takashi Tamiguchi, Yoshhide Asano, Zenshiro Tanaka, Kaname Akamata, Naohiko Aozasa, Shinji Noda, Takehiro Takahashi, Yohei Ichimura, Tetsuo Toyama, Miki Sugita, Hayakazu Sumida, Yoshihiro Kawan, Miki Miyazaki, Koichi Yanaba and Shinichi Sato. University of Tokyo Graduate School of Medicine, Tokyo, Japan

**Background/Purpose:** Scleroderma is a chronic disease of unknown etiology characterized by skin fibrosis and is divided into two clinical entities: localized scleroderma and systemic sclerosis. Localized scleroderma differs from systemic sclerosis in that it is not accompanied by Raynaud’s phenomenon, acrosclerosis, and internal organ involvement. Early lesions of localized scleroderma are histologically characterized by lymphocytic perivascular infiltration in the reticular dermis and swollen endothelial cells. However, there have been few information regarding histological features other than these findings in localized scleroderma. Since en coup de sabre (ECS) is a certain subset of localized scleroderma with a relatively uniform clinical image, we focused on this disease subset and evaluated its histopathological features.

**Methods:** We retrospectively evaluated 16 patients with ECS on the basis of clinical and histological findings. For each patient, age, disease duration, and clinicopathologic data were obtained. Skin biopsies were evaluated for the following features: epidermal atrophy, spongiosis, vascular degeneration of the basal cell layer, necrotic keratinocytes, thickening of dermal collagen bundles, perivascular or pericapillary inflammatory infiltrate, vacuolar changes of follicular epithelium, and melanin incontinence.

**Conclusion:** The appearance of funnel plots was symmetrical and Egger’s test results were not significant (p = 0.60).
Results: Regardless of clinical manifestations, vascular degeneration at the dermoeidermal junction was found in all ECDS patients. Furthermore, melanin incontinence was seen in 11 (69%) patients. Importantly, keratinocyte necroses, which are frequently accompanied with severe vascular degeneration, were restricted to 2 patients with early and active lesions. Vascular changes in hair follicular epithelium were seen in 8 (50%) patients. Regarding the histological features in the dermis, dermal fibrosis was found in all patients, but the degree of fibrosis did not correlate with disease duration. In early ECDS patients (disease duration of < 3 years), moderate to severe periappendiculine lymphocytic infiltration and vascular changes in follicular epithelium were prominent, while epidermal atrophy was less frequently observed, compared with late ECDS patients (disease duration of ≥ 6 years).

Conclusion: Vascular degeneration at the dermoeidermal junction is a common histological feature in ECDS and perivascular and/or perappendiculine lymphocytic infiltration and vascular degeneration of follicular epithelium are characteristic especially in early ECDS, further supporting a canonical idea that the elimination of mutated epidermal cells by epithelium are characteristic especially in early ECDS, further supporting a common histological feature in ECDS and perivascular and/or periappendiculine lymphocytic infiltration and vascular changes in follicular epithelium were prominent, while epidermal atrophy was less frequently observed, compared with late ECDS patients (disease duration of ≥ 6 years).

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Methods: A total of 393 OCT scans of hands and forearms on 20 SSc patients and 15 healthy controls (HC) were performed employing topical probe “VivoSight” (Michelson Diagnostics). Matlab software was employed to calculate mean OD of the scans. Signal changes within epidermis (ED), Dermal–Epidermal Junction (DEJ) and dermis of SSc patients and HC were analysed and collated to a unique graph. Construct validity was determined by correlation with the current gold standard, the modified Rodnan Skin Score (mRSS). The minimum (Min) value of OD before the dermis and the maximum (Max) value of OD in the dermis were considered to compare the forearm skin OCT mean A-scans of SSc patients and HC. ROC analysis of HC and mRSS=0 mean A-scans suggested that the OD value at 300±16 micron was the one with best sensitivity/specificity ratio in discriminating HC vs clinically unaffected SSc skin. We therefore included the mean value of OD at 300±16 micron for further analysis. Statistical analysis was performed employing Pearson correlation, one-way ANOVA and Bonferroni correction tests as appropriate.

Results: OCT mean A-Scans showed a different pattern in HC and four mRSS groups. SSc affected skin showed a consistent decrease of OD in the papillary dermis (PD), which caused a loss of definition of the DEJ. Max OD values of the PD in HC and the four mRSS subgroups was significantly different across the five groups (P < 0.0001) and showed a significant correlation with mRSS (r = -0.69, P < 0.0001). Similarly, Min OD values were significantly different across the five groups (P < 0.0001) and showed a strong correlation with mRSS (r = -0.6, P = 0.0002). In both cases after Bonferroni correction for multiple variables, the difference in Min and Max OD remained significant between HC and patients with mRSS=0 or 1. On the contrary, OD300 was significantly different between HC and patients with mRSS=0 or 1 (P < 0.001).

Conclusion: The decrease of OD in the PD in skin fibrosis as assessed by OCT is a valid quantitative outcome measure of skin fibrosis.
Sensitivity to change ability of OCT is under evaluation to determine whether the technique could be used as outcome measure of skin involvement in SSc in clinical intervention trials and clinical management.

References

Disclosure: G. Abignano, None; S. Z. Aydin, None; C. Castillo-Gallego Jr., None; D. Woods, Michelson Diagnostics, 3; A. Meekings, Michelson Diagnostics, 3; D. McGonagle, None; P. Emery, None; F. Del Galdo, None.

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Myopathy Is a Poor Prognostic Feature in Systemic Sclerosis: Results From the Canadian Scleroderma Research Group.
Michelle Jung1, Murray Baron2, Marie Hudson3, Ashley Bonner4, Janet E. Pope5 and Canadian Scleroderma Research Group. 6. 1Western University, London, ON, 2Jewish General Hospital, Montreal, QC, 3McGill University, Montreal, QC, 4McMaster University, Hamilton, ON, 5St. Joseph’s Health Care London, London, ON, 6Montreal, QC

Background/Purpose: Myopathy/myositis is associated with more severe systemic scleroderma (SSc). The aim of this study was to determine such clinical information from the Canadian Scleroderma Research Group database (CSRG).

Methods: Data from the CSRG are collected annually on SSc patients. Two surrogate markers for myopathy used in this study were elevated creatine kinase (CK) and physician-reported history of myopathy/myositis of the patients. Comparisons were made between those with and without myopathy/myositis to determine the strongest associations with this complication; overall, in lcSSc and dcSSc and in early dcSSc subset. Survival with and without myopathy/myositis was determined.

Results: The study included 1143 patients with mean of 8 years of duration. Elevated CK occurred in 5.6%; 9.7 % had a history of inflammatory myositis or myopathy according to physician; 5.7% had proximal muscle weakness. Those with elevated CK compared to remained were more likely to be male (24.5 % in elevated CK vs. 12.6 % in normal CK; p<0.013), younger (51.93 vs. 56.07 years, p=0.045); have dcSSc (40.4 % vs. 37.9 %; p<0.002), physician-reported history of myositis/myopathy (45.3 % vs. 8.5 %, p< 0.000), tendon friction rubs (30.0 % vs. 13.4 %; p<0.001), FVC < 70 % (23.9 % vs. 13.1 %; p<0.039), RNP antibody (12.0 % vs. 5.0 %, p < 0.032), Topol antibody (26.0 % vs. 14.4 %, p < 0.026), higher skin scores (MRSS 16.14 vs. 9.81; p<0.000), and higher HAQ score (0.98 vs. 0.79; p<0.011). When using logistic regression younger age male, dcSSc, early dcSSc, tendon friction rubs, higher MRSS, Topol, RNP, PMScI, and FVC<70% were associated with elevated CK. Survival was less in those with myopathy/myositis or elevated CK (p=0.003 and p=0.025 respectively). Those with elevated CK had less survival (p=0.025). Results were similar when the other definition of myopathy/myositis.

Conclusion: Myopathy/myositis has a worse prognosis with respect to function and other organ involvement (ILD) and survival.

Disclosure: M. Jung, None; M. Baron, None; M. Hudson, None; A. Bonner, None; J. E. Pope, None;

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Autoantibodies to Survival of Motor Neuron (SMN) Complex Are Common in Patients with Anti-U1RNP/Sm and Are Associated with Features of Scleroderma and Myopathy.

Background/Purpose: Survival of motor neuron (SMN) complex that plays a key role in small nuclear ribonucleoproteins (snRNPs) assembly and interacts with snRNPs has recently been identified as a novel target of autoantibodies in patients with polymyositis/dermatomyositis (PM/DM). Although isolated anti-SMN complex antibodies are uncommon autoantibody specificity associated with PM/DM, their frequent coexistence with anti-snRNPs (U1RNP, Sm) autoantibodies was noticed. Clinical significance of autoantibodies to SMN complex coexisting with anti-snRNPs was examined in unselected cohort of rheumatology clinic.

Methods: Sera from patients enrolled to Center for Autoimmune Disease (n = 1966, including 453 SLE, 132 scleroderma, 125 PM/DM, 130 RA, 61 Sjögren’s syndrome) were screened for their autoantibody specificities by immunoprecipitation (IP) using 135S-labeled K562 cells extract. Anti-SMN complex antibodies were determined based on IP of the stable SMN complex (38kD SMN and 120–130kD gemin3 and 4). Antibodies directed to SMN protein were measured by ELISA using SMN recombinant protein. Antibodies to SMN complex were also tested by anti-SMN antigen-capture ELISA using monoclonal antibodies. Clinical information was from the database and chart review.

Results: Anti-snRNPs antibodies were identified in 266 sera (174 anti-U1RNP, 13 anti-U1/U2, and 79 anti-Sm+U1RNP). Although isolated anti-SMN complex antibodies were found previously only in 2 patients with PM, anti-SMN complex antibodies coexisting with anti-snRNPs (11% in anti-U1 or -U1/U2RNP, 6% in anti-Sm+U1RNP) were clearly detected in 28 cases. Prevalence of anti-SMN among anti-snRNPs(+) sera was 14% in Caucasian (P = 0.069 vs African American (AA)), 7% in AA, and 15% in Latin. Levels of anti-SMN antibodies (recombinant protein) were also low in AA (P < 0.005 vs Caucasian, P < 0.05 vs Latin). Clinical features of anti-SMN+snRNPs(+) were compared with anti-snRNPs(+) alone patients (table). Although the diagnosis of SLE and anti-Sm antibodies appears to be less in the anti-SMN+snRNPs(+) group, clinical features of SLE in this group of patients were similar to those of anti-snRNPs(+) patients. Anti-SMN group has more muscle weakness (P = 0.026) and diagnosis of PM/DM (P = 0.051). Diagnosis of SSc (P = 0.022) and features associated with SSc, Raynaud’s phenomenon (P = 0.0008) sclerodactyly (P = 0.016), pitting scars (P = 0.03), and interstitial lung disease are more common in anti-SMN+snRNPs(+) group vs anti-snRNPs(+) alone.
Conclusion: Anti-SMN complex antibodies produced in a tight association with anti-snRNPs are relatively common. Anti-SMN complex antibody positive patients have higher prevalence of clinical features associated with SSc and PM/DM.

Clinical features of anti-SMN + snRNPs vs anti-snRNPs antibody positive patients

<table>
<thead>
<tr>
<th></th>
<th>Anti-SMN + snRNPs (n = 28)</th>
<th>Anti-snRNPs (n = 239)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>54% (14/26)</td>
<td>36% (87/239)</td>
</tr>
<tr>
<td>Diagnosis of SLE</td>
<td>54% (14/26)</td>
<td>69% (101/143)</td>
</tr>
<tr>
<td>Anti-Sm</td>
<td>18% (5/28)</td>
<td>21% (51/238)</td>
</tr>
<tr>
<td>Diagnosis of PM/DM</td>
<td>8% (2/26)</td>
<td>3% (6/234)</td>
</tr>
<tr>
<td>Elevated CPK</td>
<td>21% (4/19)</td>
<td>30% (55/184)</td>
</tr>
<tr>
<td>Muscle weakness</td>
<td>26% (6/23)</td>
<td>9% (19/206)</td>
</tr>
<tr>
<td>Diagnosis of SSc</td>
<td>15% (4/26)</td>
<td>3% (8/235)</td>
</tr>
<tr>
<td>Raynaud’s</td>
<td>79% (19/24)</td>
<td>41% (82/198)</td>
</tr>
<tr>
<td>Sclerodactyly</td>
<td>26% (6/23)</td>
<td>8% (16/199)</td>
</tr>
<tr>
<td>Pitting scars</td>
<td>26% (6/23)</td>
<td>10% (19/199)</td>
</tr>
<tr>
<td>Intestinal lung disease</td>
<td>23% (5/22)</td>
<td>13% (25/198)</td>
</tr>
</tbody>
</table>

Disclosure: J. Y. Chan, None; Y. Li, None; A. Ceribelli, None; E. S. Sobel, None; W. H. Reeves, None; E. K. L. Chan, None; M. Satoh, None.

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Rpp25 Is a Major Target of Autoantibodies to the Th/To Complex As Measured by ELISA and a New Chemiluminescence Assay. Michael Mahler1, Cristina Gascon1, Sima Patel1, Angela Ceribelli2, Edward K.L. Chan2 and Minori Satoh1. 1INOVA Diagnostics, Inc., San Diego, CA, 2University of Florida, Gainesville, FL

Background/Purpose: Anti-nuclear antibodies (ANA) play an important role in the diagnosis of systemic autoimmune diseases including systemic sclerosis (SSc). A significant portion of ANA in SSc are directed against nucleolar antigens including the Th/To antigen. Several proteins of the Th/To complex have been reported to react with anti-Th/To antibodies. Although known for over 20 years, anti-Th/To antibodies are rarely used in routine testing algorithms to aid in the diagnosis of SSc. Furthermore, little is known about the clinical association of autoantibodies targeting the individual components of the Th/To antigen. The objective of the present study is to evaluate the newly developed ELISA and chemiluminescence immunoassay (CIA, QUANTA Flash, INOVA) to measure autoantibodies to Rpp25 using immunoprecipitation (IP) as reference method.

Methods: A component of Th/To antigen (Rpp-25) was expressed as histidine-tagged recombinant protein in E.coli and purified by a standard method. Anti-Rpp25 antibodies in human sera were tested by ELISA and QUANTA Flash (fully automated on the BIO-FLASH System), and compared with results by immunoprecipitation as a standard. Anti-Th/To by IP was based on detection of 7-2 and 8-2 RNA by immunoprecipitation and silver staining of RNAs. The first cohort consisted of 121 SSc patients including 8 anti-Th/To positive samples confirmed by IP, enrolled in the University of Florida Center for Autoimmune Diseases (UF/CAD) registry from 2000–2012. Previously described eight anti-Th/To positive samples were randomly selected based on the available amount of sera. As controls, sera were collected from ANA positive asymptomatic healthy individuals (n=20), from rheumatoid arthritis patients (n=20) and from random healthy individuals (n=10).

Results: The reactivity to Rpp25 by ELISA was significantly higher in anti-Th/To IP positive than in negative samples (p<0.0001). A specificity of 95.5% (95% CI 86.3–98.5%) and a sensitivity of 91.1% (95% CI 89.9–92.5%) was determined. To verify the results using a second method, anti-Th/To IP positive sera and negative controls were tested using the Rpp25 assay on the BIO-FLASH. At cut-off selected by receiver operating characteristic analysis 9/10 (90.0%) of the anti-Th/To positive sera but none of the controls were positive for anti-Rpp25 antibodies by BIO-FLASH (p<0.0001). Thus a sensitivity of 90.0% (95% CI 55.5–99.0%) and a specificity of 100% (95% CI 95.0–100.0%) were found. Ten samples were tested by ELISA and BIO-FLASH for anti-Rpp25 reactivity and the results were highly correlated (r=0.96, 95% CI 0.85–0.99, p<0.0001).

Conclusion: Rpp25 is a major target of autoantibodies to the Th/To autoantigen complex. Autoantibodies to Rpp25 detected by ELISA and especially CIA show excellent agreement with IP for anti-Th/To antibodies. The new assays may help to make this long-known antibody specificity widely available to clinicians. Further studies are needed to evaluate the clinical utility of the new assays.

Disclosure: M. Mahler, Inova Diagnostics, Inc., 3; C. Gascon, Inova Diagnostics, Inc., 3; S. Patel, Inova Diagnostics, Inc., 3; A. Ceribelli, None; E. K. L. Chan, None; M. Satoh, None.

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Line Blot Assay, a Screening Test for Autoantibodies in Systemic Sclerosis (SSc). Kae Takagi1, Yusashi Kawaguchi1, Sayuri Kataoka1, Yuko Ota1, Yuko Okamoto2, Masanori Hanaoka1, Hisae Ichida1, Takahisa Gono1, Yasuhiro Katsumata2 and Hisashi Yamakawa1. 1Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan, 2Tokyo Women’s Medical University, Tokyo, Japan, Institute of Rheumatology,Tokyo Wom-en’s Medical University, Tokyo, Japan

Background/Purpose: Detection of auto-antibody is informative for diagnosis of SSc. Line blot assay (LBA) provides a quantitative in vitro assay for detecting human IgG class auto-antibodies against 13 different antigens simultaneously. The aim of our study is to evaluate availability of LBA for SSc in clinical setting, and assessing the sensitivity compared with other conventional assay.

Methods: LBA strips coated with thin parallel lines of 13 synthesized antigen (CENPA, CENPB, U1RNP, fibrillarin, RNAPIII(RP11 ARP155), NOR80, Th/To, PM-Scl100, PM-Scl75, Ku, Ro-52, PDGFR) captures serum auto antibody. Captured autoantibody is detected by Alkaline Phosphatase conjugated second antibody combined with automated scan system. Serum samples from SSc patients in our hospital were investigated. Anti-Scl70 antibody and anti-centromere antibody was also measured using conventional DID assay.

Results: Serum from 80 SSc patients, 75 female and 5 male patients between 51.7±15.2 years old, were investigated. Eighty SSc patients consisted with 47 diffuse cutaneous SSc (dcSSc) type and 33 limited cutaneous SSc (lcSSc) type patients. Anti nuclear antibody positivity detected by indirect immunofluorescence methods was 92.5%. Higher total skin score (MRRS), complications of lung fibrosis, Raynaud’s phenomena, and arthritis were more frequently observed in dcSSc patients. Sensitivity and specificity of anti-Scl70 antibody using LBA was 90% and 92% respectively. Sensitivity and specificity of anti-centromere antibody using line assay was 87.5 % and 95.5% respectively. Sensitivity against both auto antibodies was much higher in LBA than DID method. Anti U3 RNP antibody, Anti NOR80 antibody and anti Ku antibody was also detected by LBA. Previous reports describe anti Th/To antibody were detected in 5–10 % of SSc patients by immunoprecipitation (IP) method. However, anti-Th/To antibody was not detected in this screening using LBA.

We also investigated the relationship between appearance of auto antibody and clinical phenotypes. It is known anti RNA polymerase III antibody positivity correlates with rapid skin sclerosis and higher MRSS points. This correlation was also identical with our cohort study. Anti Ku antibody positivity is known to correlate with myositis and pulmonary hypertension. However, our analysis indicated anti Ku antibody positivity was only correlated with myositis not with pulmonary hypertension.

Conclusion: Although the specificity of LBA was not better than conventional DID method, sensitivity was much higher than conventional DID assay. In case of anti Th/To antibody, none of sera showed positivity. Even though we have not evaluated anti Th/To antibody positivity by IP method, the frequency of anti Th/To antibody by LBA is much lower than previous report. Affinity to anti Th/To antibody by in this LBA may be affected by peptide design interfere conformation. Anti U3 RNP antibody, anti NOR80 and anti Ku antibody are usually detected by IP and western blot assay. These methods are complicated and not widely manipulated by commercial base laboratory. The LBA method provides more easy detection of auto antibody, and gives more beneficial information by measuring multiple parameters at once for characterization of SSc.

Disclosure: K. Takagi, None; Y. Kawaguchi, None; S. Kataoka, None; Y. Ota, None; Y. Okamoto, None; M. Hanaoka, None; H. Ichida, None; T. Gono, None; Y. Katsumata, None; H. Yamakawa, None.
Utility of Novel Patient-Reported Outcome Instruments in Predicting Cardiac Involvement and Pulmonary Hypertension in Patients with Systemic Sclerosis.

Monique E. Hinchcliff, Mary A. Carns, Sofia Podlusky, John Varga and Sanjiv J. Shah. Northwestern University Feinberg School of Medicine, Chicago, IL

Background/Purpose: Heart involvement in systemic sclerosis (SSc) includes left ventricular systolic and diastolic dysfunction, right ventricular dysfunction, pericardial disease, and pulmonary hypertension. We recently demonstrated the construct validity for discriminative purposes of 2 new patient-reported outcome instruments: the Patient-Reported Outcomes Measurement Information System 29-item Health Profile (PROMIS-29) and the Functional Assessment of Chronic Illness Therapy-Dyspnea short form (FACIT-Dyspnea) in assessing general health and dyspnea in patients with SSc. No studies to date have assessed the utility of PROMIS-29 and FACIT-Dyspnea in predicting cardiac involvement in SSc as assessed by comprehensive echocardiography. We hypothesized that PROMIS-29 and FACIT-Dyspnea would be comparable to legacy patient-reported outcome instruments such as the Medical Research Council Dyspnea Index (MRC), the Short-Form 36 (SF-36), the Scleroderma Health Assessment Questionnaire (s-HAQ), and the St. George’s Respiratory Questionnaire (SGRQ) in predicting cardiac involvement in patients with SSc.

Methods: Comprehensive 2D/Doppler echocardiography + tissue Doppler imaging was performed to screen for cardiac involvement and pulmonary hypertension at the initial clinic visit to a tertiary referral program. All patients fulfilled ACR criteria for SSc. A battery of legacy patient-reported outcome instruments including the MRC, SF-36, s-HAQ, and SGRQ as well as two novel instruments including the PROMIS-29 and FACIT-Dyspnea were administered.

Results: 185 patients underwent echocardiography and completed patient-reported outcome questionnaires at the baseline visit. The mean age of subjects was 53±12y, 88% were women, and 60% had limited cutaneous SSc; median modified Rodnan skin score was 6 (interquartile range 4–17). There was echocardiographic evidence for pericardial effusion in 17%, pulmonary artery systolic pressure >40 mmHg in 16%, right ventricular dysfunction in 8%, left ventricular (LV) systolic dysfunction in 5%, LV diastolic dysfunction in 26% and any of the above in 43% of subjects. FACIT-Dyspnea and FACIT-Functional Limitation scores were highly associated with PASP on echo and overall cardiac involvement (Figure). Area under the ROC curve for FACIT-Dyspnea (c-statistic = 0.8 for PASP) were comparable to legacy instruments (MRC, s-HAQ, and SGRQ) and superior to SF-36 (P<0.01). For overall cardiac involvement, FACIT-Dyspnea and PROMIS-29 were equivalent to legacy instruments (P=NS).

Conclusion: PROMIS-29 and FACIT-Dyspnea are comparable to legacy patient-reported outcome instruments in predicting cardiac involvement and pulmonary hypertension in SSc and may be preferable to legacy instruments because they are freely available in many languages, are readily administered electronically, and are simple to score and interpret.

Disclosure: M. E. Hinchcliff, None; M. A. Carns, None; S. Podlusky, None; J. Varga, None; S. J. Shah, None.

Results From a Multi-Tiered Item Collection On Linking Systemic Sclerosis to the International Classification of Functioning, Disability and Health: A EULAR Scleroderma Trials and Research Initiative.

Lesley Ann Saketkoo1, Reuben Escorpizo2, Kevin J. Keen3, Kim Fligelstone4 and Oliver Distler5. 1Louisiana State University Health Science Center, New Orleans, LA, 2ICF Research Branch in cooperation with the WHO Collaborating Centre for the Family of International Classifications Department of Health Sciences; and Health Policy, University of Lucerne, Switzerland, 3University of Northern British Columbia, Prince George, BC, 4Royal Free Hospital, Scleroderma Unit and Scleroderma Society, London, United Kingdom, 5Department of Rheumatology and Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland

Background/Purpose: Systemic Sclerosis (SSc) affects multiple organs with complex combinations of disability. Skin fibrosis, ischemic pain, ulceration, arthritis, joint contractures, myopathy and cardiopulmonary, renal as well as gastrointestinal involvement affect emotional, social and physical functioning.

International Classification of Functioning, Disability, and Health (ICF), introduced by the World Health Organization (WHO), is a universal frame-
work that describes the disabilities associate with a health condition in terms of the bio-psycho-social model with consideration of environmental and personal factors.

Methods: Comprehensive literature review identified all validated outcome measures in SSc. Five instruments were selected to represent the broadest range of SSc manifestations (OD, LAS), deconstructed to concepts and linked separately by 2 health professionals familiar with updated ICF linkage rules (RE, LAS). Inter-reviewer agreement was analyzed (Kk). Remaining instruments were deconstructed and linked. Five formal meetings with 27 patients (4 males) and 24 SSc specialists (physicians, therapists and nurses) from 16 countries provided data which were deconstructed, confirmed by participants and then linked to the ICF.

Results: 27 validated instruments were identified. 5 validated SSc instruments were linked to ICF codes and tested inter-linker agreement. The proportion of agreement ranged from 0.8611 (95% CI: 0.7500, 0.9444) to 0.9647 (0.9175, 1.0000) (Table 1) with the overall proportion of agreement 0.9359 (0.9172, 0.9506). 228 and 618 categories were linked in instrument and group data respectively. All instrument linkages were captured within the expert group data collection (Table 2).

Table 1. Proportion of agreement with and without correction for chance.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>No. of Concepts</th>
<th>No. of ICF Codes</th>
<th>Proportion of Agreement</th>
<th>Proportion of Agreement Corrected for Chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAMS</td>
<td>9</td>
<td>4</td>
<td>0.6111 (0.5700, 0.7444)</td>
<td>0.7097 (0.5291, 0.8835)</td>
</tr>
<tr>
<td>mRSS</td>
<td>17</td>
<td>5</td>
<td>0.9647 (0.9176, 1.0000)</td>
<td>0.9510 (0.8739, 1.0000)</td>
</tr>
<tr>
<td>RCS</td>
<td>7</td>
<td>10</td>
<td>0.9862 (0.8367, 0.9338)</td>
<td>0.9637 (0.7397, 0.7726)</td>
</tr>
<tr>
<td>SHAQ</td>
<td>7</td>
<td>11</td>
<td>0.9508 (0.8577, 0.9234)</td>
<td>0.9650 (0.8488, 0.8729)</td>
</tr>
<tr>
<td>SSc GIT</td>
<td>25</td>
<td>16</td>
<td>0.9506 (0.9138, 0.9718)</td>
<td>0.9599 (0.9306, 0.9712)</td>
</tr>
<tr>
<td>Overall</td>
<td>65</td>
<td></td>
<td>0.9509 (0.9172, 0.9706)</td>
<td>0.9730 (0.7230, 0.9453)</td>
</tr>
</tbody>
</table>

HAMS: Hand Mobility in Scleroderma Test. mRSS: Modified Rodnan Skin Score. RCS: Raynaud Condition Score. SHAQ: Scleroderma Health Assessment Questionnaire. SSc GIT: SSc Gastrointestinal Tract Instrument

Table 2. ICF Linkage of Validated SSc Instruments and Expert Data

<table>
<thead>
<tr>
<th>ICF Domain</th>
<th>Patient &amp; Medical Experts</th>
<th>Validated Instruments</th>
<th>Common to Both</th>
<th>Total Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Structure</td>
<td>126</td>
<td>16</td>
<td>16</td>
<td>126</td>
</tr>
<tr>
<td>Body Function</td>
<td>149</td>
<td>108</td>
<td>107</td>
<td>150</td>
</tr>
<tr>
<td>Activities and Participation</td>
<td>265</td>
<td>96</td>
<td>96</td>
<td>265</td>
</tr>
<tr>
<td>Environmental Factors</td>
<td>74</td>
<td>9</td>
<td>9</td>
<td>78</td>
</tr>
<tr>
<td>Total</td>
<td>618</td>
<td>229</td>
<td>228</td>
<td>619</td>
</tr>
</tbody>
</table>

Conclusion: SSc is the most complex disease linked to the ICF. Important challenges exist in ICF Core Set development for SSc. OCCurrences in the data suggest ICF level of specificity was insufficient to describe the SSc experience, e.g. Raynaud’s and specific aspects of pain. 618 linkages are unusually high for ICF item collection. SSc is likely to require the development of an advanced ICF Core Set model to accommodate its complexity and ensure utility.

Further face, content and construct validation strategies with item reduction are now underway. Very importantly, the weight of these results implies that the global, regional and personal impact of SSc across cultures, age and socioeconomic status is likely to be severely under-estimated. Efforts to establish fair assessment for use in policy making and provision of services and funding are essential towards optimal health and functioning in SSc.

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Worsening Carbon Monoxide Diffusing Capacity Predicts Mortality in Patient with Systemic Sclerosis and Pulmonary Arterial Hypertension

Enrolled in the Pulmonary Hypertension Assessment and Recognition of Outcomes in Scleroderma Registry. Elena Schiopu1, Dinesh Khanna 1, V. D. Steen 2, Berne, Switzerland, 89 of these patients have had at least 2 DLco measurements after entry. 58 (65%) had limited SSc, 81 (90%) were females, mean/SD age at study entry was 60.2/9.7 years, and mean/SD duration of Raynaud’s was 13.4/11.6 years. The mean/SD baseline of the percent predicted DLco (%DLco) was 68% (22%). %DLco (±mPAP ±pulmonary vascular resistance (PVR) was 9.8/16, 4.5/16, 35.3/91 mmHg and 43/120 dynes/cm², respectively. 35 patients had a decreasing DLco (>5%), mean 6.7%, 36 had no change in DLco (mean 2.3%) and 18 had an improved DLco (mean 13.2%). Patients with a worsening DLco had a 3 year survival of 75% compared to 90% in those with stable or improved DLco. The Kaplan Meyer curves revealed a statistically different survival rate based on the worsening %DLco (P=0.03).

Results: 160 patients with Group 1 PAH have been entered into PHAROS. 89 of these patients have had at least 2 DLco measurements after entry. 58 (65%) had limited SSc, 81 (90%) were females, mean/SD age at study entry was 60.2/9.7 years, and mean/SD duration of Raynaud’s was 13.4/11.6 years. The mean/SD baseline of the percent predicted DLco (%DLco) was 68% (22%). %DLco (±mPAP ±pulmonary vascular resistance (PVR) was 9.8/16, 4.5/16, 35.3/91 mmHg and 43/120 dynes/cm², respectively. 35 patients had a decreasing DLco (>5%), mean 6.7%, 36 had no change in DLco (mean 2.3%) and 18 had an improved DLco (mean 13.2%). Patients with a worsening DLco had a 3 year survival of 75% compared to 90% in those with stable or improved DLco. The Kaplan Meyer curves revealed a statistically different survival rate based on the worsening %DLco (P=0.03).

Conclusion: In this multicenter prospective cohort of patients with SSc with PAH, worsening of the diffusion capacity in the course of the disease was associated with increased mortality. Rate of worsening of the DLco should be considered when evaluating the prognosis of patients with SSc-PAH.

Disclosure: E. Schiopu, MedImmune, 2, United Therapeutics, Inc., 8, D. Khanna, Actelion, BMS, Gilead, Genentech, ISDN, and United Therapeutics, 2, Actelion, BMS, Gilead, Genentech, ISDN, and United Therapeutics, 5, Actelion, BMS, Gilead, Genentech, ISDN, and United Therapeutics, 8, V. D. Steen, Gilead, 5.

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Biomarkers of Pulmonary Hypertension in Patients with Scleroderma: A Case-Control Study.

Background/Purpose: The objective of this study was to evaluate for an association between various biomarkers and the presence or absence of pulmonary hypertension (PH) in scleroderma

Methods: Proteomic analysis was used to retrospectively compare growth factor and cytokine levels in 48 patients with scleroderma and PH and 48 patients with scleroderma without clinical or ECHO evidence of PH. PH was defined as either an mPAP ≥ 25mmHg by right heart catheterization (n = 44) or an RVSP of > 45 mmHg by Echo with strong clinical evidence supporting a diagnosis (n = 4). An additional proteomic analysis was performed on a subset of 24 patients from each group using samples that had been drawn at least 6 months prior to the first sample to determine if changes in candidate biomarker levels were associated with PH. A multiplex proteomic assay was subsequently performed to look at growth factors (bFGF, PIGF, VEGF, HGF, sFLT-1) and cytokine levels (IL-1B, IL-2, IL-4, IL-5, IL-6, IL-10, IL-12 p70, IL-13, TNF-alpha, and INF-gamma) (MesoScale Discovery, Gaithersburg, MD). Univariate and multivariable logistic regression were used to examine the association of growth factor and cytokine levels with the presence of pulmonary hypertension.

Results: The mean age in the PH group was 66 yrs (range 34–89) compared to 56 (range 27–83) in the non-PH group. Seventy-three percent (n=35) in the PH group had limited scleroderma compared to 65% (n=31) in the control group. Average disease duration was 17.3 years in the PH group and 12.2 years in the non-PH group. Differences in gender and scleroderma subtype were not significant between the two groups. We
found levels of IL-12 p70 (9.0 vs. 4.0; p=0.04), PI GF (26.7 vs. 21.3, p = 0.01), and sFLT-1 (122.1 vs. 99.1, p=0.02) were significantly higher in the 48 patients with PH compared with the 48 without PH at the latest blood sampling time point. When comparing biomarker levels at the earlier time point (17/24 with sample prior to PH diagnosis in the PH group) in the 24 patients with and 24 patients without pulmonary hypertension, sFLT-1 (122.2 vs. 100.5; p=0.0062; CI: −36.87, −6.52), HGF (451.6 vs. 202.1; p=0.003; CI: −403.79, −95.28), and IL-10 (12.6 vs. 4.4; p=0.03; CI: −15.67, −85), were significantly higher in the PH group. In a multivariable model adjusted for age, race, disease duration, and ILD, PI GF remained higher among those with PH (OR 1.06, p=0.16) although this was no longer statistically significant. In examining the stability of markers over time, all biomarkers were stable between the two samples except for VEGF (260.8 vs. 546.1; p=0.001) and bFGF (19.8 vs. 11.1; p=0.01) which showed wide variability in levels between patients and at the 2 time points. IL-12p70 (−20.4, p = 0.05, CI: −0.48, −0.00) and IL-5 (−0.51, p = 0.03, CI: −0.952, −0.059) were negatively associated with severity of pulmonary hypertension as measured by mean pulmonary artery pressures (mPAP) among those with PH.

Conclusion: We found that PI GF (and possibly sFLT-1 and IL-12) may be associated with PH in scleroderma. This study confirms prior associations of PI GF with scleroderma vascular disease and suggests that this factor should be further explored as possible biomarkers of development of PH.

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Left-Heart Disease Is a Frequent Cause of Pulmonary Hypertension in Systemic Sclerosis, Is Associated with Increased Levels of MR-ProANP and MR-ProADM but Is Unrelated to Elevated NT-ProBNP Levels: A Retrospective Cohort Analysis.

Lada Miller1, Sandra Chartrand1, Martial Koenig1, Jean-Richard Goulet1, Eric Rich1, Michael Abrahamowicz2, Jean-Luc Senecal1 and Tamara Grodzickiy 1.

1Hôpital Notre-Dame du CHUM, Montréal, QC, 2Hôpital Notre-Dame du CHUM, Montréal, QC, 3Centre Universitaire de Santé McGill (CUSM), Montréal, QC

Background/Purpose: Pulmonary hypertension (PH) is a significant cause of morbidity and mortality in systemic sclerosis (SSc). Pulmonary arterial hypertension (PAH) is reportedly the most frequent cause of PH in SSc, affecting 8–12% of patients. We observed that a significant proportion of our SSc patients with PH as diagnosed by right heart catheterization (RHC) had PH due to causes other than PAH. The frequency of other causes of PH in SSc has not been accurately determined to date. The aim of the present study was therefore to determine the frequency of different causes of PH in our SSc cohort and to identify associated clinical, serological and radiological variables.

Methods: A retrospective analysis of 432 SSc patients was done. All patients routinely underwent screening for PH. Clinical, serological and radiographic data from patients with PH confirmed by RHC (n=26) were analyzed. Living SSc PH patients (n=21) and 19 control SSc patients without PH were prospectively re-evaluated with serial measurements of NT-proBNP and the hemodynamic biomarkers MR-proANP and MR-proADM.

Results: The most frequent cause of PH was left heart disease (LHD) (15/26, 58%). PAH was seen in 9/26 patients (34%). Other causes of PH were veno-occlusive disease and multifocal PH. No association was found between the type of PH and the autoantibody profile. LHD-related PH was associated with significantly lower NT-proBNP levels than PAH at the time of established PH (137 ± 137 pg/ml vs 484 ± 248 pg/ml, p=0.024), and all SSc patients without PH had normal levels of NT-proBNP. MR-proANP and MR-proADM levels were significantly higher in SSc patients with PH than those without PH (105 [81–151] pmol/L vs 78 [32–91] pmol/L, respectively, p = 0.004, and 0.7 [0.42–0.87] nmol/L vs 0.5 [0.4– 0.6] nmol/L, p = 0.018). Similarly, MR-proANP and MR-proADM levels were significantly higher in SSc patients with LHD-PH as compared to those without PH (105 [77–137] pmol/L vs 78 [32–91] pmol/L, respectively, p = 0.014, and 0.75 [0.47–0.92] nmol/L vs 0.5 [0.4–0.6] nmol/L, p = 0.012). However, there was no significant difference between the LHD-PH and the PAH groups.

Conclusion: SSc-associated PH is heterogeneous. RHC is essential to determine the underlying cause. The most frequent cause of PH is LHD, not PAH. Levels of MR-proANP and MR-proADM, but not NT-proBNP, were increased in LHD-PH, and may be more reliable markers than NT-proBNP in this subgroup of patients. This study is the first to identify such a high frequency of LHD-PH correlating with normal NT-proBNP levels but increased MR-proANP and MR-proADM in SSc.

Disclosure: L. Miller, None; S. Chartrand, None; M. Koenig, None; J. R. Goulet, None; E. Rich, None; M. Abrahamowicz, None; J. L. Senecal, None; T. Grodzickiy, None.

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Measurement of Pulmonary Arteries by Cardiac Magnetic Resonance Imaging: A Simple and Useful Tool for the Detection of Pulmonary Hypertension in Systemic Sclerosis Patients without Overdiagnosis of Microvascular Perfusion Defects or Fibrosis.

Sandra Chartrand, Lada Miller1, Martial Koenig1, Jean-Richard Goulet1, Eric Rich1, Annie S. Chin2, Yves Provost2, Carl Chartrand-Lefebvre2, Pauline Gou1, Jean-Luc Senecal1 and Tamara Grodzickiy 1. Hôpital Notre-Dame du CHUM, Montréal, QC, 2Hôtel-Dieu de Montréal du CHUM, Montréal, QC

Background/Purpose: Pulmonary hypertension (PH) is a major complication of systemic sclerosis (SSc). We observed that a significant proportion of our SSc patients with PH as diagnosed by right heart catheterization (RHC) had PH due to causes other than pulmonary arterial hypertension (PAH), notably left heart disease (LHD) (15/26, 58%). We hypothesized that LHD in these patients could be explained by cardiomyopathy secondary to microvascular disease and/or fibrosis. The aim of our study was to detect microvascular perfusion defects and/or fibrosis, as well as useful parameters for PH diagnosis, by cardiac magnetic resonance imaging (MRI) in SSc patients with and without PH.

Methods: A retrospective analysis of our cohort of 432 SSc patients was performed. All patients routinely underwent screening for PH, and diagnosis of PH was proven by RHC in all suspected cases. Data from clinical, cardipulmonary and serological investigations were analyzed. All living patients with PH (n=18) as well as a control group of 19 consecutive SSc patients without clinical suspicion of PH underwent a cardiac MRI (a morphologic and functional study with steady state free precession technique in static and cine imaging, and a T2 short-term inversion recovery (STIR) study, followed by a delayed contrast-enhanced imaging acquisition).

Results: Twenty-six SSc patients (26/432; 6%) had PH diagnosed by RHC. Eighteen of these patients (11 with PH due to LHD [61%], 4 with PAH [22%]; 3 from other causes) and 19 without clinical suspicion of PH (control group) underwent cardiac MRI. Age, disease duration, gender, ethnicity, disease subtypes and autoantibody profiles were similar between the two groups. Systolic pulmonary artery pressure by transthoracic echocardiography (48.3 ± 7.5 mmHg vs 30.3 ± 5.7 mmHg, p=0.001) as well as the carbon monoxide transfer factor (TLCO) (54.3 ± 15.4% of predicted value vs 69.1 ± 22.8% of predicted value, p=0.043) were statistically significantly different between SSc patients with and without PH, respectively. Cardiac MRI showed statistically significant differences between SSc patients with and without PH, respectively, for the measurement of the diameter of the main pulmonary artery (PA) (30.90 ± 5.03 mm vs 26.30 ± 3.86 mm, p=0.006), the right PA (23.50 ± 4.11 vs 18.60 ± 2.90 mm, p=0.001), and the ratio of the main PA to the ascending aorta (0.97 ± 0.10 vs 0.84 ± 0.10, p=0.002). There was a trend toward significance for the measurement of the left PA (21.60 ± 3.52 mm vs 19.80 ± 1.98 mm, p=0.07). None of the 37 patients had significant myocardial hypersignal in T2 STIR nor delayed gadolinium enhancement.

Conclusion: Cardiac MRI investigation did not show overt evidence of myocardial perfusion defects nor fibrosis to explain PH secondary to LHD in our SSc cohort. Never more sensitive cardiac MRI modalities may be more useful and should be evaluated in future studies. However, cardiac MRI measurement of the diameter of the main PA, the right PA and possibly of the left PA, as well as the ratio of the main PA to the ascending aorta, seem to be simple and reliable methods for PH diagnosis in SSc patients, and may prove to be useful noninvasive tools in the investigation of PH.

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Systemic Sclerosis Associated Pulmonary Hypertension - Is Pulmonary Veno-occlusive Disease As Common As They Say?

Benjamin E. Schreiber1, Greg Keir2, D. Dobaro3, Clive Handler4, Svetlana Nityanovaya5, Jay Suntharaligam5, Nicola Sverzellati6, Graham Robinson7, David Hansell8, Ahol U. Wells9, Christopher P. Denton4 and John G. Coghlan.1 1Royal Free Hospital, London, London, United Kingdom, 2Royal Brompton Hospital, United Kingdom, 3Royal Free Hospital, London, United Kingdom, 4Royal Free Hospital, Medical School, London, England, 5Royal United Hospital, Bath, United Kingdom, 6University of Parma, Parma, Italy, 7Royal Brompton Hospital, London, United Kingdom, 8UCL, London, United Kingdom

Background/Purpose: Recent reviews have suggested a high prevalence of pulmonary veno-occlusive disease (PVOD) amongst patients with systemic sclerosis (SSc) associated pulmonary hypertension (PH). Interlobular septal thickening (IST) and centrilobular nodules (CLN) are reported to correlate with presence of PVOD, which is associated with worse outcomes in small series. We tested this hypothesis on a large series of systemic sclerosis patients who underwent evaluation for pulmonary hypertension.

Methods: A retrospective study of patients with systemic sclerosis who underwent CT of the chest within six months of a diagnostic right heart catheterisation. The CTS were blindly scored by two independent radiologists including detailed assessment for extent of interstitial lung disease (using the Goh et al. AJRCCM 2008 staging system), IST and CLN. Each lung quadrant was scored separately for interlobular septal thickening (IST) with score 0–5 and centrilobular nodules (CLN), score 0–3. Survival data were collected on all patients.

Results: Mean age was 57.8 (range 22–85). 78% were female. 84 patients had LcSSc, 32 had DcSSc and 1 had MCTD. CT scans were performed a mean of 2.7 months from the RHC.

There was limited or no ILD extent (<20%) in 46 patients (43%), 20% in 28% and extensive (>20%) in 30%. On right heart catheterisation 53% had precapillary PH while 47% did not. 

95 scans were reported independently in a blinded fashion by two radiologists. Of the remaining 95 patients, 49 had PAH and 46 did not. Of those with PH, 18 had <20% ILD, 18 had 20% ILD and 13 had >20% ILD. Amongst patients with PH, there was a weak trend towards worse survival in patients with more lung disease (HR 1.5, 95% CI 0.89,2.52, p=0.11).

IST of any degree was observed in 15% of patients and CLN in 18%. Mean IST score was 1 (on a scale of 0–4) and mean CLN score was 0.63 (scale of 0–2). IST was not associated with extent of ILD (p=0.19 by chi-square), and nor was CLN (p=0.74, by chi-square). IST did not correlate with PVR (R2=2%) whereas CLN did correlate with PVR (R2=15%).

By Cox proportional hazards analysis, PVR was a strong predictor of death (p=0.001). Increasing IST was associated with worse survival on univariate analysis (p=0.038) however statistical significance is lost (p=0.11) after adjustment for age.

Increasing CLN is strongly associated with higher mortality (p=0.013) even after adjustment for age, gender, extent of interstitial lung disease and mean pulmonary artery pressure (p=0.047). This is particularly observed in patients without PH (p=0.004 on this multivariate analysis) rather than in patients with PH (where p=0.19 on multivariate analysis). However, CLN is not a significant predictor after adjustment for PVR (p=0.18).

Conclusion: Interlobular septal thickening and centrilobular nodules are frequently seen in patients with systemic sclerosis and are each associated with worse survival. However, IST increases with age and CLN increases with worsening pulmonary vascular resistance. In our study they were not independent predictors of worse outcome in systemic sclerosis. It is therefore possible that the significance of these radiological findings is primarily as markers of known prognostic risk factors.

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Renal Dysfunction and Disease Severity in Scleroderma-Associated Pulmonary Arterial Hypertension.

Stephen C. Mathai1, Laura K. Hummers1 and Virginia D. Steen.2 1Johns Hopkins University, Baltimore, MD, 2Georgetown Univ Medical Center, Washington, DC

Background/Purpose: Renal disease is a common complication of scleroderma (SSc). Isolated reduction in glomerular filtration rate (GFR), a marker of impaired renal function, can occur in patients with normal serum creatinine. A recent single-center study of patients with SSc and pulmonary arterial hypertension (SSc-PAH) suggests that an estimated GFR (eGFR) < 60 ml/min/1.73m2 at baseline occurs in over 40% of patients and portends a three-fold increased risk of death in this population. Therefore, we sought to determine the prevalence and clinical correlates of renal dysfunction in a large, multi-center observational cohort using the PHAROS (Pulmonary Hypertension Assessment and Recognition of Outcomes in Scleroderma) registry.

Methods: We identified patients with SSc-PAH, defined according to the Dana Point criteria. eGFR was calculated using the 4-variable Modified Diet in Renal Disease equation (MDRD); eGFR < 60 ml/min/1.73m2 was considered abnormal. Demographic, serologic, physiologic, and hemodynamic parameters were compared between groups using t-tests or chi-squared analyses where appropriate.

Results: 133 SSc-PAH patients were included in this study (Table 1). Overall, 33% (44/133) of subjects had an eGFR < 60ml/min/1.73m2 (low eGFR group). In general, the low eGFR group was older and was more likely to have diffuse disease, but there was no difference in gender, race, duration of SSc, or antibody profiles between groups. Pulmonary function and New York Heart Association functional class were similar between groups, however, six minute walk distance was significantly lower in the low eGFR group. Patients in the low eGFR group were more likely to have had a renal crisis and to have worse hemodynamics (higher mean pulmonary artery pressure, lower cardiac output, and higher pulmonary vascular resistance).

Table 1. Patient Population

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Overall (n=133)</th>
<th>eGFR&lt;60 (n=44)</th>
<th>eGFR&gt;60 (n=89)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>60 (11)</td>
<td>64 (9)</td>
<td>59 (13)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Gender (n,%)</td>
<td>109 (83)</td>
<td>38 (86)</td>
<td>71 (82)</td>
<td>0.49</td>
</tr>
<tr>
<td>Race (n, Caucasian)</td>
<td>120 (90)</td>
<td>42 (95)</td>
<td>78 (88)</td>
<td>0.15</td>
</tr>
<tr>
<td>Limited vs. Diffuse (n, limited)</td>
<td>52 (40)</td>
<td>13 (30)</td>
<td>41 (47)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Duration of SSc (yrs)</td>
<td>8.2 (9.5)</td>
<td>7.7 (9.5)</td>
<td>8.9 (9.4)</td>
<td>0.68</td>
</tr>
<tr>
<td>First Raynaud’s symptom (yrs)</td>
<td>14.3 (12.0)</td>
<td>14.9 (13.3)</td>
<td>13.9 (11.4)</td>
<td>0.69</td>
</tr>
<tr>
<td>History of renal crisis (n,%)</td>
<td>6 (5)</td>
<td>5 (13)</td>
<td>1 (1)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FVC (% predicted)</td>
<td>81.7 (15.7)</td>
<td>84.9 (15.4)</td>
<td>79.9 (15.7)</td>
<td>0.10</td>
</tr>
<tr>
<td>FEV1/FVC (% predicted)</td>
<td>81.7 (9.9)</td>
<td>82.0 (11.1)</td>
<td>80.7 (9.9)</td>
<td>0.51</td>
</tr>
<tr>
<td>TLC (%predicted)</td>
<td>79.0 (18.5)</td>
<td>79.3 (19.3)</td>
<td>78.9 (18.2)</td>
<td>0.90</td>
</tr>
<tr>
<td>DLCO (%predicted)</td>
<td>40.1 (17.5)</td>
<td>37.5 (19.9)</td>
<td>41.5 (16.1)</td>
<td>0.22</td>
</tr>
<tr>
<td>Home oxygen use (n, %)</td>
<td>39 (28)</td>
<td>13 (33)</td>
<td>26 (32)</td>
<td>0.86</td>
</tr>
<tr>
<td>NYHA class (IV vs III/IV)</td>
<td>32 (27)</td>
<td>29 (34)</td>
<td>35 (41)</td>
<td>0.22</td>
</tr>
<tr>
<td>Mean PAP (mmHg)</td>
<td>62.5/7</td>
<td>20.2/3</td>
<td>42.5/4</td>
<td>0.52</td>
</tr>
<tr>
<td>CO (L/min)</td>
<td>5.0 (1.6)</td>
<td>4.4 (1.2)</td>
<td>5.4 (1.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PCWP (mmHg)</td>
<td>10 (3)</td>
<td>9 (3)</td>
<td>11 (3)</td>
<td>0.03</td>
</tr>
<tr>
<td>PVR (Wood units)</td>
<td>5.8 (3.9)</td>
<td>7.2 (3.5)</td>
<td>5.1 (3.9)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Conclusion: In this large cohort of patients with SSc-PAH, renal dysfunction was common and associated with more severe functional and hemodynamic impairments. Interestingly, there was no association between antibody profiles or race and prevalence of renal dysfunction. The determinants of renal disease and the relationship between renal dysfunction and mortality in this cohort will be the focus of future studies in the PHAROS registry.

Disclosure: S. C. Mathai, None; L. K. Hummers, None; V. D. Steen, Gilead, 5.

Survival, Hospitalization or Need for Combination Therapy At One Year in Patients with Scleroderma-Associated Pulmonary Arterial Hypertension.

Robyn T. Domsic1, Lorinda Chung2, Jessica K. Gordon3, Yona Handler4, and C. P. Denton. 1Johns Hopkins University, Baltimore, MD, 2Stanford Univ Medical Center, Palo Alto, CA, 3Hospital for Special Surgery, New York, NY, 4Georgetown Univ Medical Center, Washington, DC, 5Washington, DC

Background/Purpose: Pulmonary arterial hypertension (PAH) is a leading cause of death in patients with systemic sclerosis (SSc). Although survival has improved with PAH-specific medications in the last decade, the optimal
We have hypothesized that tissue resident cells fundamentally determine disease localization (Cua and Sherlock, Nature Medicine 17(9): 1055–6) and herein extend our previous observations (Sherlock et al. in press) to demonstrate the presence of IL-23R+ cells in the uvea and to further characterize these cells and their effects.

**Methods:** We used GFP reporter mice to investigate the tissue distribution of IL-23R+ cells in the main tissues inflamed in spondyloarthritis: the enthesis, aortic valve and uvea. Flow cytometric analysis and multiphoton microscopy was employed to characterize the location of such cells and the reactivity of this tissue to IL-23 was determined in vitro and in vivo.

**Results:** Entheses, the aortic root and the uvea all contain a novel tissue resident IL-23R+ T lymphocyte, negative for both CD4 and CD8, which allows the tissue to respond to IL-23. Multiphoton microscopy confirms an extremely precise enthesal localization of the IL-23R+ cell type. These cells are RAG dependent, but express the PLZF transcription factor which confers an ‘innate like’ responsiveness on T cells, allowing them to immediately respond to cytokines. Entheses can respond within hours to IL-23 in vitro in the absence of further cellular recruitment. Moreover, IL-23 expression in mice is sufficient by itself to induce hallmark features of spondyloarthritis, with severe inflammation developing very specifically at the enthesis and aortic root. Enthesal bone erosion, new bone formation and periostitis are likewise present.

**Conclusion:** The highly restricted anatomical distribution of IL-23+ cells explains both the exquisitely precise tissue localization of disease in spondyloarthritis, as well as the known genetic associations with disease. This represents a very unique mechanism whereby HLA-B27 and its tendency to cause IL-23 elaboration may predispose to pathology. These IL-23+ tissue resident cells thus form the point of integration between the specific immunological disregulations known to be associated with disease, and the very precise anatomical sites affected. The importance of these tissue resident cells is emphasized by the ability of IL-23 to drive entheses despite depletion of the conventional IL-23 responsive Th17 cells. Neutralization of IL-23 therefore represents an excellent therapeutic strategy in spondyloarthritis since it will inhibit a potent molecule associated with known genetic factors, and do so directly at the site of pathology.

**Disclosure:** J. Sherlock, Merck, 3; B. Joyce-Shaikh, Merck, 3; S. Turner, Merck Pharmaceuticals, 3; C. C. Chao, Merck Pharmaceuticals, 3; M. Sathe, Merck, 3; J. Grein, Merck Pharmaceuticals, 3; D. Gorman, Merck Pharmaceuticals, 3; E. P. Bowman, Merck Pharmaceuticals, 3; T. McClanahan, Merck Pharmaceuticals, 3; J. Yearley, Merck Pharmaceuticals, 3; G. Eberl, None; C. D. Buckley, None; R. Kastelein, Merck Pharmaceuticals, 3; R. Pierce, Merck Pharmaceuticals, 3; D. Laface, Merck Pharmaceuticals, 3; D. Cua, Merck Research Laboratory, 3.

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**Dynamic in Vivo Imaging of Th17-Mediated Osteoclastic Bone Resorption in Live Bones by Using Intravital Multiphoton Microscopy.** Junichi Kikuta and Masaru Ishii. Immunology Frontier Research Center, Osaka University, Osaka, Japan

**Background/Purpose:** Rheumatoid arthritis (RA) is a chronic autoimmune disease characterized by joint synovial inflammation and progressive cartilage/bone destruction. Although various kinds of cell types, such as T/B lymphocytes, macrophages and synovial fibroblasts, are involved in the pathogenesis of chronic inflammation in RA, bone destruction is considered to be mainly mediated by enhanced activation of osteoclasts. Recently CD4+ T helper 17 (Th17) cells have been reported to express RANKL on the cell surface, which were suggested to be important for osteoclastic bone destruction in arthritic joints. However, the RANKL expressed on the surface of Th17 possesses little ability for inducing differentiation, and the practical function of RANKL and Th17 on bone erosion remained elusive. This study aimed to investigate how the homing and bone destructive functions of osteoclasts are regulated in situ and how Th17 cells control the osteoclastic bone resorption in vivo.

**Methods:** To examine in vivo behaviors of mature osteoclasts and Th17 cells, we utilized advanced imaging system for visualizing live bone tissues with intravital multiphoton microscopy that we have originally established. To identify mature osteoclasts in fluorescent microscopy, we utilized the mice in which GFP is expressed under the promoter of a vacuolar type H+-ATPase a3 subunit, those are preferentially and abundantly expressed in mature osteoclasts (a3-GFP mice). Polyclonally differentiated Th17 cells were labeled with fluorescent dye and then
Effects of Odanacatib On BMD and Overall Safety in the Treatment of Osteoporosis in Postmenopausal Women Previously Treated with Alendronate. Roland Chapurlat1, Sydney Bonnick2, Tobias De Villiers3, Alberto Odio4, Santiago Palacios5, Boyd Scott6, Celine Le Bailly De Tilleghem7, Carolyn DaSilva8, Albert Leung9 and Deborah Gurner10. 1Hoˆpital Edouard Herriot, Lyon, France, 2Cooper Clinic, Dallas, TX, 3Mediclinic Panorama, Cape Town, South Africa, 4Alta California Medical Group, Simi Valley, CA, 5Instituto Palacios, Madrid, Spain, 6Merck Sharp & Dohme Corp., Whitehouse Station, NJ, 7Merck Sharp & Dohme Corp., Brussels, Belgium, 8Whitehouse Station, NJ

Background/Purpose: Odanacatib (ODN) is a potent, orally-active cathepsin K inhibitor being developed for the treatment of postmenopausal osteoporosis. This study evaluated the effects of ODN 50mg once weekly (OW) on BMD and biochemical markers of bone turnover in patients previously treated with alendronate (ALN) (closed daily or weekly) for ≥3 years, as well as the safety and tolerability of ODN.

Methods: This was a randomized, double-blind, placebo-controlled, 24-month study. The primary endpoint was % change in femoral neck (FN) BMD from baseline at Month 24. 243 postmenopausal women ≥60 years of age with low BMD T-score (T-score range -2.5 to < -3.5) at the total hip, FN or trochanter but no history of hip fracture and who had been treated with ALN for ≥3 years were randomized in a 1:1 ratio to receive ODN 50mg OW or placebo OW for 24 months. All patients received vitamin D3 5000 IU/wk and calcium supplementation (to 1200 mg/day). BMD was assessed by DXA at baseline, 6, 12 and 24 months. Biochemical markers of bone resorption (s-CTX, u-NTx) and bone formation (s-BSAP and s-P1NP) were measured at baseline and 3, 6, 12, 18 and 24 months. This study was not designed and did not have the power to evaluate the effect of ODN on fractures.

Results: In the placebo group, FN and trochanter BMD were not significantly different from baseline levels for the first 12 months, but declined significantly from baseline by Month 24 (−0.94% and −1.35%, respectively). BMD at the total hip declined in a linear manner from baseline to month 24 (−1.87% at 24 months). BMD at the lumbar spine (LS) was not significantly different from baseline for the entire 24 months of the study. BMD changes from baseline at 24 months in the ODN group were significant vs placebo at all 3 hip sites and the LS. The changes in BMD for the FN, trochanter, total hip and LS from baseline were 1.73%, 1.83%, 0.83% and 2.28%, respectively. ODN 50mg OW significantly decreased the biomarker of bone resorption, u-NTx/Cr, and significantly increased biomarkers of bone formation, s-P1NP and s-BSAP, compared to placebo. The increase observed for the bone resorption marker s-CTX with ODN treatment was unexpected. AEIs were comparable between the 2 treatment arms. The overall safety profile appeared similar between ODN 50mg OW and placebo.

Conclusion: By visualizing in vivo behaviors of mature osteoclasts, we for the first time identified different functional subsets of live osteoclasts on the bone surface, from ‘static – bone resorptive’ to ‘moving – non resorptive’. Furthermore, RANKL turned out not only to promote the differentiation of osteoclasts but also to regulate the bone-resorptive function of fully differentiated mature osteoclasts. RANKL-bearing Th17 cells were shown to control bone resorption of mature osteoclasts, demonstrating novel actions of Th17 that may be a novel therapeutic target in RA.

Disclosure: J. Kikuta, None; M. Ishii, None.
Methods: We designed a prospective, observational cohort study of incident SRC subjects identified through a web-based survey. Every second week, an e-mail was sent to 589 participating physicians from around the world to identify incident cases of SRC. Data on patient demographic and disease characteristics, as well as exposure to ACE inhibitors was collected. A one-year follow-up case report form was sent to all the physicians who identified a case. The primary outcome of interest was death or dialysis at one year after the onset of SRC, comparing patients exposed and unexposed to ACE inhibitors at the time of onset of SRC.

Results: We identified 88 incident cases of SRC, of which 12 were lost to follow up (86% follow up rate). Mean age was 52 years, 67% were women, 76% had diffuse SSc and median disease duration since the onset of the first non-Raynaud’s symptom was 1.5 years. The majority of cases had a hypertensive SRC (n=71/76) and only 5 had a normotensive SRC. Eighteen patients (24%) were on an ACE inhibitor immediately prior to the onset of the SRC. At one year follow up, 27 (36%) SRC patients had died and an additional 13 (17%) remained on dialysis.

The crude one-year cumulative incidence of death in those exposed to ACE inhibitors at the time of onset of SRC compared to the unexposed was 1.56 (95% confidence interval [CI] 0.70–3.47) and the crude one-year cumulative incidence of dialysis was 0.61 (95% CI 0.18–2.09). The crude Cox proportional hazard ratio comparing the time to death of SRC patients exposed to ACE inhibitors prior to the onset of SRC to those unexposed was 1.95 (95% CI 0.87–4.35). After controlling for differences in prodromal exposure and history of systemic hypertension in the two groups, the adjusted Cox proportional hazard ratio comparing the time to death of SRC patients exposed to ACE inhibitors prior to the onset of SRC to those unexposed was 2.52 (95% CI 1.05–6.05, p=0.0394).

Conclusion: SRC was associated with poor one-year outcomes. Exposure to an ACE inhibitor prior to the onset of SRC was associated with an increased risk of death during the first year of follow up after SRC. Clinicians caring for patients with early SSc should use ACE inhibitors cautiously.

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OA cartilage lesions at all dosages tested (p<0.05). Picrosirius staining also showed a significantly better preservation of the collagen network in dogs treated with SrRan at 50 and 75 mg/kg/day (p<0.03). The thickening of the subchondral plate found in the OA placebo treated dogs was reduced by SrRan treatment (50 mg/kg/day, p=0.02). The increased gene expression levels of MMP-1, MMP-13, ADAMTS5 and cathepsin K found in OA cartilage were all reduced by SrRan treatment (75 mg/kg/day, p=0.02, p=0.03, p=0.06, p<0.0011, respectively). A significant suppression of the increased levels of IL-1β in OA synovium by SrRan was also found (50 and 75 mg/kg/day, p=0.05). The serum level of CTX-II was significantly reduced at sacrifice in dogs treated with 50 and 75 mg/kg SrRan.

Conclusion: This study is the first to demonstrate that SrRan globally reduced the progression of OA structural changes, both cartilage lesions and subchondral bone sclerosis, in an in vivo animal model. The inhibition of the synthesis of several key pathophysiological pathways may have contributed to the protective effect of SrRan.

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A Systems Biology Approach to Elucidating Pathways Active During the Development of Osteoarthritis. Richard F. Loeser1, Amy L. Olex2, Brian Westwood2, Margaret A. McNulty3, Cathy S. Carlson3, Michael Callahan4, Cristin Ferguson4 and Jacquelyn S. Fetrow2. 1Wake Forest School of Medicine, Winston-Salem, NC, 2Wake Forest University, Winston-Salem, NC, 3University of Minnesota, St. Paul, MN, 4Wake Forest School of Medicine, Winston-Salem, NC.

Background/Purpose:OA affects the entire joint but most studies have focused on the disease process in a single tissue. In this study, we identified genes regulated during different stages of the development of surgically-induced OA by microarray using RNA isolated from the joint “organ” and analyzed the data using an unbiased computational modeling approach to discover the pathways active in the disease process.

Methods:12 week-old male C57BL/6 mice underwent surgical destabilization of the medial meniscus (DMM) to induce OA or sham surgery as control. Joint tissues were collected for isolation of RNA (n=9 mice per group per time point) pre-surgery (time 0) and at 2, 4, 8, and 16 weeks after surgery and for histological analysis of OA severity (n=6 mice per group per time point). RNA was isolated from joint tissue collected from the medial half of the joint, including cartilage, meniscus, subchondral bone, and joint capsule with synovium. RNA was pooled from 3 mice for each Affymetrix microarray and 3 arrays were performed for each group at each time point. Signal log ratios (SLR) of DMM/sham were calculated using normalized array data. Genes passing detection, SLR (≥0.5 or ≤-0.5) for at least one time point in all 3 pools), and consistency filters were used for computational modeling to identify patterns of gene expression by consensus clustering, network analysis using ActiveModules (JAM) and functional classification using DAVID and KEGG.

Results: Histological lesions of OA were present in the medial tibial plateau (MTP) of the DMM knees beginning at the earliest (2 week) time point and became progressively more severe by 16 weeks. Osteophytes were cartilaginous at 2 weeks and became progressively ossified. A total of 427 genes passed the consistency and significance filters. There were more upregulated than downregulated genes at all time points except at 8 weeks (17 up, 53 down) with the most upregulated at 4 weeks (336 up,33 down) followed by 2 weeks (174 up,12 down) and 16 weeks (84 up,2 down). Clustering identified 27 clusters with 2 or more genes and DAVID analysis of clusters upregulated at 2 and 4 weeks included morphogenesis, differentiation, development, collagen, and ECM genes as well as transcription regulatory genes. Cell division and cytoskeleton genes were in a cluster highly down-regulated at 8 weeks while genes upregulated at 16 weeks included Ppelp (involved in collagen binding), Col3A1 and fibromodulin. JAM analysis revealed 13 subnetworks with gene expression activity during the time course where the majority of up-regulated genes were up at 4 weeks. Prominent sub-networks included the TGF-β signaling pathway, ECM-receptor interactions (including thrombospondins, syndecans, and collagen) and Wnt and hedgehog signaling.

Conclusion: The results support a phasic development of OA. Early matrix remodeling was associated with activation of TGFβ and Wnt/hedgehog signaling which may be drivers of cartilage degradation and osteophyte formation. The quiescent stage at 8 weeks suggests a temporary stabilization of the joint followed by activation of a more fibrotic process at 16 weeks. The findings suggest that specific therapies intended to slow disease progression may be most effective at specific stages of the disease.

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Changes in Subchondral Bone Provide a Sensitive Marker for Osteoarthritis and Its Progression: Results From a Large Osteoarthritis Initiative Cohort. Michael A. Bowes1, Christopher B. Wolstenholme1, Devin Hopkinson1, Graham R. Vincent1 and Philip G. Conaghan1. 1Imorphics Ltd, Manchester, United Kingdom, 2University of Leeds, Leeds, United Kingdom.

Background/Purpose: Change in subchondral bone has been clinically associated with progression of osteoarthritis (OA). Modern image analysis techniques allow accurate, automated identification of bone in MR images, facilitating the use of 3D changes in the bone to characterize and monitor OA. Objective was to compare rate of change in bone area of all the knee bones from all subjects in the OA1 dataset with definite medial OA with a control group absent of radiological OA over a 4 year period.

Methods: 933 subjects with medial OA and MR images at baseline, 12, 24, 36 and 48 month were selected from the Osteoarthritis Initiative dataset; medial OA was defined as KL ≥ 2 and presence of medial osteophytes. 904 control subjects with absence of radiographic OA were also identified, defined as KL = 0 at all time-points. One index knee was analyzed per subject. Femur, tibia and patella bones were automatically segmented from MRIs using active appearance models. Adjacent areas were automatically identified within the model1 and were measured at each time-point. All regions of the articulating surface of the femur, tibia and patella were included in the analysis.

Results: Mean age (SD) of the case group was 62 years (8.8); control group 59 (7.8); mean (SD) BMI for case/control 29.7 (4.9)/26.9 (4.3); %females for case/control 35%/47%. Rate of change of bone area in the medial compartments was typically 0.5% per annum in the case group with significantly lower change in the controls. Lateral compartments exhibited around half this amount of change, and showed less difference in the rates of change between cases and controls (though still highly significant). ANCOVA analysis demonstrated that age, BMI and gender could explain only a small amount of the variance in bone change.

Conclusion: Change in bone area within all knee compartments discriminated significantly between OA and control subjects. Discrimination was strongest in medial compartments, and particularly in the femur. The patella-femoral joint is an important component of OA disease, and discrimiates between the groups as strongly as the femorotibial joint. Measurement of bone change provides a valuable tool for monitoring OA progression.

Reference

Disclosure: M. A. Bowes, Imorphics Ltd, 1, Imorphics Ltd, 3; C. B. Wolstenholme, Imorphics Ltd, 3, Imorphics Ltd, 1; D. Hopkinson, None; G. R. Vincent, Imorphics Ltd, 3, Imorphics Ltd, 1; P. G. Conaghan, None.
Intra-Articular Injection of Adipose-Derived Stem Cells Inhibits Activation of the Synovium and Protects Against Cartilage Damage and Enthesophyte Formation in Murine Experimental Osteoarthritis. Peter L. E. M. van Lent1, Menno C. ter Haarne1, Arjen B. Blom1, Rik Schelbergen1, Louis Castella2, Thomas Vogl3, Johannes Roth1, Roxane Blattes2, Christian Jorgensen1 and Wim B. van den Berg1.1Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 2INSERM U1031, Toulouse, France, 3University of Muenster, Muenster, Germany, 4Hospital Lapeyronie, Montpellier, France

Background/Purpose: OA lesions are treated with mesenchymal stem cells aiming to enhance tissue repair by transformation to eg. chondrocytes. Recently it has been shown that adipose derived stem cells (ADSC) express strong immunosuppressive characteristics which might impair the activated phenotype of synovial OA macrophages. Previous studies have shown that synovial macrophages are crucial in mediating cartilage destruction and entheseophyte formation in murine collagenase-induced osteoarthritis (CiOA). In the present study we explored the effect of intra-articular injection of ADSCs on synovium, cartilage destruction and entheseophyte formation during murine CiOA.

Methods: Adipose derived stem cells (ADSCs) were isolated from fat surrounding the popliteal lymph nodes and were injected into knee joints at day 7 after induction of CiOA. CiOA was induced by injection of collagenase into murine knee joints, which causes instability and joint destruction and is characterized by synovial lining thickening. Mediators present in washouts of synovium were measured using Luminex. OA phenotypes were measured within 8 weeks after induction. Total knee joints were isolated and performed for histology. Synovial activation was measured using an arbitrary scale of 0–3, cartilage destruction according to the scorings method of Peitker et al. (2006) and entheseophyte formation in cruciate and medial collateral ligaments using image analysis.

Results: A single dose of ADSCs (20 × 10^6 in mouse serum) was injected into the knee joint of mice, 7 days after induction of collagenase-induced osteoarthritis. Histology showed that thickness of the synovial lining layer, which is characteristic for this model, was significantly inhibited by ADSCs treatment at day 14 (9%) and day 42 (35%) when compared to control (serum) treated OA joints. This was in line with significant lower levels of IL-1β (53%) and IL100A/A9 (51%) (no effect on TNFa and IL-6) in synovial washouts measured at day 14 after treatment. Destruction of cartilage was lower for both day 14 (55%) and day 42 (35%) and was particularly found in the medial tibia. Strikingly, ADSCs treatment had a protective effect on entheseophyte formation associated with ligaments. At day 42, the formation of entheseophytes in medial collateral and cruciate ligaments was inhibited by 92% and 43% respectively. Intra-articular injection of GFP-labeled ADSCs into day 7 OA knee joints, showed that stem cells were clearly detected within the synovial intima in close interaction with macrophages.

Conclusion: Our study indicates that a single injection of ADSCs into the knee joints of mice with CiOA gives protection of synovial activation, cartilage destruction and entheseophyte formation when given at day 7 after onset probably by inhibiting the activated phenotype of synovial macrophages.

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734 Chemokine (C-C Motif) Receptor 2 Signaling Mediates Persistent Pain in Experimental Osteoarthritis, Rachel E. Miller1, Phuong Tran1, Rosalina Das2, Nayereh Ghoreishi-Haack1, Richard J. Miller2 and Anne-Marie Malfait1.1Rush University Medical Center, Chicago, IL, 2Northwestern University, Evanston, IL

Background/Purpose: To investigate the role of MCP-1/CCR2 in the development of pain in osteoarthritis (OA) using a mouse model, destabilization of the medial meniscus (DMM). The protracted nature of this model enables longitudinal analysis of pain-dependent behaviors and concomitant molecular changes in the innervating dorsal root ganglia (DRG).

Methods: DMM or sham surgery was performed in the right knee of 10-week old male C57BL/6 or Ccr2 null mice (Tacionic) (total number used = 225). Pain-dependent behaviors were assessed at 0, 4, 8, and 16 weeks post surgery. Mechanical allodynia in the hind paw was assessed with von Frey fibers. Locomotion was assessed using a LABORAS platform. At the same time points, immersing dorsal DRG, L3-L5, from DMM or sham-operated and age-matched naive mice were collected for qRT-PCR of monocyte chemoattractant protein (MCP-1) and its receptor, CCR2. The response of DRG neurons to MCP-1 was recorded through intracellular Ca2⁺-imaging. In brief, neurons were isolated, cultured for 3 days, and loaded with a calcium indicator dye. The number of cells responding to MCP-1 was counted. Cell culture supernatants were analyzed for MCP-1 protein via ELISA. For immunohistochemistry of DRG, mice were perfused transcardially with paraformaldehyde and DRG were collected for staining with anti-F4/80 (macrophage marker). Histopathology of the knees was evaluated according to OARSI recommendations.

Results: Joint pathology after DMM progresses slowly over 16 weeks. We documented pain-dependent behaviors longitudinally over this period, and found two stages of OA-associated pain: early-onset mechanical allodynia progressed to week 4, and was maintained for 16 weeks. Locomotive changes indicative of chronic pain (decreases in distance traveled and climbing) were first apparent 8 weeks after DMM, and maintained up to week 16. These changes were reversible with buprenorphine; DRG mRNA levels of MCP-1 and CCR2 were increased compared to naive and sham controls, peaking at week 8 post DMM (p<0.01); Exposure of DRG neurons isolated 8 weeks post DMM to MCP-1 resulted in an increased calcium mobilization response compared to naive and sham controls, indicating a functional role for MCP-1/CCR2 signaling in DRG neurons (p<0.0001); Protein levels of MCP-1 were increased in the supernatants of these cultured DRG cells compared to naive and sham (p<0.0001); DRG may be infiltrated by immune cells, particularly macrophages, which may contribute to pain signaling. Therefore, we examined changes in the DRG macrophage population following DMM and found that by week 8, macrophages infiltrated the DRG and this was maintained through week 16; Ccr2 null mice developed comparable joint damage 8 weeks post DMM to wild types, but showed altered pain behavior: i) Similar levels of mechanical allodynia developed up to week 8, but the allodynia completely resolved by week 16 weeks; ii) Ccr2 null mice were protected from decreases in locomotion at 8 and 16 weeks.

Conclusion: These data support a role for MCP-1/CCR2 in the persistence of experimental OA-associated pain. This pathway merits further exploration as a target for pain in OA.

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735 Mass Spectrometry Assays of Plasma Biomarkers to Predict Radiographic Progression of Knee Osteoarthritis, Susan Y. Ritter1, William M. Reichmann1, Jamie E. Collins1, Alejandra Garces2, Bryan Krastins2, David Sarracino2, Mary Lopez2, Elena Losina3 and Antonios O. Aliprantis1.1Brigham and Women’s Hospital, Boston, MA, 2Thermo Fisher Scientific IRIMS Center, Cambridge, MA

Background/Purpose: Biomarkers to identify osteoarthritis (OA) patients at risk for disease progression are needed. Recently, we performed a proteomic analysis of knee synovial fluid from normal and OA patients to identify differentially expressed proteins that could represent biomarkers of disease activity. Mass spectrometry assays were developed to identify representative peptides from several of these proteins in both synovial fluid and peripheral blood. We tested a panel of these putative biomarkers in a cohort of OA patients followed prospectively for 30 months to identify those peptides that correlate with radiographic progression.

Methods: Multiplexed high throughput selected reaction monitoring (SRM) assays were developed to measure multiple peptides representative of the following 9 proteins identified in previous discovery experiments: afamin, clusterin, insulin-like growth factor binding protein, acid labile subunit, lumican, pigment epithelium-derived factor, lubricin, hepatocyte growth factor, kallistatin, cartilage oligomeric matrix protein. Plasma samples obtained from baseline visit of 173 subjects in an observational OA progression cohort were trypsin digested and SRM assays were performed. Linear regression was used to determine association between each biomarker level at baseline and maximal joint space narrowing from baseline to 30 months. A biomarker panel was identified when the area under the ROC curve was >0.70.

Results: Three plasma biomarkers were associated with accelerated joint space narrowing: 1) afamin, p<0.01; 2) lubricin, p<0.001; 3) clusterin, p<0.0001. In addition, a model combining lubricin and clusterin was associated with joint space narrowing, p<0.001. These data suggest that biomarkers may be used to identify OA patients at risk for joint space narrowing progression.
Results: For this progression cohort, average age was 61 and average joint space narrowing over 30 months was 0.68 mm. A good correlation between multiple peptides for each individual protein was observed, indicating our assays were correctly measuring their target proteins. From our panel of putative biomarkers, peptides representative of clusterin, lumican and lubricin showed statistically significant associations with joint space narrowing after adjustment for age and sex. Partial R² values from these linear regression models show the clusterin LFVTPAEEK and lubricin LVEVNPK peptide biomarker explains about 2–3% of the variability of JSN, values similar to the amount explained by age (Table). A biomarker score was developed combining normalized data for both lubricin and clusterin peptides, which increased the model R² to 0.079.

Table. Linear regression models adjusting for age and sex

<table>
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<th>Model #</th>
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<th>Parameter Estimate</th>
<th>Partial R²</th>
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<tr>
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</table>

*Normalized values for Clusterin(F) and PRG4(L) using beta estimates from models 1 and 2

Conclusion: Targeted mass spectrometry assays provide a rapid means to validate novel biomarkers in human samples. Our results suggest that when combined, clusterin and lubricin levels in plasma are as predictive of OA progression as age. Replication of these findings in other prospective OA cohorts is planned.

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**Disclosure:** S. L. Gaffen, None; A. Garg, None.

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**Citrullination of ENA-78/CXCL5 Results in Conversion From A Non-Monocyte Recruiting to a Monocyte Recruiting Chemokine.**

Ken Yoshida1, Olek Korchnytskiy2, Paul P. Tak3, Takeo Isozaki4, Jeffrey H. Ruth5, Phillip Campbell1, Dominique L. Baeten2, Danielle M. Gerlag6, M. Asif Amin7 and Alisa E. Koch8. 1University of Michigan, Ann Arbor, MI, 2Institute of Cell Biology, Lviv, Ukraine, 3GlaxoSmithKline U.K. and Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands, 4Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands, 5University of Michigan Medical School, Ann Arbor, MI

Background/Purpose: Citrullination is a post-translational modification that is the conversion of arginine to citrulline in proteins mediated by peptidylarginine deiminase (PAD). Antibodies directed towards the citrullinated proteins are highly specific for rheumatoid arthritis (RA). We and others have shown that some chemokines including ENA-78/CXCL5 play important roles in the development of RA. We undertook this study to examine whether citrullinated ENA-78/CXCL5 (citra-ENA-78/CXCL5) is detected in RA biological fluids, and if so, what its biological activity is.

Methods: An expression plasmid containing polyclinidine tagged human ENA-78/CXCL5 was transfected into the human embryonic kidney 293T cell line for ENA-78/CXCL5 production. After citrullination of the ENA-78/CXCL5 with rabbit PAD, citoENA-78/CXCL5 was used as standard for enzyme-linked immunosorbent assay (ELISA). The concentrations of citoENA-78/CXCL5 in synovial fluids (SFs) or sera were measured by ELISA using anti-modified citrulline antibody. The citoENA-78/CXCL5 levels in RA were compared with osteoarthritis (OA) and other inflammatory rheumatic diseases, and the correlation between the citoENA-78/CXCL5 levels and clinical data was analyzed. Monocyte and polymorphonuclear neutrophil (PMN) chemotaxis assays were performed using a 48-well Boyden chamber system to examine the biological activity of citoENA-78/CXCL5 compared to ENA-78/CXCL5. C57BL/6 mice were injected intra-articularly with ENA-78/CXCL5 or citoENA-78/CXCL5 to induce inflammation and the severity of inflammation was evaluated to compare the biological activity of citaENA-78/CXCL5 to ENA-78/CXCL5.

Results: CitoENA-78/CXCL5 was significantly higher in RA (n=11, mean±SE: 286.3±80.0 pg/ml) than NL sera (n=15, 12±2.6 pg/ml) and higher in RA (n=20, 1126.4±296.6 pg/ml) compared to other inflammatory diseases (n=14, 141.1±8.2 pg/ml) and OA (n=15, 2.3±1.0 pg/ml). There was no significant correlation between ENA-78/CXCL5 levels and clinical data. On the other hand, there were significant positive correlations between citoENA-78/CXCL5 and C-reactive protein (CRP) levels (RA: r=0.4, p=0.05; OA: r=0.4, p=0.05), citoENA-78/CXCL5 and erythrocyte sedimentation rate (ESR) (RA: r=0.5, p=0.05; OA: r=0.7, p=0.05). Chemotaxis assays showed that PMN migration in response to citoENA-78/CXCL5 was similar to that induced by ENA-78/CXCL5. However, citoENA-78/CXCL5 induced monocyte migration, but ENA-78/CXCL5 did not. In vitro, citoENA-78/CXCL5 induced more intracellular inflammation compared to ENA-78/CXCL5.

Conclusion: CitoENA-78/CXCL5 was detected in RA biological fluids and the concentrations were significantly higher in RA than OA or other diseases, and correlated with the inflammatory markers ESR and CRP. CitoENA-78/CXCL5 induced monocyte migration while ENA-78/CXCL5 did not. This may be attributed to the fact that citoENA-78/CXCL5 acquired a monocyte recruiting function that ENA-78/CXCL5 does not have. These results indicate that citoENA-78/CXCL5 may have novel inflammatory properties compared to ENA-78/CXCL5 in RA pathogenesis.

Disclosure: K. Yoshida, None; O. Korchnytskiy, None; P. P. Tak, GlaxoSmithKline, 3; T. Isozaki, None; J. H. Ruth, None; P. Campbell, None; D. L. Baeten, None; D. M. Gerlag, None; M. A. Amin, None; A. E. Koch, None.
A Novel Orally Active Phosphatidylinositol 3-Phosphate 5-Kinase (PIKfyve) Inhibitor Ameliorates Mouse Psoriasis-Like Model by Inhibition of Interleukin-12 and Interleukin-23 Production From Macrophages. Aya-toshi Andou, Eviryanti Agung, Yukiie Seki, Yoishiro Shima, Sen Takeshita, Takashi Yamamoto and Hiroiysi Eda. Ajinomoto Pharmaceuticals Co., Ltd., Kanagawa, Japan

Background/Purpose: Phosphatidylinositol (3,5)-bisphosphate (PI(3,5)P2) is the most recently-identified phospholipid component of cellular membrane. Phosphatidylinositol 3-phosphate 5-kinase (PIKfyve) is a critical enzyme for the synthesis of PI(3,5)P2 from phosphatidylinositol 3-monophosphate (PI(3)P), which has been implicated in intracellular trafficking events, but little is known about its biological function. We discovered a lead-compound APY0201 which is a potent, highly selective PIKfyve kinase inhibitor. In this study, we characterized anti-inflammatory properties of APY0201 in vitro and in vivo.

Methods: In vitro study: Mouse macrophages (thioglycolate-induced peritoneal exudate cells) and human peripheral blood mononuclear cells (PBMCs) stimulated by IFN-γ and heat-killed whole bacteria (Staphylococcus aureus/Cowan strain 1 (SAC)) were used in this assay.

In vivo study: The imiquimod (IMQ)-induced psoriatic model was used. Female Balb/c mice received daily topical application of approx. 16 mg 0.5% IMQ cream & Vaseline mix (1:1, equivalent to 0.4 mg IMQ) on the right ear for 4 days. APY0201 or vehicle was orally or topically administered once daily, and the severity of inflammation was assessed by daily ear thickness and ear weight after 4 days of IMQ-treatment.

Results: APY0201 inhibited the conversion of PI(3)P to PI(3,5)P2 in the presence of recombinant human PIKfyve with an IC50 value of 8.9 nM. It is highly selective for PIKfyve compared to various receptors, channels and enzymes including 25 lipid kinases and 83 protein kinases. Interestingly, APY0201 demonstrated potent in vitro inhibitory activity against interleukin(12)-p70 production from mouse macrophages and human PBMCs with an IC50 value of 8.4 nM and 9.9 nM, respectively.

Furthermore, IL-12/23 production but not other inflammatory mediators, such as TNF-α and MCP-1 from these cells were inhibited by APY0201. Downregulation of PIKfyve using siRNA of PIKfyve inhibited expression of IL-12/23 production

Conclusion: Our results identify SF2/ASF as a novel regulator of IL-2 expression in human T cells and a potential molecular mechanism underlying the altered T cell defect in SLE.

Disclosure: A. Andou, None; E. Agung, None; Y. Seki, None; Y. Shima, None; S. Takeshita, None; T. Yamamoto, None; H. Eda, None.

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The Serine Arginine Protein SF2/ASF Is a Novel Regulator of IL-2 Transcription and Restores IL-2 Production in T Lymphocytes From SLE Patients. Vaishali R. Moulton, Alexandros P. Grammatikos and George C. Tsokos. Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA

Background/Purpose: Systemic lupus erythematosus (SLE) is a complex autoimmune disease which affects mainly women in the reproductive years, and causes painful arthritis, skin disease and complications in the kidneys and brain. Abnormal T lymphocytes in SLE not only regulate autoantibody-producing B cells, but are also responsible for target organ infiltration. Currently, no specific therapies target T cell defects. Moreover, there are no known molecular markers to predict disease activity. Aberrant molecular mechanisms responsible for T cell defects are thus promising targets for therapy, as well as potential biomarkers for disease. A key defect of T cells from lupus patients is that they produce insufficient amounts of the vital cytokine interleukin (IL)-2. Reduced IL-2 production is linked to reduced cytotoxicity, defective regulatory T cell function, and impaired activation-induced cell death leading to persistence of autoreactive T cells. We previously showed that T cells from SLE patients express decreased levels of the T cell receptor (TCR) - associated CD3 zeta (ζ) chain, a feature directly linked to their poor IL-2 production. We recently showed that the serine arginine (SR) protein splicing factor 2/alternative splicing factor (SF2/ASF) enhances the expression of CD3ζ chain by limiting the production of an unstable mRNA splice variant. In this study we asked whether the expression of SF2/ASF is aberrant in T cells from SLE patients and if SF2/ASF regulates T cell function, specifically IL-2 production.

Methods: T cells were isolated by negative selection from peripheral blood of SLE patients and healthy controls. SF2/ASF mRNA and protein expression was assessed using real time PCR and immunoblotting respectively. T cells were transiently transfected with siRNA or plasmids using electroporation. T cells were activated with anti-CD3 and anti-CD28 antibodies. Transcriptional activity was studied using the dual luciferase reporter assay system. IL-2 production was measured in supernatants by enzyme linked immunosorbent assay (ELISA). Chromatin immunoprecipitation assays were used to assess transcription factor binding to the IL-2 promoter.

Results: We show that SF2/ASF expression levels are decreased in T cells from SLE patients, and correlate inversely with patients’ SLE disease activity index (SLEDAI). Importantly, overexpression of SF2/ASF in SLE T cells enhances their IL-2 production. In parallel, silencing SF2/ASF expression in normal T cells reduces their IL-2 secretion. Using reporter assays, we show that SF2/ASF increases transcriptional activity of the IL-2 promoter. Further, SF2/ASF induces the expression of the nuclear factor of activated T cells (NFAT) and c-fos transcription factors, and induces increased binding of NFAT and c-fos to the IL-2 promoter. Finally, we show recruitment of SF2/ASF to the IL2 promoter indicating its direct role in IL-2 transcription.

Conclusion: Our results identify SF2/ASF as a novel regulator of IL-2 expression in human T cells and a potential molecular mechanism underlying the altered T cell defect in SLE.

Disclosure: V. R. Moulton, None; A. P. Grammatikos, None; G. C. Tsokos, None.
Results: Patient samples before ACR classification had significant (p = 0.01) alterations in 16 soluble mediators of inflammation, as well as VWF and hs-CRP. Levels of particular TNF Receptor (TNFR) family members, TNFRI, TNFRII, BLYs, and APRIL, dramatically increased as lupus classification approached (levels at clinical symptoms versus pre-clinical sera, p = 0.001). The increase in these TNFR mediators affecting B-lymphocyte activation parallels the accumulation of autoantibodies seen leading up to diagnosis in SLE cases. Interferon (IFN)-associated mediators of inflammation are also of particular interest and were assessed. An initial evaluation of 20 SLE cases from this study revealed a significant increase in IFN activity leading up to diagnosis (p = 0.0279). We find a similar pattern of increased IFN-γ, IP-10, MIG, and MIP-1α (p = 0.01) leading up to diagnosis. Mediators such as VWF, hs-CRP, stem cell factor and resistin also increase over the pre-clinical course to SLE transition (p = 0.01). Inflammatory mediators IL-12 and IL-17 were significantly elevated (p = 0.01) in pre-clinical samples compared with first ACR criterion and lupus classification.

Conclusion: Before SLE patients transition to clinical disease, they have significantly elevated levels of soluble inflammatory mediators. Further elevation of select markers occurs between early clinical symptoms and classified disease. That these alterations are present prior to the transition to active SLE suggests that multiple perturbations in immune-mediated inflammatory processes occur long before clinical classification and suggest that high-risk, pre-clinical individuals, destined to become SLE patients, can be identified before their illness is clinically manifested and damaging.

Disclosure: M. E. Muñoz, None; J. R. Anderson, None; J. M. Robertson, None; T. B. Niewold, None; C. G. Tsokos, None; M. P. Keith, None; J. B. Harley, None; J. A. James, None.

ACR Concurrent Abstract Session I: Epidemiology and Health Services Research I: Epidemiology and Outcomes in Rheumatic Disease
Sunday, November 11, 2012, 2:30 PM–4:00 PM

472 Utility of HLA-B5801 Genotyping and Renal Dosing of the Starting Dose of Allopurinol in Preventing Allopurinol Hypersensitivity Syndrome: A Cost-Effectiveness Analysis. Yanjuan Zhu1, Ada Man2, Tuhina Neogi3,4 and Hyon K. Choi2,5,6,7,8
1Boston University, Boston, MA, 2Boston University School of Medicine, Boston, MA, 3Boston University, Boston, MA, 4Boston University School of Medicine, Boston, MA, 5Boston University School of Medicine, University of British Columbia, Arthritis Research Centre of Canada, Vancouver, BC, 6Australia, 7University of Sydney, Sydney, Australia, 8Boston Univ Schl of Med, Boston, MA

Background/Purpose: Allopurinol is the leading choice of urate-lowering therapy (95%) for gout which affects 8.3 million US adults. However, allopurinol is associated with a rare but potentially fatal reaction: allopurinol hypersensitivity syndrome (AHS). Studies have shown that HLA-B5801 allele carriage and renal impairment are strongly associated with AHS, suggesting utility of considering these factors in treatment decisions to prevent AHS and AHS-related deaths. We examined the cost-effectiveness of HLA-B5801 genotyping and renal dosing in preventing AHS and AHS-related deaths.

Methods: We built a decision model to compare 4 treatment strategies for million hypothetical patients starting allopurinol in the US. All key parameters and costs were derived from the literature, including the risk of AHS: 0.163%, the risk of death among AHS cases: 26%, the probabilities of HLA-B5801 allele carriage: 0.01 (Caucasians) and 0.07 (Asians), relative risk (RR) of AHS among HLA-B5801 positive patients: 96.6, sensitivity for predicting AHS by renal dosing: 90% [1], HLA-B5801 genotyping cost: $45.11 and the average AHS hospitalization cost: $50,152. Sensitivity analyses were conducted by varying the risk of AHS, RR of AHS among HLA-B5801 positive patients, sensitivity for predicting AHS by renal dosing, and AHS hospitalization cost.

Results: Initiating treatment in all patients with the standard dose resulted in 1630 AHS cases and 424 AHS related deaths. Compared with the standard dose strategy, the combined use of HLA-B5801 genotyping and renal dosing prevented 95% of AHS cases and AHS-related deaths, and saved $32,500,684. It led to incremental cost-effectiveness ratios (ICERs) of $21,009 per AHS case avoided and $80,647 per death avoided among Caucasians (i.e., cost-saving). Compared with renal dosing alone, the combined use of HLA-B5801 genotyping and renal dosing avoided 80 more AHS cases and 21 more AHS-related deaths at an incremental cost of $41,072,740, resulting in ICERs of $513,400 per AHS case avoided and $1,955,845 per death avoided among Caucasians. The corresponding effectiveness and ICERs were more favorable among Asians (Table). Sensitivity analyses suggested the results were robust to variation in these model parameters.

Table. Hospitalization and Risk of Recurrent Gout Attacks

<table>
<thead>
<tr>
<th>Hospitalization Over 2 Days</th>
<th>No. Control Periods</th>
<th>No. Hazard Periods</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1931</td>
<td>1402</td>
<td>1.00 (referent)</td>
</tr>
<tr>
<td>Yes</td>
<td>10</td>
<td>22</td>
<td>3.86 (1.69–8.84)</td>
</tr>
</tbody>
</table>

Conclusion: Our study confirmed that the risk of gout attacks increases during hospitalization. These data support the consideration of the provision of appropriate prophylaxis to patients with pre-existing gout during hospitalization.

Disclosure: Y. Zhang, None; C. Chen, None; H. K. Choi, None; C. E. Chaisson, None; D. J. Hunter, None; T. Neogi, None.

741 Increased Risk of Recurrent Gout Attacks During Hospitalization. Yueling Zhang1, Clara Chen2, Hyon K. Choi3, Christine E. Chaisson4, David J. Hunter5 and Tuhina Neogi6,7,8
1Boston University, Boston, MA, 2Boston University School of Public Health, Boston, MA, 3Boston University School of Medicine, University of British Columbia, Arthritis Research Centre of Canada, Boston, MA, 4University of Sydney, Sydney, Sydney, Australia, 5Boston Univ Schl of Med, Boston, MA

Background/Purpose: While anecdotal evidence suggests that risk of recurrent gout attack increases during hospitalization and gout is one of the most common reasons for in-patient rheumatology consultations, to our knowledge no study has formally tested this hypothesis. Understanding the magnitude of risk conferred by hospitalization on recurrent gout attacks would provide clinical guidance as to whether prophylactic therapy should be provided to prevent gout attacks in patients with existing gout during hospitalization, particularly since such attacks contribute to increased length of hospital stay.

Methods: We conducted an online case-crossover study to assess putative risk factors, including hospitalization, for recurrent gout attacks among persons with pre-existing gout. Those who had experienced at least one gout attack within the previous year were recruited online and underwent verification of gout diagnosis through medical records review. Participants logged onto the study website when they experienced a gout attack and provided exposure information (including hospitalization) over the two-day period prior to an acute gout attack (case period) using an online questionnaire. The same questionnaire was collected for a two-day period during an intercritical period (control period) in a 3-month interval for up to four times. We examined the relation of hospitalization and reasons for hospitalization over a 2-day period to the risk of recurrent gout attacks using conditional logistic regression.

Results: Our analysis included 724 subjects who experienced recurrent gout attacks during the study period (mean age 54.5, mean BMI 32.1, 78.5% male). Over the one-year follow-up period, 35 hospitalizations occurred. Of these, 3 hospitalizations were due to gout-related conditions and were excluded from the analysis. Of the remaining, 10 were for surgery, 9 for acute infections, and 13 for other conditions. The proportion of hospitalization was 5.2 and 15.4 per 1000 person-periods during the control and case periods, respectively. Adjusting for alcohol consumption, purine intake, and use of diuretics, allopurinol, colchicine, and NSAIDs, the odds of recurrent gout attacks during hospitalization increased by more than 3-fold (odds ratio=3.86, 95% confidence interval: 1.69 – 8.84) compared with periods without hospitalization (Table).

Table.

<table>
<thead>
<tr>
<th>Periods</th>
<th>No. Control</th>
<th>No. Hazard</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>10</td>
<td>22</td>
<td>3.86 (1.69–8.84)</td>
</tr>
</tbody>
</table>

Conclusion: Our study confirmed that the risk of gout attacks increases during hospitalization. These data support the consideration of the provision of appropriate prophylaxis to patients with pre-existing gout during hospitalization.

Disclosure: Y. Zhang, None; C. Chen, None; H. K. Choi, None; C. E. Chaisson, None; D. J. Hunter, None; T. Neogi, None.

742
Conclusion: The combined use of the HLA-B5801 genotyping and renal dosing of the starting dose of allopurinol was able to avert the majority of AHS cases and AHS-related deaths. The ICERs were especially favorable when the starting dose of allopurinol was able to avert the majority of AHS cases and AHS-related deaths at no incremental costs, this strategy alone was the proposed safe starting dose of allopurinol. Arthritis Rheum. 2012 Apr 5. doi: 10.1002/art.34488

Dalbeth N. Starting dose is a risk factor for allopurinol hypersensitivity syndrome: A Case-Control Study. Arthritis Rheum. 2007 Apr. doi: 10.1002/art.22335

** Conclusion: We identified anemia as a novel risk factor for gout. Anemia was associated with an approximately 2-fold increased risk of gout independent of kidney function and serum urate. These findings suggest that anemia is a risk factor for gout on par with other chronic conditions such as obesity and diabetes. The biological mechanism linking anemia to gout remains unclear.

Disclosure: M. McAdams DeMarco, Takeda Pharmaceuticals, 2; J. W. Maynard, None; J. Coresh, None; A. N. Baer, Takeda Pharmaceuticals, 2.

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Racial Differences in Reported Knee Pain Severity Persist Even After Adjustment for Knee Examination and Radiographic Findings: Data From the Osteoarthritis Initiative. Paige Luneburg, Laura Yerges-Armstrong, Braxton D. Mitchell and Marc C. Hochberg. University of Maryland, Baltimore, MD, University of Maryland School of Medicine, Baltimore, MD

Background/Purpose: African Americans have a higher prevalence of both radiographic and symptomatic radiographic knee osteoarthritis (OA) than Caucasians. In addition, African Americans with knee OA report more pain than Caucasians. While the reasons for these disparities are poorly understood, differences in risk factor patterns and/or pathoanatomic characteristics have been suggested. We hypothesized that these racial differences might be explained by differences in findings found upon physical examination, even while stratifying by radiographic severity.

Methods: Racial differences in pain reporting and severity as well as radiographic and physical examination findings of the knees were assessed using baseline data from subjects enrolled in the Osteoarthritis Initiative (OAI), a multicenter, longitudinal observational study initiated in 2004 to

Table. Results of the Base Case Analysis

<table>
<thead>
<tr>
<th>Population</th>
<th>Strategy</th>
<th>Incremental cost (per million patients)</th>
<th>AHS Cases avoided</th>
<th>ICER (per case)</th>
<th>Deaths avoided</th>
<th>ICER (per death)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Caucasians</td>
<td>1. Standard starting dose (300mg/day) for all patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>2. Renally-adjusted starting dose for HLA-B5801 negative patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3. Standard starting dose for HLA-B5801 negative patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>4. Renally-adjusted starting dose for HLA-B5801 negative patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>US Asians</td>
<td>1. Standard starting dose for all patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>2. Renally-adjusted starting dose for all patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3. Standard starting dose for HLA-B5801 negative patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>4. Renally-adjusted starting dose for HLA-B5801 negative patients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

*Negative dollar amounts = cost-saving

Table. HR of incident gout by baseline anemia in ARRIC

<table>
<thead>
<tr>
<th>Model</th>
<th>HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unadjusted</td>
<td>2.01 (1.46, 2.76)*</td>
</tr>
<tr>
<td>Sex and race adjusted</td>
<td>1.52 (1.10, 2.12)*</td>
</tr>
<tr>
<td>Sex, race and eGFR adjusted</td>
<td>1.54 (1.11, 2.14)*</td>
</tr>
<tr>
<td>Adjusted for confounders¹</td>
<td>1.64 (1.18, 2.26)*</td>
</tr>
<tr>
<td>Additionally adjusted for clinical factors²</td>
<td>1.73 (1.24, 2.43)*</td>
</tr>
<tr>
<td>Additionally adjusted for serum urate</td>
<td>1.83 (1.30, 2.57)**</td>
</tr>
</tbody>
</table>

¹ Confounders: Sex, race, categorical eGFR, BMI and alcohol intake.
² Clinical factors: Baseline hypertension, diuretic use, CHD, and CHF.

Conclusion: African Americans have a higher prevalence of both radiographic and symptomatic radiographic knee osteoarthritis (OA) than Caucasians. In addition, African Americans with knee OA report more pain than Caucasians. While the reasons for these disparities are poorly understood, differences in risk factor patterns and/or pathoanatomic characteristics have been suggested. We hypothesized that these racial differences might be explained by differences in findings found upon physical examination, even while stratifying by radiographic severity.

Methods: Racial differences in pain reporting and severity as well as radiographic and physical examination findings of the knees were assessed using baseline data from subjects enrolled in the Osteoarthritis Initiative (OAI), a multicenter, longitudinal observational study initiated in 2004 to
examine biomarkers and risk factors for clinically significant knee OA. This analysis was limited to 690 African Americans and 3,337 Caucasians with complete data from the baseline visit for knee pain, clinical knee examination features, covariates of interest and bilateral flexion-knee radiographs that had been centrally read for OA using the Kellgren-Lawrence (KL) scale. Three measures of pain severity (KOOS, WOMAC and NRS) were analyzed for each knee. We first evaluated racial differences in clinical exam findings using logistic regression models. We next used ANCOVA to determine if race was associated with pain severity while adjusting for anthropometric and demographic variables (body mass index, age, gender, income, depression score, and education level). Analyses were stratified into two groups by radiographic severity (KL ≤ 0 or 1 and KL ≥ 2). Finally, we additionally adjusted for clinical exam features that were significantly different between the racial groups.

Results: Patellar quadriceps tendinitis, lateral and medial tibiofemoral joint line tenderness, patellofemoral crepitus and grind, and pain on knee flexion were more common in blacks than whites (p < 0.008 for all). No significant differences between racial groups were observed for static alignment, anserine bursa pain or presence of effusion. Blacks reported more knee pain for all three measures of pain severity (p < 0.0001) regardless of radiographic severity. After adjusting for differences in knee examination, blacks still reported more knee pain for all three measures of pain severity: adjusted means and P-values are reported in Table 1.

Table. Adjusted mean (SE) changes of Joint Space Width (JSW) by soft drink intake*

<table>
<thead>
<tr>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI tertiles</td>
<td>Soft drinks, times/week</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>202</td>
</tr>
<tr>
<td>&lt; 2</td>
<td>439</td>
</tr>
<tr>
<td>≥ 2</td>
<td>140</td>
</tr>
<tr>
<td>&lt; 27.5</td>
<td>9</td>
</tr>
<tr>
<td>≥ 27.5</td>
<td>117</td>
</tr>
</tbody>
</table>

* Adjusted for age, race, education, marital status, household income, employment, follow-up time, depression, knee injury and knee surgery, smoking, milk intake, total energy intake, baseline BMI, KL grade and JSW, weight change, the changes of rim distance and beam angle.
** Adjusted for BMI as well.
† BMI tertiles: Man: T1: ≤ 25.5, T2: 25.5–30.8, T3 ≥ 30.9; Women: T1: ≤ 27.5, T2: 27.5–30.8, T3 ≥ 30.9.

Conclusion: Our results suggest that frequent consumption of soft drinks may be associated with increased OA progression in men. Replication of these novel findings in other prospective studies demonstrating the reduction in soft drink consumption leads to delay in OA progression are needed to test this hypothesis.

Disclosure: B. Lu, None; J. Driban, None; T. McAlindon, None; C. Eaton, None.

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Increased Risk of Acute and Chronic Renal Comorbidity in Ankylosing Spondylitis: Results From a Population-Based Study. Walter P. Maksymowych1, Sheelagh Szabo1, Sumati Rao1, Mary A. Cifaldi2 and Adrian R. Levy3. 1University of Alberta, Edmonton, AB, 2Oxford Outcomes, Vancouver, BC, 3Abbott Laboratories, Abbott Park, IL, 4Oxford Outcomes Ltd, Vancouver, BC

Background/Purpose: Clinical evidence points to an increased risk of renal comorbidity in ankylosing spondylitis (AS) compared to the general population. However, there are no population-based estimates available in the literature. An increased risk of renal comorbidity would have substantial implications for the monitoring and treatment of AS because the mainstay of pharmacological treatment is the use of non-steroidal anti-inflammatory agents (NSAIDs). We estimated the prevalence and age- and sex-standardized increased risk of renal comorbidity, including acute and chronic kidney disease and amyloidosis in a population-based cohort of persons diagnosed with AS in Québec between 1996 and 2006, compared to the general population.

Methods: A retrospective cohort study was conducted using the administrative physician-billing database of the Régie de l’Assurance Maladie du Québec. The cohort included individuals with at least one International Classification of Diseases, 9th Revision (ICD-9) billing code for AS between 1996 and 2006. A comparison cohort was generated using a 1% random sample of individuals without AS. Renal complications were identified by ICD-9 codes for amyloidosis, hypertensive chronic renal disease, acute and chronic renal disease. Age- and sex-stratified prevalence, and standardized prevalence ratios with 95% confidence intervals (CI), of renal complications
in AS compared with the general population were calculated. Sensitivity analysis was conducted using two ICD-9 codes for AS.

Results: There were 8,616 individuals identified with AS; 56% were male and the median age at diagnosis was 42 years. Overall, renal complications were diagnosed among 3.4% and 2.1% of males and females with AS, compared to 2.0% and 1.6% of males and females in the general population cohort, respectively. Prevalence of renal complications increased with age in both the AS and general population cohort. Age- and sex-stratified prevalence ratios, comparing the risk of renal complications among those with AS to the general population, demonstrated a significantly excess risk of renal complications that was highest among younger individuals with AS. Overall, individuals with AS were at a significantly increased risk of renal complications compared to members of the general population (irrespective of a coding for hypertension), with a standardized prevalence ratio of 1.7 (1.5 – 2.0).

Standardized prevalence ratios were 6.0 (2.0 – 18.0) for amyloidosis, 1.7 (1.4 – 2.0) for chronic kidney disease, 3.2 (0.8 – 12.4) for hypertensive kidney disease, and 1.9 (1.5 – 2.3) for acute kidney disease. The excess risk was highest among younger individuals with AS, and results were similar when two ICD-9 codes were used to identify AS.

Conclusion: This population-based analysis shows that individuals with AS are at increased risk of many types of renal complications, including acute kidney disease, with the excess risk being greatest among younger individuals. These data highlight the importance of careful monitoring for renal complications among those with AS, particularly during long-term continuous use of NSAIDs.


ACR Concurrent Abstract Session
Miscellaneous Rheumatic and Inflammatory Diseases: Periodic Fever Syndromes
Sunday, November 11, 2012, 2:30 pm – 4:00 pm

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Familial Mediterranean Fever: Inhibition of IL-6 Signalling As a New Therapeutic Option in a Frequent Autoinflammatory Syndrome
Nicola Stein1, Matthias Witt1, Michael Baueerle1, Fabian Prof2, Hendrik Schulze-Koops1 and Mathias Gruenke1, 2Medizinische Klinik und Poliklinik IV, Klinikum der Universität München, Munich, Germany, 2Klinikum Nürnberg, Nuerenberg, Germany, 3University of Munich, Munich, Germany

Background/Purpose: Familial Mediterranean Fever (FMF) is the most prevalent episodic fever syndrome with more than 100,000 affected individuals worldwide. Colchicine is the established first-line therapy to control disease activity, to achieve remission and to prevent secondary amyloidosis, a significant complication of an inadequately controlled disease and the major cause of mortality in FMF patients. One third of patients with FMF are non- or only partial responders to colchicine and therewith call for experience with other immunosuppressive agents in FMF. Here, we present the first case series of five patients with Familial Mediterranean Fever (FMF) refractory to treatment with colchicine and/or anakinra, who have been switched to monthly treatment with tocilizumab.

Methods: Up to date, eight FMF-patients have been screened for receiving tocilizumab because of inadequate clinical and/or serological response to colchicine and inadequate response or intolerance of anakinra. Treatment has been started in five FMF-patients and is administered with 8 mg/kg bodyweight tocilizumab every 28 days. Colchicine was continued in four patients and discontinued in one patient. Treatment with anakinra, previously given in two patients, was discontinued.

Results: Three patients showed a good clinical and serological response to tocilizumab. In these patients remission of FMF symptoms was achieved with the first application of tocilizumab. A normalization of SAA- and CRP-level was documented after the first application of tocilizumab in one patient and after the third application in another patient. The therapy was well tolerated in four patients with no relevant side effects (one uncomplicated urinary tract infection). In one patient with no acute FMF-attack after the first application of tocilizumab, the therapy had to be discontinued because of an anaphylactic reaction during the second infusion. The first treated patient achieved prolonged remission with tocilizumab-treatment and has been switched back to colchicine alone for maintenance therapy after the ninth infusion. He still is in remission, now 18 months after initiation of tocilizumab therapy. Patient 2 is still on tocilizumab. The request for a self-administerable drug led to a switch back to anakinra after the third infusion of tocilizumab in patient 3. Only patient 4 did not respond to tocilizumab and showed persistent arthralgia and a relapse with abdominal pain after the third infusion. The non-responding patient and the patient with the anaphylactic reaction were switched to anakinra. Three additional patients have currently been scheduled for start of tocilizumab therapy in the nearest future.

Conclusion: This is the first documentation of a case series of successful treatment of FMF with tocilizumab. Of note, interference with IL-6 activity did not only result in complete clinical remission in three of the five patients previously resistant to immunosuppressive therapy, but also in complete serological remission as indicated by normalization of SAA in two individuals. These data strongly argue in favour of IL-6 as a main inflammatory cytokine in FMF and, thus, as a promising target in this disease.

Disclosure: N. Stein, None; M. Witt, None; M. Baueerle, None; F. Prof, None; H. Schulze-Koops, None; M. Gruenke, None.

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Efficacy and Safety of Canakinumab in Patients with Cryopyrin Associated Periodic Syndrome: Results From Meta-Analysis of 5 Studies
Helen J. Lachman1, Jasmin B. Kuemmerle-Deschner2, Tosho Heike3, Theresa Sabel1, Shunpei Yamanaka4, Phil Mckernan5, Albert Widmer6, Nicole Davis7 and Eric Hachulla8. 1University College London Medical School, London, United Kingdom, 2Division of Pediatric Rheumatology, Department of Pediatrics, University Hospital Tuebingen, Tuebingen, Germany, 3Department of Pediatrics, Graduate School of Medicine, Kyoto University, Kyoto, Japan, 4Department of Pediatrics, Graduate School of Medical Science, Kyushu University, Fukuoka, Japan, 5Department of Pediatrics, Yokohama City University, Graduate School of Medicine, Yokohama, Japan, 6Novartis Pharma AG, Basel, Switzerland, 7Novartis Pharmaceuticals Corporation, East Hanover, NJ, 8Department of Internal Medicine, Claude Huriez Hospital, University of Lille, Lille CEDEX, France

Background/Purpose: Canakinumab (CAN) is approved in over 60 countries for the treatment of CAPS. This meta-analysis evaluated the efficacy and safety of CAN and assessed potential differences across age and the 3 CAPS phenotypes (FCAS, MWS, and NOMID).

Methods: This meta-analysis pooled data from 5 studies (1 phase II and 4 phase III). Data from 2 of the 4 phase III, open-label, uncontrolled studies with similar efficacy endpoints (n=185, including 128 CAN-naïve patients) were pooled for efficacy analysis (the other studies were of a different design and not included). Patients previously treated with CAN could “roll over” into one of these phase III studies. Step-wise dose escalations from 150 mg or 2 mg/kg (if weight 15–40 kg) every 8 weeks (q8w) up to 600 mg or 8 mg/kg and not included). Patients previously treated with CAN could “roll over” into one of these phase III studies. Step-wise dose escalations from 150 mg or 2 mg/kg (if weight 15–40 kg) every 8 weeks (q8w) up to 600 mg or 8 mg/kg q8w were allowed in patients who did not achieve/remain in complete response (CR; defined as physician global assessment [PGA] ≤ minimal, assessment of skin disease ≤ minimal, serum C-reactive protein ≤ 10 mg/L and/or serum amyloid A protein ≤ 10 mg/L) in the 2 studies pooled for efficacy. The primary efficacy endpoint, CR was assessed in CAN-naïve patients (n=128). Percentage of patients with relapse assessment and PGA were evaluated in CAN-naïve plus roll-over patients (n=185). For safety analysis, data from all 5 studies were pooled (n=194).

Results: 85.2% (109/128) of CAN-naïve patients achieved CR; 65.6% (84/128) with 150 mg or 2 mg/kg, 42 patients (32.8%) required dose escalation to 300 or 600 mg (4–8mg/kg) q8w of whom 25 achieved CR at a higher dose, including 7 patients at the highest dose. Of 159 patients assessed for relapse, 142 (89.3%) did not relapse at any dose. CR and relapse data by phenotype and age are shown in Table.

Patients treated with 150mg or 2mg/kg q8w had greater reduction in disease activity (PGA; absent/minimal symptoms) than patients who required dose escalation (91.4% vs 60% to 77.8%) at the End of Study (EOS) (or Week 48). FCAS patients (92%) showed lowest disease activity score at EOS compared to MWS (85.1%) and NOMID (81.8%). Patients as young as 2–<4 yrs had a reduction in disease activity score by Day 8 and EOS (57.1% and 71.4%, respectively, with absent/minimal symptoms). 94.3% (183/194) patients had at least 1 adverse event (AE). Most frequently reported AEs were nasopharyngitis (36.1%), headache (23.7%), rinitis (17.5%) and upper respiratory tract infection (16.4%). Serious AEs (SAEs) occurred in 13.4% and 16.4% vs 3.2%).

The meta-analysis showed increased risk of any adverse event (AE) (OR = 1.7, 95% CI = 1.4–2.0) for chronic kidney disease 3.2 (0.8 – 12.4) for hypertensive kidney disease, with the excess risk being greatest among younger individuals. These data strongly argue in favour of IL-6 as a main inflammatory cytokine in FMF and, thus, as a promising target in this disease.


Sunday, November 11
Conclusion: This meta-analysis confirms the efficacy of CAN in CAPS across all phenotypes and also for the youngest patients (2–4 yrs). Dose escalation was most frequent in younger and NOMID patients who did not respond to initial dose. It did not appear that there was an increase in AEs and SAEs with an increase in dose or decrease in age.

Disclosure: H. J. Lachmann, Novartis, 5; J. B. Kuenmerle-Deschner, Novartis, 2, Novartis, 5; 7, T. Heike, None; T. Harra, None; S. Yokota, Novartis, 5; P. Mckernan, Full time employee of Novartis, 3; A. Widmer, Full time employee of Novartis, 3; N. Davis, Full time employee of Novartis, 3; E. Hachulla, None.

Background/Purpose: TNF receptor associated periodic syndrome (TRAPS) is a rare dominantly inherited periodic fever syndrome due to mutations of the TNFRSF1A gene. It is characterized by recurrent fever attacks associated with rash, musculoskeletal and abdominal pain, conjunctivitis, and periorbital edema. Approximately 10–20% of pts develop renal amyloidosis. The IL-1 receptor antagonist anakinra has been reported to be an efficacious treatment. Canakinumab (CAN) is a fully human monoclonal antibody with a T1/2 of 4 wks. Interim data of open label 4-months CAN therapy and 5-months follow-up in active TRAPS pts is presented.

Methods: 14 adults and 6 children (7 to 78 yrs, median 39 yrs) with active TRAPS entered a 3-part trial: 4 months open-label 150 mg (or 300 mg) CAN every 4 wks followed by up to 5 months treatment withdrawal, and then 24 months open-label CAN. Disease activity was evaluated by a 5-point physician’s global assessment (PGA) score and by CRP and SAA levels. Primary endpoint was complete or almost complete response at Day 15. Complete response was defined as clinical remission (PGA of 0 or 1 [absent or minimal signs/symptoms] and normal CRP and/or SAA. Complete response was defined as clinical remission and elevated but ≥70% reduced from baseline CRP and/or SAA. Quality of life was assessed by the SF-36 in adults. Those without response by Day 8 were eligible for another 150 mg dose and then 300 mg thereafter. Pts were observed after last dose until relapse (5 month max) before restarting CAN.

Results: On Day 8, 16 (80%) achieved complete/almost complete response and 18 (90%) achieved clinical remission. Two pts without clinical remission were dose up-titrated to 300 mg. At Day 15, 19 (95%) achieved complete/almost complete response, including all 4 without it at Day 8. Clinical remission was maintained by all from Day 15 onwards except 1 who relapsed at Day 85, responding to that visit’s CAN dose. Median time to clinical remission was 4 days (95% CI: 3.8). Median baseline CRP (125 mg/L) and SAA (198 mg/L) both reduced to <5 mg/L from Day 15 onwards. All relapsed after stopping CAN at a median 91.5 days. The relapse graded by the PGA was mild in 11, moderate in 7, and severe in 2. Upon redose, 18 regained complete/almost complete response 8–27 days later and 2 relapsed at final visit with no follow-up available for this analysis. Baseline SF-36 components improved after CAN therapy. All pts reported ≥1 adverse event (AE). Infections, mostly of the upper respiratory tract (URI), was the most common AE category. Headache (n=9) followed by abdominal pain (n=7) were the most common specific AEs reported. Two serious AEs, a URI and a TRAPS relapse, were reported. All pts are active in the 24-month open-label period.

Conclusion: Canakinumab produced a rapid and effective clinical and serological benefit which was maintained with continued dosing. Relapse occurred at a median of 3 months after last dose, was usually mild or moderate, and resolved upon re-dosing. Canakinumab demonstrated a favorable safety and tolerability profile in this small study. Data support IL-1β’s pivotal role in TRAPS and further study is needed to better define canakinumab treatment.

Disclosure: M. Gattorno, Novartis, 2; Novartis, 5; Novartis, 8; Sobi, 8; L. Obici, Novartis, 5; A. Meini, Novartis, 5; V. Tormeye, None; K. Abrams, Novartis, 3; Novartis, 1; N. Davis, Novartis, 3; C. Andrews, Novartis, 3; Novartis, 1; H. J. Lachmann, Novartis, 5.

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Efficacy and Safety of Canakinumab in Adults with Colchicine Resistant Familial Mediterranean Fever. A. Gul1, O. Ozdogan2, B. Erer3, S. Ugurlu4, N. Davis5, S. Sevgi6 and O. Kasapcopur1. 1Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey, 2Novartis Pharmaco, 3East Hanover, 4Novartis Pharma, Istanbul, Turkey

Background/Purpose: Familial Mediterranean fever (FMF) is associated with variations in the MEFV gene resulting in proteolytic activation of IL-1β through the inflammasome complex. FMF is characterized by recurrent fever attacks associated with rash, peritonitis, pleuritis, arthritis, and/or erysipelas-like rash. Colchicine is the standard of care to prevent attacks and development of secondary amyloidosis, but there is no established treatment available for those resistant or intolerant to it. Canakinumab, a fully humanized selective anti-IL-1β monoclonal antibody with a half-life of 4-weeks binds to human IL-1β and neutralizes its proinflammatory effects. The aim of this study is to evaluate the efficacy and safety of canakinumab by documenting the FMF attack rate and adverse events (AE) in adolescents and adults with FMF who are resistant or intolerant to colchicine.

Methods: FMF patients describing ≥1 attack/month in the preceding 3-months despite the highest tolerated colchicine dose were eligible to enter a 30-day run-in period. Those with an attack in the run-in period advanced to a 3-month treatment period to receive canakinumab 150mg sc every 4-weeks starting at the next attack in the following month. Patients then followed-up for up to 2 months or until the next attack. Attacks were confirmed by presence of fever, peritonitis and/or CRP. Primary efficacy outcome was the proportion of patients with ≥50% reduction in time-adjusted attack frequency in the treatment vs pre-treatment periods. Secondary objectives included the percent of patients with no attacks in the treatment period, time to next attack after the last canakinumab dose, and changes in the quality of life by SF-36. Safety was assessed by AEs and laboratory values at each visit.

Results: Thirteen patients entered the run-in period and 9 (median age 22 yrs, range 12–34 yrs) advanced to the treatment period. Only 1 patient had an attack (peritonitis) in the treatment period and all had a ≥50% reduction in their time-adjusted pre-treatment attack rate. Median baseline elevated CRP (58mg/L) and serum AA (162mg/L) levels normalized (CRP, 2.5mg/L; SAA, 5.8mg/L) by Day 8 and remained low throughout the study. The Physical and Mental Component scores of the SF-36 improved from a median baseline of 32 and 38 to 81 and 78 at Day 8 respectively, and continued to improve throughout the treatment period. Five patients had an attack in the follow-up period which occurred a median 71 days (31–78 days) from the last canakinumab dose. Compared to baseline, the physician and patient global assessment of FMF control improved with treatment with overall the response to treatment reported as Very Good by both physicians (9/9) and patients (7/9) at study end. Eight patients reported at least 1 adverse event (AE) with headache (n=4) and upper respiratory tract infection (n=2) being the only AEs reported in more than 1 patient. No one discontinued early from the trial.

Conclusion: In this pilot study, canakinumab was found to be effective at controlling the attack recurrence in FMF patients resistant or intolerant to colchicine. AEs were similar to previous canakinumab trials and were manageable. Further studies are warranted to explore the role of canakinumab in the treatment of FMF.

Disclosure: A. Gul, Novartis Pharmaceutical Corporation, 3; Novartis Pharmaceutical Corporation, 2; Xoma Corporation, 2; Xoma Corporation, 5; Servier, 5; H. Ozdogan, Novartis Pharmaceutical Corporation, 2; Novartis Pharmaceutical Corporation, 9; B. Erer, None; S. Ugurlu, None; N. Davis, Novartis Pharmaceutical Corporation, 3; S. Sevgi, Novartis Pharmaceutical Corporation, 3; O. Kasapcopur, Novartis Pharmaceutical Corporation, 2; Novartis Pharmaceutical Corporation, 5.

Table.

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<th>Phenotype</th>
<th>Number of NOMID %</th>
<th>MMS %</th>
<th>FCAS %</th>
<th>&lt;4 yrs</th>
<th>4–11 yrs</th>
<th>12–17 yrs</th>
<th>18–59 yrs</th>
<th>≥60 yrs</th>
<th>No follow-up</th>
<th>Complete response</th>
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<td>Parameters</td>
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<td>(n/N)</td>
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<td>42.9</td>
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<td>86.4</td>
<td>67.8</td>
<td>55.2</td>
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<tr>
<td>Complete response</td>
<td>N=108</td>
<td>76.1</td>
<td>30.2</td>
<td>32.6</td>
<td>28.9</td>
<td>51.0</td>
<td>29.9</td>
<td>63.6</td>
<td>49.5</td>
<td>43.0</td>
</tr>
</tbody>
</table>

A. Gul1, H. Ozdogan2, B. Erer3, S. Ugurlu4, N. Davis5, S. Sevgi6 and O. Kasapcopur. 1Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey, 2Novartis Pharma, 3East Hanover, 4Novartis Pharma, Istanbul, Turkey

Note: *Of the 38 NOMID patients, 21 (55.3%) required dose escalation, 11 of whom later achieved complete response, 3/4 patients were NOMID.
Whole Transcriptome Analysis in Erdheim-Chester Disease: A Multi-center Collaborative Study of 58 Patients. Laurent Arnaud1, Julien Haroche1, Lorenzo Dagna2, Augusto Vaglio3, Bruno Faivre4, Karim Dorgam5, Baptiste Hervier5, Fleur Cohen-Aubart5, Gay Gorochov5, and Zahir Amoura5. Hospital Pitié-Salpêtrière, AP-HP & UPMC Univ Paris 06, Paris, France, 2Vita-Salute San Raffaele University School of Medicine and San Raffaele Scientific Institute, Milano, Italy, 3University of Parma, Parma, Italy, 4Institut National de la Santé et de la Recherche Médicale, INSERM UMR-S 945, Paris, France

Background/ Purpose: To date, gene expression profiling has not been performed in Erdheim-Chester disease (ECD), a rare, non-Langerhans form of histiocytosis. The aim of this study was to analyze the transcriptome of ECD compared to healthy individuals, as a manner to identify new pathways involved in the pathogenesis of the disease as well as new therapeutic targets.

Methods: Total RNA was extracted from peripheral blood mononuclear cell (PBMC) obtained in 58 patients with biopsy-proven ECD and 36 healthy individuals. Complementary DNA (cDNA) was hybridized in Illumina Human HT-12v4 Expression Bead Chips. Statistical analysis of Microarray (SAM) algorithm with Benjamini and Hochberg multiple testing correction was used to determine the statistical significance of the differences in gene expression while controlling the false-discovery rate. Cluster analysis was also performed with IMP and Affymetrix. Differentially expressed genes were analyzed to identify potential functional pathways using Ingenuity® Pathway Analysis (IPA).

Results: Gene expression analysis using SAM showed 265 significantly down- or up-regulated transcripts between ECD patients and controls. Cluster analysis of these transcripts by similarity on gene expression patterns identified several clusters containing only ECD patients, healthy individuals, or both, underlining the strong heterogeneity of the disease. The set of genes statistically different between ECD and healthy individuals was further analyzed with IPA Analysis, which revealed a role for genes related to growth factor and cytokine activities, cyclin-dependant cell-cycle genes, regulation of phosphate homeostasis, DNA packaging, transcription regulation, and mRNA stability.

Conclusion: This large multicenter collaborative transcriptome analysis of 58 patients with Erdheim-Chester disease reveals that complex gene expression patterns are involved in the pathogenesis of the disease. This may be seen as a significant advance in this rare disease with poor prognosis and non-formally codified therapeutic management.

Disclosure: L. Arnaud, None; J. Haroche, None; L. Dagna, None; A. Vaglio, None; B. Faivre, None; K. Dorgam, None; B. Hervier, None; F. Cohen-Aubart, None; G. Gorochov, None; Z. Amoura, None.

IFNg Production Is Intimately Associated with Clinical and Laboratory Features of CpG-Induced Secondary Hemophagocytic Lympohistocytosis (sHLH)/Macrophage Activating Syndrome (MAS) in Mice. Vanessa Butois, Laurence Chatel, Laura Cons, Maureen Deen, Cristina de Min, Marie Kosco-Vilbois and Werner Felten. NovImmune S.A., Geneva, Switzerland.

Background/ Purpose: Repeated TLR9 stimulation with CpG DNA has been found to result in a sHLH/MAS-like disease in mice (1). CpG-administered mice present with cytopenia, anemia, thrombocytopenia, splenomegaly, hepatitis and hyperferriterina. The use of IFNg deficient mice as well as treatment of wild type mice with the anti-IFNg monoclonal antibody (mAb), XM1G1.2, suggested an important role for IFNg in the pathogenesis of sHLH/MAS. Our aim was to extend these findings and perform biomarker studies to correlate the kinetics of IFNg production to sHLH/MAS disease endpoints.

Methods: C57BL/6 mice (n=10) were administered 5 × 50µg injections of CpG-1826 over a 10-day period (day 0, 2, 4, 7 and 9). XM1G1.2 was administered i.v. at 30ng/kg 24hrs preceding each CpG injection. Quantitative Real-time PCR was used to analyze inflammatory gene expression. Luminex multiplex technology was used to detect serum inflammatory cytokines. Whole blood cell count, red blood cells and haemoglobin were assessed using a haematocellular counter.

Results: We observe a multi-phasic production of IFNg in serum with peak levels reaching 600pg/ml at day 7. Cytokine mRNA level expression confirms the multi-phasic production of IFNg in the liver and spleen following each exposure to CpG. The initial peak of IFNg production correlates with the rapid appearance of cytopenia and thrombocytopenia, while each additional injection of CpG sustains these symptoms and generates new features such as anemia, hemoglobinemia, splenomegaly, hypercytokinemia and ferriterina, culminating in induction of acute phase protein SAA and severe disease. IFNg-induced gene signature biomarkers, e.g., CTIIA (MHC class II trans-activator gene) and CXCL10, are upregulated in spleen and liver as too inflammatory cytokines IL-6 and TNFα. Neutralization of IFNg by XMG1.2 reduces body weight loss and splenomegaly, normalizes white blood cell counts, significantly reverses the decrease in other laboratory parameters (e.g., platelets, haemoglobin and red blood cells) and controls hyperferriterina.

Conclusion: Thus, IFNg production is intimately associated with the clinical and laboratory features in the CpG-induced sHLH/MAS model suggesting the inhibition of this cytokine as a therapeutic target for patients afflicted with this life-threatening disease.


Disclosure: V. Butois, None; L. Chatel, None; L. Cons, None; M. Deen, None; M. Kosco-Vilbois, None; W. Felten, None.

ACR Concurrent Abstract Session

Muscle Biology, Myositis and Myopathies: Classification, Treatment and Outcome in Idiopathic Inflammatory Myopathies

Sunday, November 11, 2012, 2:30 pm–4:00 pm

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Progress Report On Development of Classification Criteria for Adult and Juvenile Idiopathic Inflammatory Myopathies. Anna Tjämlind1, Matteo Bottai2, Lisa G. Rider3, Victoria P. Werth4, Clarissa A. Pilkington5, Marianne de Visser6, Lars Alfredsson7, Anthony A. Amato8, Richard J. Barohn9, Matthew H. Liang10, Jasvinder A. Singh11, Frederick W. Miller12, Ingrid E. Lundberg12 and the International Myositis Classification Criteria Project 13. Rheumatology Unit, Department of Medicine, Karolinska University Hospital, Solna, Karolinska Institutet, Stockholm, Sweden, Stockholm, Sweden, 2Institute for Environmental Medicine, Karolinska Institutet, Stockholm, 3Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, 4NIH, NIH, Bethesda, MD, 5University of Pennsylvania and Philadelphia V.A. Medical Center, Philadelphia, PA, 6Great Ormond Street Hospital for Children NHS Trust, London, United Kingdom, 7Department of Neurology, Academic Medical Centre, Amsterdam, Netherlands, Amsterdam, Netherlands, 8Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, 9Brigham and Women’s Hospital and Harvard Medical School, Boston, MA, 10Department of Neurology, University of Kansas Medical Center, Kansas City, USA, Kansas City, MO, 11Brigham & Womens Hospital, Boston, MA, 12University of Alabama at Birmingham, Birmingham, AL, 13Karolinska Institutet, Stockholm, Sweden, 14Stockholm

Background/ Purpose: In patients with idiopathic inflammatory myopathies (IIM) persisting muscle impairment after treatment underscores the need for improved management. Inadequate classification criteria for IIM are a fundamental limitation in clinical studies of myositis. An international, multidisciplinary collaboration, the International Myositis Classification Criteria Project (IMCCP), with support from ACR and EULAR, seeks to develop and validate new classification criteria for adult and juvenile IIM and its major subgroups.

Methods: Identification and definition of potential criterion Candidate variables to be included in classification criteria were assembled from published criteria and inclusion criteria in controlled trials of myositis and refined using Nominal Group Technique. Effort was made to assure content validity. Comparator groups confirmed with IIM were defined.

Data collection Within this retrospective case control study, clinical and laboratory data from IIM and comparator patients were collected from 47 rheumatology, dermatology, neurology and pediatrics clinics worldwide from 2008–2011.

Analysis Crude pair-wise associations among all variables measured and between each variable and clinician’s diagnosis were assessed. Three approaches for derivation of classification criteria were explored: 1. Traditional: case defined by specified number of items from a set 2. Risk score: patient assigned a probability risk score by summing score-points associated with the variables (Model 1) 3. Classification tree: case defined by a decision tree (Model 2)

A random forest algorithm explored the most important variables. Results obtained with each approach were utilized to improve others iteratively.

Validation Internal validation using bootstrap methods was performed.
Results: Data from 973 IIM (74% adults; 26% children) patients and 629 comparators (81% adults; 19% children) were obtained, representing subgroups of IIM (245 polymyositis, 239 dermatomyositis, 176 inclusion body myositis and 246 juvenile dermatomyositis cases). The comparators include other myopathies and systemic rheumatic diseases. Two models were developed (Table). Model 1 performs better than Model 2 although both models perform equally to, or better than, current published criteria.

Table. New models for classification criteria for IIM and performance of criteria

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical Muscle Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Objective symmetric weakness, usually progressive, of the proximal upper extremities</td>
<td>0.7</td>
</tr>
<tr>
<td>Objective symmetric weakness, usually progressive, of the proximal lower extremities</td>
<td>0.6</td>
</tr>
<tr>
<td>Neck flexors are relatively weaker than neck extensors</td>
<td>1.6</td>
</tr>
<tr>
<td>In the legs proximal muscles are relatively weaker than distal muscles</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Skim Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Heliotrope rash</td>
<td>3.3</td>
</tr>
<tr>
<td>Gottron’s papules</td>
<td>2.3</td>
</tr>
<tr>
<td>Gottron’s sign</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Other Clinical Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Dysphagia or esophageal dysmotility</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Laboratory Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Serum creatine kinase (CK) activity</td>
<td>1.2</td>
</tr>
<tr>
<td>Anti-Jo-1 (anti-His) antibodies</td>
<td>4.2</td>
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<tr>
<td><strong>Score-sum from above items</strong></td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Muscle Biopsy Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Endomyosial infiltration of mononuclear cells surrounding, but not invading, myofibers</td>
<td>1.6</td>
</tr>
<tr>
<td>Perimysial and/or perivascual infiltration of mononuclear cells</td>
<td>1.1</td>
</tr>
<tr>
<td>Perifascicular atrophy</td>
<td>1.7</td>
</tr>
</tbody>
</table>

When muscle biopsies are available, multiply the score-sum of all other variables by 0.9 and then add the scores of the positive biopsies.

MODEL 2. CLASSIFICATION TREE

(a) Heliotrope rash:
   If yes then IIM; if no go to step (b)
   (b) Objective symmetric weakness, usually progressive, of the proximal lower extremities:
      If yes then go to step (c); if no go to step (b)
      (c) Endomyosial infiltration of mononuclear cells surrounding, but not invading, myofibers:
         If yes then IIM; if no go to step (d)
      (d) Perimysial and/or perivascual infiltration of mononuclear cells:
         If yes then IIM; if no go to step (e)
      (e) Serum alanine aminotransferase activity:
         If yes then IIM; if no go to step (f)
   (f) Interstitial lung disease:
      If yes then IIM; if no go to step (g)
   (g) Dysphagia or esophageal dysmotility:
      If yes then IIM; if no go to step (h)
   (h) Mechanic’s hands:
      If yes then IIM; if no then not IIM
   (i) Endomyosial infiltration of mononuclear cells surrounding, but not invading, myofibers:
      If yes then IIM; if no then not IIM

Performance of New and Existing Classification/Diagnostic Criteria for IIM

<table>
<thead>
<tr>
<th>Performance (%)</th>
<th>Model 1 Risk Score a</th>
<th>Model 1 Tree</th>
<th>Model 2 Tree</th>
<th>Peter &amp; Bohan [12]</th>
<th>Tanimoto et al. [26]</th>
<th>Targoff et al. [27]</th>
<th>Dalakas &amp; Hohlfeld [28]</th>
<th>Hoogendijk et al. [31]</th>
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<tr>
<td>Sensitivity</td>
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<td>94</td>
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<td>Specificity</td>
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<tr>
<td>Positive predictive value</td>
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<td>93</td>
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<td>85</td>
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<td>Negative predictive value</td>
<td>84</td>
<td>87</td>
<td>80</td>
<td>90</td>
<td>72</td>
<td>84</td>
<td>43</td>
<td>57</td>
</tr>
<tr>
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<td>86</td>
<td>79</td>
<td>91</td>
<td>45</td>
<td>70</td>
</tr>
</tbody>
</table>

a Cut point for probability: 50%

Background/Purpose: Although muscle fatigue is a major source of functional impairment in dermatomyositis (DM) and polymyositis (PM), few valid and reliable methods for efficient evaluation of functional disability exist. The Functional Index (FI) was the first to specifically assess impairment in myositis, and consisted of 14 tasks to determine muscle endurance. The Functional Index-2 (FI-2) was a revision of FI, which decreased the tasks from 14 to 7. However, busy clinical practices may preclude feasibility of use. We developed a Functional Index-3 (FI-3) to streamline content for assessment of muscle endurance in DM and PM patients and tested its validity at a single academic center.

Methods: Twenty-eight patients with DM or PM diagnosis were recruited at our institution from 2010–2012. All patients participated in at least one of two sessions which included 3 tasks (shoulder flexion, head lift, hip flexion) performed bilaterally. After each task, participants completed the Borg CR-10 to rate perceived muscle exertion. Self-reported limitations in daily activities were assessed by the Myositis Activity Profile (MAP) and the Health Assessments Questionnaire (HAQ). Intra-class correlation (ICC) coefficients were calculated. Performance results from the tasks were correlated to the MAP, HAQ, and Borg CR-10 using Spearman’s correlation coefficient to assess validity.

Results: Fifteen patients with DM, 7 patients with anti-synthetase syndrome, and 6 patients with PM participated. The mean (SD) age was 58 (11) years and mean (SD) disease duration was 6.5 (4.4) years. There were 19 (68%) females. Six patients (21%) had active disease as determined by creatine kinase level and clinician judgment. Twelve patients completed the second session for intra-rater reliability. Consistently high ICC values indicate high intra-rater reliability; ICC (95% confidence interval): shoulder flexion, right 0.90 (0.69, 0.97); shoulder flexion, left 0.88 (0.64, 0.96); head lift, 0.66 (0.19, 0.89); hip flexion, right 0.64 (0.15, 0.88); hip flexion, left 0.84 (0.56, 0.95). Ten patients completed the second session for inter-rater reliability, and the high ICC values show that the raters agreed: shoulder flexion, right 0.81 (0.43, 0.95); shoulder flexion, left 0.94 (0.78, 0.98); head lift, 0.92 (0.74, 0.98); hip flexion, right 0.46 (−0.16, 0.83); hip flexion, left 0.60 (0.03, 0.88). Two patients had large decreases in repetitions in hip flexion during the second session (>8 repetitions). Correlations were significant between MAP, HAQ, and Borg CR-10 in all tasks as shown in the table.
Table. Spearman correlations of disease activity and Borg CR-10 scores with FI-3 task scores in session one

<table>
<thead>
<tr>
<th></th>
<th>MAP score (n=28)</th>
<th>HAQ score (n=27)</th>
<th>Borg CR-10 scores (n=28)</th>
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<tr>
<td></td>
<td>p-value</td>
<td>p-value</td>
<td>p-value</td>
</tr>
<tr>
<td>Shoulder flexion right</td>
<td>-0.62</td>
<td>-0.69</td>
<td>-0.57</td>
</tr>
<tr>
<td>Shoulder flexion left</td>
<td>-0.54</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Head lift</td>
<td>-0.50</td>
<td>0.006</td>
<td>0.55</td>
</tr>
<tr>
<td>Hip flexion right</td>
<td>-0.69</td>
<td>-0.77</td>
<td>-0.46</td>
</tr>
<tr>
<td>Hip flexion left</td>
<td>-0.56</td>
<td>-0.65</td>
<td>-0.40</td>
</tr>
</tbody>
</table>

Conclusion: The FI-3 is an efficient and valid method for assessment of muscle endurance in DM and PM patients. FI-3’s validity is supported by the significant correlations between functional tasks and the MAP, HAQ, and Borg CR-10 scores.

Disclosure: C. Chong, None; O. Ni Mhuircheartaigh, None; H. Alexanderson, None; T. A. Kermani, None; C. S. Crowson, None; A. B. Green, None; A. M. Reed, None; F. C. Ernste, None.

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Effect of B Cell Depletion Therapy with Rituximab On Myositis Associated Autoantibody Levels in Idiopathic Inflammatory Myopathy, Rohit Aggarwal1, Chester V. Oddis1, Andry Bandos1, Danielle Goudeau1, Diane Koontz2, Qi Zengbian1, Ann M. Reed3, Dana F. Ascherman4 and Marc C. Levesque1, 1University of Pittsburgh, Pittsburgh, PA, 2Univ of Pittsburgh Med Ctr, Pittsburgh, PA, 3Mayo Clinic, Rochester, MN, 4University of Miami, Miami, FL.

Background/Purpose: Myositis associated autoantibodies (MAA) in idiopathic inflammatory myopathy (IIM) demonstrate unique phenotypic features. In some autoimmune disorders, autoantibody levels correlate with disease activity and are reduced after B cell depletion (BCD). Our aim was to determine the effect of BCD on the serum levels of 3 common MAAs (anti-Jo-1, -TIF1g, -SRP) and to assess whether quantitative changes in MAA levels correlate with IIM core-set measures (CSM) [muscle muscle testing (MMT), muscle enzyme, physician global, patient/parent global, extramuscular disease activity and HAQ].

Methods: Treatment-resistant IIM subjects (n=200) received rituximab in a 44-week clinical trial, the Rituximab in Myositis (RIMY) Study. CSM were evaluated monthly and serial serum samples were collected. Anti-Jo-1 (n=25), -SRP (n=25) and -TIF1g (n=23) levels were measured using validated ELISAs. Temporal trends in MAA levels and longitudinal relationship between MAA levels and CSM within patients (adjusted for the total immunoglobulin (IgG) levels) was estimated using linear mixed models (SAS v. 9.2). Spearman correlation within each subject longitudinally and median MAA levels and CSM over time were evaluated.

Results: After start of the treatment autoAb levels in Jo-1 subjects decreased by approximately 9 units per week (p<0.001). Anti-Jo-1 levels longitudinally correlated with all CSM (p<0.05) univariately and after adjusting for IgG levels. In contrast, anti-TIF1g and anti-SRP levels do not demonstrate systematic trends with time; there was no significant correlation between anti-TIF1g or anti-SRP levels and any CSM. Median (IQR) Anti-TIF1g levels were unchanged between baseline [34 (11–85)] and the last visit [38 (13–94)]. Post-hoc analysis of anti-SRP levels (n=25) revealed intermediate results as 13/25 (52%) anti-SRP subjects dropped their autoAb level while 9 were unchanged. The 13 subjects with a decrease in anti-SRP levels had significantly higher baseline anti-SRP levels compared to the remaining patients [median 81 (12–208) vs. 5 (4–50); p=0.02]. Those 13 subjects demonstrated moderate to strong correlation (r>0.35) between anti-SRP levels and CSM except for the HAQ (median rho 0.26).

Conclusion: Anti-Jo-1 autoAbs levels in IIM patients decreased after BCD with rituximab and longitudinally correlated with changes in all CSM. In contrast, anti-TIF1g and anti-SRP levels did not change significantly over time and there were no significant correlations with CSM, except a subset of anti-SRP patients with higher baseline levels. The strong association of anti-Jo-1 levels with clinical outcomes suggests that these autoantibodies may have a direct pathogenic role in IIM that is mitigated by B cell depletion with rituximab and may be a good biomarker for disease activity.

Disclosure: R. Aggarwal, None; C. V. Oddis, Genentech and Biogen IDEC Inc., 9; A. Bandos, None; D. Goudeau, None; D. Koontz, None; Q. Zengbian, None; A. M. Reed, None; D. P. Ascherman, None; M. C. Levesque, Genentech and Biogen IDEC Inc., 2.
 Beneficial Role of Rapamycin in Experimental Autoimmune Myositis, Nicolas Prevel1, Yves Allenbach2, David Klatzman1, Benoît Salomon1 and Olivier Benveniste2. 1UPMC Université Paris 06, UMR 7211, Paris, France, 2Pitié-Salpetrière Hospital, Paris, France

Background/Purpose: Idiopathic inflammatory myopathies are a heterogeneous group of different diseases, classified into four main categories: dermatomyositis, polymyositis, immune-mediated necrotizing myopathy, and sporadic inclusion body myositis. The treatment of polymyositis consists of corticosteroids frequently associated to other immunosuppressive drugs. The obligatory and often severe side effects of these drugs, which have to be taken for several months or years, prompted us to propose alternative treatments, which have to be tested first in experimental animal models. Rapamycin is a known potent immunomodulator with less side effects compared to other immunosuppressants (e.g. ciclosporin). Rapamycin has been used for a decade in transplant patients to prevent graft rejection. In vivo, rapamycin has been described to decrease the presence and location of ulcers, with the novel finding that ulcers located at the digital pulp or periungual region; and ulcers elsewhere on the body including cutaneous ulceration gene 5 (MDA5), a DM-specific autoantigen that is associated with ILD, and may be associated with antibodies against melanoma differentiation-associated gene 5. We sought to better describe cutaneous ulceration in dermatomyositis (DM) model of polymyositis in mouse (Allenbach Y et al. Am J Pathol, 2009, 174, 989–998).

Methods: EAM is induced by 3 injections of myosin coupled with complete Freund’s adjuvant. Mice received rapamycin (1 mg or 3 mg/kg/day) during 25 days starting before myosin immunization (preventive treatment) or during 10 days following the last myosin immunization (curative treatment). Muscle strength and histology, composition of lymphocyte subpopulations, and KLF2 pathway, a transcription factor controlling lymphocyte homing, were studied.

Results: Under preventive or curative treatment, an increase of muscle strength was observed with in parallel a decrease of muscle inflammation, both being well correlated (R²=0.645, p<0.0001). Rapamycin induced a general decrease in frequency of effector T cells (lymphopenia in draining or non draining lymph nodes and spleen, harmoniously distributed between CD4+ and CD8+ T cells, but sparing B cells), and an increase in frequency of regulatory T cells (CD4+CD25+Foxp3+) in draining lymph nodes (rapamycin 3 mg/kg/day preventively treated mice compared to controls: 16.9±2.2% vs. 9.3±1.4%, p<0.001), which were mostly activated regulatory T cells (CD62LlowCD44high, 58.1±5.7% vs. 33.1±7%, treated vs. untreated, p<0.001). Furthermore, during preventive treatment, rapamycin increased the levels of KLF2 transcript in CD44lowCD26low naive T cell (2.2±0.14 vs. 1.05±0.14, treated vs. untreated, p<0.05) and in CD62LlowCD44high activated T cell (1.02±0.18 vs. 0.44±0.08, treated vs. untreated, p<0.05).

Conclusion: Rapamycin is an effective treatment for EAM, resulting in a decrease in effector T cells, an increase in regulatory T cells, and upregulation of KLF2 in naïve and activated T cells. Those observations suggest that rapamycin may represent an effective new therapeutic approach in patients with polymyositis. This approach may also be beneficial, since a deficiency in regulatory T cells has been reported during polymyositis.

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Cutaneous Ulceration in Dermatomyositis: Association with MDA-5 and Interstitial Lung Disease, Neera Narang1, Livia Casciola-Ronen2, Antony Rosen3, David Fiorentino4 and Lorinda Chung5. 1Stanford Univ Medical Center, Stanford, CA, 2Johns Hopkins University, Baltimore, MD, 3The Johns Hopkins University, Baltimore, MD, 4Stanford University School of Medicine, Redwood City, CA, 5Stanford Univ Medical Center, Palo Alto, CA

Background/Purpose: Dermatomyositis (DM) is a multisystem autoimmune disease that affects the muscles and skin and can be associated with malignancy or interstitial lung disease (ILD). Cutaneous ulceration can be seen in patients with dermatomyositis, and this has classically been associated with internal malignancy. We have recently described that ulceration can also be associated with antibodies against melanoma differentiation-associated gene 5 (MDAS), a DM-specific autoantigen that is associated with ILD, and mild or no muscle disease. We sought to better describe cutaneous ulceration in DM and to specifically identify clinical and serologic correlates of ulcers and their anatomic location.

Methods: We retrospectively examined a cohort of 131 DM patients followed in our interdisciplinary rheumatology-dermatology clinic. We collected data on demographics, ANA and DM-associate auto-antibodies (Jo-1, NXP2, Mi2, TIF-Gamma, SAE1, Ro52, MDAS) and clinical features including presence and location of ulcers, ILD (evidence of fibrosis or alveolitis on computed tomography), and malignancy within 3 years of symptom onset. The cutaneous ulcer locations were subdivided into three categories: ulcerations over joints (Gottron papules, knees, or elbows); ulcerations of the digital pulp or periungual region; and ulcers elsewhere on the body including those in sun-exposed areas. We compared the features of patients with ulcers to those without ulcers using chi-squared tests. We used univariate and multivariate logistic regression models to identify significant predictors for the presence of ulcers and ILD.

Results: In the overall cohort, the mean age was 45±19 years, 31% were male, and the ethnic distribution was 66% Caucasian, 19% Asian, 5% African American, and 10% Hispanic. 40 patients had cutaneous ulcers and 91 patients did not have ulcers. 50% of patients had ulcers over the Gottron papules and exterior surfaces, 40% at the digital pulp or periungual areas, and 62.5% had ulcers located elsewhere. Patients with any cutaneous ulcers were more likely to be Asian (p=0.006) or anti-MDA5+ (p<0.0001). We did not find a significant association between ulcers and malignancy. In multivariate analysis MDA5+ remained significant and increased the odds of ulcers by 10-fold (OR=10.1, 95%CI 2.0–51.8, p=0.006). Examining only the ulcer+ patients, ulcers located at the digital pulp or periungual areas was associated with a 20-fold increased odds of being MDA5+ (OR=20.9, 95%CI 3.5–126.5, p=0.0009). Consistent with previous reports, MDA5+ was associated with an increased risk for ILD (OR=5.8, 95%CI 1.8–18.4, p=0.003), that was higher in the presence of ulcers (OR=8.3, 95%CI 2.5–28.3, p=0.007), particularly if located at the digital pulp or periungual areas (OR=14.2, 95%CI 3.4–58.3, p=0.002).

Conclusion: We confirmed the strong association between MDA5+ and cutaneous ulcerations, with the novel finding that ulcers located at the digital pulp and periungual areas are highly predictive of the presence of ILD in these patients. DM patients who display this cutaneous phenotype should undergo appropriate evaluation for ILD.

Disclosure: N. Narang, None; L. Casciola-Ronen, None; A. Rosen, None; D. Fiorentino, None; L. Chung, None.

ACR Concurrent Abstract Session
Pediatric Rheumatology: Clinical and Therapeutic Disease I: Juvenile Idiopathic Arthritis I

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Efficacy and Safety of Canakinumab in Patients with Active Systemic Juvenile Idiopathic Arthritis and Fever: Results From Two Pivotal Phase 3 Trials. Hermine I. Brunner1, Nicolina Rupert2, Pierre Quartier1, Tamás Constantin3, Nico Wulffraat4, Gerd Horneff5, Riva Brik6, Liza McCann6, Huri Oズkogan7, Lidia Rutkowski-saka8, Rayel Schneider9, Yackov Berkov10, Immaculada Calvo11, Mufret Ergun11, Laurence Goffin12, Mathias Kindler13, Tilmann Kallinich14, Karine Lheritier15, Ken Abrams16, Andrea Stancati17, D. J. Lovell18 and Alberto Martin11. 1Pediatic Rheumatology Collaborative Study Group (PRCSG), Cincinnati, OH, 2Pediatrie Rheumatology International Trials Organisation (PRITO)-Istituto Genova, Italy, 3Necker-Enfants Malades Hospital, Paris, France, 4Novartis Pharma AG, Basel, Switzerland, 5Novartis Pharmaceutical Corporation, East Hanover, NJ, 6Cincinnati Children’s Hospital, Cincinnati, OH

Background/Purpose: Systemic juvenile idiopathic arthritis (sJIA) is an interleukin-1β (IL-1β)-mediated autoinflammatory disease. Canakinumab is a selective, fully human, anti-IL-1β monoclonal antibody. Two pivotal phase 3 trials evaluated the efficacy and safety of canakinumab in patients (pts) with active sJIA with fever.

Methods: Pts aged 2–19 yrs with active sJIA (fever, ≥2 active joints, C-reactive protein >30 mg/L) with inadequate response to standard of care treatments (NSAIDs, steroids, MTX) were enrolled. Trial 1 was a 4-wk, double-blind, single-dose study of pts randomized to subcutaneous (SQ) canakinumab 4 mg/kg or placebo. Trial 2 enrolled 177 pts, including eligible pts rolling over from Trial 1. In Part I of Trial 2, pts received open-label (OL) canakinumab 4 mg/kg/4wks SQ for up to 32 wks. Pts with an adapted ACR30 response to OL canakinumab 4 mg/kg were eligible to receive canakinumab 4 mg/kg SQ for up to 32 wks or placebo. The primary endpoint of Trial 2 was the proportion of ACR30 responders at Day 15. The primary endpoint of Trial 2 in Part I was the proportion of steroid-treated pts at entry who successfully tapered steroids, and in Part II the time to flare. Pts withdrawn due to protocol-driven
discontinuation rules were offered participation in the currently on-going OL long-term extension study.

Results: In Trial 1, 84 pts (canakinumab n = 43; placebo, n = 41) were enrolled. At Day 15, of the 84 pts, significantly more pts in the canakinumab group (83.7% [36/43]) vs. the placebo group (9.8% [4/41]) achieved an aACR-Ped30 response (P < 0.0001). In Trial 2, 177 pts received canakinumab in Part I, 100 of whom were randomized in Part II (canakinumab, n = 50; placebo, n = 50) and 77 discontinued. During Part I of Trial 2, 44.5% (57/128) of the steroid-treated pts successfully tapered steroids (P < 0.0001), with the mean steroid dose lowered to 0.05 mg/kg/d from 0.34 mg/kg/d. Of note, 32.8% (42/128) of the pts stopped steroids completely. In Part II, the median time to flare on placebo was 236 days vs. not observed with canakinumab, corresponding to a statistically significant 63% relative risk reduction of flares (HR 0.37; 95% CI 0.17–0.78; P = 0.0043). Inactive disease was achieved by 30.9% (54/175) of the canakinumab-treated pts at the end of Part I and 62% (31/50) upon completion of Part II (142.80% of) the enrolled pts from Trial 2 entered the OL extension study, which included 48 pts who had withdrawn from the Part I due to efficacy related protocol-driven discontinuation. In both trials, infections were the most common type of adverse event (AE) reported. Most Serious AEs were associated with infections, disease flare, and macrophage activation syndrome (MAS, n = 7, including 2 on placebo). Two deaths were reported (1 canakinumab, 1 placebo), both associated with MAS.

Conclusion: These data support that canakinumab is an effective treatment for active sJIA with fever. Canakinumab demonstrated superior efficacy vs. placebo, allowed successful reduction of steroid use, and significantly decreased the risk of sJIA flares, while demonstrating an acceptable safety profile.

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Conclusion: Catch-up Growth During Tocilizumab Therapy for Systemic Juvenile Idiopathic Arthritis: 2-Year Data From a Phase 3 Clinical Trial. Fabricio De Benedetti1, Nicolino Ruperto2, Graziela Espada3, Valeria Gerloni3, Berit Flato3, Gerd Hornoff4, Barry L. Myones5, Karen Onel6, James Franz4, Andrew Kenwright, Terri H. Lipman7, Kamal N. Bharucha8, Alberto Martin1 and D. J. Lovell9. IRCCS Ospedale Pediatrico Bambino Gesù, Rome, Italy, 2Paediatic Rheumatology International Trials Organisation [PRINTO], Genova, Italy, 3Paediatric Rheumatology International Trials Organisation–IRCCS [PRINTO], Genova, Italy, 4Centre of Pediatric Rheumatology, Santk Augustin, Germany, 5Paediatric Rheumatology Collaborative Study Group [PRSCG], Cincinnati, OH, 6Genentech, South San Francisco, CA, 7Roche, Welwyn Garden City, United Kingdom, 8University of Pennsylvania School of Nursing, Philadelphia, PA, 9Cincinnati Children’s Hospital, Cincinnati, OH

Background/Purpose: Systemic juvenile idiopathic arthritis (sJIA), characterized by chronic arthritis associated with prominent systemic and labora-

tory features, also has a significant impact on the growing skeleton, resulting in impaired linear growth and systemic osteoporosis. A phase 3 trial (TENDER) demonstrated that the interleukin-6 (IL-6) receptor inhibitor tocilizumab (TCZ) is effective in the treatment of patients with sJIA. Long-term growth responses for children in the TENDER trial (up to week 104) are presented.

Methods: The TENDER trial enrolled 112 patients (ages 2–17 years) with active, refractory sJIA [≥6-month duration with inadequate response to previous nonsteroidal anti-inflammatory drugs (NSAIDs) and oral corticosteroids]. After a 12-week, randomized, placebo-controlled phase, patients received open-label TCZ in the long-term extension. Height parameters, laboratory data, and clinical assessments of disease activity were compared at baseline and through year 2 of the study.

Results: At enrollment in the TENDER trial, the height measurements of study patients revealed profound growth failure (mean height standard deviation score [SDS] of −2.1; n = 107). During treatment, the majority of patients had greater than normal height velocities, with 85% of female patients and 73% of male patients demonstrating catch-up growth (Figure). The height SDS increased significantly from baseline to year 2 of the study, with a mean improvement of 0.61 (p < 0.0001, paired t-test). Although the mean corticosteroid dose was higher in the first year (0.13 mg/kg/day compared with 0.05 mg/kg/day in the second year), mean height velocities in the first and second years of the study were comparable at 5.8 and 6.3 cm/y, respectively (p = 0.32, paired t-test). During TCZ treatment, a significant increase in insulin-like growth factor 1 (IGF-1) levels was observed, suggesting a normalization of growth hormone axis function (mean baseline IGF-1 SDS of −1.1 [n = 95] compared with year 2 mean IGF-1 SDS of 0.0 [n = 91]; p < 0.0001, paired t-test). The osteocalcin/c-telopeptide of type 1 collagen (OC/CTX-1) ratio increased significantly (p = 0.0045, paired t-test), suggesting an increase in osteoblast activity relative to osteoclast activity.

Patients with greater improvement in JADAS-71 scores during the first year had greater height velocities during that year (r = −0.35, p = 0.0002; mean decrease in JADAS-71 of 29.2 [n = 107]).

Conclusion: TCZ therapy for sJIA resulted in catch-up growth of study patients. Additionally, TCZ therapy resulted in increased IGF-1 levels and OC/CTX-1 ratios, suggesting beneficial effects on the growth hormone axis and on bone metabolism. Improvement in JADAS scores correlated with increased height velocity. Continued data collection (for a total of 5 years) will allow a comprehensive analysis of growth outcomes in the TENDER study.

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Analysis of Biomarkers in Systemic Juvenile Idiopathic Arthritis Patients On Canakinumab Therapy, Nico Wulfraat1, Hermine I. Brunner1, Niccolò Ruperto1, Pierre Quartier2, Riva Brik2, Liza McCann2, Huri Ozdogan3, Lidia Rutkowska-Sak4, Ray elf Schneider5, Valeria Gerloni6, Liora Harel7, Maria Hilaˇrio4, Kristin Houghton7, Rik Joos1, Daniel Kingsbury2, Arndt Brachat4, Stephan Bek4, Martin Schumacher4, Marie-Anne Valentin4, Harel1, Maria Hila´rio2, Kristin Houghton2, Rik Joos1, Daniel Kingsbury2, Arndt Brachat4, Stephan Bek4, Martin Schumacher4, Marie-Anne Valentin4, N. R. Nirmala5, Hermann Gram3, Ken Abrams8, Alberto Martini1 and D. J. Lovell1.

1Paediatric Rheumatology International Trials Organization (PRINTO), Genova, Italy, 2Pediatric Rheumatology Collaborative Study Group (PRCSCG), Cincinnati, OH, 3Necker-Enfants Malades Hospital, Paris, France, 4Novartis Institutes for Biomedical Research, Basel, Switzerland, 5Novartis Institutes for Biomedical Research, Cambridge, MA, 6Novartis Pharmaceuticals Corporation, New Jersey, 7Cincinnati Children’s Hospital, Cincinnati, OH

Background/Purpose: Systemic Juvenile Idiopathic Arthritis (SJIA) is a severe disabling subtype of Juvenile Idiopathic Arthritis characterized by arthritis plus systemic symptoms, such as high fever, rash, serositis, and lymphadenopathy. Among others, interleukin (IL)-1β is an inflammatory cytokine that plays a dominant role in SJIA and several other autoinflammatory conditions, with anti-IL-1β therapy showing good efficacy in many of these settings. Canakinumab (CAN) is a high-affinity selective human monoclonal antibody targeted against IL-1β. Levels of inflammatory biomarkers and gene expression profiles of patients with active SJIA before and during canakinumab treatment were studied from patients aged 2 to <20 years participating in 2 phase III trials.

Methods: Serial measurements of levels of cytokines and proteins involved in inflammation (IL6; IL18; S100A8, A9 and A12) were made at baseline and at Days 3 and 29 after initiation of CAN treatment. Whole blood samples and DNA microarrays were used to characterize the early (Day 3) transcriptional response to CAN treatment and to predict efficacy. Gene Expression: For all comparisons, the number of down regulated genes was much larger than the number of upregulated genes upon treatment, suggesting that the active disease state was mainly characterized by transcriptional activation of “disease genes”. Transcriptional changes upon CAN treatment at Day 3 were highly consistent between the two trials. Subjects who showed strong transcriptional changes (primarily down regulation, p<0.05) also showed a strong adapted pediatric ACR response (≥ACR50) at Day 15, while subjects that did not reach ACR50 by Day 15 showed a much weaker transcriptional response at Day 3. Strongly responsive genes included many known inflammation and neutrophil-related genes, including IL-1β, encoding the CAN target. A set of transcripts was identified for which baseline expression levels predicted a subgroup of strong (<ACR30) responders at Day 15. However, another subgroup of strong responders was indistinguishable from weak responders (>ACR30) based on transcript levels at baseline.

Conclusion: CAN treatment resulted in a strong reduction of elevated baseline IL6 protein levels in patients with active SJIA, while IL18 protein levels remained largely unchanged until Day 29 of the treatment period. Many patients who showed a strong clinical benefit already at Day 15 were characterized by high baseline expression levels of inflammatory and neutrophil associated genes which were repressed after 3 days of CAN treatment. A second, smaller, group of patients showing good clinical response did, however, not show this pattern, suggesting the existence of mechanistically different subpopulations in this disease.

Disclosure: N. Wulfraat, Novartis, 9, H. I. Brunner, Novartis, UCB, Genentech, Jansen, GSK and Medimmune, 5, Participant in Scientific Advisory Committee for Canakinumab program in SJIA, 9; N. Ruperto, Abbott, AstraZeneca, Bristol Myers and Squibb, Centocor Research & Development, Eli Lilly and Company, 9; Francesco Angelini’s s.p.a., 2, AstraZeneca, Novartis, Bristol Myers and Squibb, Roche, Jansen Bilogics B.V., 8, Glaxo Smith & Kline, Italfarmaco, Merck Serono, Novartis, Pfizer Inc., Regeneron, Roche, Sanofi Aventis, Schwarz Biosciences GmbH, Xoma, Wyeth Pharmaceuticals Inc, 2, P. Quartier, Novartis, 8, R. Brik, None; L. McCann, None; H. Ozdogan, Novartis, 8, L. Rutkowska-Sak, None; R. Schneider, Hoffman-La-Roche, 5, Hoffman-La-Roche, 8, V. Gerloni, None; L. Harel, None; M. Hila´rio, None; K. Houghton, None; R. Joos, None; D. Kingsbury, None; A. Brachat, Novartis, 1, Novartis, 3; S. Bek, Novartis, 3; M. Schumacher, Novartis, 3; M. A. Valentim, Novartis, 1, Novartis, 3; N. R. Nirmala, Novartis, 1, Novartis, 5; H. Gram, Novartis, 1, Novartis, 3; A. Martini, Abbott, AstraZeneca, Bristol Myers and Squibb, Centocor Research & Development, Eli Lilly and Company, Xoma, Wyeth Pharmaceuticals, 2, AstraZeneca, Novartis, Bristol Myers and Squibb, Glaxo Smith & Kline, 8, Francesco Angelini’s s.p.a., Glaxo Smith & Kline, Italfarmaco, Merck Serono, Novartis, Pfizer Inc., Regeneron, Roche, Sanofi Aventis, Schwarz Biosciences GmbH, 9; D. J. Lovell, AstraZeneca, Bristol Myers and Squibb, Abbott, Pfizer, Regeneron, Hoffman-La-Roche, UBC, Xoma, Genentech, 5, Wyeth Pharmaceuticals, 8, Amgen, Forest Research, 9, Arthritis & Rheumatism, 9.

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Potentially Fatal Pulmonary Complications in Systemic Juvenile Idiopathic Arthritis, Yukiko Kimura1, Jennifer E. Weiss1, Kathryn L. Haroldson1, Tzielan C. Lee2, Marilynn G. Purno3, Sheila K. Feitosa de Oliveira4, Eglà C. RabinoVич5, Meredith P. Riebschleger6, Jordi Antón7, Peter R. Blier8, Valeria Gerloni6, Melissa M. Hazen10, Elizabeth Kessler11, Karen One12, Murray H. Passo13, Robert M. Rennebohm14, Carol A. Wallace15, Patricia Woo16, Nico M. Wulfraat17 and CARRAn Investigators8. 1JM Sanzari Children’s Hospital, Hackensack University Medical Center, Hackensack, NJ, 2Stanford Univ School of Med, Stanford, CA, 3Texas Scottish Rite Hospital, Dallas, TX, 4Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, 5Duke University Medical Center, Durham, NC, 6University of Michigan Health System, Ann Arbor, MI, 7Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy, 8Baystate Children’s Hospital, Springfield, MA, 9Gaetano Pini Chair of Rheum, Milan, Italy, 10Children’s Hospital Boston, Boston, MA, 11Medical College of Wisconsin, Milwaukee, WI, 12University of Chicago, Chicago, IL, 13Medical University of South Carolina, Charleston, SC, 14Alberta Children’s Hospital, University of Calgary, Calgary, AB, 15Seattle Childrens Hospital, Seattle, WA, 16University College London, London, United Kingdom, 17University Medical Center Utrecht, Utrecht, Netherlands, 18Durham

Background/Purpose: Systemic Juvenile Idiopathic Arthritis (sJIA) is characterized by fevers, rash, and arthritis, for which IL1 and IL6 inhibitors appear to be effective. Pulmonary artery hypertension (PAH), interstitial lung disease (ILD) and alveolar proteinosis (AP) have been recently reported in sJIA patients with increased frequency and is associated with mortality. The purpose of our study was to identify and characterize these cases and compare them to a larger cohort of sJIA patients.

Methods: A retrospective review of sJIA patients who developed PAH, ILD and/or AP solicited through an electronic listserv was performed. Demographic, sJIA and pulmonary disease characteristics and medication exposure information were collected. These features were compared to a cohort of sJIA patients enrolled in the Childhood Arthritis and Rheumatology Research Alliance (CARRA) pediatric rheumatic diseases registry.

Results: Patients (N=25) were significantly more likely (p<0.05) than the CARRA registry cohort (N=389) to be female and have more systemic features. They were also significantly more likely to have exposed to the following: an IL-1 inhibitor, tocilizumab, infliximab, corticosteroids, intravenous immunoglobulin, cyclosporine and cyclophosphamide. Eighty% were diagnosed after 2004. Twenty (80%) patients had MAS during their disease course and 16 (64%) had suggested/confirmed MAS at pulmonary diagnosis. Sixteen patients had PAH, 7 AP and 8 ILD. Dyspnea on exertion and shortness of breath were the most common symptoms. One patient was diagnosed at autopsy and did not have any known prior pulmonary symptoms. Pulmonary disease characteristics are shown in the Table. Seventeen (68%) patients were taking or recently (<1 month) discontinued a biologic agent at pulmonary symptom onset, and 12 (48%) were taking anti-IL1 therapy (primarily anakinra). Seventeen (68%) patients died at a mean of 10.2 months from pulmonary diagnosis.
Clinical features at pulmonary disease diagnosis

**Total N: 25**

- **Age at start of pulmonary symptoms (years)**\* 11.7 ± 5.2 (3.5–18.8)
- **Disease duration at pulmonary diagnosis (months)**\* 50.6 ± 44.6 (8–160)
- **Time between pulmonary symptoms to diagnosis (mos)**\* 3.1 ± 3.2 (0–10)
- **Time between pulmonary diagnosis to death (N=17)**\* 10.2 ± 13 (0–44)

**Disease features at pulmonary disease diagnosis N (%)**

<table>
<thead>
<tr>
<th>Feature</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>sJIA manifestations</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Any systemic manifestations**</td>
<td>23</td>
<td>92</td>
</tr>
<tr>
<td>MAS (suspected or confirmed)</td>
<td>16</td>
<td>64</td>
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<tr>
<td>Pericarditis/serositis</td>
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<td>Thrombotic thrombocytopenic purpura</td>
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<tr>
<td>Arthritis</td>
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<td>64</td>
</tr>
<tr>
<td>Pulmonary symptoms</td>
<td>18</td>
<td>72</td>
</tr>
<tr>
<td>Shorness of breath</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>Dyspnea on exertion</td>
<td>18</td>
<td>72</td>
</tr>
<tr>
<td>Cough</td>
<td>11</td>
<td>44</td>
</tr>
<tr>
<td>Clubbing</td>
<td>10</td>
<td>40</td>
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<tr>
<td>Chest pain</td>
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<td>20</td>
</tr>
<tr>
<td>Pulmonary diagnosis</td>
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<td>80</td>
</tr>
<tr>
<td>Pulmonary artery hypertension</td>
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<td>64</td>
</tr>
<tr>
<td>Allergic bronchopulmonary aspergillosis</td>
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<td>28</td>
</tr>
<tr>
<td>Interstitial lung disease</td>
<td>7</td>
<td>28</td>
</tr>
</tbody>
</table>

\* Mean ± SD (range)

**Conclusion:** Despite recent advances in therapy, sJIA remains a disease with significant morbidity and mortality. This is the first time that a large cohort of sJIA patients who developed PAH, AP and ILD has been described. These are important, largely fatal and under-recognized complications of sJIA which are likely to be the result of severe uncontrolled systemic disease activity and inflammation, but may be influenced by exposure to certain medications. Further prospective studies are needed to determine the factors associated with the development of these complications. Increased awareness regarding these complications in sJIA is needed, and screening for these complications should be considered in sJIA patients with significant and persistent systemic disease activity.

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**The Impact of Adalimumab On Growth in Patients with Juvenile Idiopathic Arthritis, D. J. Lovell, Nicolina Ruperto, Katerina Jarosova, Dana Nemcovova, Veronika Vargova, Hartmut Michels, Elizabeth Chalom, Norman Ilowite, Carine Wouters, Hermine Brunner, Karolyn Krakht, Hartmut Kupper, Edward Giannini, Alberto Martini and Neelufar Mozaffarian.**

Cincinnati Children’s Hospital, Cincinnati, OH, Pediatric Rheumatology International Society—IRCS (PRINTO), Genova, Italy, Pediatric Rheumatology Collaborative Study Group (PRSGC), Cincinnati, OH, Abbott, Abbott Park, IL, Abbott GmbH and Co. KG, Ludwigshafen, Germany.

**Background/ Purpose:** Children with juvenile idiopathic arthritis (JIA) often exhibit growth impairments. Treatment with adalimumab (ADA) has been shown to be safe and effective in JIA patients (pts) when dosed every other week (eow) for up to 3 years, but the effect of ADA on growth is not known. The purpose of this post hoc analysis is to describe growth parameters in pts with JIA treated with ADA in a clinical trial setting.

**Methods:** Pts aged 4–17 with polyarticular course JIA were enrolled in a phase 3, randomized-withdrawal, double-blind (DB), stratified, parallel-group study, which consisted of a 16-wk open-label (OL) lead-in phase, a 32-wk DB phase and an OL extension (OLE) phase. In the OLE phase, pts were dosed in pts with JIA treated with ADA in a clinical trial setting. For this analysis, pts in the DB phase who had a 3 month baseline period prior to study follow-up to assess for prevalent opportunistic infections (which excluded patients from analysis) and current medication exposures. All medication exposures to methotrexate (MTX), TNF inhibitor and systemic glucocorticoids (GC) were considered current for 30 days past the days supplied by the last filled prescription. Hospitalized and outpatient incident opportunistic infections were identified using physician diagnosis or hospital discharge codes. Identification of some infections (mycoses, tuberculosis, and herpes zoster) also required evidence of treatment with specific antimicrobials within 90 days. We calculated incidence infection rates (IR). The rates in the non-JIA comparator cohort were standardized to the age, sex, and race distribution of the JIA cohort. We calculated incidence rate ratios (IRR) to compare infection rates.

**Results:** The JIA cohort included 8,503 children with 14,373 person-years of follow-up; 1,392 used TNF inhibitors and 3,491 used MTX during follow-up. The non-JIA comparator cohort included 360,362 children with 490,939 person-years of follow-up. When all opportunistic infections were considered together as a single outcome, there were 42 infections in the JIA cohort (IR 300 [216–406] per 100,000; IRR 2.4 [1.7–3.3] versus non-JIA comparator). Among all children with JIA, there were no identified infections with Aspergillus, Blastomyces, Histoplasma, Cryptococcus, Legionella, Legionnaires disease, IC virus, or tuberculosis. We identified 1 infection each (IR 7 per 100,000) with Nocardia, non-tuberculous mycobacteria, Toxoplasma, and Pneumocystis. We identified 3 infections with Coccidioides (IR 21 per 100,000; IRR 101 [8.1–5319] versus non-JIA comparator); 5 infections with Salmonella (IR 35 per 100,000; IRR 3.8 [1.2–9.5]); and 32 cases of herpes zoster (IR 225 per 100,000; IRR 2.1 [1.4–3.0]). Among children with JIA, herpes zoster was not strongly associated with current use of GC (IRR 1.8 [0.6–4.5] versus no current GC use), MTX (IRR 1.4 [0.5–3.6] versus no current MTX or TNF inhibitor use), or TNF inhibitors (IRR 2.2 [0.7–6.9] versus current MTX use without current TNF inhibitor use).

**Conclusion:** Opportunistic infections are rare among children with JIA. Nevertheless, children with JIA had a higher rate of opportunistic infections including Coccidioides, Salmonella, and herpes zoster, than children without JIA. Herpes zoster was not strongly associated with specific immunosuppressant medications used to treat JIA.

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Results: Among the 171 pts enrolled in this study, 144 (84%) met ACR Pedi 30 response criteria at week 16, and 133 (78%) entered the DB phase. Of the 133 pts, 77% were female, with a mean age of 11.2 years, and a mean disease duration of 3.8 years; at baseline, 55 pts (41%) were in the ≤33rd percentile for weight and 78 pts (59%) were >33rd percentile. There were no differences between MTX and non-MTX groups in mean changes from baseline in weight, height, or BMI percentiles (P > 0.26). Pts in the lower 33rd percentile climbed to a higher mean growth rate through 104 weeks of ADA treatment (Figure). For those who started in the >33rd percentile, growth rates showed an initial increase that remained in the normal range throughout the study (Figure). Similar patterns were observed for height and BMI percentiles in these 2 groups. ACR Pedi 30/50/70/90 response rates improved over time in both groups, reaching 85%/76%/60%/36% for the ≤33rd percentile group and 93%/76%/51%/29% for the >33rd percentile group by the end of the DB phase with ADA treatment.

Conclusion: Long-term ADA treatment ± MTX is associated with improvement and maintenance of growth in children with JIA who had experienced impaired development. ADA treatment improved JIA signs and symptoms in both groups, regardless of baseline growth status.

Reference

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ACR Concurrent Abstract Session
Rheumatoid Arthritis - Clinical Aspects I: Risk Factors and Prediction of Rheumatoid Arthritis
Sunday, November 11, 2012, 2:30 PM–4:00 PM

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A Prediction Rule for the Development of Rheumatoid Arthritis: A Prospective Cohort Study of Seropositive Arthralgia Patients. Lotte van de Stadt1, B. I. Witte2, W.H. Bos1 and Dirkjan van Schaardenburg1. 1Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands, 2VU University Medical Center, Amsterdam, Netherlands

Background/Purpose: Patients presenting with arthralgia and a positive test for anti-cyclic citrullinated peptide antibodies (aCCP) and/or IgM rheumatoid factor (IgM-RF) (seropositive) are at risk for developing RA. We aim to predict the development of arthritis in these patients using antibody characteristics and clinical variables.

Methods: A prediction rule was developed using a prospective cohort of 374 seropositive arthralgia patients. Patients were followed biannually in the first year and then annually for the development of arthritis, which was defined as presence of one or more swollen joints at clinical examination. 18 prediction variables were selected based on clinical applicability, biologic plausibility, previous research and expert opinion. Backward stepwise Cox regression was used to create a prediction model (p removal 0.1). Regression coefficients were rounded to half points to make a prediction rule. Scores were multiplied by 2 for easier clinical applicability. The diagnostic performance of the prediction rule was evaluated using the area under the curve (AUC) of ROC curves.

Results: Patients were followed for a median of 32 months (IQR: 13–48). 131 arthralgia patients (35%) developed arthritis after a median of 12 months (IQR: 6–23), of whom 121 (92%) were diagnosed with RA according to the 2010 ACR/EULAR criteria. The prediction model consisted of 9 variables: antibody status (double positive, or high titer aCCP confers higher risk), RA in a first degree family member, Vas pain over 50, presence of morning stiffness, arthralgia in both upper and lower extremities, duration of symptoms shorter than 12 months, presence of intermittent complaints, history of swollen joints as reported by the patient and alcohol non-use. The variables age, sex, smoking, NSAID use, symmetric symptoms, symptoms in small joints, tender joint count, CRP and Shared Epitope were excluded. Patients scored 0 to 12 points on the prediction rule. The AUC value of the prediction rule was 0.82 (95% CI: 0.75–0.89). According to Cox regression analysis with the prediction rule as categorical variable, patients could be categorized in three risk groups: low risk (0–4 points), intermediate risk (5–6 points) and high risk (7–12 points). 155 (41%) patients had low, 102 (27%) intermediate and 117 (31%) high risk. The percentages of arthritis development per risk group are depicted in the figure. With the low risk group as a reference, the intermediate risk group had a hazard ratio (HR; 95% CI) of 4.3 (2.3–8.1) and the high risk group had a HR of 14 (7.7–25).

Conclusion: In patients who present with seropositive arthralgia, the risk of developing arthritis and subsequent RA can be predicted. The prediction rule that was made in this patient group can help 1) to inform patients and 2) to select high-risk patients for intervention studies before clinical arthritis occurs.

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Anemia May Provide Clinically Relevant Information Beyond Conventional Disease Activity Assessment to Predict Radiographic Damage Progression in Rheumatoid Arthritis. Burkhard Moller1, Frauke Föger1, Peter M. Villiger2 and Axel Finckh3. 1Inselspital University Hospital, Bern, Switzerland, 2Inselspital University Hospital of Bern, Bern, Switzerland, 3Inselspital-University Hospital of Bern, Bern, Switzerland, 4Geneva University Hospitals, Geneva 14, Switzerland Burkhard Mölller, Frauke Föger, Peter M. Villiger, Axel Finckh, on behalf of the Swiss Clinical Quality Management Program for Rheumatic Diseases.

Background/Purpose: Anemia in rheumatoid arthritis (RA) is prototypic for anemia of chronic disease (ACD) and often neglected in clinical practice. Previous studies have shown a relation between this extra-articular manifestation of RA and disease severity. Purpose: To study the relation between anemia and radiographic progression in RA.

Methods: This study is nested in a large prospective RA patient cohort. Data were collected between 1996 and 2007. Anemia was defined according to the WHO criteria (Hb < 12 g/dL, and/or Hb < 13 g/dL). We also used one less (Hb < 12.2 g/dL and/or Hb < 13.7 g/dL) and one more severe definition of anemia (Hb < 11 g/dL and/or Hb < 13.2 g/dL) in sensitivity analyses. Erosions were assessed with a validated erosion score (Ratening score) of 38 joints at hands and feet in 11255 radiograph sets from 4005 RA patients, over a mean follow-up of 2.2 years. Radiographic progression was
analyzed using longitudinal regression models for repeated data and adjusted for potential confounding factors, such as age, gender, rheumatoid factor, disease duration and erosion score at inclusion, baseline and time dependent DAS28ESR, DMARD, glucocorticoid and anti-TNF therapy. Subgroup analyses were performed in patients starting on methotrexate (n = 728) or anti-TNF-therapy (n = 938), in patients achieving different stages of severe, moderate, mild disease activity or remission (DAS28ESR = 2.6, n = 1255) at the final visit, and in 508 patients achieving remission after TNF blockade.

**Results:** Erosions progressed significantly (p < 0.001) faster in patients with than without anemia, despite adjusting for clinical disease activity and other important predictors of joint damage. As an example, erosion had progressed by mean 1.36% (95% CI 1.21-1.51) in non-anemic versus 2.66% (2.17-3.14) in anemic patients after one year. Patients with less severe anemia had a less rapid and patients with more severe anemia displayed a more rapid joint damage progression, suggesting a 'dose response effect'. Effect modification by anemia went insignificant in subgroups of patients with persistent joint damage progression, suggesting a 'dose response effect'. Effect modification by anemia went insignificant in subgroups of patients with persistent joint damage progression, suggesting a 'dose response effect'.

**Conclusion:** Anemia appears to capture structural disease processes that remain unmeasured by conventional disease activity measures in patients with or without TNF blockade. Thus, anemia may help to identify patients with more rapid erosive disease.

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**Patients with Early Inflammatory Arthritis Who Fulfill the 2010 American College Rheumatology/European League Against Rheumatism Classification Criteria for Rheumatoid Arthritis Have Increased Mortality Compared to Those Who Do Not: Results from the Norfolk Arthritis Register.** Jh Humphreys1, Suzanne Verstappen2, Mark Lunt3, Jackie Chipping4, Kimme Hyrich5, Tamya Marshall6 and Deborah Symmons7. 1Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 2Arthritis Research UK Epidemiology Unit, The University of Manchester, Manchester, United Kingdom, 3Norfolk Arthritis Register, School of Medicine Health Policy and Practice Faculty of Health UEA, Norwich, United Kingdom, 4Arthritis Research UK Epidemiology Unit, The University of Manchester, Manchester, United Kingdom, 5Norfolk Arthritis Register, School of Medicine Health Policy and Practice Faculty of Health UEA, Norwich, United Kingdom, 6Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester, United Kingdom, 7University of Manchester, Manchester Academy of Health Sciences, Manchester, United Kingdom

**Background/Purpose:** Mortality is increased in rheumatoid arthritis (RA) in comparison with the general population. The majority of studies have used 1987 ACR criteria to define RA when investigating mortality. The aim of this study was to: (i) examine whether, in a cohort of patients with early inflammatory polyarthritis (IP), the 2010 ACR/EULAR classification criteria for RA identify those with decreased survival; and if this is the case (ii) to identify which components of these criteria are the strongest predictors of mortality.

**Methods:** Consecutive adults with ≥2 swollen joints for ≥4 weeks were recruited to the Norfolk Arthritis Register (NOAR) between 1990 and 2009. Patients included in this analysis had symptom duration ≤2 years and had not received any disease modifying therapy at initial assessment. Data on the components of the 2010 criteria, along with demographic details, were obtained at baseline visit through a nurse-administered questionnaire and joint examination. Patients also completed the health assessment questionnaire (HAQ). Bloods samples were taken for C-reactive protein (CRP), rheumatoid factor (RF) and anti-citrullinated protein antibody (ACPA) estimation. All patients registered with NOAR are flagged with the UK Office for National Statistics (ONS) who provide mortality data. Survival analyses were performed using Cox proportional hazards models univariately, then adjusting for baseline covariates model was then developed including all components of the 2010 criteria as well as baseline smoking status, age and gender.

**Results:** 1671 patients had complete data for analysis, with 20488 person-years follow up. 1092 (65%) patients were female and there were 471 (28%) deaths reported by the ONS by 31st December 2011. 905 (54%) patients fulfilled the 2010 criteria at baseline, and these patients had a significantly increased risk of death compared to those patients in NOAR who did not fulfill the 2010 criteria, both univariately and in the age and sex adjusted model, hazard ratio(HR) 1.39 (95% CI 1.15–1.68). Results of the Cox regression models for the different parameters are shown in the table. High titre antibody positivity (more than three times the upper limit of normal) was the strongest predictor of mortality in the multivariate model adjusted for all components of the 2010 criteria, age, sex, and smoking status (HR 1.64 (95% CI 1.34 – 2.01)).

**Table 1. Predictors of mortality in the 2010 ACR/EULAR classification criteria for RA**

<table>
<thead>
<tr>
<th>Component</th>
<th>Univariate</th>
<th>Age &amp; sex adjusted</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACPA high positive</td>
<td>1.56 (1.29-1.88)</td>
<td>1.39 (1.15-1.68)</td>
<td>–</td>
</tr>
<tr>
<td>ACPA negative</td>
<td>1.42 (1.11-2.32)</td>
<td>1.33 (1.16-2.13)</td>
<td>1.39 (1.17-1.68)</td>
</tr>
<tr>
<td>RF/ACPA positive</td>
<td>1.60 (1.11-2.40)</td>
<td>1.42 (1.09-1.88)</td>
<td>1.40 (1.06-1.84)</td>
</tr>
<tr>
<td>RF/ACPA low positive</td>
<td>1.62 (1.09-2.40)</td>
<td>1.42 (1.16-1.88)</td>
<td>1.36 (0.92-2.03)</td>
</tr>
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<td>RF/ACPA high positive</td>
<td>1.62 (1.11-2.40)</td>
<td>1.42 (1.16-1.88)</td>
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<td>Normal CRP</td>
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<td>1.62 (1.11-2.40)</td>
<td>1.42 (1.16-1.88)</td>
<td>1.36 (0.92-2.03)</td>
</tr>
<tr>
<td>Disease duration: 6 weeks</td>
<td>0.85 (0.60-1.25)</td>
<td>0.80 (0.56-1.18)</td>
<td>0.84 (0.58-1.22)</td>
</tr>
</tbody>
</table>

**Conclusion:** In patients presenting with early inflammatory polyarthritis, those who fulfill the 2010 criteria have significantly increased mortality compared to those who did not. The components of the 2010 criteria which appear to be important predictors of mortality are high titre RF or ACPA positivity, and abnormal CRP at baseline.

**Disclosure:** J. Humphreys, None; S. Verstappen, None; M. Lunt, None; J. Chipping, None; K. Hyrich, None; T. Marshall, None; D. Symmons, None.

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**An Easy to Use Referral Model for Arthritis From the Rotterdam Early Arthritis Cohort.** C. Alves1, Jolanda J. Luine2, Darian P. Shackleton1, P.J. Barendregt4, A.H. Gerarde3 and Johanna M.W. Hazes3. 1Erasmus MC, Rotterdam, Netherlands, 2Erasmus MC - University Medical Center, Rotterdam, Netherlands, 3Medisch Centrum Parklaan, Netherlands, 4Maasstad Hospital, Rotterdam, Netherlands, 5Vlietland Hospital, Schiedam, Netherlands, 6Erasmus Medical Center, Rotterdam, Netherlands

**Background/ Purpose:** The first hurdle general practitioners (GPs) face to identify Rheumatoid Arthritis(RA) is to recognize presence of arthritis. Due to the low incidence of arthritis in primary care it is challenging to differentiate between patients with inflammatory musculoskeletal disease and those without. We set out to create a referral model to aid early referral in primary care based on data from the REACH.

**Methods:** The REACH cohort includes patients with either arthritis or 2 painful joints with 2 additional inflammatory characteristics. Four hundred and one patients referred to REACH by their GPs were used in this analysis. A prediction model was built by selection of variables from the history, physical examination and laboratory values that were likely available to GPs. The presence of at least one joint with synovitis was used as outcome excluding patients with gout. Variable selection was performed by classifying variables in 8 categories: symptoms, duration of complaints, life style, family history, comorbidity, medication use and systemic complaints (fever, skin disorder) followed by logistic regression with backward selection in each category. A referral model was build with the variables with p<0.1 evaluated in a logistic regression model that was bootstrapped 200 times to elicit the for optimism corrected c-statistic. Performance was also evaluated using ROC-curves and calibration plots. The addition of blood markers to the simple model was also evaluated.

**Results:** Table 1 shows baseline characteristics for the 401 patients. Arthritis was present at baseline in 182 patients. The referral model based on the REACH data resulted in a model containing the following variables: age, female sex, problems with fitting shoes, self-reported limitation of joint movement, lower number of self-reported painful joints, higher number of self-reported swollen joints, self-reported redness or hot/warm joints, the presence of squeeze pain in hand or feet and delay in presenting to the GP. The AUC was 0.79 (corrected for optimism: 0.72), adding ESR resulted in an AUC of 0.80 and adding RF resulted in 0.81. The simplest model calibrated slightly better (fig 1).
**Table 1. baseline characteristics**

<table>
<thead>
<tr>
<th></th>
<th>case, n=182</th>
<th>non case, n=219</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean, SD)</td>
<td>51 (15)</td>
<td>47 (12)</td>
</tr>
<tr>
<td>Gender (%)</td>
<td>66%</td>
<td>66%</td>
</tr>
<tr>
<td>Duration of complaints (median, range)</td>
<td>68 (4-370)</td>
<td>122 (1-416)</td>
</tr>
<tr>
<td>Delay patient (median, range)</td>
<td>21 (0-328)</td>
<td>43 (0-361)</td>
</tr>
<tr>
<td>Tender joint count (median, range)</td>
<td>7 (0-34)</td>
<td>6 (0-38)</td>
</tr>
<tr>
<td>Rheumatoid factor positive (%)</td>
<td>25%</td>
<td>13%</td>
</tr>
<tr>
<td>Anti-CCP positive (%)</td>
<td>17%</td>
<td>6%</td>
</tr>
<tr>
<td>C-reactive proteine (median, range)</td>
<td>6 (1–180)</td>
<td>3 (1–55)</td>
</tr>
<tr>
<td>ESR (median, range)</td>
<td>18(2–100)</td>
<td>8(0–66)</td>
</tr>
<tr>
<td>Duration of complaints (median, range)</td>
<td>21 (0-328)</td>
<td>43 (0-361)</td>
</tr>
<tr>
<td>Gender (%)</td>
<td>69%</td>
<td>66%</td>
</tr>
<tr>
<td>Age (mean, SD)</td>
<td>51 (15)</td>
<td>47 (12)</td>
</tr>
<tr>
<td>Pain (median, range)</td>
<td>59.2 (61)</td>
<td>47.3 (47)</td>
</tr>
<tr>
<td>HAQ (median, range)</td>
<td>0.38 (0.25)</td>
<td>0.38 (0.125)</td>
</tr>
<tr>
<td>DAS 28 - CRP (mean, SD)</td>
<td>5.53 (5.58)</td>
<td>4.61 (4.57)</td>
</tr>
<tr>
<td>DAS 28 (mean, SD)</td>
<td>59.2 (61)</td>
<td>47.3 (47)</td>
</tr>
</tbody>
</table>

Conclusion: We were able to create a referral model based on history taking and physical examination suitable for referral of patients with arthritis at risk for RA and perhaps other inflammatory diseases in primary care. Adding laboratory values did not improve performance and thus may be omitted based on the resources of the primary care facility.

Disclosure: C. Alves, None; J. J. Luime, None; D. P. Shackleton, None; P. J. Barendregt, None; A. H. Gerardis, None; J. M. W. Hazes, None.

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**2010 ACR/EULAR Rheumatoid Arthritis Classification Criteria Predicts Radiological, but Not Clinical Outcomes At 18 Months Into Disease in a Canadian Early Arthritis Cohort.** Ariel Masetto1, Arthur J. Fernandes2, Patrick Liang3, Pierre Cossette4 and Gilles Boire1, 1CHUS, Fleurimont, QC, 2Université de Sherbrooke, Sherbrooke N, 3CHUS, Sherbrooke, QC, 4CHUS - Sherbrooke University, Sherbrooke, QC

Background/Purpose: The potential of the 2010 ACR/EULAR rheumatoid arthritis (RA) classification criteria to discriminate early arthritis patients according to their clinical and radiological outcomes needs to be confirmed.

**Methods:** Consecutive patients with at least 3 swollen joints (SJC≥3) were recruited; duration of disease was more than 1 and less than 12 months; microcrystalline arthritides and connective tissue diseases were actively excluded. All patients were treated with the target of SJC= 0, using whatever DMARDs was required. According to the 2010 RA criteria, our cohort was classified in two groups: RA and non-specific inflammatory arthritis (NSIA). Both groups were compared at baseline and at 18 months into disease according to radiological and clinical outcomes: Sharp erosion score (classified erosive if ≥ 3), Health Assessment Questionnaire (HAQ), Disease Activity Score in 28 joints (DAS28-CRP), and pain (0–100 mm VAS). Remission rates at 18 months were calculated based on DAS 28 and ACR 2011 remission criteria.

**Results:** A total of 422 patients were available at baseline. Of these, 319 (75.6%) were classified as RA. Based on clinical outcome measures, RA patients had more severe disease than NSIA patients at baseline (higher DAS 28, HAQ and pain scores measures – p<0.001). At 18 months, this initial clinical discrepancy had now disappeared, but more RA patients had progressed to erosive status than NSIA patients (54% vs 33%; p<0.001). Using two different definitions of remission, there was no difference in remission rates.

**Conclusion:** In this early arthritis cohort actively treated to SJC= 0, there was no difference in the 18-month clinical outcomes (HAQ, DAS 28, Pain, Remission rates) between 2010 ACR/EULAR criteria-defined RA and NSIA patients. Patients with RA had a worse radiological outcome, but significant joint damage occurred in one third of NSIA patients. Early intensive treatment of NSIA patients, and not only of early RA patients, thus appears warranted.

Disclosure: A. Masetto, None; A. J. Fernandes, None; P. Liang, None; P. Cossette, None; G. Boire, None.

**770**

Is Late Onset Rheumatoid Arthritis (LORA) Really a Distinct Entity of RA? Results From the Swiss Observational Cohort. Ruediger Mueller1, Tori Kaege1, Axel Finckh1 and Johannes von Kempis1. 1MD, St. Gallen, Switzerland, 2Geneva University Hospitals, Geneva 14, Switzerland

**Background/Purpose:** Rheumatoid arthritis (RA) is generally described as a disease with two peaks of onset, either late (late onset RA, LORA) or early (young onset RA, normal 30–55 years, YORA). Considering that the average age of the population is continuously rising, LORA will gain importance in the near future. Despite this growing importance LORA has not been the focus of much interest in the past. This study was set up to analyse disease activity and progression in LORA in comparison to YORA patients with early disease.

**Methods:** This is a cohort study within the Swiss RA registry SCQM. We included all patients with recent onset arthritis, either RA (disease duration ≤1 year) or undifferentiated, as diagnosed by the data-entering physician. Patients were followed up to 5 years. The cut off between YORA and LORA was operationally set at 60 years of age. Disease progression and activity was assessed based on DAS 28 and the progression of joint erosions using the Ratingen score.

**Results:** A total of 592 patients with early undifferentiated or RA was analysed. The age at disease onset had a Gaussian distribution, with a single peak at 60 years of age. 366 patients were 60 years or younger (YORA) and 226 patients were older (LORA) at disease onset. DAS 28
scores were significantly higher among LORA as compared to YORA patients (4.8 vs. 4.5, p = 0.049). Corticosteroids were used in 68% of LORA patients as a first line treatment, compared to 25.4% in YORA patients (X² test, p < 0.0001). DMARDs, on the other hand, were used in 100% of the YORA patients as first line treatment compared to 91.2% of the LORA patients. During follow up, new glucocorticoid, synthetic, or biologic DMARD were initiated in 32.8%/61.1%/14.1% of all decisions the LORA patients. During follow up, new glucocorticoid, synthetic, or biologic DMARD were initiated in 32.8%/61.1%/14.1% of all decisions made in the LORA patients. During follow up, new glucocorticoid, synthetic, or biologic DMARD were initiated in 32.8%/61.1%/14.1% of all decisions made in the LORA patients. During follow up, new glucocorticoid, synthetic, or biologic DMARD were initiated in 32.8%/61.1%/14.1% of all decisions made in the LORA patients.

**Conclusion:** Our results do not support the existence of a separate LORA subgroup with a distinct peak of incidence and/or course of the disease.

**Disclosure:** R. Mueller, None; T. Kaege, None; A. Finckh, Roche, Pfizer, BMS, 2, Roche, Pfizer, BMS, 5; J. von Kempis, None.

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**ACR Concurrent Abstract Session**

**Rheumatoid Arthritis Treatment - Small Molecules, Biologics and Gene Therapy: Comparative Efficacy and Novel Treatment Strategies in Rheumatoid Arthritis**

Sunday, November 11, 2012, 2:30 PM–4:00 PM

**771**

**Discontinuation of Adalimumab without Functional and Radiographic Damage Progression After Achieving Sustained Remission in Patients with Rheumatoid Arthritis (the HONOR study): 1-Year Follow-up**

**Background/Purpose:** Discontinuing anti-TNF therapy after achieving a stable low disease activity (LDA) or remission (REM) state in rheumatoid arthritis (RA) has become an important area of investigation in current rheumatology from the risk-benefit point of view including health-economic considerations. However, there is little information about characteristics of patients in which adalimumab (ADA) can be successfully discontinued in patients with long-standing RA. Remission induction was achieved with ADA plus methotrexate (MTX) at patients with long-standing RA encountered during routine clinical practice. In the present HONOR study, we investigated whether the resultant remission was preserved for at least 12 months after discontinuing ADA.

**Methods:** Sustained REM was defined as persistent DAS28-ESR <2.6 achieved for at least 6 months. Patients with age >18 years who had attained the sustained REM with ADA plus MTX went on ADA discontinuation with their consent and those with follow-up of ≥12 months become subject to evaluation. The primary endpoint was a proportion of patients who maintained the sustained REM for at least another 12 months after the discontinuation. DAS28, SDAI, CDAI, HAQ-DI and DmTSSS were analyzed before and after discontinuation of ADA. To predict retaining REM even after withdrawing ADA, a logistic regression/ROC analysis was conducted on clinical variables and cut-off values at the discontinuation were determined.

**Results:** Of the 197 patients who initiated ADA treatment between July 2008 and April 2011, 69 (35.0%) met the criteria of sustained REM. Fifty-one out of the 69 patients consented to enter the study. The mean age of the 51 patients was 59.5 years with the mean disease duration of 7.1 years. Thirty-six percent of evaluable 42 patients maintained ADA-free remission (DAS28-ESR <2.6) for 12 months. DAS28-ESR at discontinuation was found to be significantly predicting the retention of remission with a cut-off value of 1.98. ADA-free remission as defined by SDAI ≤3.3 was also maintained for 12 months in 19 (49%) of the 42 patients. A vast majority of patients (94.9%) showed no evidence of radiographic progression at 12 months. Moreover, mean functional improvement observed at the time of ADA discontinuation was almost preserved for 12 months.

**Conclusion:** Although the sample size is limited, the results of the HONOR study indicated that after reaching REM with ADA plus MTX 36% (DAS28-ESR) and 49% (SDAI) patients could discontinue ADA for >12 months without functional impairment and radiographic damage progression. Deep remission at discontinuation was associated with successful biologic-free remission. Hence, “Treatment holiday” of biologics by discontinuing ADA is now feasible in patients with RA following sustained remission.


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**Tocilizumab Monotherapy Compared with Adalimumab Monotherapy in Patients with Rheumatoid Arthritis: Results of a 24-Week Study,** Arthur Kavanya, Paul Emery, Ronald F. van Vollenhoven, Ara H. Kriikanum, Rieke Alten, Mich Klemarn, David Musselman, Sunil Agarwal, Jennifer Green and Cem Gazbay. UCSD School of Medicine, La Jolla, CA, University of Leeds, Leeds, United Kingdom, Karolinska Institute, Stockholm, Sweden, San Diego Arthritis Medical Clinic, San Diego, CA, Schloppark Klinik, University Medicine Berlin, Berlin, Germany, Genentech Inc, South San Francisco, CA, Welwyn Garden City, United Kingdom, Geneva University Hospitals, Geneva, Switzerland

**Background/Purpose:** Approximately one-third of RA pts treated with biologics receive them as monotherapy (ie, without other DMARDs). Although tocilizumab (TCZ), an IL-6 receptor inhibitor, has been assessed as monotherapy in 6 trials, direct comparison with an anti-TNF agent as monotherapy has not occurred. ADACTA is the first trial specifically designed to determine superiority of one approved biologic vs another (TCZ vs adalimumab [ADA]) as monotherapy for RA.

**Methods:** ADACTA was a phase 4 randomized, double-blind, 24-wk study in pts with RA of ≥6-mo duration and DAS28 >5.1 who were MTX intolerant or for whom continued treatment with MTX was considered ineffective or inappropriate. Pts received TCZ 8 mg/kg IV every 4 wks (+ placebo [PBO] ADA) or ADA 40 mg SC every 2 wks (+ PBO TCZ) for 24 wks. Primary endpoint was mean change from baseline (BL) in DAS28 at 24 wks.

**Results:** The ITT population included 325 pts (163, TCZ; 162, ADA). BL characteristics were similar between the TCZ and ADA arms: mean age (54.4 and 53.3 y), mean RA duration (7.3 and 6.3 y), and mean DAS28 (6.72 and 6.76). At wk 24, mean change from BL in DAS28 was significantly greater with TCZ than with ADA (p<0.0001; Table). Statistically significantly greater proportions of TCZ than ADA pts achieved DAS28 <2.6, DAS28 ≤3.2, and ACR20/50/70 responses (p<0.005; Table). A difference in favor of TCZ was observed in proportions of pts achieving Clinical Disease Activity (CDAI) and Simplified Disease Activity (SDAI) remission (≥2.8 and ≤3.3) at wk 24 (post hoc analysis; p<0.05; Table). From wk 16 onward, the proportion of pts achieving ACR50/70/90 was numerically greater with TCZ, and by wk 24 it reached 18% compared with 11% for ADA. For exploratory endpoints HAQ-DI, SF-36 MCS, SF-36 PCS, and FACIT Fatigue, differences in mean change from BL at wk 24 were numerically higher for TCZ than ADA. Incidences of AEs, serious AEs, and serious infection were similar between arms (TCZ, 82.1%/11.7%/3.1%; ADA, 91.6%/9.9%/3.1%). Transaminase and LDL elevations and neutrophil count reductions were more common with TCZ. Two deaths occurred in the TCZ arm: 1 due to sudden death, the other due to reported illicit drug overdose.
Table. Selected Endpoints at Week 24 (ITT population)

<table>
<thead>
<tr>
<th></th>
<th>TCZ, n = 163</th>
<th>ADA, n = 162</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change from BL in DAS28</td>
<td>−3.3†</td>
<td>−1.8 (diff −1.5)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Secondary efficacy endpoints

| DAS28 <2.6, % | 39.9 | 10.5 | <0.0001 |
| DAS28 ≤32, % | 51.5 | 19.8 | <0.0001 |
| ACR20, % | 65.0 | 49.4 | 0.0038 |
| ACR50, % | 47.2 | 27.8 | 0.0002 |
| ACR70, % | 32.5 | 17.9 | 0.0023 |
| Exploratory and post hoc efficacy endpoints | | | |
| CDAI remission, % | 17.2 | 9.3 | 0.0389‡ |
| SDAI remission, % | 18.4 | 8.0 | 0.0067‡ |
| ACR/EULAR remission (Boolean), % | 18.0 | 11.0 | 0.0569‡ |
| Change from BL in HAQ-DI | −0.7 | −0.5 (diff −0.2) | 0.0653‡ |

†Last-observation-carried-forward and nonresponder imputation were applied to primary and secondary continuous and categorical endpoints, respectively, to handle missing data and data after withdrawal and escape.
‡p values were adjusted for region and duration of RA for all endpoints. In addition, when evaluating changes from baseline, p values were adjusted for baseline values of the analyzed parameter.

Conclusion: TCZ as monotherapy was superior to ADA as monotherapy in reducing RA signs/symptoms in MTX-intolerant pts or pts for whom MTX was considered ineffective or inappropriate. The overall AE profiles of the two agents were similar, and lab changes were consistent with previous reports.

References

2. Soliman Ann Rheum Dis 2011;70:583;
4. Dougados Ann Rheum Dis e-pub;
5. Weinblatt Arthritis Rheum 2011;63(suppl):S864;
8. Nishimoto Mod Rheumatol 2009;19:12;

Disclosure: A. Kavanaugh, Roche Pharmaceuticals, Amgen, Abbott, BMS, Janssen, UCBB, Pfizer, 2. P. Emery, Merck, Abbott, Pfizer, UCBB, Roche Pharmaceuticals, BMS, 5; R. F. van Vollenhoven, Abbott, BMS, GlaxoSmithKline, Merck Sharp and Dohme, Pfizer, Roche Pharmaceuticals, UCBB, 2, Abbott, BMS, GlaxoSmithKline, Merck Sharp and Dohme, Pfizer, Roche Pharmaceuticals, UCBB, 5; A. H. Dikranian, Genentech, UCBB, Abbott, BMS, 8; R. Alten, BMS, Novartis, Pfizer, Roche Pharmaceuticals, UCBB, 2, Abbott, BMS, Novartis, Pfizer, Roche Pharmaceuticals, UCBB, 5; Abbott, BMS, Novartis, Pfizer, Roche Pharmaceuticals, UCBB, 8; M. Klearman, Genentech, 3; D. Musselman, Genentech, 3; S. Agarwal, Roche Pharmaceuticals, 3, Roche Pharmaceuticals, 1; J. Green, Roche Pharmaceuticals, 3, Roche Pharmaceuticals, 1; C. Gabay, Roche Pharmaceuticals, Abbott, Merck, Pfizer, BMS, Merckserono, Novartis, Amgen, 5; Roche Pharmaceuticals, Abbott, Merck, UCBB, Pfizer, BMS, Merckserono, Novartis, Amgen, 8.

Remission Rates with Tofacitinib Treatment in Rheumatoid Arthritis: A Comparison of Various Remission Criteria.

Methods: We analyzed the data from five Phase 3 RA trials of tofacitinib monotherapy (ORAL Solo) or tofacitinib with background DMARD (ORAL Step, Scan, Sync and Standard) and compared remission rates as defined by various remission criteria: a) DAS28-4(ESR) <2.6 (co-primary endpoint in all five Phase 3 studies); b) DAS28-3(3CRP) <2.6; c) CDAI ≤2.8; d) index-based ACR/EULAR criteria (S334 = 3.3); and e) Boolean-based ACR/EULAR criteria. 1 Remission rates were calculated under each set of criteria for each treatment sequence: tofacitinib 5 mg twice daily (BID), tofacitinib 10 mg BID, placebo (PBO) to 5 mg BID, and PBO to 10 mg BID; PBO sequences were pooled. ORAL Standard also included adalimumab 40 mg sc every 2 weeks as an active control. All trials had an initial PBO period of 3 or 6 months. Here, 3-month LOCF data are presented to illustrate results.

Results: Despite the short treatment duration, rates of remission were 5–30% with tofacitinib treatment (Table). Remission rates were numerically greater for both tofacitinib doses versus placebo, and rates for tofacitinib 10 mg BID were generally greater than with 5 mg BID. Across trials, the DAS28-3(3CRP)-based criteria generated markedly higher remission rates compared with other remission criteria.

Table. Remission rates across Phase 3 trials at Month 3

<table>
<thead>
<tr>
<th>Phase 3</th>
<th>Treatment (N)</th>
<th>DAS28-4(ESR) ≤2.6</th>
<th>DAS28-3(3CRP) ≤2.6</th>
<th>CDAI ≤3.3</th>
<th>S334 ≤3.3</th>
<th>Boolean ACR/EULAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORAL Solo</td>
<td>Tofacitinib 5 mg BID (241)</td>
<td>5.6</td>
<td>19.1</td>
<td>5.4</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>ORAL Step</td>
<td>Tofacitinib 10 mg BID (242)</td>
<td>9.0</td>
<td>24.8</td>
<td>8.3</td>
<td>9.1</td>
<td>7.4</td>
</tr>
<tr>
<td>ORAL Scan</td>
<td>Tofacitinib 5 mg BID (131)</td>
<td>6.7</td>
<td>21.2</td>
<td>6.1</td>
<td>6.8</td>
<td>6.8</td>
</tr>
<tr>
<td>ORAL Sync</td>
<td>Tofacitinib 10 mg BID (153)</td>
<td>10.4</td>
<td>27.8</td>
<td>7.5</td>
<td>9.0</td>
<td>5.3</td>
</tr>
<tr>
<td>ORAL Standard</td>
<td>PBO (131)</td>
<td>1.7</td>
<td>4.6</td>
<td>0.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ORAL</td>
<td>Tofacitinib 5 mg BID (309)</td>
<td>5.3</td>
<td>21.4</td>
<td>5.8</td>
<td>5.8</td>
<td>4.5</td>
</tr>
<tr>
<td>ORAL</td>
<td>Tofacitinib 10 mg BID (309)</td>
<td>11.7</td>
<td>28.2</td>
<td>5.5</td>
<td>5.8</td>
<td>7.4</td>
</tr>
<tr>
<td>ORAL</td>
<td>PBO (154)</td>
<td>1.6</td>
<td>5.2</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Tofacitinib 5 mg BID (311)</td>
<td>10.0</td>
<td>22.2</td>
<td>5.5</td>
<td>5.8</td>
<td>5.1</td>
<td></td>
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<tr>
<td>Tofacitinib 10 mg BID (309)</td>
<td>11.2</td>
<td>25.6</td>
<td>7.1</td>
<td>7.1</td>
<td>5.8</td>
<td></td>
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<tr>
<td>PBO (157)</td>
<td>1.4</td>
<td>5.1</td>
<td>0</td>
<td>0</td>
<td>1.3</td>
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<tr>
<td>Tofacitinib 5 mg BID (196)</td>
<td>5.6</td>
<td>15.3</td>
<td>4.6</td>
<td>4.1</td>
<td>2.0</td>
<td></td>
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<tr>
<td>Tofacitinib 10 mg BID (196)</td>
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<td>18.9</td>
<td>6.1</td>
<td>7</td>
<td>5.6</td>
<td></td>
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<tr>
<td>Adalimumab 40 mg sc QW (199)</td>
<td>4.5</td>
<td>14.1</td>
<td>2.5</td>
<td>4.0</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>PBO (106)</td>
<td>2.2</td>
<td>4.8</td>
<td>1.9</td>
<td>2.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Last observation carried forward; rates are percentages of patients achieving the respective outcome.

Conclusion: Tofacitinib was effective in reaching treatment target and inducing remission after 3 months of treatment using various established and new remission criteria including the ACR/EULAR index and Boolean-based criteria. Remission rates were generally greater with tofacitinib 10 mg BID compared with 5 mg BID.

References


A CD4+ T-Cell Gene Expression Signature Predicts Drug Survival On Methotrexate Monotherapy in Early Rheumatoid Arthritis. Arthur G. Pratt1, Philip M. Brown1, Simon J. Cockell2, Gillian Wilson1 and John D. Isaacs3. 1Newcastle University, Newcastle Upon Tyne, United Kingdom, 2Newcastle University, Newcastle-upon-Tyne, United Kingdom, 3Freeman Hospital, Newcastle-upon-Tyne, United Kingdom. 4Musculoskeletal Research Group, Institute of Cellular Medicine, Newcastle University and Newcastle upon Tyne NHS Foundation Trust, Newcastle Upon Tyne, United Kingdom.

Background/Purpose: The mechanism of action of methotrexate (MTX) in the management of rheumatoid arthritis (RA) remains incompletely understood. It is nonetheless capable of inducing clinical remission as a monotherapy in approximately 30% of cases, being the most cost-effective therapeutic choice in such individuals. We investigated the CD4+ T-cell transcriptome in early RA patients, seeking biomarkers for drug survival on MTX monotherapy and associated pharmacological insights.

Methods: RNA was extracted from highly purified peripheral blood CD4+ T-cells from consenting early RA patients within 4 hours of blood draw, at which time patients had been symptomatic for a median of 12 weeks, and were naïve to immunomodulatory treatments. All patients were subsequently treated with MTX monotherapy, which was continued for as long as this treatment was deemed successful between patient and consulting rheumatologist, over an 18 month follow-up period. Intra-muscular steroid bolus administration (but not oral steroid therapy) was permitted during the study at the discretion of the consulting rheumatologist. Transcriptional profiling of baseline samples was undertaken using Illumina WG6v3 BeadChip oligonucleotide array technology and analysed using GeneSpring XI (Agilent).

Results: Of 37 recruited patients, 6 were excluded from analysis because of insufficient or defaulted follow-up. Amongst the remaining 31 patients, 19 (61%) remained on MTX monotherapy at the end of follow-up, but the treatment strategy was unsuccessful (and required withdrawal or rescue MTX) in 12 patients. Of these, 11 (92%) were switched to OL ADA following an inadequate response (ADA Withdrawal and Rescue ADA arms). This post hoc analysis evaluated the proportion of pts who entered P2 and were in LDA, had normal function (HAQ-DI <0.5), and/or the absence of radiographic progression (∆mTSS ≤ 0.5) at wk 78 by initial treatment group (ie, the ADA+MTX group includes ADA Withdrawal, Continuation, and OL Carry On arms; the PBO+MTX group includes MTX Continuation and Rescue ADA arms). To account for the full population of P1 ADA+MTX-R, those who withdrew ADA during P2 were replaced by an equivalent proportion of R from the ADA Continuation arm.

Results: Among pts who entered P2 (ADA+MTX, N=466; PBO+MTX, N=460), significantly more were in LDA, had normal function, and/or the absence of radiographic progression following 26 wks of treatment with ADA+MTX vs PBO+MTX (Table). Differences in clinical and functional outcomes between initial treatment groups disappeared following an additional 26 or 52 wks of treatment, at which time PBO+MTX-R (n=348) were switched to OL ADA+MTX. Although the addition of OL ADA to PBO+MTX-R slowed radiographic progression during P2, more pts who received ADA+MTX from baseline had no radiographic progression at wk 78 than pts who received initial PBO+MTX.

Table: Week 26, 52, and 78 Clinical, Functional, and Radiographic Outcomes in Patients Who Received Continued ADA + MTX Versus Those Who Continued PBO + MTX or Added Open-label ADA Following an Inadequate Response

Disclosure: A. G. Pratt, None; P. M. Brown, None; S. J. Cockell, None; G. Wilson, None; J. D. Isaacs, None.

Long-Term Outcomes of Early Rheumatoid Arthritis Patients Initiated with Adalimumab Plus Methotrexate Compared with Methotrexate Alone Following a Targeted Treatment Approach. Roy Fleischmann1, Ronald F. van Vollenhoven2, Josef S. Smolen3, Paul Emery4, Stefan Fountoulakis5, Suschittra S. Rath2,5, Harriet Kuper6 and Arthur Kavanagh8. 1University of Texas Southwestern Medical Center, Dallas, TX, 2Karolinska Institute, Stockholm, Sweden, 3Medical University of Vienna and Hietzing Hospital, Vienna, Austria, 4Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 5Abbott, Rungis, France, 6Abbott GmbH and Co. KG, Ludwigshafen, Germany, 7UCSD School of Medicine, La Jolla, CA.

Background/Purpose: In rheumatoid arthritis (RA), anti-TNF therapy is considered following 3–6 months of failed methotrexate (MTX) treatment. Some patients (pts), particularly those with many risk factors, may benefit from earlier intervention with anti-TNF+MTX, as this combination maximizes the likelihood of response. This analysis assessed, on a group level, whether there is a long-term advantage for early RA pts treated with initial and continued adalimumab (ADA)+MTX vs those treated with initial placebo (PBO)+MTX and who either continued unaltered therapy or rapidly added ADA following an inadequate response (IR).

Methods: OPTIMA was a 78-week (wk), phase 4, randomized, controlled trial of initial ADA+MTX vs PBO+MTX in MTX-naïve pts <10 yrs, ≤1 year disease duration, and active RA. Therapy adjustments were made at wk 26 on the basis of achieving a target of stable low disease activity [LDA, defined for this study as DAS28(CRP) <3.2] at wks 22 and 26 (Period 1, P1): ADA+MTX-responders (R) were re-randomized to either withdrawal or continue ADA (ADA Withdrawal and Continuation arms, respectively) and PBO+MTX-R continued randomized therapy (MTX Continuation arm) for an additional 52 wks (P2). IR-pts received open-label (OL) ADA+MTX during P2 (OL ADA Carry On and Rescue ADA arms). This post hoc analysis evaluated the proportion of pts who entered P2 and were in LDA, had normal function (HAQ-DI <0.5), and/or the absence of radiographic progression (∆mTSS ≤ 0.5) at wk 78 by initial treatment group (ie, the ADA+MTX group includes ADA Withdrawal, Continuation, and OL Carry On arms; the PBO+MTX group includes MTX Continuation and Rescue ADA arms). To account for the full population of P1 ADA+MTX-R, those who withdrew ADA during P2 were replaced by an equivalent proportion of R from the ADA Continuation arm.

Results: Among pts who entered P2 (ADA+MTX, N=466; PBO+MTX, N=460), significantly more were in LDA, had normal function, and/or the absence of radiographic progression following 26 wks of treatment with ADA+MTX vs PBO+MTX (Table). Differences in clinical and functional outcomes between initial treatment groups disappeared following an additional 26 or 52 wks of treatment, at which time PBO+MTX-R (n=348) were switched to OL ADA+MTX. Although the addition of OL ADA to PBO+MTX-R slowed radiographic progression during P2, more pts who received ADA+MTX from baseline had no radiographic progression at wk 78 than pts who received initial PBO+MTX.
A Multicenter, Randomized, Controlled, Open-Label Pilot Study of the Feasibility of Discontinuation of Adalimumab in Rheumatoid Arthritis Patients in Stable Clinical Remission. Katerina Chatzidionysiou1, Carl Turesson2, Annika Teleman3, Ann Knight4, Elisabet Lindqvist5, Per Larsson6, Lars Cöster7, Barbro Rydberg7, Ronald F. van Vollenhoven7 and Mikael Heimbürger8

Background/Purpose: Treatment with TNF blockers, once started as therapy for RA, is usually continued indefinitely. Information about the possibility to discontinue anti-TNF therapy in RA patients who have obtained remission is limited. If remission could be sustained after cessation of anti-TNF therapy, this would have vast clinical as well as economic implications. The objective of the ADMIRE trial was to assess the possibility of discontinuing adalimumab treatment while maintaining remission in RA patients in stable remission (DAS 28 ≤2.6 for ≥3 months) on combination therapy with adalimumab + methotrexate (MTX).

Methods: A randomized, controlled, open label pilot study of RA patients in stable remission treated with adalimumab + MTX. Patients were randomized in a 1:1 ratio to continue with adalimumab + MTX (arm AM) or to discontinue the biologic agent and continue with MTX monotherapy (arm M).

Results: Thirty-three patients were enrolled in the study and were randomized to arm AM (n=17) and arm M (n=16). One patient in arm AM was excluded (did not fulfill inclusion criteria) and one patient in arm M was excluded due to protocol violation. The median (IQR) age of patients was 61 (53–65) years, median (IQR) disease duration was 8 (5–15) years and 67% were female. Median (IQR) DAS28 was 1.86 (1.53–2.39) and MTX dose was 20 mg/w (12.5–20) at baseline. At the end of 28 weeks, 15/16 patients (94%) and 5/15 patients (33%) in arms AM and M, respectively, were in remission (P=0.001). In the M group, 3/15 patients were in remission on MTX only. The proportion of patients with a flare during the first 28 weeks in the AM and M arms was 50% (8/16) and 80% (12/15), respectively (P=0.08).

Other results from secondary analyses are shown in Table 1.

Table 1. Primary and secondary efficacy endpoints.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Arm AM (adalimumab + MTX) n=16</th>
<th>Arm M (MTX) n=15</th>
<th>Difference between groups*</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. (%) of patients in remission at week 28</td>
<td>15/16 (94%)</td>
<td>5/15 (33%)</td>
<td>0.001</td>
</tr>
<tr>
<td>No. (%) of patients with at least 1 flare during first 28 weeks</td>
<td>8/16 (50%)</td>
<td>12/15 (80%)</td>
<td>0.08</td>
</tr>
<tr>
<td>No. (%) of patients with at least 1 DAS28&gt;2.6 during first 28 weeks</td>
<td>8/16 (50%)</td>
<td>11/15 (73%)</td>
<td>0.2</td>
</tr>
<tr>
<td>No. (%) of patients with at least 1 DeltaDAS28&gt;1.2 during first 28 weeks</td>
<td>1/16 (6%)</td>
<td>8/15 (53%)</td>
<td>0.005</td>
</tr>
<tr>
<td>No. (%) of patients with at least 1 DeltaDAS28&gt;2.6 AND DeltaDAS28&gt;1.2 during first 28 weeks</td>
<td>8/16 (50%)</td>
<td>13/15 (87%)</td>
<td>0.04</td>
</tr>
<tr>
<td>No. (%) of patients with at least 1 DeltaDAS28&gt;2.6 AND DeltaDAS28&gt;0.6 during first 28 weeks</td>
<td>1/16 (6%)</td>
<td>7/15 (47%)</td>
<td>0.01</td>
</tr>
<tr>
<td>No. (%) of patients with at least 1 DeltaDAS28=2.6 AND DeltaDAS28&gt;0.6 during first 28 weeks</td>
<td>5/16 (31%)</td>
<td>11/15 (73%)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*Fisher exact test for categorical variables; log-rank (Mantel-Cox) test for survival analysis.

Conclusion: In this pilot study, remission was rarely maintained in patients with long standing RA who discontinued adalimumab. Compared to patients who continued combination therapy, the proportion in sustained remission was significantly lower for the primary and most secondary endpoints. Adalimumab discontinuation may be feasible in only a minority of patients with established RA in stable clinical remission on adalimumab + MTX.
and the first randomized controlled trial of an anti-TNF to include the entire axSpA population.

Methods: The ongoing 158 week (wk) RAPID-axSpA trial is double-blind and placebo (PBO) controlled to Wk24, dose-blind to Wk48 and then open label to Wk158. Recruited patients (pts) had adult-onset active axSpA as defined by the ASAS criteria, BASDAI ≥4, spinal pain ≥4 on a 10 point scale, CRP > upper limit of normal or sacroiliitis on MRI. Pts must have failed ≥1 NSAID. Up to 40% of pts could have experienced secondary failure to 1 previous anti-TNF. The pt population reflected the broad axSpA population, including AS pts meeting the modified New York criteria and nr-axSpA pts who met the ASAS MRI or clinical criteria. Pts were randomized 1:1 to PBO, or 400mg CZP at Wk 0, 2 and 4 (loading dose, LD) followed by either 200mg CZP every 2 wks (Q2W) or 400mg CZP every 4 wks (Q4W). Pts receiving PBO who failed to achieve an ASAS20 response at both Wk2 and 16 were rescued and randomized at Wk16 to receive CZP 200mg Q2W or CZP 400mg Q4W following LD. The primary endpoint was ASAS20 response at Wk12. Non-responder imputation was used for ASAS responses; last observation carried forward was used for BASFI, BASMI and BASDAI.

Results: 325 pts were randomized. Baseline (BL) characteristics were similar between treatment groups (PBO/CZP 200 mg Q2W/CZP 400 mg Q4W) with the exception of higher CRP concentrations, and greater proportion of anti-TNF experienced pts in the PBO group (25.4%/17.2%/21.2 mg/L; 24.3%/13.5%/10.3%, respectively). AS pts had longer disease and symptom duration at BL compared to nr-axSpA pts. Clinical improvements in ASAS20 responses at Wk12 were statistically significant in the PBO 200 mg Q2W and CZP 400 mg Q4W arms vs PBO (Table) and were observed as early as Wk1 (40.5% and 34.6% vs 14.2%, p<0.001). ASAS40 response and ASAS partial remission rates were also higher in the CZP arms vs PBO. At Wk12 and 24, combined CZP arms showed statistically significant improvements vs PBO in BASDAI, BASFI, and BASMI. Similar improvements were reported with CZP vs PBO in both AS and nr-axSpA pts (combined dose) vs PBO (Table). Adverse events (AEs) occurred in 70.4% vs 62.6%, serious AEs in 4.7% vs 4.7%, and serious infections in 1.1% vs 0 of CZP (combined dose) pts vs PBO pts, respectively. No deaths, TB or malignancies were reported.

Table. Clinical outcomes at Wk12 and Wk24 for axSpA pts in RAPID-axSpA

<table>
<thead>
<tr>
<th>Outcome</th>
<th>AS</th>
<th>ASAS20</th>
<th>ASAS40</th>
<th>ASAS</th>
<th>AS partial remission</th>
<th>ASAS 5/6</th>
<th>BASDAI</th>
<th>BASFI</th>
<th>BASMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>107</td>
<td>111</td>
<td>57</td>
<td>56</td>
<td>51</td>
<td>8.4%</td>
<td>-1.22</td>
<td>-0.06</td>
<td>-0.41</td>
</tr>
<tr>
<td>PBO</td>
<td>107</td>
<td>111</td>
<td>57</td>
<td>56</td>
<td>51</td>
<td>8.4%</td>
<td>-1.22</td>
<td>-0.06</td>
<td>-0.41</td>
</tr>
<tr>
<td>CZP</td>
<td>200mg Q2W</td>
<td>200mg Q2W</td>
<td>200mg Q2W</td>
<td>200mg Q2W</td>
<td>200mg Q2W</td>
<td>8.4%</td>
<td>-1.22</td>
<td>-0.06</td>
<td>-0.41</td>
</tr>
<tr>
<td></td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>8.4%</td>
<td>-1.22</td>
<td>-0.06</td>
<td>-0.41</td>
</tr>
<tr>
<td></td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>8.4%</td>
<td>-1.22</td>
<td>-0.06</td>
<td>-0.41</td>
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<td></td>
<td>400mg Q4W</td>
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<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>400mg Q4W</td>
<td>8.4%</td>
<td>-1.22</td>
<td>-0.06</td>
<td>-0.41</td>
</tr>
</tbody>
</table>

* p < 0.05 vs PBO. CFH = change from baseline

Conclusion: CZP effectively and rapidly reduced the signs and symptoms of axSpA, including spinal mobility, with no new safety signals observed. Improvements were similar across CZP dosing regimens, and observed in both AS and nr-axSpA pts.

Reference:

Disclosure: R. B. M. Landewé, UCP Pharma, 5, UCB Pharma, 2; M. Rudwaleit, UCB Pharma, 5, Egorov Heijlén, UCP Pharma, 5, UCB Pharma, 2; P. Chang, UCB Pharma, 5, W. P. Maksymowych, UCB Pharma, 5, University of Alberta, PR China, Beijing, China, 3University of Alberta, Edmonton, AB, 4Glostrup Hospital, Copenhagen, Denmark, 5Copenhagen University Hospital at Glostrup, Glostrup, Denmark

**Spinal MRI Has Little Incremental Diagnostic Value Compared with MRI of the Sacroiliac Joints Alone in Early Spondyloarthritis**

Ulrich Weber1, Veronika Zuber2, Zheng Zhao2, Robert GW Lambert3, Stanley Chan4, Susanne Juhl Pedersen6, Mikkel Ostergaard7 and Walter P. Maksymowych8. 1Department of Rheumatology, University of Alberta and PLA General Hospital, Beijing, China, Beijing, China, 3University of Alberta, Edmonton, AB, 4Glostrup Hospital, Copenhagen, Denmark, 5Copenhagen University Hospital at Glostrup, Glostrup, Denmark

**Background/Purpose:** The definition of a positive MRI as major criterion in the Assessment of SpondyloArthritis classification criteria for axial spondyloarthritis (SpA) is based on MRI of the sacroiliac joints (SIJ) alone. It is not known whether additional MRI of the spine may enhance diagnostic certainty over and above SIJ MRI alone. We aimed to assess the incremental diagnostic value of spinal MRI evaluated both separately from and combined with SIJ MRI in early SpA compared to SIJ MRI alone.

**Methods:** The study sample comprised 2 independent cohorts A/B of 130 consecutive patients with back pain ≤50 years newly referred to 2 university clinics, and 20 healthy controls (HC), in whom both SIJ and spinal MRI were available. Patients were classified according to clinical examination and pelvic radiography as having non-radiograph SpA (nr-axSpA; n=50), ankylosing spondylitis (AS; n=33), or mechanical back pain (MBP; n=47). SIJ and spinal MRI were assessed by 3 blinded readers according to standardized modules. Readers recorded presence/absence of SpA and their level of confidence in this conclusion by global evaluation of the MRI scans on a 0–10 scale (0 = definitely not SpA; 10 = definite SpA). SIJ alone and spinal MRI alone were read independently 6 months apart, with another interval of 1–3 months to the combined assessment of both SIJ and spinal MRI (combined read). We analysed differences between SIJ alone versus spinal MRI alone, and SIJ alone versus combined read of SIJ and spinal MRI. This was done descriptively by the number/percentage of subjects recorded concordantly by any 2 readers for each group and for the 2 cohorts.

**Results:** For cohorts A and B, respectively, and for assessment of SIJ and spinal scans independently there were 0% and 16.1% of nr-axSpA patients who showed spinal lesions in the absence of SIJ lesions, while 15.8% and 19.4% of nr-axSpA patients considered having a negative SIJ MRI showed a positive spinal MRI according to global assessment. Low confidence (5–7) in a diagnosis of SpA by global evaluation of SIJ MRI increased to high confidence (8–10) by global evaluation of spinal MRI in only 0% and 3.2% of nr-axSpA patients in the 2 cohorts. For cohorts A and B, 5.3% and 3.2% of nr-axSpA patients considered negative for SpA by SIJ MRI scan alone were re-classified as being positive for SpA by global evaluation of combined SIJ and spinal scans. 51.7% and 30.3% of the MBP patients (cohort A/B) showed lesions only on spinal MRI. Up to 15.0% and 18.2% of all controls were considered as having SpA by spinal MRI scan alone, based on spinal BME in 60.9% and on fat infiltration in 26.1% of these subjects.

**Number (percentage) of subjects as recorded concordantly by any 2 readers for comparisons of SIJ alone versus spinal MRI alone, and SIJ alone versus combined read of SIJ and spinal MRI read**

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Cohort A (n=62)</th>
<th>Cohort B (n=88)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>nr-axSpA</td>
<td>AS</td>
</tr>
<tr>
<td>Number of subjects</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>Lessons SIJ-Spine+</td>
<td>0 (0)</td>
<td>8 (57.1)</td>
</tr>
<tr>
<td>Global SIJ-Spine+</td>
<td>3 (15.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Global SIJ+ Combination read</td>
<td>1 (5.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Global Spine- Combination read</td>
<td>7 (36.8)</td>
<td>2 (22.2)</td>
</tr>
</tbody>
</table>

**Conclusion:** Spinal MRI adds little incremental value compared to SIJ MRI alone in terms of lesion detection and classification of early SpA patients.

**Disclosure:** U. Weber, None; V. Zuber, None; Z. Zhao, None; R. G. Lambert, None; S. Chan, None; S. J. Pedersen, None; M. Ostergaard, None; W. P. Maksymowych, None.
Background/Purpose: Few studies have evaluated changes in active inflammation of spine and sacroiliac (SI) joints by MRI during long-term treatment for axial SpA, and no data are available comparing TNF-blockers with placebo.

Objectives: To determine whether combination infliximab (IFX)+NSAID therapy is superior to NSAID monotherapy for improvement in inflammatory lesions in patients with active, axial SpA who were naïve to NSAIDs or treated with a submaximal dose of NSAIDs and to measure changes in lesions during follow-up with either NPX or no treatment in patients who achieved ASAS partial remission.

Methods: Part I of the INFAST study was a double-blind, randomized controlled trial of IFX in biologic-naïve patients 18–48 years of age with early (<3 years symptom duration), active axial SpA with signs of active saccroiliitis on MRI. Patients were randomized (2:1) to receive 28 weeks of treatment with either IV IFX 5 mg/kg (weeks 0, 2, 6, 12, 18, and 24)+NPX 1000 mg/d or IV PBO+NPX 1000 mg/d. In Part II of INFAST, patients who had achieved ASAS partial remission at week 28 continued in Part II with no IFX treatment and were randomized (1:1 ratio) to continue on NPX or to stop NPX until week 52. MRIs of spine and SI joints at baseline, week 28, and week 52 were used to assess active, inflammatory lesions. Group differences were analyzed descriptively or using Fisher exact tests.

Results: ASAS partial remission at week 28, the primary outcome, was achieved by more patients treated with IFX+NPX (61.9%) than PBO+NPX (35.3%), P<0.0021. At week 52, similar percentages of patients in the NPX and no-treatment groups maintained partial remission (47.5 vs 40%), 88% of patients had readable MRIs showing active SI lesions at baseline; 59% had spine lesions. A change from presence at baseline to complete absence of lesions at week 28 occurred more often with IFX+NPX than PBO+NPX for the SI joint (21.9% vs 3.9%, P=0.0043) and spine plus SI joints (16.2% vs 9%, P=0.0016), but not for spine alone (29.5% vs 15.7%, P=0.0764). In Part II, no treatment group differences were observed on these measures. Scores from Part I and II are shown in Table 1 and Table 2, respectively.

Table 1. MRI Scores in Part I

<table>
<thead>
<tr>
<th>Outcome</th>
<th>IFX+NPX (N=165)</th>
<th>PBO+NPX (N=51)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Week 28</td>
</tr>
<tr>
<td>Berlin MRI spine score Mean</td>
<td>2.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Median</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>SI joint score Mean</td>
<td>5.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Median</td>
<td>4.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Table 2. MRI Scores in Part II (Patients in ASAS Partial Remission at Week 28)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>NXP (N=40)</th>
<th>No Treatment (N=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 28</td>
<td>Week 52</td>
</tr>
<tr>
<td>Berlin MRI spine score Mean</td>
<td>0.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Median</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SI joint score Mean</td>
<td>1.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Median</td>
<td>1.3</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Conclusion: Patients with early, active axial SpA who were treated with IFX+NPX had greater MRI improvement and a greater percentage achieved MRI remission than patients treated with NPX alone. During follow-up, no differences were observed in MRI measures for patients who received NPX vs no treatment.

Disclosure: J. Sieper, Merck, Abbott, Pfizer, 2, Merck, Abbott, Pfizer, UCB, Roche, Lilly, 5, Merck, Abbott, Pfizer, 8; J. Lenaerts, Abbott, BMS, MSD, Pfizer, Roche, Astra Zeneca, 5; J. Wollenhaupt, MSD, 5, MSD, 8; V. Mazurov, None; L. Myasooutova, None; S. H. Park, None; Y. W. Song, None; R. Yao, Merck Pharmaceuticals, 3; D. Chitkara, Merck Pharmaceuticals, 3; N. Vastesaeger, Merck Pharmaceuticals, 3.

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The Relationship of Inflammation, Fatty Degeneration and the Effect of Long-Term TNF-Blocker Treatment On the Development of New Bone Formation in Patients with Early Active Axial Spondyloarthritis

Background/Purpose: Clinical trial results suggest that new bone formation is neither inhibited nor augmented by anti-TNF agents in ankylosing spondylitis (AS). Recently, a potential role of different inflammatory lesions such as inflammation (INF) and fatty degeneration (FD) to predict new bone formation in patients with active AS was suggested. This is the first study to analyze the relationship between INF and FD as assessed by magnetic resonance imaging (MRI) and syndesmophyte formation as assessed by conventional radiography in vertebral edges (VE) of AS patients under long-term anti-TNF treatment.

Methods: Images were scored blinded for the time point of investigation of MRIs and x-rays of patients who participated in the EASIC Registry. Most patients were treated with infliximab. Presence or absence of INF, FD and syndesmophytes was documented on the level of VEs in the anterior part of the spine at each time point. Data were compared using Fisher’s exact test after adjustment for within-patient variation. Relative risk (RR) calculation was based on a general linear model and Poisson variation.

Results: At week 28, the primary outcome, was achieved by more patients treated with IFX+NPX (61.9%) than PBO+NPX (35.3%), P<0.0021. At week 52, similar percentages of patients in the NPX and no-treatment groups maintained partial remission (47.5 vs 40%), 88% of patients had readable MRIs showing active SI lesions at baseline; 59% had spine lesions. A change from presence at baseline to complete absence of lesions at week 28 occurred more often with IFX+NPX than PBO+NPX for the SI joint (21.9% vs 3.9%, P=0.0043) and spine plus SI joints (16.2% vs 9%, P=0.0016), but not for spine alone (29.5% vs 15.7%, P=0.0764). In Part II, no treatment group differences were observed on these measures. Scores from Part I and II are shown in Table 1 and Table 2, respectively.

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<tr>
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<td>2.9</td>
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</tr>
<tr>
<td>Median</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>SI joint score Mean</td>
<td>5.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Median</td>
<td>4.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Table 2. MRI Scores in Part II (Patients in ASAS Partial Remission at Week 28)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>NXP (N=40)</th>
<th>No Treatment (N=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 28</td>
<td>Week 52</td>
</tr>
<tr>
<td>Berlin MRI spine score Mean</td>
<td>0.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Median</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>SI joint score Mean</td>
<td>1.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Median</td>
<td>1.3</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Conclusion: Patients with early, active axial SpA who were treated with IFX+NPX had greater MRI improvement and a greater percentage achieved MRI remission than patients treated with NPX alone. During follow-up, no differences were observed in MRI measures for patients who received NPX vs no treatment.

Disclosure: J. Sieper, Merck, Abbott, Pfizer, 2, Merck, Abbott, Pfizer, UCB, Roche, Lilly, 5, Merck, Abbott, Pfizer, 8; J. Lenaerts, Abbott, BMS, MSD, Pfizer, Roche, Astra Zeneca, 5; J. Wollenhaupt, MSD, 5, MSD, 8; V. Mazurov, None; L. Myasooutova, None; S. H. Park, None; Y. W. Song, None; R. Yao, Merck Pharmaceuticals, 3; D. Chitkara, Merck Pharmaceuticals, 3; N. Vastesaeger, Merck Pharmaceuticals, 3.

1Hospital Sagrat Cor, Barcelona (Spain), Barcelona, Spain, 2Aarhus University Hospital THG, Aarhus (Denmark), Aarhus, Denmark, 3Hospital del Mar, Parc de Salut Mar, Barcelona, Spain, 4Nuffield Orthopaedic Centre, Oxford, United Kingdom, 5Oxford University, Oxford, United Kingdom, 6Oxford NIHR Musculoskeletal Biomedical Research Unit, University of Oxford, Oxford, UK, Oxford, United Kingdom, 7University of Oxford; Southampton General Hospital, Southampton, United Kingdom, 8Hospital del Mar-IMIM, Universitat Autònoma de Barcelona, Barcelona; and RETICEF, ISCIII Madrid; Spain, Barcelona, Spain, 9URFOA-IMIM, Parc de Salut Mar; Idiap Jordi Gol; University of Oxford; University of Southampton, Barcelona, Spain

Background/Purpose: Patients with Ankylosing Spondylitis (AS) have reduced bone mass, and altered biomechanics at the spine, but their fracture risk remains unclear. We have used a large population-based public health database to study the association between AS and incident fractures.

Methods: We screened the SIDIAP Database (www.sidiap.org) to identify those aged 15 years or older with a diagnosis of Ankylosing Spondylitis (ICD-10 M45), and ascertainment incident osteoporotic (OP) fractures (any but skull, fingers and toes) in this population in the period 2006–2011. Five controls with no AS or other inflammatory arthritis were matched on gender, age and General Practitioner (GP). SIDIAP contains the anonymised medical records and pharmacy invoice data of a representative >4.9 million people (80% of the total population). Cox regression stratified on matched sets was used to estimate adjusted (body mass index, smoking, alcohol and oral corticosteroids) hazard ratios (HR) according to AS status. We tested for a priori defined interactions with age, gender, inflammatory bowel disease (IBD) and regular NSAID use.

Results: We identified 6,474 AS patients (0.14% of the population) and 32,346 controls and observed them for a median (inter-quartile range) of 5.98 (2.67–5.99) years. OP and clinical spine fracture rates were 9.6/4/1,000 person-years (8.52–10.90) and 2.12(1.63–2.76) among AS compared to 8.05 (95%CI 7.57–8.56) and 1.05(0.88–1.24) in controls respectively [Figure]. Adjusted HRs for OP and clinical spine fractures were 1.18 (95% CI 1.08–1.53; p = 0.001) and 1.05(0.87–1.25; p = 0.02) respectively for AS patients. Further adjustment for oral corticosteroid use attenuated the association with OP fractures (HR 1.15 (0.99–1.32; p = 0.06) but not with clinical spine fractures (HR 1.80 (1.30–2.51); p < 0.001). No interactions were present with IBD. By contrast, there were relevant interactions with NSAID use (p = 0.001) and gender (p = 0.07) on OP fracture. Adjusted HRs 1.20 (1.02–1.42; p = 0.002) and 0.75 (0.55–1.02; p = 0.07) for NSAID non-users VS users respectively [Figure], and 1.01 (0.80–1.26; p = 0.95) for females and 1.28 (1.08–1.53; p = 0.006) for males. Similar interactions were found for NSAID use and age on clinical spine fractures (p = 0.02 and p = 0.03 respectively) [Figure].

Conclusion: Patients with AS are at 18% higher risk of osteoporotic fracture related to use of oral corticosteroids, and at almost double risk of clinical spine fractures, independently of oral corticosteroids. The excess risk associated with AS is biggest in younger males who do not take oral NSAIDs regularly.

Disclosure: J. Muñoz-Ortega, None; P. Vestergaard, None; J. Blanch, None; P. Wordsworth, None; A. Judge, None; M. K. Arden, None; N. K. Arden, None; C. Cooper, Amgen, ABBI, Novartis, Pfizer, Merck Sharp and Dohme, Eli Lilly, Servier; S. Díez-Pérez, None; D. Priedo-Alhambra, None.

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1University Health Network, Toronto Western Research Institute, University of Toronto, Toronto, ON, 2Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON, 3Cedars-Sinai, Los Angeles, CA, 4Cedars-Sinai Medical Center, Los Angeles, CA, 5NIAMS/NIH, Bethesda, MD, 6Univ of Texas Health Science Center at Houston, Houston, TX, 7UCSF, San Francisco, CA

Background/Purpose: The influence of anti-TNF therapy on radiographic progression in ankylosing spondylitis (AS) is not well established. We studied this effect on radiographic progression in AS patients.

Methods: Three-hundred-and-seventy-six patients were included with at least 2 sets of radiograph at least 1.5 years apart (range 1.5 to 9 years) from a multicenter longitudinal cohort of 1600 AS patients. Patients with total spinal ankylosis at baseline were excluded. Patients were assessed at least annually on a protocol format. Time-averaged BASDAI ESR and CRP, NSAID and anti-TNF indices were calculated. Full recommended dose of NSAID/anti-TNF taken for the entire period between x-rays were assigned a score of 100. Total anti-TNF exposure was calculated from the anti-TNF index and the years of exposure. Patients with mSASS increase at a rate of ≥ 1 unit/year were considered progressors. T-test, Chi-square and logistic regression were performed. For multivariate analysis, variables were selected from those that were significant in the univariate analysis. Variables were separated in different models based on the correlation matrix.

Results: The mean age of patients was 40.8 ± 13.8 years (75% males and 92% HLA-B27 positive) and the mean disease duration was 16.5 ± 12.9 years. Among patients enrolled, 60% had never smoked and 17% stopped smoking in the period between radiographs. No baseline radiographic abnormality was seen in 44% patients and 35% showed progression ≥ 1 mSASS unit/year.

In the univariate analysis, males progressed faster (1.2 vs 0.8 mSASS unit/year) with an odds ratio (OR) of 1.9 (95% CI: 1.02–1.81; p = 0.04) at 1,843 patients. Other significant variables included age of onset, baseline and time-averaged CRP and ESR and cumulative dose of anti-TNF received (Table 1A). The NSAID index was not significant in the univariate analysis. In the multivariate analysis (Table 1B), the following variables remained significant: Gender (β = 3.75;p = 0.001), baseline ESR (β = 1.03;p = 0.001), baseline mSASS (β = 1.05;p = 2 × 10−10) and cumulative anti-TNF exposure (β = 0.99;p = 0.006). To estimate the effect with any exposure to biologics, cumulative anti-TNF exposure was substituted with the dichotomous variable: history of anti-TNF exposure. Anti-TNF use was protective against progression with an OR of 0.4 (p = 0.006). The other variables remained significant as in the previous model.

Table 1A. Univariate and Multivariate Regression Analysis for radiographic progression

<table>
<thead>
<tr>
<th>Covariate</th>
<th>p value</th>
<th>Odds Ratio</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Gender</td>
<td>0.02</td>
<td>1.93</td>
<td>1.10–3.39</td>
</tr>
<tr>
<td>Age of Onset</td>
<td>0.004</td>
<td>1.03</td>
<td>1.01–1.06</td>
</tr>
<tr>
<td>Disease Duration</td>
<td>2 × 10−5</td>
<td>1.04</td>
<td>1.02–1.06</td>
</tr>
<tr>
<td>Smoking History</td>
<td>0.04</td>
<td>1.61</td>
<td>1.02–2.54</td>
</tr>
<tr>
<td>Baseline CRP</td>
<td>0.004</td>
<td>1.03</td>
<td>1.01–1.05</td>
</tr>
<tr>
<td>Time-Averaged CRP</td>
<td>0.002</td>
<td>1.05</td>
<td>1.02–1.08</td>
</tr>
<tr>
<td>Baseline ESR</td>
<td>0.0001</td>
<td>1.03</td>
<td>1.01–1.04</td>
</tr>
<tr>
<td>Time-Averaged ESR</td>
<td>0.006</td>
<td>1.02</td>
<td>1.01–1.04</td>
</tr>
<tr>
<td>Baseline mSASS</td>
<td>1 × 10−11</td>
<td>1.07</td>
<td>1.05–1.09</td>
</tr>
<tr>
<td>Total Biologic Exposure</td>
<td>0.04</td>
<td>0.99</td>
<td>0.99–1.00</td>
</tr>
</tbody>
</table>
The Wnt Inhibitors DKK1 and SFRP1 Are Downregulated by Promoter Hypermethylation in Systemic Sclerosis. Clara Dees1, Inga Schloßmann1, Robin Funke1, Alfiya Distler1, Katrin Palumbo-Zerr2, Pawel Zerr2, Oliver Langen, Germany, University Hospital Zurich, Zurich, Switzerland. Expression of endogenous Wnt inhibitors might be silenced through DNA methylation and involve genes implicated in the pathogenesis of SSc. Also increased activation of the Wnt signaling pathway resulted in decreased gene transcription by 56% for DKK1 and by 89% for SFRP1 in SSc fibroblasts from 11 ± 3% to 52 ± 16% of control levels and the expression of DKK1 was completely reversed to control levels (p < 0.05 each). Consistent with the reduced mRNA levels, the protein levels of both DKK1 and SFRP1 were severely decreased in skin of SSc patients as analyzed by immunohistochemistry. In addition, decreased expression of DKK1 and SFRP1 was also found in experimental fibrosis. In the model of bleomycin-induced dermal fibrosis, the mRNA levels of DKK1 deceased by 73 ± 5% (p = 0.036) upon bleomycin challenge and those of SFRP1 by 35 ± 3% (p = 0.004). Both genes were re-activated by treatment of bleomycin-challenged mice with 5-aza. Compared to untreated mice injected with bleomycin, the mRNA levels increased upon treatment with 5-aza by 504 ± 42% (p = 0.024) for DKK1 and by 131 ± 23% (p = 0.015) for SFRP1. Marker results were obtained for protein levels consistently. 5-aza significantly reduced bleomycin-induced dermal fibrosis with decreased dermal thickening and reductions in hydroxyproline content and myofibroblast counts. Conclusion: We demonstrate that the endogenous Wnt inhibitors DKK1 and SFRP1 are downregulated by promoter hypermethylation in SSc. Inhibition of Damms by 5-aza re-activated gene expression in SSc fibroblasts and in experimental fibrosis. As different inhibitors of Damms are already approved for other diseases and are well tolerated, our findings might have direct translational implications and provide a novel approach to inhibit Wnt signaling in SSc.

Disclosure: C. Dees, None; I. Schloßmann, None; R. Funke, None; A. Distler, None; K. Palumbo-Zerr, None; P. Zerr, None; O. Distler, Actelion, Pfizer, Boehringer-Ingelheim, Bayer, Roche, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrum, Novartis and Active Biotec, 2, Actelion, Pfizer, Boehringer-Ingelheim, Bayer, Roche, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrum, Novartis and Active Biotec, 2, Actelion, Pfizer and Ergonex, 8; G. A. Schett, None; J. H. Distler, None.

Table 1B. Univariate Regression

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Variables included: Gender, Disease Duration, Baseline ESR, Baseline mSASSS &amp; Total Anti-TNF Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Gender</td>
<td>0.003</td>
</tr>
<tr>
<td>Baseline ESR</td>
<td>0.001</td>
</tr>
<tr>
<td>Baseline mSASSS</td>
<td>2 × 10⁻⁴</td>
</tr>
<tr>
<td>Total Anti-TNF Exposure</td>
<td>0.006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2</th>
<th>Variables included: Gender, Age of Onset, Baseline ESR, Baseline mSASSS &amp; Total Anti-TNF Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Gender</td>
<td>0.01</td>
</tr>
<tr>
<td>Baseline ESR</td>
<td>0.0004</td>
</tr>
<tr>
<td>Baseline mSASSS</td>
<td>1 × 10⁻⁸</td>
</tr>
<tr>
<td>Total Anti-TNF Exposure</td>
<td>0.04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 3</th>
<th>Variables included: Gender, Disease Duration, Baseline ESR, Baseline mSASSS &amp; Anti-TNF (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Gender</td>
<td>0.01</td>
</tr>
<tr>
<td>Baseline ESR</td>
<td>5 × 10⁻⁵</td>
</tr>
<tr>
<td>Baseline mSASSS</td>
<td>3 × 10⁻³</td>
</tr>
<tr>
<td>Anti-TNF Use (Yes/No)</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Age of onset and Disease duration were strongly correlated in the matrix (R²=0.98) and so they were included in separate models. Only one inflammatory parameter (Baseline ESR) was used for the same reason. Model 3 was used to calculate the Odds of progression in patients who took anti-TNF at some time compared to those with no exposure.

Conclusion: Inflammation is associated with radiographic progression. Anti-TNF therapy slows the rate of radiographic progression in AS.

Disclosure: N. Haroon, Janssen Pharmaceutica Product, L.P., 5, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5, R. D. Inman, Sanofi-Aventis Pharmaceutical, 5, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5, Janssen Pharmaceutica Product, L.P., 5, Merck Pharmaceuticals, 5, T. J. Learch, None; M. H. Weisman, None; M. M. Ward, None; J. D. Reveille, None; L. S. Geneser, None.

783 Neutralization of Plasminogen Activator Inhibitor-1 Resolves Skin Fibrosis and Vascular Injury in a Murine Model of Human Scleroderma. Raphael Lemaire1, Tim Burwell2, Tracy Delaney3, Cindy Chen1, Julie Bakken1, Lily Cheng1, Philip Brohawn4, Isabelle de Mendez5, Dominik Corkill6, Anthony Coyle7, Ronald Herbst8 and Jane Conner9, 1Medimmune LLC, Gaithersburg, MD, 2Medimmune, LLC, Cambridge, England, 3Pfizer, Inc., Cambridge (formerly at MedImmune LLC, Gaithersburg, MD, USA).

Background/Purpose: Scleroderma is a systemic autoimmune disease in which thrombosis and fibrosis contribute to skin pathology. Plasminogen activator inhibitor-1 (PAI-1) is the major inhibitor of pro-fibrinolytic plasminogen activators uPA and tPA and its expression has been shown to be increased in the skin of scleroderma patients. The purpose of this study was to evaluate the contribution of PAI-1 inhibition of PAs to pathological changes in the skin in an animal model that recapitulates both the fibrotic and occlusive vasculopathy of human scleroderma.

Methods: B10D2 splenocytes were injected into BALB/c Rag2⁻/⁻ mice resulting in a model of graft-vs-host disease-induced skin fibrosis (GVHD). A monoclonal antibody that selectively prevents the binding of PAI-1 to its target PAs was administered ip two times per week beginning either at time of engraftment or at week 3 post-engraftment. Effect of PAI-1 neutralization was assessed on clinical skin score, gene expression and histological changes in the skin. In addition, the effect of blocking PAI-1 on MMP-1 activation was evaluated in vitro in human dermal microvascular endothelial cells (HMVECs).

Results: In this model fibrosis peaks at week 6 post-graft, following the inflammation peak at week 4. PAI-1 expression is increased in the skin beginning at week 2.

2. Prophylactic neutralization of PAI-1 significantly reduced the clinical skin score in a dose-dependent manner as early as week 2 post-graft. Clinical benefits were associated with normalization of fibrinolysis genes (plasmin, PAI-1, uPA, uPAR, KLK6) and a decrease in collagen turnover. Treatment with PAI-1 neutralizing antibody in a therapeutic regimen also resulted in a significant reduction of the clinical skin score. Clinical benefits were associated with normalization of fibrinolysis along with resolution of skin fibrosis over chronic phase of the disease (week 4–6) as shown by reduction of dermal thickness and extracellular collagen which correlated with reduction of expression of pro-fibrotic cytokines (TGF-β, IL-13) and matrix turnover regulators (TIMP-1). The matrix turnover component of PAI-1 inhibition was
further supported where neutralization of PAI-1 in cultured dermal HMVECs decreased MMP-1 activation in a concentration-dependent manner.

Conclusion: These data suggest that PAI-1 plays a key role in both the skin vasculopathy and fibrosis observed in this murine model of human scleroderma and that inhibition of the binding of PAI-1 to PAs resolves fibrosis via two distinct plasmin-based mechanisms: (1) directly via reducing MMP activation and (2) indirectly via reducing infiltration of profibrotic cytokine-secreting inflammatory cells following thrombosis-based resolution of vascular injury and activation.

Disclosure: R. Lemaire, None; T. Burwell, None; T. Delaney, None; C. Chen, None; J. Bakken, None; L. Cheng, None; P. Brokawa, None; L. de Mendez, None; D. Corkill, None; A. Coyle, None; R. Herbst, None; J. Connor, None.

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Resident Lung Fibroblast Gene Expression Signatures Predict Susceptibility or Resistance to Experimental Lung Fibrosis, Emma Derrett-Smith1, Rachel Hoyles1, Korsa Khan1, David J. Abraham1 and Christopher P. Denton2. 1UCL Medical School, London, United Kingdom, 2UCL, London, United Kingdom

Background/Purpose: In scleroderma (SSc), lung fibrosis is linked to epithelial damage and dysregulated repair mechanisms. Resident lung fibroblasts may affect multiple cell types including epithelium, endothelium, smooth muscle cells and fibrocytes. We have used two complementary transgenic mouse strains with altered TGFβ signalling to better understand the regulatory role of resident lung fibroblasts in defining susceptibility to fibrosis.

Methods: The TβRIIΔk-fib mouse model of SSc, in which TGFβ signalling is upregulated in fibroblasts, is susceptible to fibrotic lung injury whereas the TβRII-null-fib strain, in which TβRII is conditionally knocked out in fibroblasts, is resistant to bleomycin-induced lung fibrosis. We have used an illumina® microarray platform to profile lung or skin fibroblasts from these two strains and identified a cohort of genes that determine susceptibility or resistance to experimental lung fibrosis, comparing to a control group using whole lung from TβRIIΔk-fib animals and wildtype littermates (n=3) on the same microarray platform. Technical validation of data and additional quantitation of gene expression was performed using quantitative RT-PCR assays with replicate samples.

Results: The TβRIIΔk-fib lung fibroblast gene expression signature includes key genes that are implicated as pathogenic drivers of fibrosis and inflammation and potential biomarkers in SSc. Conversely, many of these genes are downregulated in TβRII-null-fib mice (figure 1), including BMP4 (fold reduction in TβRII-null-fib 31.8, p<0.02; fold upregulation in TβRIIΔk-fib compared with WT 2.01, p<0.06); elastin (TβRII-null-fib 17.8, p<0.14; TβRIIΔk-fib 1.86, p<0.09); CCL2 (TβRII-null-fib 56.8, p<0.09; TβRIIΔk-fib 1.72, p<0.03) and MMP13 (TβRII-null-fib 13.2, p<0.08; TβRIIΔk-fib 3.6, p<0.4). CTGF (CCN2) was strongly upregulated in TβRII-null-fib mice (figure 1), including BMP4 (TβRII-null-fib 31.8, p<0.03)and MMP13 (TβRII-null-fib 13.2, p<0.08). The signature of overexpression was present in the whole lung analysis suggesting that fibroblast-specific differences in gene expression determine altered fibrotic response.

Conclusion: These data define a cohort of genes differentially expressed in fibroblasts that associate strongly with susceptibility or resistance to experimental lung fibrosis. These transcripts include many that are important in tissue repair and that have previously been shown to be over expressed in SSc skin samples. They suggest that resident fibroblast gene expression signature may govern fibrosis in lung and skin.

Disclosure: E. Derrett-Smith, None; R. Hoyles, None; K. Khan, None; D. J. Abraham, None; C. P. Denton, None.

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Crosstalk Between Integrins and TGFβ in the Pathogenesis and Treatment of Multiple Presentations of Scleroderma Elizabeth E. Gerber1, Fredrick M. Wigley2, Elaine C. Davis3, David L. Hsu1 and Harry C. Dietz4. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2Johns Hopkins University, Baltimore, MD, 4McGill University, Montreal, QC

Background/Purpose: Scleroderma, defined as pathologic fibrosis of the skin, has many clinical presentations. In the most commonly recognized form, systemic sclerosis (SSc), previously healthy individuals acquire fibrosis of the skin and viscera associated with autoantibodies. Although a genetic contribution to SSc has been established, familial recurrence rates and sporadic cases have not been found. The study of SSc is hindered by a lack of animal models that faithfully recapitulate this complex disease. In contrast, a rare disorder, stiff skin syndrome (SSS), shows childhood onset of diffuse skin fibrosis with autosomal dominant inheritance and no visceral fibrosis or autoimmunity. Both disorders have been linked to TGFβ. SSS is caused by heterozygous missense mutations in the gene encoding fibritinII-1, a major constituent of extracellular microfibrils. SSS mutations localize to the only domain that harbors an Arg-Gly-Asp motif that mediates cell-matrix interaction by integrin-binding.

Methods: Two SSS mouse models were generated by homologous recombination and either bred to Igfb3-/- mice or treated with antibodies by IP injection. Primary human dermal fibroblast cultures were derived from forearm biopsies and stimulated with 2 ng/mL TGFβ1. Analyses included skin stiffness scoring, histology, flow cytometry, Western and Northern blotting, and qPCR. Data are shown as standard boxplots (R statistical software) and analyzed with 2-tailed t tests.

Results: Knock-in mutations in Fbn1 in mice that either reproduce a naturally-occurring SSS mutation (Fbn1W1572C/+) or impose an oblique loss of integrin binding (Fbn1P1345E/+), are sufficient to initiate and maintain dermal fibrosis. This associates with upregulation of surface expression of β1 and αvβ3 integrins by dermal cells. Treatment with β1 integrin activating (β1Aβ) for 12 weeks reduces active αvβ3 in the dermis and prevents stiffness and skin fibrosis (Fig.1). Notably, genetic ablation of integrin β3 also prevents the phenotype and TGFβ3 antagonism, commenced at a later age, completely reverses it. In vitro, SSc patient cells also show aberrant integrin expression and function that contributes to a fundamental change in the signaling properties of ligand-activated TGFβ receptors, favoring activation of extracellular-regulated kinase (ERK). Integrin- or ERK-mediating treatments normalized the pro-fibrotic repertoire in SSc cells, increasing levels of matrix-inhibiting microRNA-29, and reducing both ERK activation and collagen expression (Fig.2).

Conclusion: This work demonstrates the potential to reverse established dermal fibrosis in a model of human disease and shows that despite the phenotypic differences between SSS and SSc, study of SSS animal models has offered a pathogenic sequence for scleroderma that suggests therapies for SSc, including β1 integrin activation and blockade of β3 integrin, TGFβ or ERK signaling.

Disclosure: E. E. Gerber, None; F. M. Wigley, None; E. C. Davis, None; D. L. Hsu, None; H. C. Dietz, None.

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Aberrant Adipogenesis in the Pathogenesis of Scleroderma. Roberta Goncalves Marangoni, Jun Wei, Monique E. Hinchcliffe, Feng Fang, Warren Tourtellotte and John Varga. Northwestern University Medical School, Chicago, IL

Background/Purpose: Skin fibrosis in systemic sclerosis (SSc) is associated with loss of subcutaneous adipose tissue (SCAT) and reduction in adipocyte size and number. The mechanisms underlying the SCAT atrophy and its significance in pathogenesis are not known. In light of emerging insights into adipogenesis and the plasticity of adipogenic progenitor cells, we investigated the mechanical basis of adipocyte atrophy and its relation to fibrosis in the skin.

Disclosure: Sunday, November 11
Methods: The kinetics of SCAT loss was investigated in mouse models of dermal fibrosis. Transgenic mice were used for adipocyte lineage tracing. Modulation of adipogenic differentiation was evaluated in mouse and human stem cells and skin fibroblasts by real-time qPCR, immunoblotting, cytochemistry, and DNA microarrays.

Results: Skin biopsies from a cohort of well-characterized patients with diffuse cutaneous SSc showed variable but consistent SCAT atrophy. Moreover, striking loss of SCAT was observed in mouse models of scleroderma induced by bleomycin. Careful time-course studies demonstrated that loss of SCAT preceded the onset of dermal fibrosis. Furthermore, loss of adipogenic markers preceded the increase in fibrogenic markers in the lesional skin. These observations suggest that adipogenic progenitor cell differentiation was redirected towards fibrogenic fates. Indeed, TGF-beta was able to preferentially promote fibrogenic differentiation of mouse 3T3L1 adipocytes in vitro. Remarkably, the tyrosine kinase abl prevented adipogenesis, which was rescued by the putative anti-fibrotic drug imatinib. Moreover, in normal skin fibroblasts imatinib caused dramatic induction of adipogenic genes. The potential significance of adipocyte-fibroblast transitions in fibrogenesis is directly addressed by fate-mapping studies using adipocyte-labeled transgenic reporter mice.

Conclusion: Our studies indicate that SCAT atrophy is consistently associated with human and mouse scleroderma, and appears to precede the onset of dermal fibrosis. Cellular adipocyte/fibroblast plasticity, readily induced in vitro and manipulated by imatinib, may directly contribute to fibrogenesis. We conclude that loss of SCAT might be a primary event in the pathogenesis of SSc, and adipogenic progenitor cell differentiation may be a potential target of therapeutic manipulation.

Disclosure: R. Goncalves Marangoni, None; J. Wei, None; M. E. Hinichiff, None; F. Fang, None; W. Tourtellotte, None; J. Varga, None.

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Tenofovir, a Potent Anti-Viral Agent, Is an Ecto-5'Nucleotidase (CD73) Inhibitor That Prevents Dermal Fibrosis in a Murine Model of Scleroderma. Jessica L. Feig1, Doreen Tiron1, Miguel Perez-Aso1, Timothy Cardozo1 and Bruce N. Cronstein2. 1New York University School of Medicine, New York, NY, 2NYU School of Medicine, Division of Rheumatology, New York, NY

Background/Purpose: Acyclic nucleoside phosphonates are a key class of antivirals commonly used in the treatment of both DNA and retroviral infections. Adefovir and tenofovir are AMP analogues that are determined as the ratio of red/green pixels representing compact/hyaluronic acid content. Samples of H&E or picrosirius red-stained slides were imaged, and pixel densities were compared to a neutral foot type, an over-pronated foot type was inversely associated with over-pronated and over-supinated foot types in a large, bi-racial community-based cohort of men and women 50 years of age or older.

Methods: Of 1,695 Johnston County Osteoarthritis Project participants clinically evaluated for foot disorders in 2006–2010, complete foot pressure data were available for 1,466 (1,425 with bilateral and 41 with unilateral foot data; mean age 68.5 years, mean body mass index [BMI] 31.2 kg/m², 67.2% women, 29.5% African American). Two trained examiners used the validated Foot Assessment Clinical Tool to determine the presence or absence of foot disorders. Foot pressure scans were recorded for both feet as participants walked at a normal pace over a Tekscan MatsuScan system (Tekscan Inc., Boston, MA). The center of pressure excursion index (CPEI) was calculated for each foot. CPEI cutoff values were set a priori to create a 3-category foot type variable: over-pronated (≥7.3), over-supinated (≥21.0), and neutral (7.3 to <21.0; referent). With the foot as the unit of analysis, separate multivariate logistic regression models were performed to examine the association between foot type and each foot disorder, adjusting for age, BMI, gender, and race. Effect modification between foot type and age, BMI, gender, or race were examined (p<0.10 for interaction was considered statistically significant).

Results: Of 2,891 feet available for analysis, 66.5% had a neutral foot type, 13.9% were over-pronated, and 19.7% were over-supinated. Hallux valgus was the most common foot disorder (57.1%), followed by overlapping toes (27.1%), hammer toes (25.9%), Morton’s neuroma (6.0%), Tailor’s bunions (5.4%), plantar fasciitis (3.4%), and claw toes (2.1%). Table shows results of adjusted models. Compared to a neutral foot type, an over-pronated foot type was associated with hallux valgus (adjusted odds ratio [aOR]=1.36, 95% confidence interval [CI]=1.13–1.65) and overlapping toes (aOR=1.36, 95% CI=1.12–1.64), while an over-supinated foot type was inversely associated with hallux valgus (aOR=0.85, 95% CI=0.74–0.97). These associations did not differ by age, BMI, gender, or race.

Disclosure: J. L. Feig, None; D. Tiron, None; M. Perez-Aso, None; T. Cardozo, None; B. N. Cronstein, Canfite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Arthritis Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.

ARHP Concurrent Abstract Session

Foot and Gait Disorders

Sunday, November 11, 2012, 2:30 PM–4:00 PM

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Foot Disorders Associated with Over-Pronated and Over-Supinated Foot Types: The Johnston County Osteoarthritis Project. Yvonne M. Golightly1, Marian T. Hannan2, Alyssa B. Dufour3, Howard J. Hillstrom4 and Joanne M. Jordan5. 1University of North Carolina, Chapel Hill, NC, 2Hebrew SeniorLife & Harvard Med Sch, Boston, MA, 3Hebrew SeniorLife & Boston Univ, Boston, MA, 4Hospital Special Surgery (HSS), New York, NY, 5University of North Carolina Thurston Arthritis Research Center, Chapel Hill, NC

Background/Purpose: Based on clinical observations, musculoskeletal foot disorders, such as hallux valgus or plantar fasciitis, appear to occur more frequently in a pronated foot type. Other disorders, like hammer toes or Tailor’s bunions, may occur more often in a supinated (high arch) foot type. The purpose of this cross-sectional analysis was to determine whether specific foot disorders were associated with over-pronated and over-supinated foot types in a large, bi-racial community-based cohort of men and women 50 years of age or older.

Methods: The Johnston County Osteoarthritis Project participants clinically evaluated for foot disorders in 2006–2010, complete foot pressure data were available for 1,466 (1,425 with bilateral and 41 with unilateral foot data; mean age 68.5 years, mean body mass index [BMI] 31.2 kg/m², 67.2% women, 29.5% African American). Two trained examiners used the validated Foot Assessment Clinical Tool to determine the presence or absence of foot disorders. Foot pressure scans were recorded for both feet as participants walked at a normal pace over a Tekscan MatsuScan system (Tekscan Inc., Boston, MA). The center of pressure excursion index (CPEI) was calculated for each foot. CPEI cutoff values were set a priori to create a 3-category foot type variable: over-pronated (≥7.3), over-supinated (≥21.0), and neutral (7.3 to <21.0; referent). With the foot as the unit of analysis, separate multivariate logistic regression models were performed to examine the association between foot type and each foot disorder, adjusting for age, BMI, gender, and race. Effect modification between foot type and age, BMI, gender, or race were examined (p<0.10 for interaction was considered statistically significant).

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Table.

<table>
<thead>
<tr>
<th>Foot Disorder</th>
<th>Foot Type</th>
<th>Foot disorder/ Foot Type (%)</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted* OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallux Valgus</td>
<td>Over-Pronated</td>
<td>277/401 (69.1)</td>
<td>1.41 (1.17–1.70)</td>
<td>1.36 (1.13–1.65)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>1095/1922 (57.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Over-Supinated</td>
<td>279/568 (49.1)</td>
<td>0.85 (0.74–0.96)</td>
<td>0.85 (0.74–0.97)</td>
</tr>
<tr>
<td>Overlapping Toes</td>
<td>Over-Pronated</td>
<td>136/401 (33.9)</td>
<td>1.38 (1.15–1.67)</td>
<td>1.36 (1.12–1.64)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>500/1220 (26.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Over-Supinated</td>
<td>148/568 (26.1)</td>
<td>0.97 (0.80–1.18)</td>
<td>0.97 (0.80–1.18)</td>
</tr>
<tr>
<td>Hammer Toes</td>
<td>Over-Pronated</td>
<td>107/401 (26.7)</td>
<td>0.96 (0.75–1.22)</td>
<td>0.89 (0.69–1.15)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>489/1922 (25.4)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Over-Supinated</td>
<td>152/568 (26.8)</td>
<td>0.98 (0.80–1.20)</td>
<td>1.00 (0.81–1.23)</td>
</tr>
<tr>
<td>Morton’s Neuroma</td>
<td>Neutral</td>
<td>115/1922 (6.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Over-Supinated</td>
<td>40/568 (7.0)</td>
<td>1.14 (0.84–1.53)</td>
<td>1.11 (0.82–1.50)</td>
</tr>
<tr>
<td>Taillor’s Bunion</td>
<td>Over-Pronated</td>
<td>36/401 (9.0)</td>
<td>1.14 (0.86–1.51)</td>
<td>1.23 (0.93–1.62)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>93/1922 (4.8)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Plantar Fasciitis</td>
<td>Over-Pronated</td>
<td>26/568 (4.6)</td>
<td>0.85 (0.59–1.22)</td>
<td>0.85 (0.60–1.22)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>14/401 (3.5)</td>
<td>0.92 (0.50–1.70)</td>
<td>0.98 (0.53–1.82)</td>
</tr>
<tr>
<td></td>
<td>Over-Supinated</td>
<td>20/568 (3.5)</td>
<td>1.14 (0.78–1.67)</td>
<td>1.13 (0.76–1.67)</td>
</tr>
<tr>
<td>Claw Toes</td>
<td>Over-Pronated</td>
<td>7/401 (1.8)</td>
<td>0.75 (0.57–1.25)</td>
<td>0.69 (0.34–1.42)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>42/1922 (2.2)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Over-Supinated</td>
<td>11/568 (1.9)</td>
<td>0.93 (0.51–1.69)</td>
<td>0.89 (0.48–1.64)</td>
</tr>
</tbody>
</table>

*Adjusted for age, BMI, gender, race.

Conclusion: Hallux valgus and overlapping toes were the only foot disorders strongly related to foot type in this sample. Future studies should determine the longitudinal association between foot types and foot disorders as well as examine shoe and orthotic interventions for specific foot types as preventive approaches for foot disorders.

Disclosure: Y. M. Golightly, None; M. T. Hannan, None; A. B. Dufour, None; H. J. Hillstrom, None; J. M. Jordan, None.

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Background/Purpose: While foot pain has been linked to poor outcomes, little is known about how the foot might affect physical functioning or, specifically, leg muscle mass. As no studies have examined the association between leg muscle mass and foot pain, structure or function, the purpose was to evaluate the relation of leg muscle mass to these characteristics, in a population-based study of older men and women. We hypothesized that foot pain and poor foot function/structure (e.g. supination or pronation) would be linked to low leg muscle mass.

Methods: Framingham Foot Study participants with complete data on leg muscle mass as well as foot pain, structure and function (2002–08) were included in this study. Whole body DXA (Lunar DXP-L) was used to measure leg muscle mass (kg). Foot pain (y/n) was present if pain, aching or stiffness was reported on most days of the month. Data from a Tekscan Matscan pressure mat were used to calculate foot structure, as the modified arch index (MAI) during bipedal standing, and foot function, as the center of pressure excursion index (CPEI) while walking using the two-step method. Results: There were 3145 participants contributing 5517 feet (Table 1). Hallux valgus and hammer toes were the most common foot disorders. Prevalence of hallux valgus and overlapping toes was higher among pronators, while prevalence of hallux valgus and hallux rigidus was lower among supinators (Table 2). Low arches were associated with a higher prevalence of Morton’s neuroma and hammer toes.

Table 1. Population characteristics and prevalence of foot disorders in the study sample. Prevalence by foot (N = 5517).

<table>
<thead>
<tr>
<th>Characteristic</th>
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</tr>
</thead>
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<td>Age (years)</td>
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Prevalence N (%) Hallux Valgus 1472 (26.3) Hammer Toes 894 (16.2) Morton’s Neuroma 439 (8.0) Overlapping Toes 294 (5.3) Tailor’s Bunions 197 (3.6) Plantar Fasciitis 173 (3.1) Hallux Rigidus 73 (1.3) Claw Toes 74 (1.3)

Conclusion: Foot structure and function were related to prevalence of specific foot disorders in this population. The results are in agreement with biomechanical theory of and clinical implications from specific foot disorders. However, these cross-sectional data cannot confirm a causal relation. These results underscore the utility of clinical input in understanding the relations between foot structure, function, and disorders and may provide insights for interventions to improve function.

Disclosure: T. J. Hagedorn, None; A. B. Dufour, None; J. L. Riskowski, None; H. J. Hillstrom, None; V. A. Casey, None; M. T. Hannan, None.

791


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Disclosure: T. J. Hagedorn, None; A. B. Dufour, None; J. L. Riskowski, None; H. J. Hillstrom, None; V. A. Casey, None; M. T. Hannan, None.
feet, respectively, with the referent the middle 60%. The foot with CPEI or MAI value farthest from the respective median value was chosen as the foot of interest for each participant. Crude and adjusted (age, body mass index (BMI, kg/m²), sex) multinomial (for foot structure and function outcomes) logistic regression was used to determine the association of a 1 standard deviation (SD) increase in leg muscle mass, both crude and normalized to height, with foot pain, structure and function. Sex-specific models were also examined.

Results: Of the 1798 participants (age: 67 ± 10 years; BMI: 28 ± 4.9 kg/m²; 57% women), the average leg muscle mass was 17.51 ± 2.23 kg in men and 11.60 ± 1.51 kg in women. 21% reported foot pain. A 1 SD increase in leg muscle mass was associated with 18% lower odds of foot pain, 25% lower odds of pronation and 19% higher odds of supination, compared to the referent. A 1 SD increase in muscle mass was associated with 14% higher odds of low arch and 15% lower odds of high arch. Adjustment for age and BMI did not change the results, but associations were attenuated after adding sex to the model. Results were similar for muscle mass normalized to height and sex-specific models.

However, as foot motion during gait influences the movement pattern through the kinetic chain, may exist between those with high, low, and normal arch structure, and future studies should evaluate if differences in movement patterns are related to foot structure. Further, as this study is cross-sectional, longitudinal studies are needed to determine the cause-effect relations between foot structure and function to LB/LE pain.

Conclusion: A low arch structure, but not high arch structure or foot function, is associated with greater odds of low extremity joint pain. The results suggest that differences in the kinetic chain may exist between those with high, low, and normal arch structure, and future studies should evaluate if differences in movement patterns are related to foot structure. Further, as this study is cross-sectional, longitudinal studies are needed to determine the cause-effect relations between foot structure and function to LB/LE pain.

Table 1. Crude and adjusted odds ratios (95% confidence intervals) of associations of lower extremity joint pain to foot structure, assessed using modified arch index (MAI), and to foot function, assessed using center of pressure excursion index (CPEI).

<table>
<thead>
<tr>
<th>Region of Interest</th>
<th>N % with Pain</th>
<th>Crude Model MAI – Crude Model</th>
<th>Adjusted Model MAI – Adjusted Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Back</td>
<td>632, 34.1%</td>
<td>1.00 (0.83, 1.35)</td>
<td>0.74 (0.57, 0.95)</td>
</tr>
<tr>
<td>Hips</td>
<td>325, 17.5%</td>
<td>1.25 (0.94, 1.66)</td>
<td>0.96 (0.71, 1.34)</td>
</tr>
<tr>
<td>Knees</td>
<td>546, 29.4%</td>
<td>1.57 (1.24, 1.99)</td>
<td>0.86 (0.66, 1.13)</td>
</tr>
<tr>
<td>Ankles</td>
<td>207, 11.2%</td>
<td>1.47 (0.85, 2.06)</td>
<td>1.00 (0.84, 1.16)</td>
</tr>
<tr>
<td>Feet</td>
<td>487, 26.2%</td>
<td>1.22 (0.95, 1.59)</td>
<td>0.92 (0.68, 1.26)</td>
</tr>
</tbody>
</table>

* Model adjusted by age, gender, body mass index

Conclusion: Our results suggest that although leg muscle mass was associated with foot pain, foot structure and foot function in our population of middle-aged and older adults, these relations are confounded by sex. Leg muscle mass is likely not a determinant of foot pain, structure or function. These results highlight the need for future work to examine the role of foot pain, structure and function in understanding other aspects of impairment and physical function.

Disclosure: A. B. Dufour, None; M. T. Hannan, None; P. P. Katz, None; J. L. Riskowski, None; T. J. Hagedorn, None; V. A. Casey, None; R. R. McLean, None.

792 Associations of Foot Structure and Function to Low Back and Lower Extremity Pain. Jody L. Riskowski1, Alyssa B. Dufour2, Thomas J. Hagedorn3, Howard J. Hillstrom3, Virginia A. Casey4 and Marian T. Hannan5. 1 Hebrew SeniorLife & Harvard Medical School, Boston, MA; 2 Hebrew SeniorLife & Boston Univ, Boston, MA; 3 Hebrew SeniorLife, Boston, MA; 4 Hebrew SeniorLife & Harvard Med School, Boston, MA; 5 Hebrew SeniorLife & Boston Univ, Boston, MA; 6 Hebrew Senior Life, Boston, MA.

Background/Purpose: Common risk factors of low back/low extremity (LB/LE) joint pain are age, gender and body mass index (BMI), with women, older adults and overweight/obese individuals at increased risk. However, as foot motion during gait influences the movement pattern through the kinetic chain, foot structure and function may also be associated with lower extremity joint pain. Thus, the aim was to evaluate the relations of LB/LE pain to foot structure and function in a population-based study.

Methods: Framingham Foot Study participants with complete data on pain in the LB/LE joints as well as foot structure and function were included.

LB/LE joint pain was determined by the response to the NHANES-type question, “On most days do you have pain, aching or stiffness in your [low back, hips, knees, ankles, or feet]?” Bipolar and unilateral pain were weighted the same; responses were dichotomized to yes or no.

A pressure mat (Matscan, Tekscan Inc.) yielded foot structure and function data during bipedal standing, and while walking, using the two-step method. From these data, modified arch index (MAI), a measure of foot structure, and center of pressure excursion index (CPEI), a measure of foot function, were calculated.

Foot structure classification used MAI with participants who had a foot in the top or bottom 20% of these values denoted as supinators or pronators, respectively, with the middle 60% the referent. Foot function classification used CPEI, with those who had a foot in the top or bottom 20% of these

* Disclosure: J. L. Riskowski, None; A. B. Dufour, None; T. J. Hagedorn, None; H. J. Hillstrom, None; V. A. Casey, None; M. T. Hannan, None.

793 Associations of Foot Forces and Pressures to Regional Foot Pain: The Framingham Foot Study. Jody L. Riskowski, Thomas J. Hagedorn, Alyssa B. Dufour, Virginia A. Casey and Marian T. Hannan. 1 Hebrew SeniorLife & Harvard Med School, Boston, MA; 2 Hebrew SeniorLife, Boston, MA; 3 Hebrew SeniorLife & Boston Univ, Boston, MA; 4 Hebrew Senior Life, Boston, MA.

Background/Purpose: Foot pain is a risk factor for disability; however, not all foot pain is the same. Foot pain etiology can vary by region (e.g., toe pain may arise from overloading toes, forefoot pain from halluc valgus), suggesting its effects on foot biomechanics may differ as well. Therefore, the aim of this study was to evaluate differences in foot biomechanics during gait by region of foot pain.

Methods: Framingham Foot Study participants with complete data on regional foot pain, foot biomechanics, and foot disorders were included in this study.

A trained examiner conducted a validated foot exam to determine presence of the following structural foot disorders: halluc valgus, hallux rigidus, claw toes, overlapping toes and hammer toe.

Biomechanical data were collected using a pressure mat (Tekscan Matscan) as participants walked barefoot at a self-selected pace. Data were processed (Novel Automask) to extract maximum force and peak pressure at the toes, forefoot, midfoot, and rearfoot.

Participants selected location(s) of foot pain from a graphic, with location options including toe, nail, ball of foot, forefoot, arch, heel and hindfoot. The eight locations of pain were collapsed into four regions: toes (toe and nail pain); forefoot (forefoot and ball pain); midfoot (arch pain); and rearfoot (heel and hindfoot pain).
Each foot was classified into one of seven groups: 1) toe pain only; 2) forefoot pain only; 3) midfoot pain only; 4) rearfoot pain only; 5) pain in two regions; 6) pain in three or more regions; and 7) no regional pain (referent).

A per-foot analysis using General Estimating Equations (SAS, v. 9.3) determined associations between regional foot pain and biomechanical measures, adjusting for age, gender, weight and presence of structural foot disorders. Alpha was set to \( p \leq 0.05 \).

**Results:** There were 3158 participants (6280 feet) included (age: 66 ± 10.5 years; BMI: 28 ± 5.5 kg/m²; 56% women), with 2634 (42%) feet having one or more structural foot disorder.

After adjustment, individuals with midfoot pain had higher midfoot force with greater toe pressure (Figure 1), while those with forefoot pain had greater rearfoot force and less toe force, compared to the referent. Individuals with pain in toes, rearfoot, and multiple regions typically displayed lower rearfoot pressure and force relative to the referent.

**Conclusion:** Region of foot pain is associated with biomechanical differences at the pain locale and other foot regions. These results suggest that region of foot pain may be associated with biomechanical differences during gait at other lower extremity joints (e.g., knee and ankle). As changes in gait affect mobility and fall risk, future work should evaluate how region of foot pain affects lower extremity function, falls and disability.

**Disclosure:** J. L. Riskowski, None; T. J. Hagedorn, None; A. B. Dufour, None; V. A. Casey, None; M. T. Hannan, None.

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**How Many Steps/Day Are Associated with a Community Level Gait Speed Among Older Adults with or At High Risk of Knee OA?** Daniel K. White¹, Roger Fielding², Tuhina Neogi³, Michael P. LaValley⁴, K. Douglas Gross⁵, Michael C. Nevitt⁶, C.E. Lewis⁷, James Torner⁸ and Catrine Tudor-Locke⁹

**Background/Purpose:** While recommended levels of physical activity associated with reducing the risk of poor health outcomes are well known, it is unclear what minimal level of walking is associated with functional benchmarks specific to older adults. The purpose of this study was to examine the minimal number of steps/day associated with walking at a community level gait speed in older adults with or at high risk of knee osteoarthritis (OA).

**Methods:** The Multicenter Osteoarthritis Study (MOST) is an NIH funded longitudinal study of older men and women who have or are at high risk for knee OA. Participants at the 60-month visit wore a StepWatch Activity Monitor to record walking behavior over 7 days. Usual gait speed (m/s) during a 20 meter walk was determined at the same clinic visit. Walking behavior (steps/day) that best discriminated a gait speed of \( \geq 1.2 \) m/s (speed needed to cross the street) was determined using a Receiver Operator Curve (ROC). Sensitivity, specificity, and positive predictive value (PPV) was calculated to quantify how well the identified steps/day predicted walking at least 1.2 m/s.

**Results:** Among 1,757 participants considered (67 ± 8 yrs, BMI 31 ± 6 kg/m², female 59%), mean walking behavior was 7,094 ± 2,917 steps/day [range 640–21,593] and mean gait speed was 1.22 m/s ± 0.21 [range 0.4 – 2.1]. Walking at least 6,500 steps/day discriminated meeting a gait speed of \( \geq 1.2 \) m/s (sensitivity = 70%, specificity = 64%, PPV = 71%).

**Conclusion:** Most older adults with or at high risk of knee OA who walk at least 6,500 steps/day have gait speeds associated with walking in the community. While further confirmation is needed, at present clinicians may consider setting a goal of 6,500 steps/day as a minimal level of walking for older adults with or at high risk of knee OA.

**Disclosure:** D. K. White, None; R. Fielding, None; T. Neogi, None; M. P. LaValley, None; K. D. Gross, None; M. C. Nevitt, None; C. E. Lewis, None; J. Torner, None; C. Tudor-Locke, None.
Clinical and Biomechanical Characteristics of Total Hip Arthroplasty Responders and Nonresponders. Gema Waldman1 and Khanna C. Foucher.1
1Rush Medical College, Chicago, IL, 2Rush University Medical Center, Chicago, IL.

Background/Purpose: In a recent study, 14% of total hip arthroplasty (THA) patients were classified as nonresponders, using osteoarthritis (OA) treatment response criteria1. Identifying characteristics of responders and nonresponders could lead to better ways to identify and manage likely nonresponders. The purpose of this study was to test the hypothesis that responders have different preoperative and postoperative clinical and gait characteristics than nonresponders. A secondary goal was to evaluate the utility of the Harris hip score (HHS) for calculating response.

Methods: We identified 132 THA patients with pre- and one year postoperative gait and HHS data from our IRB-approved data repository. We calculated responder criteria in three ways based on the literature1: (i) Return to Normal (RTN); follow-up HHS ≥ 2 standard deviations above baseline; (ii) a modified version of OMERACT-OARSI responder criteria: relative change ≥ 20%; and (iii) Minimally Important Different (MID): follow-up HHS score ≥ 0.5 standard deviation above baseline. Gait variables of interest were self-selected normal walking speed, sagittal plane dynamic range of motion (ROM) and the 3D peak external moments. We used t-tests to compare pre- and postoperative gait variables for responders and nonresponders.

Results: 20%, 13% and 7% of patients were classified as nonresponders based on RTN, modified OMERACT-OARSI, and MID criteria, respectively. Using the modified OMERACT-OARSI criteria, baseline physical characteristics were similar for both groups (Table). Preoperatively, nonresponders had 35% higher HHS (p = 0.001) and 25% higher ROM (p = 0.021) compared to responders. After surgery, nonresponders had significantly lower HHS compared to responders (p < 0.001), as well as lower addition and external rotation moments (p = 0.038). Findings were similar when comparisons were done using the other responder criteria.

Table. Characteristics of THA subjects classified as responders and nonresponders

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Responders (97%)</th>
<th>Nonresponders (13%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Physical Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>60 ± 10</td>
<td>61 ± 10</td>
<td>0.888</td>
</tr>
<tr>
<td>BMI (kg/m2)</td>
<td>29 ± 5</td>
<td>28 ± 4</td>
<td>0.475</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>0.795</td>
</tr>
<tr>
<td>Clinical Characteristics</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Preoperative HHS</td>
<td>55 ± 13</td>
<td>74 ± 14</td>
<td></td>
</tr>
<tr>
<td>Postoperative HHS</td>
<td>93 ± 8</td>
<td>80 ± 17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Absolute Change</td>
<td>39 ± 12</td>
<td>6 ± 8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Relative Change (%)</td>
<td>80 ± 44</td>
<td>9 ± 11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Preoperative Gait Biomechanics</td>
<td></td>
<td></td>
<td>0.021</td>
</tr>
<tr>
<td>‘Normal’ walking speed (m/s)</td>
<td>1.01 ± 0.24</td>
<td>0.62 ± 0.20</td>
<td>0.930</td>
</tr>
<tr>
<td>Postoperative Gait Biomechanics</td>
<td></td>
<td></td>
<td>0.021</td>
</tr>
<tr>
<td>‘Normal’ walking speed (m/s)</td>
<td>11 ± 6</td>
<td>20 ± 6</td>
<td></td>
</tr>
<tr>
<td>Peak Flexion Moment (°Body Weight × Height)</td>
<td>4.19 ± 1.49</td>
<td>4.97 ± 1.98</td>
<td>0.140</td>
</tr>
<tr>
<td>Peak Extension Moment (°Body Weight × Height)</td>
<td>1.79 ± 0.86</td>
<td>1.80 ± 0.67</td>
<td>0.954</td>
</tr>
<tr>
<td>Peak Adduction Moment (°Body Weight × Height)</td>
<td>3.45 ± 1.02</td>
<td>3.23 ± 1.30</td>
<td>0.423</td>
</tr>
<tr>
<td>Peak Abduction Moment (°Body Weight × Height)</td>
<td>1.60 ± 0.86</td>
<td>1.73 ± 0.75</td>
<td>0.548</td>
</tr>
<tr>
<td>Peak External Rotation Moment (°Body Weight × Height)</td>
<td>0.33 ± 0.21</td>
<td>0.34 ± 0.26</td>
<td>0.818</td>
</tr>
<tr>
<td>Peak Internal Rotation Moment (°Body Weight × Height)</td>
<td>0.37 ± 0.22</td>
<td>0.37 ± 0.15</td>
<td>0.994</td>
</tr>
<tr>
<td>Preoperative Gait Biomechanics</td>
<td></td>
<td></td>
<td>0.021</td>
</tr>
<tr>
<td>‘Normal’ walking speed (m/s)</td>
<td>11.9 ± 19</td>
<td>11.3 ± 19</td>
<td>0.249</td>
</tr>
<tr>
<td>Dynamic sagittal plane range of motion (degrees)</td>
<td></td>
<td></td>
<td>0.915</td>
</tr>
<tr>
<td>Peak Flexion Moment (°Body Weight × Height)</td>
<td>5.91 ± 2.03</td>
<td>5.82 ± 2.17</td>
<td>0.852</td>
</tr>
<tr>
<td>Peak Extension Moment (°Body Weight × Height)</td>
<td>2.70 ± 1.10</td>
<td>2.82 ± 0.83</td>
<td>0.664</td>
</tr>
<tr>
<td>Peak Adduction Moment (°Body Weight × Height)</td>
<td>3.54 ± 0.94</td>
<td>3.03 ± 0.91</td>
<td>0.038</td>
</tr>
<tr>
<td>Peak Abduction Moment (°Body Weight × Height)</td>
<td>1.88 ± 0.84</td>
<td>1.87 ± 0.97</td>
<td>0.921</td>
</tr>
<tr>
<td>Peak External Rotation Moment (°Body Weight × Height)</td>
<td>0.43 ± 0.23</td>
<td>0.31 ± 0.21</td>
<td>0.038</td>
</tr>
<tr>
<td>Peak Internal Rotation Moment (°Body Weight × Height)</td>
<td>0.51 ± 0.21</td>
<td>0.44 ± 0.18</td>
<td>0.201</td>
</tr>
</tbody>
</table>

Notes:
1. Bold text indicates t-test or chi-square test p < 0.05.
Conclusion: Although a different score was used, a similar proportion of THA patients were classified as nonresponders here as in a previous study. This suggests that the HHS can be used to calculate response criteria if WOMAC scores are unavailable. HHS and ROM were initially higher in patients who would become nonresponders, but after surgery the nonresponders were left with lower mean HHS and lower adduction and external rotation moments. These gait moments reflect net activity of hip abductors. More work is needed to determine whether addressing the abductor impairment suggested by the biomechanical data would improve response. These results demonstrate that some patients who would appear to be more highly functioning before surgery may have both poorer responses and poorer final outcomes.

Reference

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A Rich Description of Clinical Exam Features in Patients with Knee Osteoarthritis and Their Correlation with Functional Outcomes. Maura D. Iversen1, Kelli Sylvester2, Abigail Grader3, Michelle A. Frits1, Marie Boneparte1, Megan Wilfong4, Jane Lucas5, Robert Shoshany6, Jeffrey B. Driban7, and Chenchun Wang.1 Northeastern University, Department of Physical Therapy, and Brigham & Women’s Hospital, Harvard Medical School, Boston, MA, 2 Department of Physical Therapy, Northeastern University, Boston, MA, 3 Brigham & Women’s Hospital, Boston, MA, 4 Tufts Medical Center, Boston, 5 Back Bay Physical Therapy, Boston, 6 Tufts Medical Center, Boston, MA.

Background/Purpose: Assessments of symptomatic knee osteoarthritis (KOA) rely on physical measures for clinical decision-making. However, there is limited literature on the association between examination procedures and reported KOA symptoms and activity limitations. This study aims to: (1) provide a rich clinical description of patients with KOA and (2) correlate examination findings with self-reported measures to determine the most efficient exam procedures to classify disease severity.

Methods: This is a secondary analysis of baseline data from 47 patients with symptomatic and radiographic KOA recruited for a randomized clinical trial comparing tai chi and physical therapy. Patients completed self-reported outcome surveys (e.g., WOMAC Osteoarthritis Index [VAS scale]), performance tests (Timed Walk, repeated Sit-to-Stand, 6-min Walk Test, Berg balance), and a standardized physical examination by a physical therapist. The exam included: an interview, muscle flexibility (Ober and Ely), muscle strength testing, ligamentous stability and meniscus integrity tests (e.g., Lachman, McMurray), pain provocation (patella compression), range-of-motion, and correlations were used to characterize the sample and determine associations between examination procedures, performance tests and outcome measures.

Results: Patients were 58 years of age (SD = 9.8), 68% were female, 54% were Caucasian. Most (78%) had a high school education or some college and 30% had employed. 83% had unilateral knee involvement and 25% used an ambulatory device. Patients reported limited function (mean WOMAC pain = 52.5 [SD = 49.1]) and were at low fall risk (mean Berg = 53.8 [SD = 27.5]). Few patients tested positive for ligament instability and 2/3 tested positive for patellofemoral involvement. There was a low to moderate correlation between self-reported pain and subject performance on tests of functional strength, aerobic fitness and walking speed. Iliotibial band tightness (based on a positive Ober test) was significantly correlated with increased pain, stiffness and self-reported functional limitations (TABLE 1).

Table 1. Correlations with Self-reported KOA Symptoms and Clinical Test Performance and Physical Examination Procedures

<table>
<thead>
<tr>
<th>Clinical and Performance Tests</th>
<th>M ± SD</th>
<th>WOMAC pain</th>
<th>WOMAC stiffness</th>
<th>WOMAC function</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-minute Walk Test (meters)</td>
<td>403.6 ± 83.5</td>
<td>r = -0.37</td>
<td>r = -0.20</td>
<td>r = -0.42</td>
</tr>
<tr>
<td>Timed Walk (20m; sec)</td>
<td>18 ± 3.5</td>
<td>p = 0.01</td>
<td>p = 0.18</td>
<td>p = 0.004</td>
</tr>
<tr>
<td>Timed Chair Stand Test (sec)</td>
<td>31.2 ± 11.3</td>
<td>r = -0.20</td>
<td>r = 0.29</td>
<td>r = 0.37</td>
</tr>
<tr>
<td>Positive Ely</td>
<td>43 (92)</td>
<td>r = 0.20</td>
<td>r = 0.06</td>
<td>r = 0.01</td>
</tr>
<tr>
<td>Positive Ober</td>
<td>17 (36)</td>
<td>r = -0.35</td>
<td>r = -0.37</td>
<td>r = -0.44</td>
</tr>
</tbody>
</table>

Note: M = mean, SD = standard deviation WOMAC = Western Ontario and McMaster Index

Acknowledgement: Supported by NCAMS R01 AT00521

Disclosure: M. D. Iversen, None; K. Sylvester, None; A. Grader, None; M. A. Frits, None; M. Boneparth, None; M. Whitmore, None; J. Lucas, None; F. Shahzad, None; J. B. Driban, None; C. Wang, None.

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1 Boston University, Boston, MA; 2 Women’s College Research Institute, University of Toronto, Toronto, ON; 3 MGH Institute of Health Professions, Boston, MA; 4 Boston Univ School of Medicine, Boston, MA; 5 University of California-San Francisco, San Francisco, CA; 6 University of Alabama, Birmingham City, AL; 7 University of Iowa, Iowa City, Iowa City, IA.

Background/Purpose: People with knee osteoarthritis (OA) reported that unpredictable pain restricts their ability to engage in physical activities in a qualitative study. Since walking is the most common physical activity employed by older adults, it would be important to understand if unpredictable pain impacts walking frequency, which would have important health implications. It is also not clear if unpredictable pain contributes to other functional limitations or restrictions in health-related quality of life (HRQOL). We therefore evaluated the association of unpredictable pain with walking frequency, more general function, and physical health related quality of life in people with or at high risk of knee OA.

Methods: The Multicenter Osteoarthritis Study (MOST) is a NIH funded longitudinal study of people who have or are at high risk for knee OA. Participants at the 84-month visit who indicated they had intermittent knee pain were asked to rate the frequency of unpredictable pain, i.e., starts without warning, and the frequency of predictable pain, i.e., starts with a trigger. Both were rated on a Likert scale (Never to Very Often). Participants were categorized as having no pain, predominately unpredictable pain, predominantly predictable pain, or both types according to the worst knee. At the same visit, gait speed over 20 meters, the WOMAC physical function (PF) subscale, and the SF-12 physical function (as a measure of HRQOL) subscale were collected. Steps/day was also collected using a pedometer (Stepwatch) over the next 7 days. We calculated study outcomes according to the presence of unpredictable and/or predictable pain, adjusting for age, sex, BMI, comorbidities, frequency of pain, and depressive symptoms using linear regression.

Results: Of data from the 84-month study visit to date, 664 people had intermittent knee pain (Age 68.5 ± 7.6 yrs, BMI 31.3 ± 6.6 kg/m², female 70%). Predominantly unpredictable pain was reported in 12%; these subjects had significantly more self-reported functional limitation (WOMAC-PF). However, other outcomes were not statistically significantly different compared to those with no pain. Subjects with unpredictable pain types also had worse WOMAC-PF compared with those with no pain, however all other outcomes had values similar to those with no pain. See Table.

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Table. Mean and standard error values stratified by pain categories. Mean values are adjusted for age, sex, BMI, comorbidities, frequency of knee pain and depressive symptoms. * indicates p<0.01 compared with ‘None’ Pain type

<table>
<thead>
<tr>
<th>Pain type</th>
<th>N (%)</th>
<th>Outcome</th>
<th>Mean</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (i.e., never or seldom predictable)</td>
<td>40 (6)</td>
<td>Steps/day</td>
<td>6765.4</td>
<td>484.2</td>
</tr>
<tr>
<td>Predominantly Unpredictable Pain</td>
<td>80 (12)</td>
<td>Steps/day</td>
<td>7339.2</td>
<td>383.6</td>
</tr>
<tr>
<td>Predominantly Predictable Pain</td>
<td>375 (56)</td>
<td>Steps/day</td>
<td>7353.1</td>
<td>185.0</td>
</tr>
<tr>
<td>Both Unpredictable and predictable pain</td>
<td>169 (25)</td>
<td>Steps/day</td>
<td>7036.1</td>
<td>278.1</td>
</tr>
</tbody>
</table>

Conclusion: While unpredictable knee pain was associated with more self-reported functional limitation, it was not associated with walking ability and frequency, or HRQOL. Similar findings were noted for those with predictable pain. Pain, regardless of its predictability, may not necessarily adversely affect engagement in walking, but does appear to affect self-perceived function.

Disclosure: D. K. White, None; G. A. Hawker, None; D. T. Felson, None; K. D. Gross, None; J. Niu, None; M. C. Nevitt, None; C. E. Lewis, None; J. Torner, None; T. Nooij, None.

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Symptom Improvement in Fibromyalgia Patients Is Related to Reduced Network Connectivity As Measured by EEG Coherence.

Background/Purpose: To assess changes in brain functional network connectivity (FC) in fibromyalgia (FM) patients treated with Reduced Impedance Noninvasive Cortical Electrostimulation (RINCE). Previous studies using MRI have reported increased FC in FM, and pain reduction has been shown to correlate with reduced FC following intervention (Arthritis Rheum. Epub 2012). Herein, we explored the notion that FC, as evaluated by electroencephalography (EEG) coherence, would be reduced by treatment with RINCE and associated with clinical improvements.

Methods: Changes in EEG coherence in subjects receiving RINCE (N=37) were compared to subjects receiving sham (N=35). Coherence is a correlation of relative amplitude and phase between pairs of EEG signals that provides information about FC across brain regions. Under IRB-approval, eyes-closed resting EEG was collected for each subject at baseline and within one week of RINCE therapy completion. EEG was collected at 19 International 10–20 electrode sites using a linked-ear reference, sampled at 16-bits, 512 samples per second. EEG files were edited to remove non-EEG artifact. To reduce coherence biasing due to cortical volume conduction over short spatial distances, only non-neighboring electrode pairings (N=118) were analyzed. Coherence was calculated using NeuroGuide 2.0 software and low frequency (1–4Hz) signal components were analyzed and compared between groups. FM symptomatology was assessed with the Fibromyalgia Impact Questionnaire (FIQ) and the SF-36.

Results: Baseline coherence was consistent between groups in 112 of 118 electrode pairs (95%, P=0.015). Following RINCE treatment, a number of significant positive correlations in both inter- and intra-hemispherical electrode pairings were found between change from baseline coherence and improvements in total FIQ and SF-36 domains (see Figure 1). Subjects experiencing reduced coherence in the electrode pairs correlating to FIQ improvement had significantly greater improvements in FIQ total score and pain VAS scale when compared to those with stable or increased coherence (see Table 1).

Table 1. Changes in FIQ total score and pain VAS scale as a function of coherence response

<table>
<thead>
<tr>
<th>Intragroup Comparisons</th>
<th>RINCE Group</th>
<th>SHAM Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Coherence</td>
<td>Increased Coherence</td>
<td>Reduced Coherence</td>
</tr>
<tr>
<td>Baseline FIQ</td>
<td>58.9</td>
<td>64.1</td>
</tr>
<tr>
<td>End-of-Study FIQ</td>
<td>55.4</td>
<td>53.0</td>
</tr>
<tr>
<td>P-Value</td>
<td>&lt;0.001</td>
<td>0.023</td>
</tr>
<tr>
<td>Baseline Pain VAS</td>
<td>6.9</td>
<td>6.6</td>
</tr>
<tr>
<td>End-of-Study Pain VAS</td>
<td>3.9</td>
<td>4.9</td>
</tr>
<tr>
<td>P-Value</td>
<td>&lt;0.01</td>
<td>0.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intergroup Comparisons</th>
<th>RINCE Group</th>
<th>SHAM Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Coherence</td>
<td>Increased Coherence</td>
<td>Reduced Coherence</td>
</tr>
<tr>
<td>MCFB FIQ</td>
<td>−45%</td>
<td>−19%</td>
</tr>
<tr>
<td>MCFB Pain VAS</td>
<td>−41%</td>
<td>−20%</td>
</tr>
</tbody>
</table>

MCFB = mean change from baseline.
Conclusion: In this study, improvements in FIQ total score and pain VAS scale were greatest in FM subjects showing reductions in brain functional network connectivity based on changes in EEG coherence. This result strengthens previous claims that reduced connectivity may be an objective biomarker of improvement in FM clinical trials. Importantly, it expands the methodology to the use of EEG, which is less costly than fMRI and more generally practical for use in point of care settings.


802 Milnacipran Reduces Brain Activity During Pain in Fibromyalgia. Anson E. Kairys, Richard E. Harris, Eric Ichesco, Johnson P. Hampson, Steven Harte, Daniel J. Clauw and Tobias Schmidt-Wilcke. University of Michigan, Ann Arbor, MI

Background/Purpose: Fibromyalgia (FM) is a chronic pain condition characterized by widespread musculoskeletal pain and a number of concomitant symptoms such as fatigue, sleep disturbance, cognitive dysfunction, anxiety, and depression. Milnacipran is a dual serotonin-norepinephrine reuptake inhibitor which has been shown to reduce pain and improve function in FM, however its clinical mechanism of action is largely unknown. Based on its neurotransmitter action in preclinical models, we hypothesized that milnacipran may decrease pain related brain activity in patients with FM.

Methods: 15 FM patients completed a randomized double-blind two-period cross-over study of milnacipran versus placebo. Each 7-week period (drug or placebo) was followed by a 14 day taper and washout. Prior to and following each period, fMRI scans were acquired for each patient. During the fMRI scanning session, pressure was applied to the patient’s thumbnail bed. Two pressure intensities were delivered to all subjects in a pseudo-random sequence. One pressure intensity was individually calibrated for each subject to elicit a perceived pain rating of approximately 50/100 (moderate pain). The other pressure intensity was held constant for all subjects at 1.5 kg/cm². All fMRI data were pre-processed using SPM5. Regressors of interest (two pressure intensities) were convolved with the hemodynamic response function and applied to voxel-wise statistics. Images were then analyzed using a flexible factorial design within SPM5 to investigate changes in brain activations pre and post drug/placebo treatment. Regions of interest (ROIs) showing significant changes in blood-oxygen-level-dependent (BOLD) activation during either placebo or drug were extracted and analyzed using SPSS 19.

Results: During milnacipran treatment, FM patients displayed a significant reduction in pain-evoked BOLD activity within the right posterior and left mid-insula (post- minus pre- milnacipran percent BOLD change $-0.727 \pm 1.09$ and $-0.485 \pm 0.837$ respectively) and left inferior parietal lobe (IPL) (mean difference $\pm SD$: $-1.08 \pm 1.27$, all $p<0.05$ corrected). None of these changes were seen during treatment with placebo, and in fact an increase in insula BOLD activity during placebo was detected ($0.707 \pm 0.766$ and $0.630 \pm 0.581$ respectively). The increase in right insula BOLD during placebo appeared to be due to incomplete washout of milnacipran during the cross-over as evidenced by decreased BOLD activity pre-placebo for those taking drug first ($n=8$; $-0.651 \pm 0.489$; $p<0.05$). No significant correlations between changes in BOLD activation for any region and improvements in clinical pain were detected ($all p>0.10$).

Conclusion: Milnacipran reduces pain-evoked BOLD activity within the insula and IPL. Additionally we find a sustained decrease in insular BOLD activation which persists following the removal of the drug. Although we did not detect a relationship with pain improvement in this small sample, larger samples may be needed to associate brain activity with the clinical mechanism of action of milnacipran. These findings have implications for randomized controlled trials of milnacipran in chronic pain populations.

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803 Frontal Brain Connectivity to the Default Mode Network Is Associated with Subjective Fatigue Irrespective of Pain and Depression. Johnson P. Hampson; Daniel J. Clauw; Jeun Kim; Vitaly Napadow and Richard E. Harris. 1University of Michigan, Ann Arbor, MI, 2Anihoula A. Martinos Center for Biomedical Imaging, Charlestown, MA, 3Martinos Center for Biomedical Imaging, Charlestown, MA

Background/Purpose: Chronic pain patients report increased levels of fatigue; however, very little is known about the underlying mechanisms of this symptom. Previous work by our group found that chronic pain patients diagnosed with fibromyalgia (FM) have elevated levels of intrinsic connectivity between the insula and the Default Mode Network (DMN) [1], a network thought to be engaged in self-referential thinking. Moreover reductions in DMN to insula connectivity were associated with concomitant reductions in clinical pain [2]. In this exploratory analysis, we investigate the relationship between longitudinal changes in fatigue levels and variation in DMN connectivity, while controlling for pain and depression.

Methods: 17 FM patients underwent resting state fMRI at baseline and at 4 weeks following non-pharmacological intervention. Within-subject resting fMRI data analysis was performed using FSL dual-regression Independent Component Analysis as reported previously [1, 2]. Group level multiple linear regression was done with FSL using change in resting DMN connectivity from baseline to post therapy versus change in fatigue scores, correcting for age and pain or depression. Clinical fatigue, pain, and depressive symptoms were assessed with Multidimensional Fatigue Inventory, the Short Form of the McGill pain questionnaire, and the Center for Epidemiologic Studies Depression questionnaires respectively.

Results: Following therapy there was a trend for reduced fatigue levels (difference mean $-1.37$; $SD = -0.99 \pm 2.84$; $p=0.06$). No significant correlation was seen between change in fatigue and pain scores ($p=0.92$), but a trend towards positive correlation between change in fatigue and depression ($p=0.07$). FM patients demonstrated significant ($p<0.05$ corrected) positive correlations between changes in resting DMN connectivity to multiple brain regions and changes in self reported fatigue, even after adjusting for pain and depression. These regions included the bilateral superior frontal gyrus (pain corrected $r=0.79$ and depression corrected $r=0.80$), insula (pain corrected $r=0.50$ and depression corrected $r=0.62$), and thalamus (pain corrected $r=0.63$ and depression corrected $r=0.72$).

Conclusion: This study suggests that connectivity of multiple brain regions involving the DMN is associated with subjective reports of fatigue. While the insula and thalamus are known to be involved in pain processing and modulation, the superior frontal gyrus is more typically involved in cognitive function. We speculate that enhanced connectivity of this structure to the
DMN could signify altered cognitive function specifically during periods of elevated fatigue.

References

Disclosure: J. P. Hampson, None; D. J. Clauw, Pfizer Inc, Forest Laboratories, Merck, Nuvo, 2, Pfizer, Forest, Lilly, Merck, Nuvo, J and J, 5; J. Kim, None; V. Napadow, None; R. E. Harris, Pfizer Inc, 2, Pfizer Inc, 5.

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A Comparison of the Nociceptive Flexion Reflex, Pressure Algometry and Summated Widespread Pain in the Diagnosis of Fibromyalgia. Robert M. Bennett1, Kim D. Jones2 and Janice Hoffman3. 1Oregon Health & Science Univ, Portland, OR, 2Oregon Health Sciences University, Portland, OR, 3Oregon Health & Science University, Portland, OR

Background/Purpose: To reevaluate the usefulness of the nociceptive flexion reflex (NFR) in distinguishing between FM patients and healthy controls, compared to computerized algometry and a summated measure of pain in 24 anatomical sites. NFR is a reflex contraction of the biceps femoris muscle elicited by progressive electrical stimulation of the sural nerve. It is measured as the least current (mA) required to stimulate the biceps contraction. Previous studies have reported that FM patients required less current to elicit biceps contraction than healthy controls (HC) (Arthritis Rheum. 2003 48(5):1420-9). Pain. 2004 Jun;107(1):7-15.

Methods: The NFR threshold (NFRz) was evaluated by using a single ascending series of stimulations of 4 mA increments, and the biceps femoris EMG was timed in relation to the onset of the stimulus to define the RII reflex. The evaluation of the NFRz used a computerized NFR Interval z score, defined as NFR Interval Mean-baseline divided by the baseline SD, as previously described (Pain. 2009 Sep;145(1-2):211-8). B. Computerized algometry was performed at 4 paired sites (volar forearm, mid trapezius, mid gluteal area and mid-point of anterior thigh) with the average of 3 readings at each site, using an AlgoMed Pressure Algometer (Medoc, Durham, NC). All subjects estimated their current pain level (VAS 0 –10) at 24 locations (table 1). Both the mean algometer scores at 4 paired sites and the summed pain at 24 locations provided a very significant discrimination between FM and HC.

<table>
<thead>
<tr>
<th>Age</th>
<th>BMI</th>
<th>Current activating biceps reflex NFRz (mA)</th>
<th>Pain VAS at NFRz</th>
<th>Max Current Reached during testing (mA)</th>
<th>Max VAS Rating Given</th>
<th>Number of electrical stimulations</th>
<th>Mean algometer scores at 4 paired sites (kPa)</th>
<th>Summated pain in 24 areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.2</td>
<td>28.44</td>
<td>24.94</td>
<td>68.06</td>
<td>33.00</td>
<td>87.50</td>
<td>20.57</td>
<td>113.8</td>
<td>111</td>
</tr>
</tbody>
</table>

Results: The study was approved by the OHSU IRB. All subjects were female and FM diagnosis was based on the 1990 ACR criteria. The ages of the FM and HC subjects were similar, but the FM had a higher BMI. In contradistinction to 2 previously reported studies, comparing FM to HC, the NFRz was slightly higher (NS 0.18) in the FM subjects (table 1). As was expected the FM subjects had higher pain ratings on activation of the reflex, but endured more electrical stimulations (NS). Both the mean algometer scores at 4 paired sites and the summed pain at 24 locations provided a highly significant discrimination between FM and HC.

Conclusion: In this study, we were unable to confirm that the nociceptive flexion reflex is increased in FM patients compared to HC. This difference may be due to the employment, in the current study, of a computerized evaluation of the NFRz which used a strict definition of the NFRz. On the other hand, 2 less technically demanding methodologies, namely pressure pain at 4 paired sites and a summation of pain VAS at 24 widespread locations, provided a highly significant discrimination between FM and HC. These latter 2 methods need to be studied in a broad variety of rheumatic disorders to evaluate their utility in diagnosing FM in the clinical setting.

Disclosure: R. M. Bennett, None; K. D. Jones, None; J. Hoffman, None.

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Milnacipran Increases Cortical to Brainstem Connectivity During Pain in Fibromyalgia. Eric Ichesco, Tobias Schmidt-Wilcke, Anson E. Kairys, Johnson P. Hampson, Steven E. Harte, Daniel J. Clauw and Richard E. Harris. University of Michigan, Ann Arbor, MI

Background/Purpose: Fibromyalgia (FM) is a chronic widespread pain disorder characterized by muscle tenderness, fatigue, poor sleep, and mood disturbance. Milnacipran is a dual serotonin-norepinephrine reuptake inhibitor FDA-approved for the treatment of this condition; however its clinical mechanism of action remains unknown. We used functional connectivity magnetic resonance imaging (fcMRI) to examine the effect of milnacipran on brain connectivity during evoked pressure pain.

Methods: 13 patients with FM completed a randomized double-blind two-period cross-over study of milnacipran versus placebo. Each 7-week period (drug or placebo) was followed by a 14 day taper and washout. Prior to and following each period, all subjects underwent fcMRI during which pressure was applied to their thumbnail. Two pressure intensities were delivered in a pseudo-random sequence: an individually calibrated pressure evoking moderate pain (50 on a 100 point Numerical Rating Scale [NRS]) and an equal pressure across all subjects. All fcMRI data were preprocessed and analyzed using Statistical Parametric Mapping 5 and the CONN toolbox. Seed based functional connectivity analyses included three anterior cingulate cortex (ACC) and bilateral periaqueductal gray (PAG) regions. Paired t-test image comparisons were deemed significant at p<0.05 cluster level corrected. Pearson’s r values for connectivity were extracted and correlated with clinical pain from the Brief Pain Inventory (BPI) and “average evoked pain” acquired immediately after the fcMRI run (NRS) for placebo and drug treatments using SPSS 19.

Results: Milnacipran treatment was associated with increased connectivity between multiple cortical regions and brain stem areas involved with descending analgesia: the perigenual ACC (seed region) showed greater connectivity to the pons and PAG (both p<0.05 corrected), and the PAG (seed region) showed greater connectivity with the bilateral mid insula cortex and the supplementary motor area/mid cingulate cortex (midCC; all p<0.05 corrected). Milnacipran also significantly decreased inter-cortical connectivity between the ACC seed regions and the inferior parietal lobule and midCC (p<0.05 corrected). These effects were not detected during the placebo period (all p>0.05). Interestingly increases in ACC to PAG connectivity following milnacipran were associated with the decreases in clinical pain (BPI interference: r = -0.672, p = 0.012) while decreases in connectivity between the ACC and midCC were associated with reduced levels of average evoked pain (r = 0.648, p = 0.017).

Conclusion: Here we provide the first evidence that milnacipran alters brain connectivity during evoked pain in patients with FM. The increased connectivity between the ACC and the PAG suggests that the analgesic action of milnacipran involves, at least in part, enhanced cortical modulation of brainstem sites implicated in descending antinoception. Conversely, the reductions in connectivity that occur during milnacipran therapy are regions where functional connectivity is increased in chronic pain states, and is associated with clinical pain report.

Disclosure: E. Ichesco, None; T. Schmidt-Wilcke, None; A. E. Kairys, None; J. P. Hampson, None; S. E. Harte, None; D. J. Clauw, Pfizer Inc, Forest Laboratories, Merck, Nuvo, 2, Pfizer, Forest, Lilly, Merck, Nuvo, J and J, 5; R. E. Harris, Pfizer Inc, 2, Pfizer Inc, 5.

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Background/Purpose: Central pain augmentation resulting from enhanced excitatory and/or decreased inhibitory neurotransmission is a proposed mechanism underlying the pathophysiology of functional pain syndromes such as fibromyalgia (FM). Previously, we demonstrated that glutamate (Glu), an excitatory neurotransmitter, and combined Glu and glutamine (Glns) levels are higher within the posterior insula of patients with FM [Harris et al. AnR 2009]. Moreover we also found that reduction in the levels of posterior insula Glx and Glu, following a non-pharmacologic intervention, were also associated with decreased pain [Harris et al. AnR 2008]. Here we sought to replicate those findings in a separate sample of FM
patients within the placebo arm of a randomized crossover trial of milnacipran versus placebo.

Methods: Thirty-nine female individuals (mean age 41.8 years, SD = 11.0) satisfying 1990 American College of Rheumatology criteria for FM completed a randomized double-blind two-period cross-over study of milnacipran versus placebo. For the purposes of this analysis, only the placebo periods were studied. Each 7-week period (drug or placebo) was followed by a 14 day taper and washout. Prior to and following each period, proton magnetic resonance spectroscopy (1H-MRS) of the right posterior insula was acquired for each patient at rest. Individual patient spectra were fit with the Linear Combination Model program and the levels of Glx were estimated relative to levels of creatine (Cr) (i.e., Glx/Cr ratio). Immediately prior to each 1H-MRS scan, evoked pressure-pain was delivered to the left thumbnail bed during a functional magnetic resonance imaging (fMRI) run (fMRI data not presented here). Subjects reported their “average pain”, during this fMRI run, using a visual analog scale (0–100; 0 here). Subjects reported their “average pain”, during this fMRI run, using a numerical rating scale (0–100; 0–worst pain imaginable). The mean age (±SD) was 46.8 (9.14) and 43.89 (9.09), respectively for the HV and RA groups. The sample was homogeneous for gender, age and skin color. RA group: mean disease duration was 7.89 years (± 6.76) and DAS-28 4.20 (± 1.71). Statistical difference was observed between groups for OR (p < 0.013) for most of the recesses. Mean (±SD) (mm) of QSR, respectively for HV and RA groups (HV/RA), were: radiocarpal: 2.07 (0.56)/3.24 (1.24); distal radioulnar: 1.45 (0.37)/2.28 (1.11); ulnocarpal: 1.37 (0.59)/2.74 (1.76); dorsal 2nd MCP: 1.06 (0.53)/1.51 (0.96); dorsal 3rd MCP: 0.88 (0.60)/1.40 (1.01); dorsal 3rd MTP: 0.81 (0.62)/1.24 (0.99); dorsal 2nd MIP: 0.46 (0.25)/0.76 (0.64); dorsal 3rd MIP: 0.44 (0.32)/0.83 (0.56); palmar 3rd MIP: 0.83 (0.27)/1.11 (0.55); coronoid fossa: 0.97 (1.06)/2.18 (2.27); olecranon fossa: 1.51 (1.17)/2.79 (2.65); posterior GH recess: 2.43 (0.45)/3.03 (1.19); knee: 2.21 (1.65)/3.95 (2.96); talocrural: 2.38 (1.13)/3.34 (1.99); talonavicular: 2.67 (1.00)/3.56 (1.50); subtalar: 2.15 (1.13)/3.07 (1.71); dorsal 5th MTP: 0.72 (0.70)/1.47 (1.11). Cutoff values of QSR specific for RA (AC = 0.780 ± 0.057 mm; distal radioulnar 2.11mm; dorsal 3rd PIP 1.99mm; knee 6.7mm and dorsal 5th MTP 2.33mm. For semiquantitative measurements, progression from score 0 to 3, at the recesses with greater chance to detect RA were: SHS: ulnocarpal (OR = 100, p < 0.001); radiocarpal (OR = 70, p < 0.001); distal radioulnar (OR = 43, p < 0.001) and knee (OR = 28, p < 0.001); SDP: radiocarpal (OR = 66, p < 0.001); SBE: radiocarpal (OR = 324, p < 0.001); lateral 5th MTP (OR = 100, p < 0.001); 2nd MCP (dorsal and radial) (OR = 92, p < 0.001) and ulnocarpal (OR = 48, p < 0.001). Inter-observer reliability for quantitative and semi-quantitative measures ranged from 0.563 to 0.872 and 0.341 to 0.823, respectively.

Conclusion: Quantitative measures specific of RA were found in almost all recesses. Semiquantitative measurements analysis showed that the worst scores found at radiocarpal, ulnocarpal and lateral 5th MTP recesses increases the chance to detect RA.

Disclosure: F. S. Machado, None; R. N. V. Furtado, None; R. D. Takahashi, None; A. L. P. de Bussi, None; J. Natour, None.

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Power Doppler Is Predictive of Treatment Failure in Early Rheumatoid Arthritis Patients: A One Year Follow-up Study. Karine R. Luz, Rita N.V. Furtado, Marcelo M. Pinheiro, Giovanna S. Petterle and Jamil Natour. Universidade Federal de São Paulo, São Paulo, Brazil

Background/Purpose: It is known that ultrasound (US) is a useful test to monitor rheumatoid arthritis (RA) patients. However, to date, no study has shown the US parameters to be able to predict treatment failure in RA patients. Thus the aim of the present study was to evaluate the findings of a new ultrasound score (US10) of the hand and wrist joints (US10) to predict treatment failure in early RA patients.

Methods: A 12-months cohort study was carried out in patients with early RA, with less-than-1 year symptom with no previous use of disease-modifying antirheumatic drugs (DMARD). The patients underwent clinical, laboratory assessment and blinded US examination (US10) at baseline, 3, 6, 9 and 12 months. The US10 included the following joints: wrist, second and third metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints. This score was composed by the following parameters, a first one was according to inflammation: a qualitative (0–1) and semi-quantitative (0–3) scoring to synovial proliferation (SPQ10, SPSQ10) and to power Doppler (PD) (PDQ10, PDQSQ10), and qualitative (0–1)–gray scale and PD scores for tenosynovitis/paratendinosis (GSTN10, PDTN). A second US finding was categorized according to joint damage: a qualitative (0–1) and semi-quantitative (0–3) scoping to bone erosions (ERQ10, ERQSQ10) and to cartilage damage (CAQ10, CASQ10). All patients were treated by a single rheumatologist following similar treatment protocol performed according to clinical activity criteria of the joint 28-Disease Activity Score (DAS28) and the Physician’s Global Assessment (AGM). Three treatment failures were observed over these 12 months: first DMARD failure (Failure 1), a second DMARD failure (Failure 2) and a first immunobiological failure (Failure 3).

Results: 48 patients completed the study, and 41 (85.41%) had Failure 1, 25 (52%) had a Failure 2 and five (10.5%) patients had a Failure 3. The respective PDQ10 baseline was a predictor for Failure 1 and Failure 2 with the following cutoff values: 2.5 (S = 87.8%, E = 71.42%, PPV = 94.7% and NPV = 50%) and 4.5 (S = 84%, E = 47.82%, PPV = 63.6% and NPV = 73.3%). The PDQSQ10 baseline was also a predictor for Failures 1 and 2 with the respective cutoff values: 5.0 (S = 90.2%, E = 71.4%, PPV = 94.9% and NPV = 55.6%) and 9.5 (S = 84%, E = 47.82%, PPV = 63.6% and NPV 73.3%). Furthermore, there was an increase in 1.47 and 1.19 OR per unit increase in score PDQ10 to predict Failures 1 and 2 (p < 0.005). The PDQ10 at baseline also showed an OR of 1.18 and 1.79 (95%, p < 0.005) to predict failure for the first and second DMARD, respectively.

Conclusion: US10, with the PDQ10 and PDQSQ10 parameters was found to be useful to predict the first and second DMARD failure in early RA patients.

Disclosure: K. R. Luz, None; R. N. V. Furtado, None; M. M. Pinheiro, None; G. S. Petterle, None; J. Natour, None.
Ultrasonography Predicts Achievement of Deeper Remission After
DAS28-Based Clinical Remission of Rheumatoid Arthritis. Ryusuke Yo-
oshimi, Maasa Hama, Daiga Kishimoto, Reiko Watanabe, Takeaki Uehara,
Yukko Asami, Atsushi Ihai, Atsahisa Ueda, Mitsuhiro Takeno and Yoshiaki
Ishigatsubo. Yokohama City University Graduate School of Medicine, Yo-
kohama, Japan

Background/Purpose: Although clinical remission is an agreeable
goal of treatment in rheumatoid arthritis (RA), the definition is still
controversial. Indeed, progressive structural damage is often found even
after achieving DAS28-based remission, suggesting the criteria are not
satisfactory for remission. There is accumulating evidence that an ultrasonography (US) is useful for judgment of the disease remission.
Here we investigated whether US is useful for predicting Boolean remission in RA patients who had been satisfied with DAS28-based remission criteria.

Methods: Twenty-seven RA patients who had been in DAS28-based clinical remission (DAS28-ESR < 2.6 or DAS28-CRP < 2.3) for more than 2 months were recruited and monitored for 2 years. Patients who had clinical flare-up were excluded, and the remaining patients were divided based on Boolean remission criteria at 2 years. Bilateral wrists and all of MCPs and PIPs were examined by Gray scale (GS) and power Doppler (PD) US at the entry. GS and PD signals were scored in each joint from 0 to 3, respectively. Total GS score and total PD score were calculated by summing up the score of individual joints. Hands X-ray was evaluated by van der Heijde-modified total Sharp score (mTSS) at the entry and end of study.

Results: Five patients dropped out of the study due to clinical flare-up, while DAS28 remission had been maintained for 2 years in 22 patients, including 16 patients (73%) who met Boolean remission criteria at the end of study. Both total GS score and total PD score at baseline were significantly lower in Boolean remission group than non-remission group (Table). There was no significant difference in other baseline parameters, including duration of disease, duration of remission, mTSS, and disease activity composite parameters between two groups (Table). However, the increase of patient’s global visual analogue scale (gVAS) and mTSS were significantly smaller during 2 year study period in Boolean remission group (~4.69 ± 10.3 vs 13.2 ± 20.3, p = 0.023, and 0.31 ± 2.36 vs 3.67 ± 3.35, p = 0.047, respectively). In US findings at the entry, total GS score, but not total PD score, was associated with clinical stage, mTSS at baseline, and swollen joint count, tender joint count and gVAS at 2 years. Furthermore, Boolean remission was achieved in all of the 11 patients having total GS score 7 or less at the entry, whereas 6 (55%) of the other 11 patients failed to reach Boolean remission. On the other hand, progression of mTSS was rather associated with high total PD score, but not with total GS score, at the entry.

Table. Correlation between Boolean-based remission at 2 years and baseline variables

<table>
<thead>
<tr>
<th>Baseline variable</th>
<th>Boolean-based remission (n = 16)</th>
<th>Boolean-based non-remission (n = 6)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>57.3 ± 11.3</td>
<td>55.3 ± 11.9</td>
<td>0.74</td>
</tr>
<tr>
<td>Sex</td>
<td>M: 4 cases, F: 12 cases</td>
<td>M: 0 cases, F: 6 cases</td>
<td>0.29</td>
</tr>
<tr>
<td>Duration of RA (month)</td>
<td>87.9 ± 50.7</td>
<td>70.3 ± 22.8</td>
<td>0.96</td>
</tr>
<tr>
<td>Duration of remission (month)</td>
<td>21.5 ± 19.0</td>
<td>17.8 ± 13.8</td>
<td>0.93</td>
</tr>
<tr>
<td>Clinical stage</td>
<td>2.06 ± 0.97</td>
<td>2.50 ± 0.76</td>
<td>0.28</td>
</tr>
<tr>
<td>modified total Sharp score</td>
<td>12.4 ± 11.9</td>
<td>33.8 ± 33.4</td>
<td>0.14</td>
</tr>
<tr>
<td>Total GS score</td>
<td>7.75 ± 6.02</td>
<td>16.0 ± 11.3</td>
<td>0.012*</td>
</tr>
<tr>
<td>Total PD score</td>
<td>1.06 ± 1.14</td>
<td>6.33 ± 6.99</td>
<td>0.020*</td>
</tr>
<tr>
<td>DAS28-ESR</td>
<td>1.59 ± 0.52</td>
<td>1.66 ± 0.34</td>
<td>0.76</td>
</tr>
<tr>
<td>DAS28-ESR</td>
<td>1.97 ± 0.59</td>
<td>2.23 ± 0.50</td>
<td>0.38</td>
</tr>
<tr>
<td>Boolean-based remission</td>
<td>6 cases (38%)</td>
<td>1 cases (17%)</td>
<td>0.62</td>
</tr>
<tr>
<td>Swollen joint count</td>
<td>0.38 ± 0.60</td>
<td>1.33 ± 1.11</td>
<td>0.060</td>
</tr>
<tr>
<td>Tender joint count</td>
<td>0.25 ± 0.43</td>
<td>0.33 ± 0.47</td>
<td>1.00</td>
</tr>
<tr>
<td>Global VAS (mm)</td>
<td>10.6 ± 9.45</td>
<td>10.2 ± 4.74</td>
<td>0.93</td>
</tr>
<tr>
<td>ESR (mm/h)</td>
<td>11.6 ± 6.65</td>
<td>16.3 ± 17.7</td>
<td>0.39</td>
</tr>
<tr>
<td>CRP (mg/dl)</td>
<td>0.13 ± 0.16</td>
<td>0.04 ± 0.01</td>
<td>0.17</td>
</tr>
<tr>
<td>MMP-3 (ng/ml)</td>
<td>98.5 ± 105</td>
<td>51.8 ± 12.1</td>
<td>0.32</td>
</tr>
<tr>
<td>RF (U/ml)</td>
<td>85.6 ± 90.7</td>
<td>54.1 ± 52.5</td>
<td>0.49</td>
</tr>
</tbody>
</table>

*p < 0.05

Conclusion: This study shows that none or low grade of GS and PD findings in US are associated with the achievement of Boolean remission in near future and that GS findings are implicated in exacerbation of clinical parameters composing Boolean remission criteria. Thus, US is essential for assessment and prediction of “true remission” of RA.

Disclosure: R. Yoshimi, None; M. Hama, None; D. Kishimoto, None; R. Watanabe, None; T. Uehara, None; Y. Asami, None; A. Ihai, None; A. Ueda, None; M. Takeno, None; Y. Ishigatsubo, None.

810 Assessment of Omeract Global Power Doppler Ultrasonography 44-
Joint Scoring System and Reduced Joint Scoring Systems in Rheumatoid
Arthritis Patients Treated with Abatacept Plus Background Methotrexate.
MA D’Agostino1, R. Wakefield2, H. Berner Hammer3, O. Vittecoq4, M. Galeazzi5, P. Balint5, E. Filippucci5, I. Moller6, A. Iagnocco9, E. Naredo10, M. Le Bari12 and UMEC-OSUS Task Force.14 AP-HP Ambroise Pare Hospital, Boulogne-Billancourt, France, 2University of Leeds, Leeds, United Kingdom, 3Diakon-
Hjemmet Hospital, Oslo, Norway, 4University Hospital, Rouen, France, 5University of Siena, Siena, Italy, 6National Institute, Budapest, Hungary, 7University Politecnica delle Marche, Ancona, Italy, 8Instituto Poal, Barce-
lona, Spain, 9Sapienza Universita di Roma, Rome, Italy, 10Hosp. Universitarios de Ochoa, Madrid, Spain, 11Copenhagen University Hospital at Glostrup, Glostrup, Denmark, 12Bristol-Myers Squibb, Rueil Malmaison, France, 13Bristol-Myers Squibb, Braine-L’Alleud, Belgium, 14Paris

Background/Purpose: The first international trial using the standard-
ized global OMERACT Power Doppler Ultrasonography (PDUS) syno-
vitis scoring system1 showed early and significant signs of improvement in synovitis in abatacept-treated pts with RA, demonstrating the sensitiv-
ity of this score.2 This trial evaluated paired MCPs 2–5 for its primary endpoint. However, there is no consensus on the minimum joint count needed to evaluate response with the OMERACT PDUS synovitis score.3 Additional analyses evaluated the effect of abatacept on the OMERACT global PDUS synovitis score, using a paired 22-joint count and a reduced set of joints defined here as Global Synovitis Score (GLOSS). We compare the responsiveness of GLOSS with two published reduced joint counts.4

Methods: This 6-month, single-arm, open-label study enrolled RA pts with inadequate response to MTX, and DAS28 (CRP) >3.2 or ≥6 tender and swollen joints and CRP > ULN. Global PDUS pairwise 22-joint score was assessed at baseline (BL); Days 7, 15, 29, 43, and 57, and then monthly by a PDUS examiner blinded from clinical assessments. A reduced subset of joints (GLOSS) that best represented the global PDUS score for paired 22 joints of all pts over three time points was identified at BL; Days 85 and 169, based on principal component analysis. The number of joints was selected based on Eigen values using a statistical method described by Jolliffe.6 The three best subsets of paired joints, one for each time point, were identified using two methods, based on values of efficiency measure (EM) of the reduced subset: 6 EM ≥0.6 at all three time points and the subset with the highest EM over the three time points. The sensitivity to change was assessed for GLOSS and the existing 12-joint1 and 7-joint2 sets using standardized response mean (SRM) in a post hoc analysis.

Results: BL demographics and mean change from BL in global PDUS score (MCPs 2–5) over 6 months have been reported.7 Mean change (95% CIs) from BL in global paired PDUS 22-joint score was –1.7 (–3.4, –0.1; n=87) at Day 7 and improved up to Day 169 [–15.7 [–19.0, –12.5; n=95]. The GLOSS that best represented the global paired PDUS 22-joint score of all pts over the three time points included 9 paired joints: shoulder, elbow, wrist, MCP1, MCP4, PIP2, knee, MTP3, and MTP5. When comparing the GLOSS with the published reduced joint sets (bilaterally taken), mean changes from BL improved up to Day 169 for all, with a similar SRM (Table).

Joint count | n Mean change in joint count (95% CI) SRM |
---|---|---|---|
GLOSS | 84 | –6.4 (–7.9, –4.9) | –0.949 |
12-joint set | 85 | –5.3 (–6.5, –4.2) | –0.994 |
7-joint set | 85 | –6.6 (–8.0, –5.3) | –1.053 |

Conclusion: Abatacept + MTX resulted in early (Day 7, by global PDUS 22-joint score) and continuous reductions in synovitis to Day 169 (with global
Table 1. Mean change (95% CIs) from BL to Mth 3 in global PDUS paired MCPs (2–5) scores and components, according to remission status at Mth 6

<table>
<thead>
<tr>
<th>Remission Status</th>
<th>Global PDUS (MCPs 2–5) score</th>
<th>Syntorial hyper trophy</th>
<th>Power Doppler</th>
<th>Joint effusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mth 6</td>
<td>-4.2 (−5.9, −2.6)</td>
<td>-3.8 (−5.3, −2.3)</td>
<td>-4.9 (−6.2, −3.7)</td>
<td>-1.9 (−3.2, −0.7)</td>
</tr>
<tr>
<td>No remission</td>
<td>-4.0 (−5.2, −2.8)</td>
<td>-3.9 (−5.0, −2.7)</td>
<td>-2.6 (−3.8, −1.4)</td>
<td>-1.4 (−2.4, −0.5)</td>
</tr>
</tbody>
</table>

Table 2. Mean change (95% CIs) in global PDUS scores from BL to Mth 3 in pts who achieved LDAS at Mth 6, according to early or late response

<table>
<thead>
<tr>
<th>Patients in LDAS at Mth 6</th>
<th>Global PDUS (MCPs 2–5) score</th>
<th>Global PDUS 22-joint score</th>
<th>GLOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early responders (at least CMI at Mth 3)</td>
<td>-4.2 (−5.8, −2.5)</td>
<td>-12.6 (−17.2, −8.0)</td>
<td>6.1 (−8.0, −4.1)</td>
</tr>
<tr>
<td>Late responders (no CMI at Mth 3)</td>
<td>-4.3 (−6.2, −2.4)</td>
<td>-10.6 (−16.7, −4.5)</td>
<td>4.3 (−6.2, −2.4)</td>
</tr>
</tbody>
</table>

Conclusion: This first international study using the standardized global OMERACT PDUS score showed that abatacept-treated pts demonstrated improvements in PD US MCP 2–5 scores regardless of remission status at Mth 6. However, pts in remission at Mth 6 had numerically greater improvements in PD US MCP 2–5 at Mth 3 than those who were not. In pts reaching LDAS at Mth 6, improvements in all PDUS scores were seen regardless of responder status. Early responders could be identified by numerically greater improvement of either global PDUS paired 22-joint score or GLOSS.

Reference

Disclosure: M. D’Agostino, PHRC, 2, Bristol-Myers Squibb, 5, Wakefield and D’Agostino: ‘Essential Applications of Musculoskeletal Ultrasound in Rheumatology’ Elsevier, 7, Roche, BMS, Pfizer, Abbott, UCB, 8, R. Wakefield, None; H. Berner Hammer, None; O. Vittecoq, None; M. Galeazzi, None; P. Balint, None; E. Filippucci, I received consulting fees from Bristol-Myers Squibb (less than $10,000 each)., 5; I. Moller, Bristol-Myers Squibb, 5, A. Iagnocco, None; E. Naredo, None; M. Ostergaard, Abbott, Pfizer/with, Centocor/Janssen, 2, Abbott, MSD/Schering-Plough, Pfizer/with, Centocor/Janssen, 2, Abbott, MSD/Schering-Plough, Pfizer/with, Centocor/Janssen, 2, C. Gailler, Full time BMS Employee, 3; K. Van Holder, Bristol-Myers Squibb, 1, Bristol-Myers Squibb, 3; M. Le Bars, Bristol-Myers Squibb, 1, Bristol-Myers Squibb, 3;
Table. Summary of efficacy among randomized pts. Data shown are number (%) of pts or mean ±SD (median (interquartile range)).

**CLINICAL EFFICACY**

**Week 14**

<table>
<thead>
<tr>
<th></th>
<th>Placebo + MTX (n=197)</th>
<th>Rilonacept 80 mg + MTX (n=195)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACR20/ACR50/ACR70</strong></td>
<td>49 (24.9%)/17 (8.6%)/30.0%</td>
<td>31 (15.8%)/12 (6.1%)/22 (11.4%)***</td>
</tr>
<tr>
<td><strong>DAS28-CRP moderate or good response</strong></td>
<td>79 (40.1%)</td>
<td>321 (83.8%)***</td>
</tr>
<tr>
<td><strong>Improvement from baseline in HAQ</strong></td>
<td>0.50 ± 0.58 (0.13 ± 0.50)</td>
<td>0.19 ± 0.56/0.50 (0.13, 0.88)***</td>
</tr>
</tbody>
</table>
| **Week 24**
| **ACR 20 response** | 62 (31.5%) | 246 (62.8%)*** |
| **ACR 50 response** | 26 (13.2%) | 142 (35.9%)*** |
| **ACR 70 response** | 8 (4.1%) | 49 (12.5%)*** |
| **DAS28-CRP moderate or good response** | 84 (44.7%) | 331 (83.8%)*** |
| **Improvement from baseline in HAQ** | 0.21± 0.55/0.13 ±0.50 | 0.53 ± 0.64/0.50 (0.13, 0.88)*** |
| **Improvement in HAQ≥0.25 from baseline** | 89 (45.2%) | 266 (67.3%)*** |

**RADIOGRAPHIC PROGRESSION**

**Baseline Total vdHS**

<table>
<thead>
<tr>
<th></th>
<th>Placebo (n=197)</th>
<th>Rilonacept 80 mg (n=195)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total score</strong></td>
<td>50.26 ± 21.64/20.00 (8.50, 57.24)</td>
<td>47.89 ± 21.64/20.00 (8.50, 57.24)</td>
</tr>
<tr>
<td><strong>Erosion subscore</strong></td>
<td>25.63 ± 12.38/13.00 (4.00, 36.00)</td>
<td>23.89 ± 12.38/13.00 (4.00, 36.00)</td>
</tr>
<tr>
<td><strong>Joint space narrowing subscore</strong></td>
<td>24.63 ± 12.38/12.00 (4.00, 36.00)</td>
<td>23.70 ± 12.38/12.00 (4.00, 36.00)</td>
</tr>
<tr>
<td><strong>Total vdHS Change from baseline at wk24</strong></td>
<td>0.10 ± 1.91/0.00 (1.00, 4.19)</td>
<td>0.03 ± 1.91/0.00 (1.00, 4.19)***</td>
</tr>
<tr>
<td><strong>Improvement of pts with GFs</strong></td>
<td>0.56 ± 1.73/0.00 (0.00, 9.00)</td>
<td>0.14 ± 1.73/0.00 (0.00, 9.00)***</td>
</tr>
</tbody>
</table>
| **Proportions of pts with wk24**
| **1 flare, %** | 54.1 28.6 23.3 |
| **2 flares, %** | 36.7 28.6 23.3 |
| **≥3 flares, %** | 9.2 11.3 11.3 |

**Conclusion:** GDM—MTX sig inhibited radiographic progression (for total vdHS and subscores) at wk24/52. Among PBO-pts who began GDM at wk16/wk24, marked slowing of radiographic progression, to the rate in pts randomized to GDM, was observed from week 42 to week 52, IV GDM—MTX improved and maintained RA signs/symptoms in pts with active RA despite ongoing MTX and continued to demonstrate an acceptable safety profile through wk52.


1. **Primary endpoint. ***, ***p-value vs. placebo < 0.05, 0.001, respectively. 
2. **Pts with missing total vdHS score at wk24 were excluded.**

**Conclusion:** GDM—MTX sig inhibited radiographic progression (for total vdHS and subscores) at wk24/52. Among PBO-pts who began GDM at wk16/wk24, marked slowing of radiographic progression, to the rate in pts randomized to GDM, was observed from week 42 to week 52, IV GDM—MTX improved and maintained RA signs/symptoms in pts with active RA despite ongoing MTX and continued to demonstrate an acceptable safety profile through wk52.


1. **Primary endpoint. ***, ***p-value vs. placebo < 0.05, 0.001, respectively. 
2. **Pts with missing total vdHS score at wk24 were excluded.**
Familial Aggregation and Heritability of Gout in Taiwan: A Nationwide Population Study. Chang-Fu Kuo1, Matthew J. Grainge1, Lai-Chu See2, Kuang-Hui Yu2, Shue-Fen Luo3, Ana M. Valdes4, Weiya Zhang1 and Kuang-Hui Yu2, Shue-Fen Luo3, Ana M. Valdes4, Weiya Zhang1 and Michael Doherty1. 1University of Nottingham, Nottingham, United Kingdom; 2Chang Gung University, Taoyuan, Taiwan; 3Chang Gung Memorial Hospital, Taoyuan, Taiwan; 4St. Thomas’ Hospital, King’s College London, London, United Kingdom

Background/Purpose: Gout has long been recognised to cluster within families. However, formal evidence for familial aggregation is scant and discordant and the magnitude of any genetic component remains unclear. Therefore we undertook the present study to estimate the familial risk of gout in individuals with affected first-degree relatives compared to individuals with no affected first-degree relatives. We also estimated the heritability and population attributable risk to assess the magnitude of genetic contribution to susceptibility to gout.

Methods: Using data from the National Health Insurance Research Database in Taiwan, we conducted a nationwide cross-sectional study of data collected from 11,770,921 men and 11,697,080 women in 2004. The case definition of gout consisted of a physician diagnosis and the use of gout-specific treatment. We identified individuals with first-degree relatives affected by gout and compared the prevalence of disease between individuals with and without affected first-degree relatives. The marginal Cox proportional hazard model with an equal follow-up time for all subjects was used to estimate RR and the 95% confidence interval (CI). This model was used to account for shared environment and case clustering within families with robust variance, and to adjust for age, place of residence, income levels and occupation.

Conclusion: The prevalence of gout was higher in individuals with affected first-degree relatives (6.92%) than those without (4.83%). The overall familial relative risk (RR) was 1.92 (95% CI, 1.90–1.93). The RRs (95% CIs) for an individual with an affected twin, sibling, offspring and parent were 2.89 (2.65–3.16), 2.26 (2.21–2.32), 2.07 (2.05–2.09) and 1.77 (1.75–1.78), respectively. The RR (95% CI) increased with the number of affected first-degree relatives, from 1.86 (1.85–1.88), 3.02 (2.95–3.09) and 4.48 (4.07–4.92) for one, two or three or more affected relatives. The heritability of gout was 0.46 (95% CI, 0.44–0.47). The population attributable risk associated with familial aggregation in Taiwan was 5.77% (95% CI, 5.65–5.82%).

Conclusion: This first ever population-based study confirms that gout aggregates within families. The heritability of gout is high in the general population in Taiwan and genetic predisposition contributes to a significant proportion of gout development.

Disclosure: C. F. Kuo, None; M. J. Grainge, None; L. C. See, None; K. H. Yu, None; S. F. Luo, None; A. M. Valdes, None; W. Zhang, Savient, 5; M. Doherty, Ardea Biosciences, Ipsen, Menarini, Novartis and Savient, 6.

Figure 1. Paired radiographs of the fingers of the right hand in a patient with tophaceous gout A. at baseline, B. after one year of pegloticase therapy.

Conclusion: This exploratory analysis suggests that intensive urate-lowering therapy can lead to improvement in structural damage, particularly bone erosion, in patients with severe chronic gout.

Disclosure: N. Dalbeth, Ardea Biosciences, 5, TAP Pharmaceuticals Inc., 5, Metabolex, 5; A. Doyle, None; F. M. McQueen, None; J. S. Sundy, Ardea Biosciences, 2, Ardea Biosciences, 5, Regeneron, 2, Regeneron, 5, Metabolex, 2, Metabolex, 5, Pharmos, 5, Pharmos, 2, Pharmos, 5, Savient, 5, Savient, 2, Celgene, 2, General Electric, 1, Academic Partners for Medical Education, LLC, 4, Medanta Duke Research Institute, 6, Bristol-Myers Squibb, 2, Bristol-Myers Squibb, 5, H. S. B. Baraf, SAVIENT, TAKEDA, Ardea, 5, SAVIENT, TAKEDA, Ardea, Metabolex, Novartis, Regeneron, 2, SAVIENT, TAKEDA, 8.

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Exploratory Analysis of Radiographic Change in Patients Treated with Intensive Urate-Lowering Therapy. Nicola Dalbeth1, Anthony Doyle1, Fiona M. McQueen1, John S. Sundy1 and Herbert S. B. Baraf2. 1University of Auckland, Auckland, New Zealand; 2Duke University Medical Center, Durham, NC, 3Arthritis & Rheumatism Associates, Wheaton, MD

Background/Purpose: In patients with gout, tophi are strongly associated with radiographic damage. Effective urate-lowering therapy (ULT) reduces tophus size. However, no studies to date have convincingly demonstrated that ULT can inhibit progression or promote healing of radiographic damage. Pegloticase therapy leads to dramatic reductions in serum urate (SU) concentrations and subcutaneous tophi in patients who respond to treatment. The aim of this exploratory analysis was to describe radiographic changes following treatment with pegloticase.

Methods: Serial plain radiographs of the hands and feet were obtained as standard of care from patients with severe chronic gout treated with pegloticase. Paired films at baseline and 12 months were available for nine patients. Five of these patients had films at baseline, 12 and 24 months. Radiographs were analysed sequentially in chronological order by two observers; a musculoskeletal radiologist and a rheumatologist with experience in radiographic scoring. Radiographs were scored for erosion and joint space narrowing according to the modified Sharp-van der Heijde method, validated for gout. Scorers were blinded to each other’s scores and to the clinical characteristics of the patients (including the clinical response to pegloticase). Inter-observer ICCs were 0.89 (0.76–0.95) for total scores and 0.83 (0.53–0.94) for change scores. A detailed qualitative site-by-site analysis was also undertaken to define additional changes observed from baseline.

Results: All patients had sustained SU <1 mg/dL during pegloticase treatment. For the entire group, median (range) total radiographic scores reduced from 73 (1.5–138) at baseline to 60.5 (1.5–110) at 12 months, p=0.01. Median (range) erosion scores reduced from 48.5 (1.5–98.5) at baseline to 42.0 (1.5–71.5) after one year, p<0.003. In contrast, narrowing scores did not change over the one year period; baseline narrowing scores were 24.5 (0–43) and at one year 22.5 (0.5–41.5), p=0.26. Further reductions were observed in total scores and erosion scores in the five patients with films available at 24 months following treatment, but not in narrowing scores (one way ANOVA p=0.009 for total score, 0.02 for erosion and 0.95 for narrowing). Qualitative site-by-site analysis identified regression of soft tissue masses, increased sclerosis, and filling in of erosions in the follow-up films (Figure).

Conclusion: This exploratory analysis suggests that intensive urate-lowering therapy can lead to improvement in structural damage, particularly bone erosion, in patients with severe chronic gout.

Disclosure: N. Dalbeth, Ardea Biosciences, 5, TAP Pharmaceuticals Inc., 5, Metabolex, 5; A. Doyle, None; F. M. McQueen, None; J. S. Sundy, Ardea Biosciences, 2, Ardea Biosciences, 5, Regeneron, 2, Regeneron, 5, Metabolex, 2, Metabolex, 5, Pharmos, 5, Pharmos, 2, Pharmos, 5, Savient, 5, Savient, 2, Celgene, 2, General Electric, 1, Academic Partners for Medical Education, LLC, 4, Medanta Duke Research Institute, 6, Bristol-Myers Squibb, 2, Bristol-Myers Squibb, 5, H. S. B. Baraf, SAVIENT, TAKEDA, Ardea, 5, SAVIENT, TAKEDA, Ardea, Metabolex, Novartis, Regeneron, 2, SAVIENT, TAKEDA, 8.

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Glomerular Filtration Rate, Chronic Kidney Disease and Incidence of Physician Diagnosed Gout. Eswar Krishnan. Stanford University, Stanford, CA

Background/Purpose: The kidney is the major organ of urate excretion in humans. Yet, there are few studies that assess whether reduced glomerular filtration and/or kidney damage increases the incidence of gout.

Methods: Seven-year follow up data from the Multiple Risk Factor Intervention Trial, a primary prevention trial for cardiovascular disease among 12,886 men aged 35 to 57 years were analyzed. At each of seven annual visits, participants were assessed for gout by the study physician. Chronic kidney disease was defined as per the National Kidney Foundation guidelines. Standardized incidence ratios (SIR) were computed using data from the Rochester Epidemiology Project. Cox proportional hazards regression analysis was used to assess the association between gout and chronic kidney disease after accounting for the effects of potential confounders (age, race, blood pressure, alcohol and fructose consumption, body mass index, fasting triglycerides, use of aspirin, diabetes status, and diuretic use).

Results: Overall there were 722 cases of incident gout over 76,602 person-years of follow up. The incidence and SIR of gout increased with decreasing eGFR (Figure). The multivariable adjusted hazard ratio for those with chronic kidney disease was 1.9 (1.6, 2.2). Each standard deviation decline in eGFR was associated with a hazard ratio of 1.4 (1.3, 1.5). Addition
of serum urate as well as urate-chronic kidney disease interaction term did not attenuate the hazard ratio.

Conclusion: Chronic kidney disease is an independent risk factor for gout. The large magnitude of the metrics of association was not explained by hyperuricemia associated with chronic kidney disease.

Disclosure: E. Krishnan, savient, 1, URL, takeda, metbolex,ARDEA, 2, METABOLEX TAKEDA, 5;

817
Feasibility of Using a Pharmacist-Based Gout Management Clinic to Improve Serum Uric Acid in Gout Patients as a Large Prepaid Health Plan.

Robert D. Goldfien1, Michele S. Ng 2, Goldie M. Yip 2, Alice Hwe2, Alice Pressman2 and Andy L. Avins2.

1Kaiser Permanente, Richmond, CA, 2Kaiser Permanente, Oakland, CA

Background/Purpose: Improving serum uric acid (SUA) levels in gout patients with hyperuricemia and gout is an effective urate-lowering therapy (ULT) in patients with gout. The objectives of this proof of concept (POC) study were to evaluate the safety and tolerability of levotofisopam and its effect on SUA in patients with hyperuricemia and gout.

Methods: This was an open-label, inpatient study of levotofisopam 50 mg TID administered for 7 days to men and women with hyperuricemia and gout. Patients were required to have had gout flare in the previous 6 months, 1+ chronically swollen joint due to gout, or 1+ tophus; and screening SUA $\geq$8.0 mg/dL and $\leq$12 mg/dL after stopping ULT for $\geq$10 days. Key exclusions were estimated GFR $<$60 mL/min/1.73 m$^2$ and 24-hour urine uric acid excretion $>$1000 mg. Patients were admitted for 3 days prior to dosing and received levotofisopam 50 mg as a single dose on Day 1, 50 mg TID on Days 2–6, and 50 mg as single dose on Day 7. The primary efficacy variable was % reduction in SUA from baseline to Day 7. Secondary variables included absolute reduction in SUA, proportion of subjects with SUA $<$6 mg/dL on Day 7, change in fractional excretion of urate, and 24-hour urinary urate on Day 6. Adverse events (AEs) were assessed during the screening, treatment, and follow-up periods.

Results: Twenty patients were enrolled, but after 13 subjects were dosed, the primary objective of confirming urate-lowering potential in gout patients was achieved and the study was stopped. Baseline characteristics: mean age 47.7 years (range 39–64); 11M/2F; mean BMI 28.5 kg/m$^2$ (range 21–33). Baseline mean SUA was 8.0 mg/dL (range 7.0–9.7). At Day 7, the mean percent reduction in SUA was 48.8% (range 31.1%–64.6%). Mean absolute reduction in SUA was 3.9 mg/dL (range 2.3–5.3), and mean treated SUA was 4.1 mg/dL (range 2.9–5.8). All 13 patients achieved a therapeutic SUA of $<$6.0 mg/dL. Substantial reduction in SUA was observed, to $<$5 mg/dL in 10/13 and $<$4 mg/dL in 7/13 patients. Significant increases in fractional excretion of urate and 24-hour urinary urate excretion were observed. There were no serious or severe AEs or premature discontinuations due to AEs. Three patients experienced gout flare. Other AEs were musculoskeletal pain/stiffness (7), headache (6), and dizziness, diarrhea, dyspepsia, toothache, rash, and ECG lead dermatsis (2 each). No clinically meaningful changes were observed in other safety assessments.

Conclusion: Monotherapy with levotofisopam led to clinically meaningful reduction of SUA in patients with hyperuricemia and gout. Treatment was generally well tolerated with 23% of the patients experiencing gout flare. Increased fractional excretion of uric acid suggests that levotofisopam reduces SUA primarily through uricosuric activity. These results support further studies to investigate the potential role of levotofisopam for the treatment of hyperuricemia in gout.


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Levotofisopam Has Uricosuric Activity and Reduces Serum Urate Levels in Patients with Gout.


1Duke University Medical Center, Durham, NC, 2PCH Integrated Regulatory Services, Inc., Laguna Niguel, CA, 3Keogh Medical Writing, Philadelphia, PA

Background/Purpose: The investigational new drug levotofisopam is the S-enantiomer of racemic tofisopam, a 2,3-benzodiazepine derivative approved in over 20 countries outside the US for treatment of anxiety and autonomic instability. Two Phase 1 trials of levotofisopam in healthy volunteers demonstrated acceptable safety and unexpected reductions in serum urate (SUA). This finding raised the possibility that levotofisopam may be an effective urate-lowering therapy (ULT) in patients with gout. The objectives of this proof of concept (POC) study were to evaluate the safety and tolerability of levotofisopam and its effect on SUA in patients with hyperuricemia and gout.

Methods: This was an open-label, inpatient study of levotofisopam 50 mg TID administered for 7 days to men and women with hyperuricemia and gout. Patients were required to have had gout flare in the previous 6 months, 1+ chronically swollen joint due to gout, or 1+ tophus; and screening SUA $\geq$8.0 mg/dL and $\leq$12 mg/dL after stopping ULT for $\geq$10 days. Key exclusions were estimated GFR $<$60 mL/min/1.73 m$^2$ and 24-hour urine uric acid excretion $>$1000 mg. Patients were admitted for 3 days prior to dosing and received levotofisopam 50 mg as a single dose on Day 1, 50 mg TID on Days 2–6, and 50 mg as single dose on Day 7. The primary efficacy variable was % reduction in SUA from baseline to Day 7. Secondary variables included absolute reduction in SUA, proportion of subjects with SUA $<$6 mg/dL on Day 7, change in fractional excretion of urate, and 24-hour urinary urate on Day 6. Adverse events (AEs) were assessed during the screening, treatment, and follow-up periods.

Results: Twenty patients were enrolled, but after 13 subjects were dosed, the primary objective of confirming urate-lowering potential in gout patients was achieved and the study was stopped. Baseline characteristics: mean age 47.7 years (range 39–64); 11M/2F; mean BMI 28.5 kg/m$^2$ (range 21–33). Baseline mean SUA was 8.0 mg/dL (range 7.0–9.7). At Day 7, the mean percent reduction in SUA was 48.8% (range 31.1%–64.6%). Mean absolute reduction in SUA was 3.9 mg/dL (range 2.3–5.3), and mean treated SUA was 4.1 mg/dL (range 2.9–5.8). All 13 patients achieved a therapeutic SUA of $<$6.0 mg/dL. Substantial reduction in SUA was observed, to $<$5 mg/dL in 10/13 and $<$4 mg/dL in 7/13 patients. Significant increases in fractional excretion of urate and 24-hour urinary urate excretion were observed. There were no serious or severe AEs or premature discontinuations due to AEs. Three patients experienced gout flare. Other AEs were musculoskeletal pain/stiffness (7), headache (6), and dizziness, diarrhea, dyspepsia, toothache, rash, and ECG lead dermatsis (2 each). No clinically meaningful changes were observed in other safety assessments.

Conclusion: Monotherapy with levotofisopam led to clinically meaningful reduction of SUA in patients with hyperuricemia and gout. Treatment was generally well tolerated with 23% of the patients experiencing gout flare. Increased fractional excretion of uric acid suggests that levotofisopam reduces SUA primarily through uricosuric activity. These results support further studies to investigate the potential role of levotofisopam for the treatment of hyperuricemia in gout.


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Trajectories of Change in Physical Function: Effects On Fractures and Mortality.

Kamil E. Barbour1, Li-Yung Lui2, Deborah E. Barnes3, Kristine E. Ensrud4, Anne B. Newman5, Kristine Yaffe6, Steven R. Cummings7 and Jamie Suley8.

1Centers for Disease Control and Prevention, Atlanta, GA, 2California Pacific Medical Center, San Francisco, CA, San Francisco, CA, 3University of California San Francisco, San Francisco, CA, San Francisco, CA, 4University of Minnesota and Minneapolis VAHS, Minneapolis, MN, Minneapolis, MN, 5University of Pittsburgh, Pittsburgh, PA, 6San Francisco Coordinating Center, CPMC Research Institute, San Francisco, CA

Background/Purpose: Prior studies have identified poor physical function as a risk factor for fractures and mortality. However, these studies did not consider change in physical function over time. We hypothesized that women

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who maintain their physical function would have a lower risk of non-traumatic fracture (hip and any non-vertebral) and death.

**Methods:** We followed 9704 women enrolled into the Study of Osteoporotic Fractures at four U.S. clinical centers. Physical function was measured a maximum of 8 times over 19 years. The median (range) number of measurements for walking (m/s) and chair stand speed (time/s) were 6 (1–8) and 5 (1–8), respectively. Random slope and intercept models were used to determine a walking and chair stand speed slope for each woman, and for the entire population. Three groups were formed for walking speed: “maintainers” (slope ≥ −1 SD from 0, n = 773, 8%); “average decliners” (1 SD below mean ≤ slope < −1 SD from 0, n = 7676, 79%); “accelerated decliners” (slope > 1 SD below mean, n = 1255, 13%). Cox proportional hazards models were used to estimate hazard ratios (HRs; 95% CI) of fracture and mortality and control for age, BMI, physical activity, falls, fracture after age 50, diabetes, stroke, hypertension, calcium intake, height, weight change, smoking, estrogen use, and hip BMD.

**Results:** The HR of hip and any non-vertebral fracture was 0.64 (0.50, 0.81) and 0.76 (0.67, 0.86) for maintainers of walking speed and 1.52 (1.31, 1.76) and 1.24 (1.13, 1.36) among accelerated decliners of walking speed when compared with the average decliner group. Similar results were shown for chair stand speed. The HR of mortality was 0.49 (0.43, 0.56) for maintainers of walking speed and 0.56 (0.50, 0.64) for maintainers of chair stand speed compared with average decliner group. The HR of mortality was null for accelerated decliners of walking speed, but surprisingly 0.75 (0.70, 0.81) for accelerated decliners for chair stand speed compared with average decliners.

**Conclusion:** Women who maintained physical function up to 19 years experienced a lower risk of fractures and mortality than average decliners of physical function, suggesting that maintaining physical function may be a marker for healthy aging.

**Disclosure:** K. E. Barbour, None; L. Y. Lui, None; D. E. Barnes, None; K. E. Ensrud, None; A. B. Newman, None; K. Yaffe, None; S. R. Cummings, None; J. A. Cauley, None.

**821**

**Association of Serum Uric Acid and Incident Fractures in Elderly Men.**

Nancy E. Lane1, Neeta Parimi2, Barton Wise3, Peggy Cawthon4, Eric Orwoll5 and MrOS Investigators Group6. 1UC Davis School of Medicine, Sacramento, CA, 2CPMC Research Institute, SF, CA, 3UC Davis, School of Medicine, Sacramento, CA, 4CPMC Research Institute, San Francisco, CA, 5Portland, OR, 6Sacramento, CA

**Background/Purpose:** Normal mineral metabolism is critical for skeletal integrity. Uric acid (UA) is produced from purines by the enzyme xanthine oxidase, and elevated levels may cause gouty arthritis and kidney stones. High uric acid levels result in endothelial damage and play a role in disease processes including hypertension, heart failure and renal disease. Conversely, UA also appears to function as an anti-oxidant and may protect against the oxidative stress associated with aging and disease. Recently, serum uric acid was reported associated with elevated bone mineral density and lower prevalence of fractures in older men (Nabipour, JBMR 2011). To confirm this association, we performed a prospective case-cohort study to understand the relation of uric acid and fracture risk in men enrolled in the Osteoporotic Fractures in Men (MrOS) study.

**Methods:** In the cohort of 5994 men 65 and older attending the baseline MrOS examination, we evaluated a subgroup 1,682 men in a case-cohort study design. This group included 387 men with incident non-vertebral fractures (with 73 hip fractures) and a sample of 1,305 men randomly selected from the cohort with baseline mineral and calcium hormone measurements. Serum uric acid was measured in baseline serum samples by Unical DXC 800 auto-analyser (Beckman Coulter, Fullerton, CA, USA). All men who experienced any non-vertebral fracture from baseline until February 2007 (average follow-up 4.7 years) were included in the analysis. Incident fractures were confirmed with x-ray reports. Hip bone mineral density was obtained at the baseline. Modified proportional hazards models that account for case-cohort study design were used to estimate the relative hazards (RH) of fracture in men for serum uric acid.

**Results:** Subjects with incident non-vertebral fractures were older, had lower total hip BMD, and higher serum phosphorus. Cases were more likely to report a history of falls and to be frail (all p < 0.01). Overall, there was no difference in risk of hip fracture by baseline uric acid after adjustment for age, clinic site, BMI, race, total hip BMD, vitamin D and PTH. However, there is 19% decrease risk of non-vertebral fractures (95% CI 0.71–0.93; p = 0.003) per 1 SD increase of baseline UA after multivariate adjustment. Total hip BMD was significantly higher in the group of men with high uric acid levels and increased continuously across quartiles of uric acid after multivariate adjustment (p for trend = 0.009).

**Conclusion:** Higher serum uric acid levels were associated with a reduction in risk of incident fractures and higher hip bone mineral density.

**Disclosure:** N. E. Lane, None; N. Parimi, None; B. Wise, None; P. Cawthon, None; E. Orwoll, None;
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Background/Purpose: Women and men with RA are at an increased risk for fracture [fx] as well as greater overall mortality. It is recognized that in the general population, overall mortality among those with a fx is increased. We sought to determine whether an incident fx following the diagnosis of RA contributes to an excess mortality beyond what would be expected for an incident fracture in those without RA.

Methods: We studied a population-based inception cohort (age ≥18 yrs), who fulfilled 1987 American College of Rheumatology criteria for RA between 1955–2007, and an equal number of age- and sex-matched non-RA subjects from the same underlying population, who were followed until death or last available follow-up. All incident fx were identified through a complete review of hospital records and multiple sources, including death certificates. Cox proportional models were used to examine the risk for death following the first incident non-pathologic fracture resulting from no more than moderate trauma [moderate trauma fx] after RA diagnosis, or equivalent index date in non-RA subjects. All analyses were adjusted for age and sex, and fractures were modeled as a time-dependent covariate. In RA subjects, we also examined in separate analyses whether steroid use, being seropositive, or having nodules or erosions (modeled as time-dependent covariates) could account for the risk of death following fracture.

Results: In 1171 RA subjects, (822 women and 349 men, mean age at RA diagnosis ≥57 SD: 56 ± 16 yrs and 58 ± 14 yrs, respectively), followed for 15,707 person-yrs [p-y], 440 had any moderate trauma fx, while 535 died over the available follow-up. In sex- and age-matched non-RA subjects, 374 had any moderate trauma fx and 441 died over 17,643 p-y follow-up. In RA subjects, a moderate trauma fx increased the risk for death (Hazard Ratio [HR]: 2.2; 95% CI: 1.8, 2.6). An increased risk for death was also observed in non-RA subjects following a moderate trauma fx (HR: 1.5; 95% CI: 1.2, 1.9) although this risk was significantly lower (p = 0.04) than in RA. In RA subjects, any moderate trauma fracture remained a significant predictor of death even after adjusting for steroid use, being seropositive, or having nodules or erosions (HR: 1.9, 95% CI: 1.6, 2.3).

Conclusion: A moderate trauma fracture in RA is associated with a greater risk of death. Risk factors and co-morbidities among those with RA who fracture may help explain this excess risk of death following fractures.

Disclosure: S. Amin, Merck Pharmaceuticals, 5; S. E. Gabriel, Pfizer Inc, 2, Roche Pharmaceuticals, 5; S. J. Achenbach, None; E. J. Atkinson, None; L. J. Melton III, None.

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Positive Effects of Tocilizumab On Bone Remodeling in Patients with Rheumatoid Arthritis. Karine Briot1, Thierry Schaeverbeke2, Fabien Etchebehere3, Philippe Gaudin4, Aleth Perdriger5, Muriel Vray6, Stephanie Rouanet1, Ghislaine Steiberg7 and Christian Roux1. 1Paris Descartes University, Paris, France, 2Groupe Hospitalier Pitié-Salpêtrière, Paris, France, 3CHU Hôpital Sud, Grenoble Teaching Hospital, Echirrolles, France, 4Hôpital Sud, Rennes, France, 5Paris, France, 6Roche, Neuilly sur Seine, France

Background/Purpose: The anti-IL-6-R antibody tocilizumab (TCZ) is an effective treatment of rheumatoid arthritis (RA). Previous studies showed that TCZ has a positive effect on bone turnover. However the effect of TCZ on bone mineral density (BMD) and regulators of bone remodeling pathways are limited. The objective of this ancillary study was to assess prospectively the TCZ effects on BMD and bone remodeling.

Methods: 103 patients with moderate to severe RA were treated with TCZ 8 mg/kg SC methotrexate (MTX) every 4 weeks in the Tocorubi study during 12 months. Total hip and lumbar spine BMC were performed at baseline and after 48 weeks by dual energy X ray absorptiometry (DXA). Pro-collagen serum type I N-terminal propeptide (PINP), a marker of bone formation; serum C-terminal cross-linked telopeptide of type I collagen (CTX-I), a marker of bone resorption, and circulating levels of osteoprotegerin, receptor activator of nuclear factor-kappaB ligand, Wnt signalling pathway inhibitors Dickkopf1 (Dkk-1) and sclerostin, were assessed at baseline, 12 and 48 weeks. Corticostrid (CS) use was described using the AUC (Area under the Curve) time weighted of cortisone intake (AUC-CS). Analysis was intent-to-treat. Results were presented in median and tested using the Wilcoxon paired signed-rank test.

Results: 103 patients (75 % women, 52±12 years) with active RA and a mean disease duration of 4±3 years were included. BMD was available for 73 patients at baseline and end of study. Serum PINP increased from baseline by 22 % (p<0.001) and 19% (p<0.001) at week 12 and week 48, respectively. By contrast CTX-I remained stable over time which led to an improvement in PINP/CTX-I ratio of 14%, (p<0.001) and 23 % (p<0.001) at week 12 and 48, respectively. Serum DKK-1 significantly decreased from baseline by –31% (p<0.001) and –25% (p=0.025) at week 12 and 48, respectively. The evolutions of DKK-1 and PINP were not correlated. Evolutions of serum OPG and sclerostin were not significant over 48 weeks. There was no change in lumbar spine and hip BMD over 48 weeks. However in patients in the highest quartile of AUC-CS (>7.5mg/d), BMD significantly decreased at trochanter (p=0.016). CS dose was not a determinant of bone remodeling markers changes.

Conclusion: in these patients treated with TCZ in combination with MTX, we did not see the expected bone loss related to inflammation. DKK-1, a key determinant of the bone destructive pattern of RA, decreases in patients treated with TCZ which could participate to a rapid and positive effect on bone balance due to an increase in bone formation. From the results of this small sample of patients, it seems that there is no indication for prevention of CS-induced bone loss in patients receiving TCZ and low doses of cortico-steroids.

Disclosure: K. Briot, None; T. Schaeverbeke, Pfizer, Roche, UCB, BMS, 2, Pfizer, Roche, Abbott, BMS, UCB, Schering-Plough, MSD, Novartis, 5; F. Etchebehere, Roche-Chugui, Abbott, Eauzte, Pfizer, 5; P. Gaudin, Abbott, BMS, 5; Abbott, MSD, Pfizer, 2; A. Perdriger, Roche-Chugui, 6; M. Vray, Roche-Chugui, 2, GSK, 5; S. Rouanet, Roche Pharmaceuticals, 3; G. Steiberg, Roche Pharmaceuticals, 3; C. Roux, Roche, Servier, Amgen, MSD, Lilly, Novartis, 5; Roche, Servier, Amgen, MSD, Novartis, 2.

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Progressive Improvements in Cortical Mass and Thickness throughout the Hip Were Observed with Denosumab Treatment in the Freedom Trial. Ken Poole1, Graham Treece1, Andrew Gee2, Jacques P. Brown3, Michael R. McClung3, Andrea Wang4 and Cesar Libanati4. 1University of Cambridge, Cambridge, United Kingdom, 2CHU-SUD Research Centre, Quebec City, QC, 3Oregon Osteoporosis Center, Portland, OR, 4Amgen Inc., Thousand Oaks, CA

Background/Purpose: Denosumab (a RANK ligand antibody) reduces remodeling, increases bone mineral density, and reduces cortical porosity in postmenopausal women with osteoporosis. In FREEDOM, denosumab treatment reduced the relative risk of hip fracture by 62% in those ≥75 years (Boonen et al, JCEM 2011). Bone strength at the hip, estimated by FEA from QCT scans, was significantly improved from baseline and compared with placebo (Kavney et al, ASBMR 2010). To better characterize the changes, we used a novel cortical bone mapping technique based on serial QCT scans, to determine the extent and distribution of mass and thickness changes at the proximal femur, a key skeletal site for fracture risk.

Methods: Eighty women age 74±5 years who participated in a FREEDOM substudy underwent hip QCT scanning at baseline, and months 12, 24, and 36 during denosumab (60 mg SC Q6M) or placebo treatment; all subjects received calcium and vitamin D supplementation. For each femur, in addition to cortical density, the distributions of cortical mass (in mg per unit cm² of periosteal surface) and thickness were measured in a blinded-to-treatment manner. Distributed measures were transferred to an average femur by first registering each individual femur to this surface. Statistical parametric mapping was used to calculate significance of denosumab or placebo effects at each time point in relation to baseline, and between treatments. Distributed results were visualised as a color map over the average femur.

Results: In denosumab-treated women, there was a progressive increase in cortical mass over time, reaching a difference vs placebo of 6% at 3 years (p<0.0001) (Fig. 1). Approximately one-third of this increase was attributed to an increase in cortical density of 7.6±1.8 mg/cm²/year (p<0.0001), which in turn remained unchanged in placebo-treated subjects (p=0.62). With denosumab, cortical thickness was also significantly increased, which may represent in-filling of the cortical compartment. In contrast, average cortical mass and thickness decreased in subjects who received calcium and vitamin D alone. Mass color maps (Fig. 2) reveal the distribution of increases in cortical mass with denosumab, which were significant over an increasingly large area of the proximal femur.
Enforced risk stratification methods are needed. Recently a strong association between osteoporosis and CVD has been recognised in other populations. RA patients are also at increased risk of osteoporosis and thus may undergo DXA scanning as part of their usual care. DXA can diagnose osteoporosis by measuring BMD or by detecting vertebral fractures (VF) using VFA. We assessed the prevalence of osteoporosis by BMD criteria and VF in our RA cohort. We also determined whether osteoporosis increases the risk of CVD in RA patients compared to traditional CVD risk factors and RA disease activity.

Methods: A cross-sectional study of our RA cohort. We evaluated risk factors for, and details of CVD among patients ≥40 years who met 1987 ACR criteria for RA classification. Only those with a prior DXA and VFA scan available for analysis were included. Study was approved by local I.R.B. All scans were evaluated by two blinded musculoskeletal radiologists to determine the prevalence, number and severity of VF using Genant criteria. Patients were diagnosed as osteoporosis using WHO DXA criteria. We compared the prevalence of osteoporosis and VF between RA patients with and without CVD, and using multivariate logistic regression analyses assessed whether VF, osteoporosis, traditional CVD risk factors and RA disease activity were independently associated with prevalent CVD.

Results: 603 patients met inclusion criteria: 74% female mean age 56 years, 76% seropositive. 230 subjects had 1 or more documented CVD event: MI 45, stent 145, CHF 33 and stroke 7. Subjects with CVD were twice as likely to have VF (24% Vs 12%) and 4 times as likely to have osteoporosis (60% Vs 15%) than those without CVD (p < 0.05). Low BMD and VF were independently associated with CVD in multivariate regression analyses (p < 0.05), and outperformed traditional risk factors for CVD and RA disease activity scores (Table 1).

Conclusion: BMD and VF among RA patients should alert physicians not just to the presence of osteoporosis, but also to the possibility of CVD. Interventions to reduce the development of CVD in RA patients with osteoporosis may be warranted.

Disclosure: A. Mohammad, None; D. Lohan, None; D. Bergin, None; S. Mooney, None; J. Newell, None; M. O’Donnell, None; R. J. Coughlan, None; J. J. Carey, None.

826

Predictors of Return to Work During 3 Years After Start of First Tumor Necrosis Factor Antagonist in a National Cohort of Biologics-Treated Patients with Rheumatoid Arthritis. Tor Olofsson1, Ingemar F. Petersson2, Jonas Eriksson3, Martin Englund2, Pierre Geborek1, Lennart T.H. Jacobsson3, Johan Askling1 and Martin Neovius1, 1Department of Clinical Sciences Lund, Section of Rheumatology, Lund University, Lund, Sweden, 2Department of Orthopedics, Clinical Sciences Lund, Lund University, Lund, Sweden, 3Clinical Epidemiology Unit, Department of Medicine, Karolinska Institutet, Stockholm, Sweden, 4Department of Rheumatology and Inflammation Research, Sahlgrenska Academy at University of Gothenburg, Gothenburg, Sweden

Background/Purpose: To estimate predictors of return to work during 3 years following start of anti-TNF therapy in working-age RA patients with total work disability at treatment start.

Methods: RA patients aged 19–61y (n=753; mean age 53y; 80% women) starting their first anti-TNF therapy between Jan 2006 and Dec 2009 and having total work disability at treatment start (90 days with sick leave or disability pension during the 3 months preceding anti-TNF start) were identified in the Swedish biologics register (ARTIS; 92% nationwide coverage). The mean/median disease duration at bio-start was 40 years who met 1987 ACR classification. Only those with a prior DXA and VFA scan available for analysis were included. Study was approved by local I.R.B. All scans were evaluated by two blinded musculoskeletal radiologists to determine the prevalence, number and severity of VF using Genant criteria. Patients were diagnosed as ‘osteoporosis’ using WHO DXA criteria. We compared the prevalence of osteoporosis and VF between RA patients with and without CVD, and using multivariate logistic regression analyses assessed whether VF, osteoporosis, traditional CVD risk factors and RA disease activity were independently associated with prevalent CVD.

Results: 603 patients met inclusion criteria: 74% female mean age 56 years, 76% seropositive. 230 subjects had 1 or more documented CVD event: MI 45, stent 145, CHF 33 and stroke 7. Subjects with CVD were twice as likely to have VF (24% Vs 12%) and 4 times as likely to have osteoporosis (60% Vs 15%) than those without CVD (p < 0.05). Low BMD and VF were independently associated with CVD in multivariate regression analyses (p < 0.05), and outperformed traditional risk factors for CVD and RA disease activity scores (Table 1).

Conclusion: BMD and VF among RA patients should alert physicians not just to the presence of osteoporosis, but also to the possibility of CVD. Interventions to reduce the development of CVD in RA patients with osteoporosis may be warranted.

Disclosure: A. Mohammad, None; D. Lohan, None; D. Bergin, None; S. Mooney, None; J. Newell, None; M. O’Donnell, None; R. J. Coughlan, None; J. J. Carey, None.

826

Osteoporosis and Vertebral Fractures Are Important Determinants of Cardiovascular Disease in Rheumatoid Arthritis. Ausaf Mohammad1, Derek Lohan1, Diane Bergin1, Sarah Mooney1, John Newell2, Martin O’Donnell1, Robert J. Coughlan1 and John J. Carey1, 1Galway University Hospitals, Galway, Ireland, 2National University of Ireland, Galway, Ireland

Background/Purpose: Cardiovascular disease(CVD) represents a major comorbidity and the leading cause of mortality for Rheumatoid arthritis(RA) patients. Unfortunately traditional risk factors for CVD underperform in RA.
register covering all inhabitants in Sweden (data available until Oct 2010). Survival analysis was conducted with return to work ≥50% as outcome (defined as the first occurrence of a month with <15 days of sick leave or disability pension during follow-up). Baseline predictors including sex, age, education level, disease duration (counted from symptom onset), HAQ, CRP and use of non-biological DMARDs were estimated using Cox regression. The model was further adjusted for year of bio-start, health care region, unemployment status, depression and anxiety disorders, and malignancies. DAS28 was analysed in a separate model excluding HAQ (due to multi-collinearity) and CRP.

Results: During the 3-year observation period after start of anti-TNF treatment the overall cumulative probability of return to work ≥50% of monthly days was 21%. The corresponding probability for patients with disease duration <5 y and ≥5 y was 34% and 13%, respectively (Figure; unadjusted hazard ratio [HR] for return to work ≥50% 3.0, 95%CI 2.1–4.2; adjusted HR 2.4, 95%CI 1.5–3.7). Besides this, HAQ (HR 1.6, 95%CI 1.1–2.3, per unit decrease), age at bio-start (1.8, 1.4–2.2, per 10 y decrease) and education level (2.1, 1.0–4.2, for 1.5–3.7). Increasing return to work if biological treatment was started earlier in the disease course, compared to later start.

Conclusion: The probability of return to work for totally disabled RA patients was higher for patients initiating anti-TNF therapy within 5 years of symptom onset, HAQ age at bio-start and education level were also statistically significant predictors, while DAS28 and use of non-biological DMARDs were not. The results suggest that there might be a potential for increasing return to work if biological treatment was started earlier in the disease course in work disabled patients.

Disclosure: T. Olofsson, None; E. P. Petersson, Pfizer, Wyeth, Abbott, UCB Pharma, 5; J. Eriksson, None; M. Englund, None; P. Geborek, None; T. H. Jacobsson, Abbott, BMS, MSD, Pfizer, UCB Pharma, 6; J. Askling, None; M. Neovius, Pfizer Inc, 6.

S360

Sustained Development of Cardiovascular Disease in Rheumatoid Arthritis Despite Cardioprotective Treatment: The 10-Year Prospective Carre-1 Study

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory joint disease which is associated with an increased cardiovascular (CV) risk. It is still unknown to what extent this is due to CV risk factors or the underlying inflammatory process in RA. With the advent of effective anti-inflammatory and cardioprotective treatment, this risk might be mitigated or even reduced. The present study compared changes in CV risk factors, RA-related factors and medication use over time in RA-patients who did and did not develop CV disease during follow-up.

Methods: Starting from 2000–2001, 10-year incidence rate of CV disease, CV risk factors, RA-related factors and medication use were assessed in a prospective cohort of 353 RA patients at baseline, at 3-years and at 10-years of follow-up. Associations between the changes in RA related factors and development of CV disease were assessed using generalized estimating equation (GEE) analyses, while changes in all variables were assessed with general linear models (GLM).

Results: After 10 years, there were 58 CV events over 2361 patient years of follow-up, incidence rate (IR) of 25.3/1,000 patientyears. This was similar to the IR between 3-years and 10-years of follow-up: 22.8/1,000 patient-years. GLM analyses showed that use of antihypertensives, statins, TNF inhibitors and general CV risk increased significantly over time, while RA related factors improved significantly. GEE analyses showed that increased use of TNF inhibitors was positively associated with less incident CV disease.

Table 1. Changes in CV risk factors and RA-related factors during follow-up

<table>
<thead>
<tr>
<th>Baseline (n=353)</th>
<th>Change 0–3 years (n=226)</th>
<th>Change 3–10 years (n=164)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in CV-risk factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol, in mmol/L</td>
<td>5.82 ± 1.11</td>
<td>−0.21</td>
</tr>
<tr>
<td>LDL-cholesterol, in mmol/L</td>
<td>3.73 ± 0.83</td>
<td>+0.37 *</td>
</tr>
<tr>
<td>HDL-cholesterol, in mmol/L</td>
<td>1.48 ± 0.48</td>
<td>+0.17</td>
</tr>
<tr>
<td>Triglycerides, in mmol/L</td>
<td>1.3 (1.0–1.8)</td>
<td>0</td>
</tr>
<tr>
<td>Total/HDL-cholesterol ratio</td>
<td>4.32 ± 1.48</td>
<td>−0.63 *</td>
</tr>
<tr>
<td>Statins, %</td>
<td>9</td>
<td>3 *</td>
</tr>
<tr>
<td>Systolic BP, mmHg</td>
<td>141 ± 19</td>
<td>0</td>
</tr>
<tr>
<td>Diastolic BP, mmHg</td>
<td>83 ± 3</td>
<td>0</td>
</tr>
<tr>
<td>Antihypertensives, %</td>
<td>24</td>
<td>+4</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>59</td>
<td>−6 *</td>
</tr>
<tr>
<td>DM, %</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Current smoking, %</td>
<td>27</td>
<td>−5</td>
</tr>
<tr>
<td>Packyears</td>
<td>18 (1–34)</td>
<td>−1</td>
</tr>
<tr>
<td>Body-mass index, kg/m2</td>
<td>26.7 ± 4.8</td>
<td>+0.4 *</td>
</tr>
<tr>
<td>Markers for CV risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intima-media thickness, mm</td>
<td>0.815 ± 0.136</td>
<td>+0.030</td>
</tr>
<tr>
<td>10-year CV risk (SCORE)</td>
<td>3.0 (2.4–9.5)</td>
<td>+0.5</td>
</tr>
<tr>
<td>RA-related factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESR, mm/hour</td>
<td>17 (9–31)</td>
<td>−2 *</td>
</tr>
<tr>
<td>CRP, mg/L</td>
<td>7 (3–18)</td>
<td>−2 *</td>
</tr>
<tr>
<td>DAS-28</td>
<td>3.91 ± 1.38</td>
<td>−0.72</td>
</tr>
<tr>
<td>DAS-remission (DAS28 ≤2.6)</td>
<td>18</td>
<td>+6</td>
</tr>
<tr>
<td>HAQ</td>
<td>0.75 (0.38–1.13)</td>
<td>−0.12 *</td>
</tr>
<tr>
<td>Use of biologics, %</td>
<td>2</td>
<td>+9 *</td>
</tr>
<tr>
<td>Use of MTX, %</td>
<td>60</td>
<td>−</td>
</tr>
<tr>
<td>Use of prednisone, %</td>
<td>15</td>
<td>−</td>
</tr>
<tr>
<td>Use of NSAIDS, %</td>
<td>67</td>
<td>−</td>
</tr>
</tbody>
</table>

* p < 0.05. Changes in CV- and RA-related factors are investigated by General Linear Models.

Discussion: The 10-year prospective Carre-1 Study.

Figures 1–4. Changes in use of biologics and RA factors over time stratified for incident CV disease.
Conclusion: The risk of incident CV disease persists in patients with RA despite the advent of effective anti-inflammatory therapies and increased use of cardioprotective medication in recent years. Patients who used TNF inhibitors and, more indirectly, had a reduction in inflammation or disease activity, were less at risk of developing CV disease. General CV risk and use of cardioprotective medications did not attenuate this association. A more aggressive cardioprotective and anti-inflammatory treatment of RA might mitigate the burden of CV disease in RA.

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Association between Anti-Tumor Necrosis Factor Therapy and the Risk of Ischemic Stroke in Subjects with Rheumatoid Arthritis, Results From the British Society for Rheumatology Biologics Registers-Rheumatoid Arthritis (BSRBR-RA). Audrey S. Low1, Mark Lunt1, Louise K. Mercer1, James B. Galloway1, Rebecca Davies1, Kath D. Watson1, British Society for Rheumatology Biologics Register (BSRBR) control centre consortium1, Deborah P. Symmons1, William G. Dixon1, Kimme L. Hyrich3 and On behalf of the BSRBR5. 1Arthritis Research UK Epidemiology Unit, The University Rheumatology Biologics Register (BSRBR) control centre consortium1, 2University of Manchester, Manchester, United Kingdom, 3Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 4Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 5British Society for Rheumatology, London, United Kingdom.

Background/Purpose: Subjects with rheumatoid arthritis (RA) are at increased risk of cardiovascular (CV) morbidity and mortality, with some studies suggesting an increased risk of stroke (CV). The aim of the analysis was to study the association of anti-TNF therapy with ischemic CV (isCVA) in routine clinical practice.

Methods: The BSRBR-RA is an ongoing national prospective cohort study of subjects with RA recently started on anti-TNF therapy (etanercept, infliximab, adalimumab). A biologic-naïve comparator cohort of subjects with RA treated only with non-biologic disease modifying anti-rheumatic drugs (nbDMARDs) was also recruited. Both cohorts were recruited from 2001–2008 and were followed by physician and patient questionnaires every six months for the first three years and annual physician questionnaires thereafter, in which data on serious adverse events such as CVAs and drug therapy were reported. All subjects were also linked to the national death register. Further data about reported CVAs were collected from medical records and validated against the World Health Organization criteria for CVA. These were further classified as isCVA using CT brain reports or if isCVA was reported as the underlying cause of death from death certificates using International Classification of Diseases 10 (ICD-10) code I63. Only validated isCVAs were included in the analysis. Subjects with prior CVA were excluded. Subjects were censored at first isCVA, death or date of last physician follow-up, whichever came first. Risk of isCVA was compared between the nbDMARD cohort and subjects ever exposed to anti-TNF using a Cox regression model. Adjustment was made using propensity scores stratified by deciles, which included age, gender, ethnicity, BMI, DAS28, disease duration, HAQ, prior nbDMARD use, steroid use at baseline, year of entry to study, smoking, baseline drugs including NSAIDs, digoxin, warfarin, antplatelet agents, statins, history of cancer, hypertension, ischemic heart disease, diabetes, depression and chronic lung disease.

Results: To 10/31/2010, 130 verified incident isCVA (21 in 3271 nbDMARD subjects, 109 in 11642 anti-TNF subjects) occurred during 11973 and 61226 person-years (pyrs) of observation respectively (incidence rate 175 versus 178 per 100,000 pyrs). After adjustment, there was no association between ever exposure to anti-TNF and isCVA risk: hazard ratio (HR) 0.88 (95% CI 0.46, 1.71).

Table.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>nbDMARD (n = 3271)</th>
<th>Anti-TNF (n = 11642)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (SD)</td>
<td>60 (12)</td>
<td>56 (12)</td>
</tr>
<tr>
<td>Female, %</td>
<td>74</td>
<td>77</td>
</tr>
<tr>
<td>Disease duration (years), median (IQR)</td>
<td>6 (15)</td>
<td>11 (9)</td>
</tr>
<tr>
<td>Baseline DAS28, mean (SD)</td>
<td>5.3 (1.1)</td>
<td>6.6 (1.0)</td>
</tr>
<tr>
<td>Baseline HAQ, mean (SD)</td>
<td>1.5 (0.7)</td>
<td>2.0 (0.6)</td>
</tr>
<tr>
<td>Number of prior nbDMARDs, median (IQR)</td>
<td>2 (1.3)</td>
<td>4 (3.5)</td>
</tr>
<tr>
<td>Baseline steroid use, %</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Baseline NSAID/COX2 use, %</td>
<td>55</td>
<td>63</td>
</tr>
</tbody>
</table>

Hypertension at baseline, % 31 30
Person-years of follow-up 11973 61226
Person-years of follow-up per person, median (IQR) 3.9 (2.1, 5.2) 5.6 (3.9, 6.9)
Number of incident fatal & non-fatal isCVA 21 109
Crude incidence rate of isCVA per 100,000 pyrs (95% CI) 175 (128, 297) 178 (151, 221)
Risk of isCVA in subjects ever exposed to anti-TNF therapy
Unadjusted HR (95% CI) Referent 1.07 (0.67, 1.71)
Adjusted for age & gender (95% CI) 1.49 (0.92, 2.40)
Fully adjusted-stratified by deciles of propensity score (95% CI) 0.88 (0.46, 1.71)

Conclusion: Exposure to anti-TNF therapy does not appear to be associated with the risk of isCVA over the short term when compared to nbDMARD therapy. Further follow-up is needed to assess time-varying risk.

Disclosure: A. S. Low, None; M. Lunt, None; L. K. Mercer, None; J. B. Galloway, None; R. Davies, None; D. K. Watson, None; B. S. F. R. B. R. (BSRBR) control centre consortium, None; D. P. Symmons, None; W. G. Dixon, None; K. L. Hyrich, None; O. B. O. T. BSRBR, BSR Biologics Register, 2.

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Subcutaneous Nodules Are Significantly Associated with Cardiovascular Events in Patients with Rheumatoid Arthritis: Results From a Very Large US Registry. Prashant Kaushik1, Susan P. Messing1, Jyoti Arora1, George Reed1, Katherine C. Saunders1, Jeffrey D. Greenberg1 and Joel M. Kremer5. 1SRaton VAMC, Albany, NY, 2University of Rochester School of Medicine and Dentistry, Rochester, NY, 3UMass Medical School, Worcester, MA, 4CORRONA, Inc., Southborough, MA, 5New York University School of Medicine, New York, NY, 6Albany Medical College and The Center for Rheumatology, Albany, NY.

Background/Purpose: Cardiovascular Disease (CVD) is now recognized to be a major comorbidity of patients with rheumatoid arthritis. Predictors of CVD have been shown to include a variety of measures of RA disease activity and severity (1). Although subcutaneous nodules (SQN) are associated with more severe RA, until this time there had been no clinical phenotypic characteristic which was immediately recognizable as a marker of increased risk for CVD in patients with RA.

Methods: Data are from the CORRONA database from Oct 2001 to Sept 2011 was evaluated.23327 patients with RA, including 182,201 individual visits who have an average of 3 years of follow-up data with 70455 patient-years and 795 CV events are included in this analysis. Presence or absence of SCN have been routinely collected over the entire 11 year history of the registry, CV events (ischemic heart disease including MI, stroke/TIA, CHF and CV death) were defined by MD reported events and exclusion of events not confirmed by the sites completing a follow up form. Cox regression models were used to estimate HR for the first event with entry into CORRONA as a left-censor, unadjusted and adjusted Hazard Ratios (HR) for SCN were estimated. A multivariable model was fit that considered the following factors as possible covariates: age, gender, age of onset of RA, presence of diabetes mellitus (DM), hypertension, smoking, alcohol consumption, use of a lipid lowering agent. Significant factors were retained in the model.

Results: Table 1 shows the estimated HR for SCN unadjusted and then adjusted with the covariates considered in the model. Unadjusted HR for SCN is 1.44, 95% CI: [1.23–1.67]. Adjusted HR is 1.25 [1.07–1.46]. An interaction of age and gender provided a better fit of the model, females with a steeper increase in risk with age than males.

Table 1. CV risk associated with subcutaneous nodules adjusted and unadjusted Hazard Ratios (HR)

<table>
<thead>
<tr>
<th>SCN</th>
<th>HR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unadjusted Multivariable Model</td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Subcutaneous Nodules</td>
<td>1.25</td>
<td>[1.07–1.46]</td>
</tr>
<tr>
<td>History of CVD</td>
<td>2.89</td>
<td>[2.40, 3.48]</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.72</td>
<td>[1.40,2.10]</td>
</tr>
<tr>
<td>Hx of Hypertension</td>
<td>1.47</td>
<td>[1.25, 1.73]</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>1.39</td>
<td>[1.16, 1.66]</td>
</tr>
<tr>
<td>Current Drinker</td>
<td>0.74 [0.63, 0.86]</td>
<td>0.0002</td>
</tr>
<tr>
<td>Age Onset of RA (per year)</td>
<td>1.004</td>
<td>[1.001, 1.007]</td>
</tr>
<tr>
<td>Ldias Measured</td>
<td>1.65</td>
<td>[1.21, 2.23]</td>
</tr>
<tr>
<td>Age (Males)* (per year)</td>
<td>1.01</td>
<td>[1.00, 1.02]</td>
</tr>
<tr>
<td>Age (Females)* (per year)</td>
<td>1.03</td>
<td>[1.02, 1.04]</td>
</tr>
<tr>
<td>Females vs Males (at age 40)*</td>
<td>0.39</td>
<td>[0.26, 0.56]</td>
</tr>
<tr>
<td>Females vs Males (at age 70)*</td>
<td>0.59</td>
<td>[0.50, 0.70]</td>
</tr>
</tbody>
</table>

*Age-Gender interaction included in the model; p-value for test of interaction.
Conclusion: We report for the first time, from a very large US observational registry, that SCN confer a significantly increased likelihood of CVD in patients with RA followed for a period of >3 years. While active RA is a risk factor for CVD the presence of subcutaneous nodules, an immediately assessable and accessible clinical phenotype, confers an increased risk for this major comorbidity.

Reference

Disclosure: P. Kaushik, None; S. P. Messing, None; J. Arora, University of Rochester, 3; G. Redd, Corrona, 5, Corrona, 5, Corrona, 5, Corrona, 5, Corrona, 5; K. C. Saunders, Corrona, 3; J. D. Greenberg, Corrona, Inc., 1, AstraZeneca, Corrona, Inc., Novartis, Pfizer, 5; J. D. Kremer, Pfizer Inc, BMS, Genentech, HGS, UCB, 2, Pfizer Inc, Amgen, Abbott, Genentech, 5, Corrona, 4, Abbott, BMS, 5.

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Background/Purpose: To report the five-year outcome of a large national multicentre, longitudinal and prospective cohort of patients with very early arthritis and rheumatoid arthritis (RA), the so-called “ESPOIR cohort study.”

Methods: Patients were recruited if they had early arthritis of less than 6 months disease duration, a high probability to develop RA, and if they were DMARD and steroids naïve. Patients have been followed every 6 months during the first 2 years then every year. Logistic regression analysis was used to determine the predictive factors of outcome.

Results: 1,355 patients were included. The mean age was 48.1 ± 12.6 years, the main delay for referral was 10.3 ± 52.4 days. DAS28 score was 5.1 ± 1.3, HAQ DI was 1.0 ± 0.7, 44.2 % and 38.8 % had respectively IgM rheumatoid factor or anti-CCP antibodies. These rate remained stable during follow-up. 22 % of the patients had erosions on hand or feet at baseline. 78.9 % of the patients fulfilled the 2010 ACR/EULAR criteria for RA at baseline and 93.8 % during follow-up.573 patients were evaluated at the 5-year follow-up visit. The outcome was rather mild in most of the patients. Disease activity (median DAS28 score: 2.5) and HAQ DI (median: 0.3) were well controlled overtime. The annual rate of radiographic progression was low (2.9 modified Sharp score unit/year). A minority of the patients required joint surgery and no increased risk of co-morbidities was observed. During the 5-year follow-up, 82.7 % of the patients received at least one DMARD, which was mainly MTX (n=536; 65.9 %) usually prescribed as monotherapy, 18.3 % of the included patients were treated with a biological DMARD and almost 60 % of the whole cohort received at least once, prednisone with a mean dosage of 8.8 ± 7.7 mg/day. Anti-CCP antibodies were the best predictive factor of radiographic progression, prescription of both synthetic or biologic DMARDs or still being followed in the cohort at 5-year

Conclusion: The quite favourable 5-year outcome of this very early RA cohort highlights the need for early referral, early effective treatment and close monitoring in the management of patients with early arthritis in daily practice.

Disclosure: B. G. Combe, None, N. Rincheval, None, J. Benessiano, None, F. Berenbaum, None, A. G. Cattelain, None, J. P. Daurès, None, M. Dougdos, None, P. Fardelhon, None, R. M. Filpo, None, P. Goupille, None, F. Guillemin, None, X. X. Le Loet, None, I. Logeart, None, X. Mariette, None, O. Meyer, None, P. Ravaud, None, A. Sarrazin, None, T. Schaeverbeke, None, J. Sibilia, None.

ACR Concurrent Abstract Session
Rheumatoid Arthritis Treatment - Small Molecules, Biologics and Gene Therapy: Efficacy and Safety of Novel Entities
Sunday, November 11, 2012, 4:30 PM–6:00 PM

A Randomized, Double-Blind, Placebo-Controlled, Multiple-Dose Study to Evaluate the Safety, Tolerability, and Efficacy of Brodalumab (AMG 827) in Subjects with Rheumatoid Arthritis and an Inadequate Response to Methotrexate. Karel Pavelka 1, Yun Chon 2, Richard Newmark 3, Ngozi Erondu 2 and Shao- Lee Lin 2. 1.Institute and Clinical of Rheumatology, Charles University, Prague, Czech Republic, 2.Amgen Inc, Thousand Oaks, CA.

Background/Purpose: A potential role for IL-17 in rheumatoid arthritis (RA) has been supported by data from clinical studies of inhibitors of the IL-17A ligand. To evaluate efficacy and safety of brodalumab (AMG 827), a human monoclonal antibody inhibitor of the IL-17 Receptor, in subjects with RA.

Methods: Subjects with RA who had an inadequate response to methotrexate (ie, continuing RA symptoms) and were biologic-naïve were randomized 1:1:1:1 to receive brodalumab (70, 140, or 210 mg) or placebo subcutaneously at day 1 and weeks 1, 2, 4, 6, 8, and 10 (Q2WK). Primary endpoint was proportion of subjects achieving an American College of Rheumatology (ACR) 50 response at week 12. Secondary endpoints included proportion with ACR 20 and 70 at week 12 and Disease Activity Score 28 joint (DAS28) at week 12. Safety was assessed by monitoring adverse events (AEs). Analyses were based on intent to treat using non-responder imputation.

Results: Two hundred fifty-two subjects were randomized; 189 to brodalumab and 63 to placebo. Two hundred forty-two subjects (183 [97%] AMG 827; 59 [94%] placebo) completed the study (defined as 16 weeks of study evaluations). Demographics and baseline characteristics were generally balanced among treatment groups. The majority (>75%) of subjects were female and white. In subjects treated with brodalumab and placebo, respectively, mean (SD) age was 50.6 (11.5) years and 53.3 (10.3) years, mean weight was 72.8 (15.1) kg and 74.8 (16.5) kg, mean duration of RA was 8.1 (7.9) years and 7.5 (6.9) years, mean Disease Activity Score 28 joint (DAS28) was 6.5 (0.8) and 6.4 (0.8), and mean C-reactive protein (CRP) was 12.8 (12.1) mg/L and 14.6 (17.6) mg/L.

ACR 50 at week 12 occurred in 16% (70 mg), 16% (140 mg), 10% (210 mg), and 13% (placebo; all non-significant vs placebo) of subjects. Differences in ACR 20 and 70 were non-significant (p > 0.05) for any treatment group as compared with placebo. Mean (SD) change from baseline in DAS28 at week 12 was −1.4 (1.3), −1.3 (1.2), −1.3 (1.2), and −1.3 (1.2) for the 70 mg, 140 mg, 210 mg and placebo groups, respectively. The p-values for DAS28 at week 12 in brodalumab treatment groups compared with placebo were all non-significant (p > 0.05). Mean (SD) percent CRP change was 97.5 (345.4), 50.7 (168.7), 45.1 (159.3), and 33.5 (170.3) for the 70 mg, 140 mg, 210 mg and placebo groups, respectively. No differences in efficacy outcomes for subgroup analyses based on sex, age, weight, or region were observed. Incidences of all AEs, including serious AEs (SAEs), were similar across treatment groups. A total of 7 subjects reported SAEs during the study (2 in the placebo group and 5 in the brodalumab groups), none of which was related treatment. There was 1 death (cardiopulmonary failure) 1 week after last dose in the 140 mg group.

Conclusion: There was no evidence of meaningful clinical efficacy or change in CRP with brodalumab treatment in subjects with RA who had an inadequate response to methotrexate. Short-term treatment was well tolerated across a dose range of 70 to 210 mg and these analyses did not suggest any safety risks with brodalumab administration. These preliminary results do not support further evaluation of brodalumab as a treatment for RA.

Disclosure: K. Pavelka, Amgen Inc, 8, Roche Pharmaceuticals, 8, Abbott Laboratories, 8, Pfizer Inc, 8, Merck & Dohme Corp, 8; Y. Chon, Amgen Inc, 1, Amgen Inc, 3; R. Newmark, Amgen Inc, 1, Amgen Inc, 3; N. Erondu, Amgen Inc, 1, Amgen Inc, 3; S. L. Lin, Amgen Inc, 1, Amgen Inc, 3.
Peroxosyme Proliferator-Activated Receptor Gamma Agonist Treatment for Rheumatoid Arthritis: A Proof-of-Concept Randomized Controlled Trial.

Michelle J. Omsseth, Annette M. Oeser, Andrew Cunningham, Aihua Bian, Ayumi Shintani, S. Bobo Tanner and C. Michael Stein. Vanderbilt Medical Center, Nashville, TN.

**Background/Purpose:** Rheumatoid arthritis (RA), a chronic inflammatory disease, is associated with insulin resistance. Experimental evidence indicates that the relationship between insulin resistance and inflammation is bi-directional: inflammation promotes insulin resistance, and insulin resistance promotes inflammation. Therefore, we examined the hypothesis that improving insulin sensitivity with pioglitazone, a thiazolidinedione PPAR-γ agonist, would decrease inflammation in patients with RA.

**Methods:** In a single center, randomized, double blind, placebo-controlled cross-over trial of 20 weeks duration, patients with RA (n=34) and moderate disease activity receiving stable disease modifying anti-rheumatic drug therapy were randomized to receive either pioglitazone 45mg daily (n=17) or matching placebo (n=17) for 8 weeks in addition to current therapy. This was followed by a 4 week wash-out period and then patients received the alternate regimen for the next 8 weeks. Primary outcome measures were change in DAS28 score; individual components of the DAS28 score including tender and swollen joint count, patient reported disease activity based on visual analog scale (VAS), and acute phase reactants; and change in insulin resistance determined by the homeostatic model assessment for insulin resistance (HOMA). Disease activity variables, inflammatory markers, and fasting insulin and glucose were measured. Analysis was by intention-to-treat and linear mixed effect models were used to determine the effect of pioglitazone on outcome measures.

**Results:** Patients had a median [IQR] age of 52.5 years [44.2–59.5 years], 82% were female and baseline median DAS28 CRP was 4.24 [3.62–5.6]. Compared to placebo, the addition of pioglitazone was associated with a 0.368 unit (95% CI, 0.0002–0.735) reduction in DAS28 CRP, (P=0.036), a 48.7% (28.5–63.1%) decrease in CRP (P=0.001), and a 23.7% (1.41–41.1%) decrease in insulin resistance as measured by HOMA (P=0.04). There was no significant reduction in swollen (P=0.83) or tender joint count (P=0.43), and a non-significant trend toward decreased patient reported disease activity VAS by 9.8mm (–0.1–19.7mm) (P=0.05). There was no significant change in ESR (p=0.27) or DAS28 ESR (P=0.92). Lower extremity edema was more common during pioglitazone (16%) treatment than placebo (0%); otherwise, adverse events occurred with similar frequency.

**Conclusion:** The addition of pioglitazone to current RA treatment improves insulin survival and modestly reduces RA disease activity measured by DAS28 CRP and CRP levels.

Disclosure: M. J. Omsseth, None; A. M. Oeser, None; A. Cunningham, None; A. Bian, None; A. Shintani, None; S. B. Tanner, None; C. M. Stein, None.

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A Phase 1, Randomized, Double-Blind, Placebo-Controlled Multiple-Dose Study of Intravenous Staphylococcal Protein A in Patients with Active Rheumatoid Arthritis On Methotrexate: Safety, Pharmacokinetics and Efficacy.


**Background/Purpose:** PRTX-100 is highly-purified GMP staphylococcal protein A (SpA) that binds with extremely high affinity to the V₄ antibody framework region of Clade V₄ immunoglobulins. SpA thus binds to human monocytes and V₄ B-cells and, at concentrations of <50 ng/mL, SpA can inhibit their activation *in vitro*. In 1999 the FDA licensed an immunoadsorbent device for treatment of RA and subsequently it was demonstrated that these treatments exposed patients to low doses of SpA. Phase I studies have characterized the safety of single intravenous doses of SpA up to 0.45 µg/kg.

**Methods:** This phase I multicenter sequential dose-escalation study enrolled patients with active RA on methotrexate (mean DAS28-28(CRP) of 5.78). Sequential cohorts were treated with 0.15, 0.45, 0.9 or 1.5 µg/kg of PRTX-100 or placebo, administered weekly for 4 weeks. Safety and disease activity were evaluated over 16 weeks following the first dose. The primary disease activity response endpoint was the number of patients with a DAS28-28(CRP) <3.2 at 2 weeks. Pharmacokinetics were evaluated after the first and last dose.

**Results:** A total of 37 patients were enrolled. PRTX-100 was generally safe and well-tolerated; 3/29 PRTX-100-treated patients had mild to moderate infusion reactions, which were self-limiting and related to dosing rate. Transient flare of RA occurred in 4/29 of PRTX-100 patients. The relationship of dose to PRTX-100 Cₘₐₓ and AUC was linear, but clearance and AUC were extremely variable within dose cohorts. The mean Cₘₐₓ at 1.5 µg/kg was 51.9 ng/mL. PRTX-100 elicited anti-drug antibodies (ADAs) in the majority of patients but the incidence or titer of ADAs was not dose-dependent. Higher titers of ADAs were associated with an increased plasma clearance after the fourth dose. The development of ADAs did not appear to preclude an effect of PRTX-100 on measures of disease activity. The endpoint of DAS28-CRP <3.2 at Week 6 was met by 3/29 PRTX-100 and 0/8 placebo patients. PRTX-100 treatment did not decrease CRP, even in patients whose swollen and tender joint count and global VAS decreased to low levels after treatment. A post-hoc analysis was performed examining changes in CDAI scores in all patients to remove the influence of the CRP component. At baseline the mean CDAI score for study patients was 36.8. In the placebo, 0.15 µg/kg and 0.45 µg/kg PRTX-100 groups, 1/8 patients attained low disease activity (CDAI ≤10) on two or more consecutive visits. Two of eight and 2/5 patients in the 0.9 and 1.5 µg/kg PRTX-100 groups, respectively, attained this same endpoint and maintained CDAI ≤10 for 12 weeks after the end of treatment. Of the 4/5 responders in the 1.5 µg/kg group, two attained a CDAI ≤6 (remission), one attained a CDAI ≤10 (low activity), and one attained a CDAI of 10.1 over the course of the study. The mean time to peak response in this group was 70 days.

**Conclusion:** Four weekly doses of intravenous PRTX-100 demonstrated an acceptable safety profile and, at the higher doses, decreased RA activity as scored by CDAI. Results of this pilot study support further clinical trials of PRTX-100 at doses of 1.5 µg/kg and higher.


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Cetorelix, a Gonadotropin-Releasing Hormone Antagonist, Significantly Reduces Tumour-Necrosis-Factor-Alpha and Demonstrates Efficacy in Patients with Active Rheumatoid Arthritis: A Proof-of-Concept, Double-Blind, Randomised Trial.

Antia Käss1, Øystein T. Forre2, Morten Frøgerland2, Hans Christian Gulsæth2, Peter Torp-Pedersen2 and Ieva Hollan1, University of Oslo, Oslo, Norway, 2Oslo University Hospital, Oslo, Norway, 3Betanien Hospital, Skien, Norway, 4Oslo University Hospital, Norway, 5Lillehammer Hospital for Rheumatic Diseases, Lillehammer, Norway.

**Background/Purpose:** The pathogenesis of rheumatoid arthritis (RA) is unclear, and treatment options can be improved. Gonadotropin-releasing hormone (GnRH) stimulates immune responses (1) and therefore might be pro-inflammatory in RA. We investigated the short-term effects of a GnRH-antagonist, cetorelix (which rapidly decreases luteinizing hormone [LH] and follicle-stimulating hormone [FSH]), in a proof-of-concept study in RA.

**Methods:** In this double-blind, single-site study in Norway (ClinicalTrials.gov: NCT00667758), 99 patients with active longstanding RA, were randomised to predefined intention-to-treat populations using computer-generated allocation (1:1) in dynamic blocks stratified for sex. Patients were assigned to subcutaneous cetorelix (n=48) (5 mg days 1–2, 3 mg days 3–5) or placebo (n=51). The primary endpoint was the change in disease activity score (DAS28CRP) by day 5, when the greatest LH and FSH suppression was anticipated. Secondary endpoints included change in tumour necrosis factor-α (TNF-α), American College of Rheumatology (ACR) responses, and DAS28CRP<2.6 remission by day 5. Patients were followed up on days 10 and 15.

**Results:** By day 5, the change in DAS28CRP was −0.82 (95% CI −1.06, −0.58) in the cetorelix group and −0.57 (−0.76, −0.37) in the placebo group, between-group difference 0.26 (−0.04, 0.57, p=0.091). By day 5, TNF-α (log pg/mL) was significantly decreased in the cetorelix group (−0.58) compared with the placebo group (−0.02; difference 0.55 [0.08, 1.01], p=0.023), and more patients on cetorelix achieved ACR20 responses (40% vs 18%; p=0.015) and DAS28CRP<2.6 remission (13% vs 0%; p=0.009). Serum CRP levels were clinically relevantly reduced in the cetorelix group versus placebo (−0.23 vs. 0.04mg/dL, p=0.060); followed by a reduction in ESR levels by day 15 (−1.06 vs. 0.04, p=0.051). Disease activity markers rebounded towards baseline after cetorelix withdrawal, except erythrocyte sedimentation rate, which is slower to change. Adverse event rates were similar between groups.

Conclusion: This study demonstrates antagonizing GnRH with cetrorelix lowers TNF-α, and improves signs and symptoms of RA. The novel association between GnRH and TNF-α may improve insights into the pathogenesis and treatment of RA, and potentially other autoimmune diseases. Larger, long-term studies on the efficacy and safety of GnRH antagonists in RA patients are warranted.

Reference:

Disclosure: A. O’Reilly, Employee of Mentrik Biotech; T. Davis, Employee of Mentrik Biotech; V. Jain, CEO of Mentrik Biotech.

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Clinical Responses and Patient Reported Outcomes to NNC0109-0012 (anti-IL-20 mAb) in Rheumatoid Arthritis (RA) Patients Following 12-Weeks Dosing and 13 Weeks Follow up: Results From a Phase 2a Trial.

Ladislav ŠEnolt1, Marie Göthberg2, Xavier Valencia3 and Eva Dokoupilova4,5

Institute of Rheumatology, Prague, Czech Republic, 2Novo Nordisk, A/S, Soeborg, Denmark, 3Novo Nordisk Inc., Princeton, NJ, 4Medical Plus s.r.o, Uherske Hradiste, Czech Republic

Background/Purpose: NNC0109-0012 (anti-IL-20 mAb) is a novel human monoclonal IgG antibody which binds to and neutralizes the activity of IL-20. Data from a phase 1 single-dose trial in healthy volunteers and RA patients, and a multiple-dose trial in RA patients, did not raise any safety concerns. NNC0109-0012 has linear pharmacokinetics in the investigated dose range (1-3 mg/kg) and signs of reduced disease activity were shown in RA patients. Objectives of this phase 2a trial were to evaluate changes in disease activity in RA patients with active disease using the following endpoints: DAS28-CRP, ACR20/50/70, and the patient-reported outcomes functional physical function (HAQ-DI), pain (Pain VAS) and global disease activity (PiGA VAS) after 12 weeks of treatment and during a 13-week follow up period.

Methods: A total of 67 RA patients (51 females:16 males) with active disease (DAS28 (CRP) >4.5, ≤5 swollen and ≥5 tender joints) were randomized in a 2:1 ratio (45 NNC0109-0012: 22 placebo) in a multicenter, double-blind, placebo-controlled, parallel group trial. Patients were dosed once-weekly s.c. with 3 mg/kg NNC0109-0012 or placebo for 12 weeks and followed for an additional 13 weeks. Patients were 18 to 75 years old with active RA and on stable methotrexate (MTX) treatment (>7.5 to <25 mg/week for at least 4 weeks). The primary endpoint was change in DAS28 (CRP) at Week 12.

Results: DAS28 (CRP) was significantly decreased compared to placebo at Weeks 12 and 16, and through Weeks 12 – 25 for seropositive (RF and anti-CCP positive) patients (n=29 and 14; 3 mg/kg and placebo, respectively). Significantly more NNC0109-0012 treated seropositive patients compared to placebo achieved ACR20/50 at Week 12 and ACR70 at Weeks 12, 16 and 20. Physical function, pain and global disease activity were significantly improved compared to placebo for seropositive patients for Weeks 12 – 25. Similar trends in NNC0109-0012 effects on most of the secondary endpoints for disease activity were observed in all randomized patients, although not all changes were significant. No deaths, serious adverse events or dose limiting toxicities were reported.

Conclusion: This phase 2a trial investigating NNC0109-0012 (anti-IL-20 mAb) in patients with RA met its primary endpoint, showing significant improvement in DAS28 (CRP) after 12 weeks. For the sub-group of RF- and anti-CCP-positive patients, the treatment effects of NNC0109-0012 on all disease parameters were significantly larger than for all randomized patients at week 12 and were sustained during the 13 weeks after stopping study drug administration. Treatment with NNC0109-0012 revealed no safety concerns. The data from this trial support further clinical development of NNC0109-0012 (anti-IL-20 mAb) in RA.

Disclosure: L. ŠEnolt, None; M. Göthberg, Novo Nordisk; X. Valencia, Novo Nordisk; E. Dokoupilova, None.
Response to MMF Therapy for Lupus Nephritis Is Independent of Genetic Variation of Inosine Monophosphate Dehydrogenase. Noa Schwartz1, Tejaskumar Patel1, Ellen M. Ginzier2, Neil Solomons2, Jill P. Buyon3 and Robert M. Clancy3. 1New York University School of Medicine, New York, NY, 2SUNY-Downstate Medical Center, Brooklyn, NY, 3Vifor Pharma, 4NYU School of Medicine, New York, NY

Background/Purpose: The Aspreva Lupus Management Study (ALMS) demonstrated the efficacy of mycophenolate mofetil (MMF-a prodrug of MFA, mycophenolic acid) for both induction and maintenance of response in lupus nephritis. However, response is not uniform and it remains unresolved whether this relates to genetic variation in inosine monophosphate dehydrogenase (IMPDH). SNPs in IMPDH1 (rs2278294) and IMPDH2 (rs11706052) confer a higher risk of acute rejection in renal transplant recipients, and lymphocytes of mutant carriers (rs11706052) yield an antiproliferative effect which is half that of subjects who are homozygous common. In addition, the ability of MMF to reduce pathogenic nitric oxide (NO) is attenuated in subjects carrying variant forms of IMPDH. Accordingly, this study was initiated to determine whether the clinical response of MMF and phenotype (NO levels) in ALMS associates with variants of IMPDH.

Methods: Subjects were 62 ALMS patients randomized to MMF in induction and/or maintenance.DNA and blood samples were obtained for evaluation of genetic variation and serum NO levels (colorimetric method. NO = nitrite + nitrate). Genotyping assignments were made based on a postread of the amplified genomic patient DNA by allelic discrimination and use of probes for IMPDH1 rs2278294 and IMPDH2 rs11706052 (Applied Biosystems). The allele calling rate of 62 DNA samples was 98% for rs2278294 and 100% for rs11706052. Assignments were verified by PCR amplification and direct sequencing. Both rs11706052 and rs2278294 (IMPDH1) were tested for departure from Hardy-Weinberg equilibrium (HWE) expectations.

Results: Representation of the two candidate SNPs had no HWE deviation; the relatively frequent minor alleles were comparable to those in the dbSNP database and in agreement with allelic discrimination and direct sequencing. Patients were stratified into two groups: Group I defined as responders to MMF at induction and non-treatment failures at maintenance, and Group 2 non-responders at induction and treatment failures at maintenance. For the IMPDH2, rs11706052, the distribution of variant alleles was similar for subjects in both groups (10.5% vs 13.9% MAF for Groups 1 (N=18) and 2 (N=19), respectively). Similar results were observed when the analysis was restricted to Hispanics (largest ethnic group. For the IMPDH1, rs2278294, no association was observed between groups (44.4% vs 44.7% MAF, Groups 1 vs Groups 2). With regard to NO, there was no association between genotypes at rs2278294 and levels (14.5±2.6 μM vs 20.4±2.8, P=0.30, homozygous variant (N=9) versus heterozygous + homozygous common (N=33), respectively.

Conclusion: In distinction to renal transplant, genetic variation at IMPDH1 and IMPDH2 does not account for variability in the clinical response to MMF or levels of NO. These results should allay concerns regarding genetic testing of these alleles to predict efficacy of MMF in lupus.

Disclosure: N. Schwartz, None; T. Patel, None; E. M. Ginzier, None; N. Solomons, None; J. P. Buyon, None; R. M. Clancy, NIH 5R01AR055088; 2.

Association of Urinary and Serum Soluble Fnl4 Levels and TWEAK Levels with Lupus Nephritis Disease Activity. Irene Blanco1, Ping Wu2, Timothy S. Zheng3, Shawn Weng4, Jennifer S. Michaelson5, Linda C. Burkly1 and Chaim Putterman1. 1Albert Einstein College of Medicine, Bronx, NY, 2Biogen Idec, Inc, Cambridge, MA, 3Biogen Idec Inc, Cambridge, MA, 4Biogen Idec, Inc., Cambridge, MA, 5Biogen Idec, Cambridge, MA

Background/Purpose: We have showed that the cytokine TWEAK is a biomarker for lupus nephritis (LN). However, soluble receptors for key immune pathways are also potential biomarkers of inflammatory diseases, including SLE. Thus, we hypothesized that a soluble form of TWEAK receptor, Fn14, might be present in human serum or urine and could be a biomarker for LN.

Methods: Serum and urine from 67 patients from the Einstein Lupus Cohort were included in this study. 34 had active LN (renal SLEDAI≥4) and 33 had inactive, non-LN SLE (general SLEDAI≤2). Healthy normals (n=39), age and race matched, were also evaluated. ELISAs were performed on serum and urine samples to determine soluble Fn14 and TWEAK levels. All data was analyzed using STATA 10.1.

Results: Of the 106 patients, 47% were Black, 47% were Hispanic and 6% were of another race/ethnicity. 79% were female with a median age of 43y. For the SLE patients the median disease duration was 6.0y. As expected LN patients had higher median protein to creatinine ratios as compared to both inactive SLE patients and normals (1.22 v 0.11 v 0.09, p<0.001). Although the normal group had a higher median GFRs overall, all groups had normal median values (90 v 89 v 115, p=0.02).

Serum Fn14 (sFn14) levels were significantly higher in LN compared to normals (p=0.002) and trended toward significance when comparing LN to the inactive SLE group (p=0.06). Median urine Fn14 levels tended to be higher in the LN group as compared to the inactive SLE (p=0.06) and normals (p=0.05) but did not achieve significance with normalization to urine creatinine (p=0.06 and 0.12 for comparison to inactive SLE and normal, respectively). While there was no significant difference between the groups with regard to serum EAK, as previously shown, median urinary TWEAK levels were significantly elevated in the LN group compared to inactive SLE and normal groups when normalized to urine creatinine concentration (LN v inactive SLE (p=0.002) and LN v normal (p=0.002).

We performed an ROC analysis to determine the capability of sFn14 to distinguish between LN and inactive SLE as well as LN and normals. The AUC for sFn14 by itself was fair (LN v inactive SLE, AUC: 0.63; LN v normals, AUC: 0.70) while that of normalized uTWEAK was good (LN v inactive SLE, AUC: 0.77; LN v normals, AUC: 0.72). However, when the AUC for sFn14 and uTWEAK were combined the AUC was increased (LN v inactive SLE, AUC: 0.80; LN v normals, AUC: 0.76).

Conclusion: sFn14 levels are significantly elevated in patients with LN. This novel finding contributes to our previous observations that urinary TWEAK is elevated in this patient population. Adding sFN14 levels to urinary TWEAK levels as a combined biomarker has a higher capacity than each alone to distinguish between LN and inactive SLE as well as LN and normals. sFn14 is a promising novel biomarker in LN, further underscoring the TWEAK/Fn14 pathway as a potential therapeutic target that warrants further study.

Disclosure: I. Blanco, None; P. Wu, None; T. S. Zheng, Biogen Idec, 3; S. Weng, BiogenIdec, 3, Bagen IDEC, 1; J. S. Michaelson, Biogen Idec, 1, Biogen Idec, 3; L. C. Burkly, Biogen Idec, 1, Biogen Idec, 3; C. Putterman, Biogen Idec, 2.
Urinary Levels of High Mobility Group Box 1 Protein Are Elevated in Patients with Active Lupus Nephritis, and Correlate with Renal Histopathology. Irene Blanco1, Neelakshi Jog1, Chaim Puttermann1, Iris Lee2 and Roberto Caricchio3, Albert Einstein College of Medicine, Bronx, NY. 1Temple University, Philadelphia, PA; 2Temple Univ Med Office Bldg, Philadelphia, PA

Background/Purpose: High mobility group box 1 protein (HMGB-1) had been implicated in the pathogenesis of SLE and potentially lupus nephritis (LN). There is increased expression in the both the glomerulus and mesangium and is found to be increased in the serum of LN patients compared to controls. To further investigate what happens locally in the kidney, we analyzed the urine of active LN patients for HMGB-1.

Methods: Urine from 61 Einstein Lupus Cohort patients was included in this study. 32 patients had active, biopsy-proven LN, (15 class III or IV, 7 mixed class III/IV v. 10 class V; all had renal SLEDAI ≥4) and 29 had inactive, non-LN SLE (general SLEDAI≤2). HMGB-1 was detected by western blot using a polyclonal antibody against it. Band intensities were measured with ImageJ software and HMGB-1 was normalized to albumin for each sample. Urine was then normalized to urine creatinine to account for the volume of each specimen. All data was analyzed using STATA 10.1.

Results: Of the 61 patients, 90.2% are female and 9.8% are male. 47.5% are Hispanic, 45.9% are Black and 6.6% are of another race/ethnicity. The median age and disease duration were 39y and 7.5y, respectively. Overall, LN patients have lower median serum albumin levels (3.6 v 4.1, p<0.001) and higher median protein to creatinine ratios (uP/C, 1.22 v 0.11, p<0.001), but there was no statistically significant difference in serum creatinine or GFR when compared to those with inactive SLE.

Medioan normalized urine HMGB-1 was significantly elevated in LN patients compared to inactive SLE (53.81 v 9.46, p<0.001). A difference in median levels was also seen between the classes. There was a significant difference between proliferative and membranous disease (33.4 v 138.8, p=0.003) and there seemed to be increased levels between mixed and membranous disease (47.5 v 138.8, p=0.07). However, there was no significant difference between proliferative and mixed LN (33.4 v 47.5, p=0.21).

Conclusion: This is the first study to look at urinary HMGB-1 levels in lupus nephritis. Levels are significantly higher in active LN patients compared to inactive SLE. Levels may be associated with class where the highest levels were seen in membranous disease. While this was correlated to uP/C in the membranous group, it was not correlated in the mixed group, despite having higher levels of proteinuria, nor in the proliferative group, where there was also elevated urinary protein though not to the level of the other groups. Therefore it is possible that the same process that drives proteinuria in membranous disease is driving elevated HMGB-1 levels.

Disclosure: I. Blanco, None; N. Jog, None; C. Puttermann, None; I. Lee, None; R. Caricchio, None.


Background/Purpose: The identification of partial proteinuria recovery (PPR) of ≥50% allows for the detection of an additional number of patients who improve their proteinuria on standard of care treatment. The long term outcome of patients with≥ 50% PPR at 1 year is not well studied.

To determine the prognostic value of PPR and complete proteinuria recovery (CPR) at 1 year on long term outcomes compared to patients who did not recover proteinuria≥ 50% on standard of care therapy.

Methods: All active lupus nephritis (LN) patients registered at a large lupus clinic from 1970–2011. Proteinuria was defined as >0.5g/24 hours based on SLEDAI-2K. Patients with proteinuria and at least one of the urinary sediments (hematuria, pyuria or casts) present at entry into the study and persistent on 2 consecutive visits were enrolled.

CPR was defined as proteinuria <0.5g/24 hours based on SLEDAI-2K. PPR was defined as ≥50% in the level of proteinuria from baseline as defined by SLEDAI-2K responder index-50 (SLEDAI-50-R). Proteinuria recovery was identified if present on 2 consecutive visits within 1 year of enrollment.

The 63 long term outcomes (death, eGFR<15, dialysis or kidney transplant, SLICC Damage Index (SDI)>0, SDI≥3) occurring after the identification of proteinuria related to LN at entry into the study were studied. The mean time to long term outcome was determined.

Conclusion: Serum hepcidin-25 levels decrease 2 months prior to renal SLE flare but not prior to non-renal SLE flare. To our knowledge, this is the first study to show that serum hepcidin-25 levels may predict renal SLE flare. These findings need to be confirmed in larger prospective cohorts but support previous evidence that hepcidin-25 may be a biomarker for renal SLE flares.

Disclosure: A. Friedman, None; N. Young, None; P. Jensen, None; X. Zhang, None; W. N. Jarjour, None; B. H. Rovin, Genentech and Biogen IDEC, Inc.; S. Teva Pharmaceuticals, 2, Lilly; D. Birmingham, None; L. Hebert, None; S. P. Ardoin, None.

Do Serum Hepcidin 25 Levels Predict SLE Renal or Non-Renal Flares? Alexandra Friedman1, Nicholas Young1, Paul Jensen1, Xiaolin Zhang1, Wael N. Jarjour2, Brad H. Rovin2, Daniel Birmingham2, Lee Hebert2 and Stacy P. Ardoin1, 1The Ohio State University Medical Center, Columbus, OH; 2Ohio State University Medical Center, Columbus, OH; 3Ohio State University, Columbus, OH

Background/Purpose: Biomarkers are needed which can accurately predict systemic lupus erythematosus (SLE) flare, allowing tailoring of immunosuppressive therapy to minimize disease damage and medication toxicity. Urinary hepcidin-25 levels have been shown to decrease 2 months prior to renal SLE flare and show promise as a biomarker of lupus nephritis flare. This study assessed serum hepcidin-25 levels before, during and after renal and non-renal SLE flares.

Methods: As part of the Ohio SLE Study (OSS), serum and urine were obtained in SLE patients prospectively every 2 month intervals. We identified 34 renal flare cycles in 21 patients and 22 non renal flare cycles in 17 patients. We measured serum hepcidin-25 levels at baseline, at time of flare and at 2 and 4 month intervals prior to flare and after flare. Renal and non-renal flares were defined and adjudicated by OSS protocol. Serum hepcidin-25 was measured in duplicate by enzyme immuno assay kits (Bachem). Descriptive statistics were performed.

Results: Serum hepcidin-25 levels showed substantial inter-patient variability and were presented relative to normalized baseline levels. As shown in Figure 1, serum hepcidin-25 levels decreased significantly 2 months prior to renal flares but did not decrease prior to non renal flares.

Disclosure: I. Blanco, None; N. Jog, None; C. Puttermann, None; I. Lee, None; R. Caricchio, None.
Proportional hazard models were used to determine the hazard ratio (HR) for long term outcomes for the different recovery definitions.

Results: 217 patients (81.8% female) were identified. At 1 year: 45 patients achieved PPR, 48 CPR and 124 not recovered.

Long term outcomes: eGFR < 15 was identified in 14.3% of the patients, dialysis or kidney transplant in 12.8%, 18% of the patient died and 56% developed damage (SDI > 0) with 30.7% with SDI > 3.

The mean time to event from 1st visit in the study were: 7.0 ± 8.3 years for death (n=39), 3.7 ± 3.7 years for eGFR < 15 (n=30), 5.5 ± 6.0 years for dialysis or kidney transplant (n=20), 3.6 ± 5.6 years for SDI=0 (n=75) and 6.1 ± 7.3 years for SDI > 3 (n=57).

Achieving a CPR at 1 year protects from the development of eGFR < 15; HR=0.29. Achieving a CPR at 1 year protects from the development of eGFR < 15 (HR = 0.25), accrual of damage with SDI > 3 (HR = 0.23) and none with CPR at 1 year subsequently went on to dialysis or transplant. (Table 1).

Table 1. Time to development of event in patient who achieved CPR and PPR at 1 year compared to patients without proteinuria recovery

<table>
<thead>
<tr>
<th>Outcome</th>
<th>CPR HR</th>
<th>PPR HR</th>
<th>HR (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>0.88 (0.75)</td>
<td>0.35 (0.05)</td>
<td></td>
</tr>
<tr>
<td>eGFR &lt; 15</td>
<td>0.29 (0.04)</td>
<td>0.25 (0.02)</td>
<td></td>
</tr>
<tr>
<td>Dialysis or Kidney Transplant</td>
<td>0.42 (0.17)</td>
<td>No event</td>
<td></td>
</tr>
<tr>
<td>SDI &gt; 0</td>
<td>1.05 (0.86)</td>
<td>0.70 (0.22)</td>
<td></td>
</tr>
<tr>
<td>SDI &gt; 3</td>
<td>0.73 (0.35)</td>
<td>0.23 (0.002)</td>
<td></td>
</tr>
<tr>
<td>Atherosclerotic events</td>
<td>1.07 (0.93)</td>
<td>0.84 (0.79)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Achieving complete recovery from proteinuria in patients with active lupus nephritis at 1 year from the onset of lupus nephritis protects against comorbidities including end stage kidney disease, dialysis and transplant, organ damage and death. Nonetheless, achieving at least partial recovery in proteinuria, ≥ 50%, at year 1 from the onset of lupus nephritis protects against the development of eGFR < 15.

Disclosure: Z. Touma, None; M. B. Urowitz, None; D. Ibanez, None; D. D. Gladman, None.

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Partial and Complete Recovery From Proteinuria in Lupus Nephritis Patients Receiving Standard of Care Treatment. Zahi Touma, D. D. Gladman, Dominique Ibanez and Murray B. Urowitz. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: In the majority of trials on lupus, partial proteinuria recovery (PPR) (≥50% decrease in the proteinuria level) is a component of the composite outcome of partial renal remission.

To determine the percentage of patients who achieve complete proteinuria recovery (CPR), PPR and CPR and/or PPR in lupus nephritis (LN) patients receiving standard treatment at 6 months, 1 year and 2 years. The aim of this study was to determine if the initial level of proteinuria predicts recovery from proteinuria.

Methods: We studied all active LN patients registered at the Lupus Clinic (1970–2011). Proteinuria was defined as >0.5g/24 hours based on a 24 hour urine collection. Patients with proteinuria and at least one of the urinary sediments (hematuria, pyuria or casts) present at the entry of the study and persistent on 2 consecutive visits were enrolled. Patients were grouped into: group 1 as 0.5–0.9g/day, group 2 as 1–2g/day and group 3 as ≥2g/day.

CPR was defined as proteinuria <0.5g/24 hours based on SLEDAI-2K. PPR was a decrease of ≥50% in the level of proteinuria from baseline as defined by by SLEDAI-50 responder index (SLEDAI-50-RI).

We determined the percentage of CPR, PPR and CPR and/or CPR achieved; 1) on 1 visit at 6 months, 1 year and 2 years 2) persistent on 2 consecutive visits at 6 months, 1 year and 2 years. The percentage of patients who recovered from proteinuria was evaluated based on initial proteinuria levels with the Kaplan-Meier estimator.

Results: 217 patients (81.8% female) were identified. The age and duration of lupus at the start of the study was 34.2 ± 12.4 and 5.7 ± 6.3 years.

PPR was achieved by 27% of patients at 6 months, 48.3% at 1 year and 69.4% at 2 years. CPR and/or CPR was achieved by 31.8% of patients at 6 months, 57.6% at 1 year and 79.3% at 2 years. CPR was achieved by 8.8% of patients at 6 months, 35.2% at 1 year and 60.2% at 2 years (table 1). The percentage of PPR, CPR and PPR and/or CPR decreased when proteinuria recovery was required on 2 consecutive visits (Table 1) (Figure 1).

Based on the level of proteinuria, in group 1, 2 and 3 more patients achieved at least PPR compared to CPR at 6 months (p=0.81), 1 and 2 years (p<0.05).

Table 1. Percentage of PPR, CPR, and PPR or CPR using 1 visit or 2 visits what does this mean

<table>
<thead>
<tr>
<th>Definitions</th>
<th>@ 6 months</th>
<th>@ 1 year</th>
<th>@ 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial recovery</td>
<td>27%</td>
<td>21%</td>
<td>48.3%</td>
</tr>
<tr>
<td>Complete recovery</td>
<td>8.8%</td>
<td>6.9%</td>
<td>35.2%</td>
</tr>
<tr>
<td>Partial or complete recovery</td>
<td>31.8%</td>
<td>25.5%</td>
<td>46.4%</td>
</tr>
</tbody>
</table>

Figure 1. Comparing Complete, Partial, and/or Complete – All Patients—1 Visit Definition

Conclusion: The identification of partial proteinuria recovery allowed the detection of additional patients who improved their proteinuria on standard of care treatment. 58% of patients achieved at least partial while only 35% achieved CPR at year 1. PPR can serve as an important primary endpoint in research studies and trials.

Disclosure: Z. Touma, None; D. D. Gladman, None; D. Ibanez, None; M. B. Urowitz, None.

ACR Concurrent Abstract Session

Systemic Lupus Erythematosus - Human Etiology and Pathogenesis I

Sunday, November 11, 2012, 4:30 pm–6:00 pm

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Interferon Regulatory Factor 5 Associates with Systemic Lupus Erythematosus Through Two Distinct and Independent Effects. Erin Zoller1, Leah C. Kottyan2, Bahram Namjou3, Samuel Vaughn3, Miranda C. Marion3, Carl D. Langefeld3, Marta E. Alarcon-Riquelme4, Juan-Manuel Anaya5, Elizabeth E. Brown on behalf of PROFILE6, Sang-Choo Bae7, Jeffrey C. Edberg8, Patrick M. Gaffney9, Diane L. Kamen10, Robert P. Kimberly10, Chaim O. Jacob11, Joan T. Merrill12, Kathy Moser Sivils11, Michelle A. Petri12, Rosalind Ramsey-Goldman13, John D. Reveille14, Anne M. Stevens15, Betty P. Tsao16, Luis M. Vila17, Timothy J. Vyse18 and Kenneth M. Kaufman1, 1Cincinnati Children's Hospital and Medical Center, Cincinnati, OH, 2Department of Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA, 3Arkansas Children's Hospital, Little Rock, AR, 4University of Alabama at Birmingham, Birmingham, AL, 5Yale University School of Medicine, New Haven, CT, 6University of California, San Francisco, San Francisco, CA, 7University of Colorado, Denver, CO, 8University of Illinois, Chicago, IL, 9University of Texas Health Science Center at Houston, Houston, TX, 10University of California, San Francisco, San Francisco, CA, 11Mount Sinai School of Medicine, New York, NY, 12University of Pittsburgh, Pittsburgh, PA, 13University of Wisconsin, Madison, WI, 14University of Washington, Seattle, WA, 15University of California, Los Angeles, CA, 16University of Puerto Rico Medical Sciences Campus, San Juan, PR, 17University of Minnesota, Minneapolis, MN, 18University of Texas Health Science Center at Houston, Houston, TX

Background/Purpose: Powerful evidence suggests that Systemic lupus erythematosus (SLE or lupus) autoimmunity is mediated by dysregulation of the IRF5-NFκB signaling pathway. The interferon regulatory factor 5 (IRF5) genomic locus is associated with lupus and seven other autoimmune diseases
in populations of each of the major ancestral groups. While the association of lupus with the IRF5 region has been extensively confirmed, previous publications have not presented a comprehensive analysis of the complete genetic variation of the entire locus including the juxtaposing gene TNPO3.

**Methods:** In order to fine map the entire IRF5/TNPO3 region, we used an Illumina Select custom array to genotype 107 single nucleotide polymorphisms (SNPs) in 8,395 SLE cases and 7,367 controls of European, African American, Asian, Hispanic, and Native American ancestry. Additionally, we imputed genetic variants spanning the IRF5/TNPO3 region and performed targeted deep sequencing of lupus cases and controls to identify over 7,000 variants in the region.

**Results:** Through direct genotyping, imputation, and deep sequencing, we have accounted for all variation within the IRF5/TNPO3 region and identified a set of variants that includes the causative polymorphism(s). In each ancestry group, we found strong association of variants located in the promoter region of IRF5. Furthermore, in Europeans and populations with European admixture, we also observed a strong independent association that spans the IRF5 and TNPO3 genes marked by a large haplotype. Through step-wise conditional analysis of the variation, our model of association using these two independent effects is able to explain the entire association of the IRF5/TNPO3 region. Using an iterative strategy, we limited the list of possible causal polymorphisms to those present in the genetic models with the strongest lupus associations. We further demonstrated evidence for over-transmission of European-derived variants to African American cases by using global and local admixture analysis.

**Conclusion:** IRF5 association reflects a crucial component in the pathogenesis of multiple ancestral groups. With these studies, we present a model of association that is superior to other genetic models published to date: we show two distinct and independent effects within the IRF5/TNPO3 locus. Being convinced that we have identified all of the genetic variation relevant to the IRF5 association in the region of IRF5/TNPO3, we have therefore captured the causal variant(s). Identifying the independent genetic effects allows for the separate pursuit of causal polymorphisms within this defined variation and disease mechanisms yet to be described.

**Disclosure:** E. Zoller, None; L. C. Kottyan, None; B. Namjou, None; S. Vaughn, None; M. C. Marion, None; C. D. Langefeld, None; M. E. Alarcon-Riquelme, None; J. M. Brown, None; E. E. Brown, None; R. Ramsey-Goldman, None; J. D. Reveille, None; R. P. Kimberly, None; M. E. Alarcon-Riquelme, None; T. J. Vyse, None; M. A. Kaufman, None.

844 Toll-Like Receptor 9-Independent and Immune Complex-Dependent Interferon-α Production by Neutrophils Upon Netosis in Response to Circulating Chromatin. 

**Disclosures:** D. Lindau, None; J. Mussard, None; A. Rabsteyn, None; M. Ribon, None; I. Köttér, None; A. Igney, None; G. Adema, None; M. C. Boissier, None; H. G. Rammenese, None; P. Decker, None.

845 Systemic Lupus Erythematosus Immune Complexes Upregulate the Expression of CD319 and CD229 On Plasmacytoid Dendritic Cells. 

**Disclosures:** Yenan Bryceson1 and Lars Rönnblom1. 1Section of Rheumatology, Uppsala University, Uppsala, Sweden, 2Center for Infectious Medicine, Karolinska Institutet, Stockholm, Sweden, 3Swedish University of Agricultural Sciences, Uppsala, Sweden.

**Background/Purpose:** Patients with SLE have an activated type I interferon (IFN) system due to an ongoing IFN-alpha synthesis by plasmacytoid dendritic cells (pDCs) stimulated by endogenous nucleic-acid containing immune complexes (ICs). The IFN-alpha production by pDC is strongly promoted by NK cells via MIP-1beta and LFA-1-mediated cell contact. In this study we aimed to further identify molecules of importance in the pDC-NK cell cross-talk.

**Methods:** Healthy donor PBMC were stimulated with medium or IC consisting of purified SLE-IgG and U1snRNP particles (SLE-IC) for 6 h. Surface expression of 45 different molecules was determined on pDCs, with flow cytometry. CRACC and LY-9 were found to be 5-fold upregulated upon stimulation with SLE-IC (CD319+), whereas CD229 (LY9) was only weakly upregulated (CD229+). CRACC and CD229 (LY9) was analyzed in isolated or cocultured pDCs and NK cells. Intracellular IFN-alpha was correlated to the expression of CRACC and LY9 on pDCs and the expression of these molecules on different immune cells was compared between SLE patients and healthy controls. Expression of the adaptor molecules SAP and EAT-2 was determined by western blot. The functional role of CRACC and LY9 in pDC and NK cells was investigated.

**Results:** Isolated neutrophils produce IFN-α upon stimulation with chromatin. IFN-α secretion by neutrophils was observed with steady-state neutrophils, and not pro-inflammatory neutrophils, from both healthy donors and SLE patients whereas pDC were less efficient. Neutrophil-derived IFN-α was detected in response to free chromatin, and not chromatin-containing immune complexes, as well as TL9 agonists. Nucleosome-induced IFN-α production by neutrophils was associated with IL-8 secretion, CD66b up-regulation, ROS production and NET formation (NETosis). Neutrophil priming is not required. In low-responders, autologous PBMC sustain IFN-α secretion by chromatin-activated neutrophils in co-cultures. In contrast to TL9 agonists, chromatin-induced IFN-α secretion occurs independently of TL9 since neutrophils isolated from both wild-type and TL9-deficient mice were activated. Finally, chromatin increases gene expression levels of IFN-α and several DNA sensors, e.g. AIM2 and STING.

**Conclusion:** Neutrophils represent also an important source of IFN-α. IFN-α was detected at the mRNA and protein levels and in an active and secreted form. This is the first report showing both that steady-state neutrophils can secrete IFN-α and identifying a natural lupus stimulus involved. Since both normal and lupus neutrophils have the capability of producing IFN-α, a key event is thus the presence of increased concentrations of circulating nucleosomes in SLE patients. Chromatin-activated neutrophils (in addition to pDC and low-density granulocytes) may secrete IFN-α early during the lupus disease, before immune complexes are produced. The generation of NET and the expression of genes involved in the recognition of DNA may strengthen pDC activation and DNA-mediated activation.

**Disclosure:** D. Lindau, None; J. Mussard, None; A. Rabsteyn, None; M. Ribon, None; I. Köttér, None; A. Igney, None; G. Adema, None; M. C. Boissier, None; H. G. Rammenese, None; P. Decker, None.
Conclusion: SLE-ICs up-regulates the expression of the costimulatory molecules CRACC and LY9 on pDCs and these molecules also have an increased expression on IFN-alpha producing pDCs. Because these SLAM molecules are self-ligands and involved in the activation of several types of immune cells, the expression on both pDCs and NK cells might facilitate the pDC-NK cell interaction and the function of these cells. In contrast to the positive signal delivered by CRACC and LY9 to NK cells, the lack of SAP and EAT-2 adaptor molecules in pDCs suggests an inhibitory function in these cells. The precise roles of CD319 and LY9 in the autoimmune disease process remains to be established, but are important to clarify given the altered expression of CRACC in SLE on both B cells and NK cells.

Disclosure: N. Hagberg, None; J. Thorell, None; G. V. Alm, None; M. L. Eloranta, None; Y. Bryceon, None; L. Rönnblom, None.

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Preferential Binding to Elk-1 by SLE-Associated IL10 Risk Allele up-Regulates IL10 Expression. Daijuke Sakurai1, Jian Zhao2, Yun Deng2, Jennifer A. Kelly3, Kathy Moser Sivils4, Kenneth M. Kaufman4, Elizabeth E. Brown on behalf of PROFILE 4, Marta E. Alarco´n-Riquelme on behalf of BIOLUPUS and GENLES network, John B. Harley5, Sang-Cheol Bae6, Tsao1, 1David Geffen School of Medicine University of California Los Angeles, Los Angeles, CA, 2Oklahoma Medical Research Foundation, Oklahoma City, OK, 3Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 4Laboratorio de Genetica y Epidemiologia, Fundacion LUPUS Argentina, Buenos Aires, Argentina, 5University of Alabama at Birmingham, Birmingham, AL, 6Centro de Genómica e Investigación Oncológica Pfizer-Universidad de Granada-Junta de Andalucía (GENYO), Granada, Spain and Oklahoma Medical Research Foundation, Oklahoma City, OK, 7Hanyang University Hospital for Rheumatic Disease, Seoul, South Korea, 8Clinical Research Center for Rheumatoid Arthritis (CRCRA), Seoul, 9Keck School of Medicine, University of Southern California, Los Angeles, CA, 10King’s College London, London, United Kingdom, 11University of Chicago, Chicago, IL, 12Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Oklahoma City, OK, 13Medical University of South Carolina, Charleston, SC, 14Rheums & Clinical Immunology Program, Oklahoma Medical Research Foundation, Charleston, SC, 15Department of Biostatistics, Wake Forest University Health Sciences, Winston-Salem, NC, 16National Defense Medical Center, Taipei, 17Seoul National University Hospital, Seoul, South Korea

Background/Purpose: The established association between IL10 and multiple autoimmune diseases including SLE and elevated levels of IL-10 in SLE patients correlating with disease activity led us to fine-map the IL10 family chromosomal region (chromosome 17p13-17p11.2) to identify SLE-associated SNPs for their potential function in multiple ancestries.

Methods: We genotyped 19 tag SNPs of the 154 kb IL10 family locus in 15533 subjects including European Americans (EA, 3820 cases vs 3412 controls), African Americans (1670 vs 1904), Asians (1252 vs 1249) and Hispanics (1445 vs 781), and imputed an additional 109 SNPs in EA. Each SNP was assessed for association with SLE, and haplotype-based conditional testing was conducted to distinguish independent signals. Transcript and SNP was assessed for association with SLE, and haplotype-based conditional testing was conducted to distinguish independent signals. Transcript and SNP binding to SLE-associated SNP alleles that might regulate IL-10 expression. The established association between IL10 and multiple autoimmune disorders including SLE and elevated levels of IL-10 in SLE on both B cells and NK cells.

Results: Among 19 genotyped SNPs, the 3'UTR downstream SNP of IL10, rs3024450, exhibited the strongest independent association with SLE susceptibility in EA only (P = 2.67 × 10^-7). OR [95%CI] = 1.30 [1.19–1.43]. Lower allele frequencies of this SNP and lack of other association signals in non-EA lead us to focus on EA for imputation, showing association with SNP of 3 additional SNPs: rs3122605 (10kb 5' upstream), rs3024493 (introns3) and rs3024495 (introns4) tagged by rs3024505 (r²=0.91). SLE patients carrying risk-alleles of these 4 SNPs had higher IL10 expression at mRNA (P=3.8×10^-10) and protein level (P=4.2×10^-8) than those carrying non-risk alleles. Only one risk allele of rs3122605 exhibited binding to clear extracts from SLE-PLBs using EMSA. This risk allele was predicted to preferentially bind to transcription factor Elk-1, and was validated by supershift in the presence of Elk-1 antibodies, suggesting it is the likely causal variant. Upon activation, cytoplasmic Elk-1 is known to be phosphorylated and translocated into the nucleus inducing transcription. Phospho-Elk-1 was detected in nuclear extracts from SLE but not normal PBMCs, and appeared higher in patients with increasing SLEDAI scores (Figure). Co-expression of phospho-Elk-1 and IL-10 in PBLs was elevated in SLE than controls (P = 0.005) and active than inactive patients (P < 0.05).

Conclusion: We identified GWAS level association (<5×10^-8) of 4 IL10 SNPs with SLE in EA. The risk allele of 5' upstream rs3122605 preferentially binding to ELK-1 was associated with elevated IL10 levels. Nuclear localization of activated phospho-Elk-1 was elevated in SLE PBLs that also expressed IL-10, especially during active disease. Taken together, the SLE-associated rs3122605 C allele conferred SLE risk by upregulating ELK-1-mediated IL-10 expression.

Disclosure: D. Sakurai, None; J. Zhao, None; Y. Deng, None; J. A. Kelly, None; K. Moser Sivils, None; K. M. Kaufman, None; E. E. Brown on behalf of PROFILE, None; M. E. Alarco´n-Riquelme on behalf of BIOLUPUS and GENLES network, None; J. B. Harley, None; S. C. Bae, None; C. O. Jacob, None; T. B. Niewold, None; P. M. Gaffney, None; J. A. James, None; R. P. Kimberly, None; G. S. Gilkeson, None; D. L. Kamen, None; C. D. Langefeld, None; D. M. Chang, None; Y. W. Song, None; W. Chen, None; J. M. Grossman, None; B. H. Hahn, None; B. P. Tsao, None.

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Enhanced ROCK Activation in Patients with Systemic Lupus Erythematosus. Josephine Iggo1, Sanjay Gupta2, Tanya M. Pav1, Roland Duculan1, Kyriakos A. Kiro1, Jane E. Salmon3 and Alessandra B. Perrins3, 1Morgan Stanley Children’s Hospital of New-York Presbyterian, Columbia University Medical Center, New York, NY, 2Hospital for Special Surgery, New York, NY

Background/Purpose: The Rho GTPases, Rac and RhoA, play a key role in immune responses by regulating both cytoskeletal reorganization and gene expression. RhoA exerts many of its effects by activating Rho kinases (ROCKs). Aberrant ROCK activation has been implicated in the pathogenesis of various cardiovascular, renal, and neurological disorders. As such, ROCK inhibitors (ROCKi) could be potential treatments for these diseases. Recent studies have demonstrated that, in T cells, Rho kinases can regulate the production of IL-17 and IL-21, two cytokines associated with the development of multiple autoimmune disorders including Systemic Lupus Erythematosus (SLE). ROCK inhibition has previously been shown to ameliorate the cytoskeletal abnormalities of SLE T cells suggesting that SLE patients may exhibit aberrant ROCK activation. The goal of this study was to measure ROCK activity in SLE patients and its relationship with clinical and immunological aspects of SLE.

Methods: We performed a cross sectional study of 28 SLE patients and 25 healthy controls matched for age (31.1 ± 9.1 years vs 31.8 ± 8.2), gender (79% female vs 92%) and race. Mean SLEDAI 4.0 ± 2.4 (Range: 0–10) and physician global assessment 0.8 ± 0.7 (Range: 0–2). Peripheral blood mononuclear cell (PBMC) lysates were used for ROCK kinase activity assays. Cytokine and chemokine profiles in plasma were analyzed via ELISA.

Results: ROCKi from SLE patients expressed significantly higher levels of ROCK activation compared to healthy controls, 1.251 (IQR 0.5–1.6) vs. 0.5645 (IQR 0.5–0.6), respectively (p=0.0015). There were two distinct subgroups of SLE patients: those with high (ROCKhigh) and low (ROCKlow) ROCK levels; 16/28 (57%) patients were in the ROCKhigh group. Using linear regression models, disease duration, lymphocyte count, and azathioprine use were identified as independent predictors of ROCK activity (p<0.01). There was no significant difference in IL-17 and IL-21 plasma levels between SLE patients and healthy controls.CCL20 levels from SLE patients were, however, significantly elevated compared to healthy controls, 16.1 pg/ml (IQR 10–23) vs. 10.2 pg/ml (IQR 7.1–15.5), respectively.
A. I. Magee, None; London, United Kingdom, 3University of Oxford, Oxford, United Kingdom

**Conclusion:** Enhanced ROCK activity was seen in a subgroup of SLE patients and was associated with disease duration, lymphocyte count, and azathioprine use. Given the multiple links between CCL20 and Th17 cells, the elevated levels seen in SLE suggest a role for Th17 cells in the pathogenesis of SLE. These data support the concept that the RhO/ROCK pathway could represent an important therapeutic target for the treatment of SLE and that measurement of ROCK activation in SLE patients may be utilized to assess the efficacy of therapies, such as ROCK inhibitors, aimed at inhibiting this pathway. Following SLE patients prospectively is necessary to further characterize ROCK levels over time and establish their relationship with disease activity and/or medications.

Disclosures: J. Isgro, None; S. Gupta, None; T. M. Pavri, None; R. Duculan, None; K. A. Kirou, None; J. E. Salmon, None; A. B. Pernis, None.

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**Targeting Glycosphingolipid Biosynthesis Normalises T Lymphocyte Function in Patients with Systemic Lupus Erythematosus.** Georgia McDonald1, Laura Miguel1, Cleo Hall2, David A. Isenberg1, Anthony I. Magee3, Terry Butters4 and Elizabeth C. Jury4. 1University College London, London, United Kingdom, 2Imperial College London, London, United Kingdom, 3University of Oxford, Oxford, United Kingdom

**Background/Purpose:** Patients with systemic lupus erythematosus (SLE) are characterised by hyperactive T-cells that provide help to autoreactive B-cells. Underlying this hyperactivity are alterations in the lipid and protein composition of membrane lipid microdomains (lipid rafts) that influence the nature, duration and outcome of immune synapse formation between T-cells and antigen presenting cells including B-cells. We examined the profile of lipid raft-associated glycosphingolipids (GSL) in T-cells, the mechanisms underlying their abnormal expression in patients with SLE and whether by normalising GSL expression, T-cell function could be restored in patients.

**Methods:** High performance liquid chromatography and flow cytometry were used to assess the GSL profile and phenotype of T-cells from 98 patients with SLE compared with 82 healthy controls and 23 patients with other autoimmune rheumatoid disease. Western blotting, quantitative PCR and confocal microscopy using fluorescently-labelled GSLs were used to assess levels of proteins controlling GSL expression and GSL location within T-cells. T-cell function was assessed by measuring phosphorylation of proximal and downstream signaling molecules, proliferation and cytokine production.

**Results:** The expression levels of lipid raft-associated GSL lactosylceramide (LC), GM3 and GM1 were significantly increased in T-cells from patients with SLE compared to healthy and disease controls. In healthy donors, LC(+), GM1(+) and GM3(+) T-cells had an activated phenotype, increased expression of proliferation marker Ki-67 and transcription factor RORγT, however, raised GSL expression was not associated with a specific T-cell phenotype in patients with SLE. Increased GSL expression in T-cells from SLE patients was not associated with altered levels of enzymes controlling GSL biosynthesis but was associated with increased GSL recycling from the plasma membrane to intracellular compartments. T-cells from patients with SLE incubated fluorescently-labelled LC into intracellular vesicles more rapidly compared to T-cells from healthy donors and this was accompanied by increased expression of the Niemann-Pick 1 and 2 genes that control GSL recycling. In vitro culture of T-cells from SLE patients with direct inhibitors of GSL biosynthesis normalised GSL membrane expression and restored their function in terms of lipid raft-associated T-cell signalling, proliferation and cytokine production.

**Conclusion:** We show that targeting lipid biosynthesis pathways using clinically approved inhibitors can rectify hyperactivity in autoimmune T-cells and restore their function.

Disclosures: G. McDonald, None; L. Miguel, None; C. Hall, None; D. A. Isenberg, None; A. I. Magee, None; T. Butters, None; E. C. Jury, None.

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**The Risk of Cardiovascular Disease in Systemic Sclerosis: A Population-Based Cohort Study.** Ada Man1, Yanyan Zhu1, Yuqing Zhang2, Maureen Dubreuil1, Young Hee Rho3, Christine Pelouquin1, Robert W. Simms1 and Hyon K. Choi3. 1Boston University School of Medicine, Boston, MA, 2Boston University, Boston, MA, 3Boston University School of Medicine, University of British Columbia, Arthritis Research Centre of Canada, Boston, MA

**Background/Purpose:** Recent studies show that the prevalence of subclinical atherosclerosis is increased in individuals with systemic sclerosis (SSc). An accurate understanding of cardiovascular disease (CVD) risk is crucial in improving the overall outcomes of SSc, a disease associated with high mortality. To further elucidate the association between SSc and CVD, we evaluated the future risk of incident myocardial infarction (MI), stroke, and peripheral vascular disease (PVD) in individuals with SSc in a general population context.

**Methods:** We conducted a matched cohort study using The Health Improvement Network database, which is derived from electronic medical records from general practices in the UK from 1986 to 2011. SSc diagnoses, covariates, and cardiovascular outcomes were identified from the records. We conducted two cohort analyses: 1) MI and stroke, and 2) PVD, excluding individuals with prevalent disease from each analysis. PVD specifying the upper extremities was not included. We estimated hazard ratios (HRs) using Cox proportional hazards regression models, comparing SSc with age-, sex-, and entry time-matched comparison cohorts, adjusting for BMI, smoking, diabetes, hyperlipidemia, hypertension, atrial fibrillation, aspirin, oral glucocorticoid, and NSAID use. We then estimated the cumulative incidence of each outcome accounting for the competing risk of death.

**Results:** Mean follow-up time was 5.2 years in the SSc cohorts and 6.0 years in the comparison cohorts. Among 865 individuals with SSc (85.8% female, mean age 58.7 years), the incidence rates (IRs) of MI and stroke were 4.4 and 4.8 per 1000 person-years (PY), versus 2.5 and 2.5 per 1000 PY in the comparison cohort, respectively. The corresponding adjusted HRs were 1.80 (95% CI 1.07 to 3.05) for MI and 2.61 (95% CI 1.54 to 4.44) for stroke. Among 858 individuals with SSc (85.3% female, mean age 58.9 years), the IR of PVD was 7.6 per 1000 PY versus 1.9 per 1000 PY in the comparison cohort, with an adjusted HR of 4.35 (95% CI 2.74 to 6.93).
Elevation of KL-6 at Early Disease Course Predicts Subsequent Deterioration of Pulmonary Function in Patients with Systemic Sclerosis and Interstitial Lung Disease. Masataka Kuwana1, Tsutomu Takeuchi 1 and Junichi Kaburaki1. Keio University School of Medicine, Tokyo, Japan, 2Shinakasaka Clinic, Tokyo, Japan

Background/Purpose: Interstitial lung disease (ILD) is the leading cause of morbidity and mortality in patients with systemic sclerosis (SSc). However, only a subset of SSc patients with ILD develops end-stage lung disease (ESLD). The presence of significant fibrosis on high-resolution computed tomography and percent predicted forced vital capacity (%FVC) <70% were shown to be variables associated with a greater decline in pulmonary function, but these findings are rarely detected in patients with early SSc. In our institution, we principally did not treat ILD in SSc patients before 2000. Therefore, our cohorts of untreated patients are extremely useful in assessing the natural history of pulmonary function in SSc patients with ILD. Using this cohort, we evaluated initial factors that predict development to ESLD.

Methods: We enrolled 50 patients with SSc, who were diagnosed as having SSc between 1980 and 1995. These patients were selected from our database based on the following criteria: they had ILD as determined by chest radiographs at diagnosis, had disease duration <3 years at diagnosis, were followed for 10 or more years unless death due to ILD-related causes, had at least 4 serial pulmonary function tests, and had never received immunosuppressants, >10 mg daily prednisolone, or other potential disease-modifying drugs. ESLD was defined as having at least one of the following: <50% FVC, required oxygen supplementation in the absence of pulmonary hypertension, or death due to ILD-related causes. We performed statistical analyses stratified by development to ESLD and multivariate analysis to assess factors that predict the ESLD development. Survival analysis was performed using the Kaplan-Meier method combined with log-rank test.

Results: Disease duration at diagnosis was 14.2 ± 7.2 months and %FVC was 83.7 ± 14.2%. The patients were followed for 173.5 ± 64.7 months, and 16 patients (32%) developed ESLD. The decline in %FVC during the 12-month period was 4.6 ± 2.4% in patients who developed ESLD and 0.5 ± 0.8% in patients who did not (P < 0.0001). Cumulative survival rates were significantly worse in patients who developed ESLD than in those who did not (P < 0.0001). Initial characteristics associated with development to ESLD included diffuse cutaneous SSc (P = 0.006), anti-topoisomerase I antibody (P = 0.004), exertional dyspnea (P = 0.03), elevated KL-6 (P < 0.0001), reduced %FVC (P = 0.007), and reduced %DLco (P = 0.001). Multivariate analysis revealed that elevated KL-6 at diagnosis was the sole parameter independently associated with the ESLD development (P = 0.0002, odds ratio = 88). Cumulative rates free of ESLD and death were significantly greater in patients with normal KL-6 than in those with elevated KL-6 (P < 0.0001 for both comparisons). Finally, the rate of decline in %FVC was negatively correlated with KL-6 at diagnosis (r = 0.71, P < 0.0001).

Conclusion: SSc patients with ILD are heterogeneous in terms of deterioration of pulmonary function. Elevated KL-6 at baseline is an independent predictor of %FVC decline and mortality. SSc patients with ILD and elevated KL-6 at early disease course are candidates for aggressive therapeutic intervention.

Disclosure: M. Kuwana, None; T. Takeuchi, None; J. Kaburaki, None.

850 An Evidence-Based Screening Algorithm for Pulmonary Arterial Hypertension in Systemic Sclerosis. James R. Seibold1, Christopher D. Denton2, Ekkehard Grünig3, Diana Bonderman4, Oliver Distler5, Dinesh Khanna6, Ulf Müller-Ladner7, Janet E. Pope8, Madelon C. Vonk9, Martin Doelberg10, Harbajan Chaudha-Boreham11, Harald Heinzl12, Daniel M. Rosenkonig2, Valerie McLaughlin13 and John G. Coghlan1. Scleroderma Research Consultants LLC, Avon, CT, 2Royal Free Hospital, London, United Kingdom, 3University Hospital, Heidelberg, Germany, 4Medical University of Vienna, Vienna, Austria, 5University Hospital Zurich, Zurich, Switzerland, 6University of Michigan, Ann Arbor, MI, 7Kerckhoff-Klinik GmbH, Bad Nauheim, Germany, 8Western University of Canada, St. Joseph’s Health Care, London, ON, 9Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 10Actelion Pharmaceuticals Ltd, Allschwil, Switzerland

Background/Purpose: Pulmonary arterial hypertension (PAH) is a leading cause of mortality and late-stage morbidity in systemic sclerosis (SSc). Current PAH screening recommendations are consensus-based and their clinical application results in high false positive rates. The rate of missed diagnoses has never been determined. The DETECT study aimed to develop an evidence-based screening algorithm for PAH in SSc patients that would limit the number of missed PAH diagnoses.

Methods: In this prospective, multicenter, cross-sectional observational cohort study [NCT00706082], adult patients with SSc for >3 years, a diffusing capacity of the lung for carbon monoxide (DLCO) <60% of predicted, and no previous diagnosis of pulmonary hypertension underwent multiple non-invasive screening tests followed by diagnostic right heart catheterization (RHC). Univariable and multivariable analyses selected the best discriminatory variables for identifying PAH, which were assessed for clinical plausibility and feasibility and incorporated into a two-step internally validated screening algorithm.

Results: Of 466 SSc patients, 19% (n = 87) had RHC-confirmed PAH and 69% (n = 321) had normal pulmonary arterial pressure (PAP). PAH was mild (mean PAP 32.5 [30.7–34.3] mm Hg; 64.4% WHO functional class I or II). Six simple screening tests (forced vital capacity [% predicted]/DLCO [% predicted]; current/past telangiectasias; anti-centromere antibody; N-terminal pro-brain natriuretic peptide; uric acid; right axis deviation on electrocardiography) were used in step 1 of the algorithm to derive a risk prediction score with pre-defined high sensitivity (to minimize the rate of missed PAH diagnoses) and to inform a decision to refer to echocardiography. Right atrial area and tricuspid regurgitation jet velocity were added in step 2 (with pre-defined low specificity) to determine referral to RHC. The DETECT algorithm, with step 1 sensitivity 97% and step 2 specificity 35%, resulted in a rate of missed PAH diagnoses of 4% requiring RHC in 62% of patients. When the current ERS/ESC screening recommendations were applied, the missed diagnoses and the RHC referral rates were 29% and 40%, respectively.
Conclusion: The two-step algorithm is a sensitive non-invasive screening tool for detection of PAH in SSc which addresses resource utilization of RHC, identifies less advanced disease and, most importantly, minimizes missed diagnoses. This is an evidence-based approach to revise standards of care in SSc patients.

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C-Reactive Protein Predicts Long-Term Progression of Interstitial Lung Disease and Survival in Patients with Early Systemic Sclerosis, Xiaochun Liu1, Maureen D. Mayes1, John D. Reveille2, Emilio B. Gonzalez3, Brock E. Harper4, Hilda T. Draeger5 and Shervin Assassi6. 1University of Texas Health Science Center at Houston, Houston, TX, 2Auckland City Hospital, Auckland, New Zealand, 3Radboud University Nijmegen Medical Centre, Nijme- gen, Netherlands, 4Department of Rheumatology, Sint Maartenskliniek, Nijmegen, Netherlands, 5St. Joseph Health Care London, London, ON, 6Univ of Texas Medical Branch, Galveston, TX

Background/Purpose: The currently available clinical markers are not reliable predictors of long-term progression of interstitial lung disease (ILD) in patients with systemic sclerosis (SSc). In a previous study conducted in the GENIOS (Genetics Environment in Scleroderma Outcome Study) cohort, none of the baseline clinical variables (including serology and disease type) was predictive of long-term decline in forced vital capacity (FVC). Elevated C-reactive protein (CRP) levels have been reported in a subset of SSc patients.

Methods: We compared the plasma CRP levels in 266 SSc patients enrolled in the GENIOS cohort (mean disease duration at enrollment 2.5 years, 59% diffuse cutaneous involvement) to that of 97 age, gender and ethnicity-matched controls. Subsequently, the correlation between the plasma CRP levels and Actedonimitantly obtained markers of disease severity was assessed. The primary outcome was decline in FVC over time. A total of 1,016 FVC measurements fulfilled the American Thoracic Society/European Respiratory Society criteria and were included in the analysis. The mean follow-up time was 4.4 years. The predictive significance for long-term change in FVC was investigated by a joint analysis of longitudinal measurements (sequentially obtained at % predicted FVC) and survival data. This approach allows inclusion of all FVC measurements and accounts for survival dependency.

Results: We confirmed that the baseline plasma CRP levels were significantly higher in SSc patients than matched controls (p = 0.027). In addition to body mass index and age at baseline, the plasma CRP levels were associated with absence of anti-centromere antibodies (p = 0.043). Also consistent with previous reports, plasma CRP levels correlated with the concomitantly obtained joint, skin and lung components of the Medsger Severity Index, as well as, FVC, DLco, mRSS. More importantly, baseline CRP levels correlated with shorter survival (p < 0.001) and predicted the long-term decline in % predicted FVC (β = −0.35, 95% CI: −0.61 - −0.09, p = 0.006). The predictive significance of CRP for ILD progression was independent of potential confounders (age at baseline, gender, ethnicity, body mass index, and treatment with immunosuppres- sive agents) in the multivariable model (β = −0.37, 95% CI: −0.63 - −0.11, p = 0.005).

Conclusion: In the present study, we show for the first time that the baseline CRP levels are predictive of long-term ILD progression. High CRP levels can identify the subgroup of patients that would benefit from more intensive monitoring and treatment.

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Systemic Sclerosis Classification Criteria: Developing Methods for Multi-Criteria Decision Analysis, Sindhu R. Johnson1, Raymond P. Naden2, Jaap Fransen3, Frank H.J. van den Hoogen4, Janet E. Pope5, Murray Baron6, Alan G. Coverly7, Marco Matteucci-Ceric8 and Dinesh Khanna on behalf of ACR/EULAR Classification Criteria SSc9. 1Toronto Western Hospital, Toronto, Toronto, ON, 2Auckland City Hospital, Auckland, New Zealand, 3Radboud University Nijmegen Medical Centre, Nijme- gen, Netherlands, 4Department of Rheumatology, Sint Maartenskliniek, Nijmegen, Netherlands, 5St. Joseph Health Care London, London, ON, 6Jewish General Hospital, Montreal, QC, 7University of Basel, Basel, Switzerland, 8Univ Florence, Firenze, Italy, 9University of Michigan, Ann Arbor, MI

Background/Purpose: Classification criteria for systemic sclerosis (SSc) are being developed. Twenty-three candidate criteria have been identified, but need to be refined. The objectives of this study were to: 1) develop a SSc-specific instrument for use in a forced-choice study and evaluate its sensibility (comprehensibility, clarity, face and content validity, and feasibil- ity); 2) use force-choice methods to reduce and weight criteria; and 3) explore the agreement between Ssc experts on the probability that cases were classified as SSc.

Methods: A standardized instrument was tested for attributes of sensibil- ity. The instrument was applied to cases of SSc from 20 cohorts covering a range of probabilities that each case had SSc (very likely to not at all). SSc experts rank-ordered cases from 1 (highest probability) to 20 (lowest probability). Experts then reduced 3 weighted the 23 criteria using forced choice-conjoint analytic methods and subsequently re-ranked the cases. Consistency in both rankings was evaluated using an intraclass correlation coefficient (ICC).

Results: Experts endorsed clarity of the form (83%), comprehensibility of the instructions and response option (100%), face and content validity (100%) and feasibility. Experts identified ‘skin thickening of the fingers and proximal to the metacarpophalangeal joints’ as a sufficient criterion for SSc classification. Other criteria were reduced and weighted (weight in points): skin thickening of the fingers (14–22), finger tip lesions (9–21), finger flexion contractions (16), telangiectasia (10), abnormal nailfold capillaries (10), puffy fingers (5), calcinosis (12), Raynaud’s phenomenon (13), tendon/bursal friction rubs (21), pulmonary fibrosis/pulmonary hypertension (13), renal crisis (11), esophageal dilation (7) and SSc-related antibodies (15). The ICC for agreement across experts was 0.73 (95% CI 0.58, 0.86) and improved to 0.85 (95% CI 0.63, 0.90). The ICC for agreement across experts was 0.73 (95% CI 0.58, 0.86) and improved to 0.85 (95% CI 0.63, 0.90).

Conclusion: Our Ssc-specific instrument for classification has demon- strable sensibility. The number of criteria were reduced by 35% (from 23 to 15) and weighted. The experts had substantial agreement in rank order. The next phase of criteria development will evaluate a threshold. Our methods reflect the rigor of modern psychometric science, and serves as a template for developing classification criteria in other diseases.

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Anti-EIF2B: A Novel Intestinal Lung Disease Associated Autoantibody in Patients with Systemic Sclerosis

Zoe Betteridge, Felix Woodhead, Christopher Bunn, Christopher D. Denton, David J. Abraham, Sajal Desai, Roland du Bois, Athol U. Wells and Neil McHugh, Royal National Hospital for Rheumatic Diseases, Bath, United Kingdom, 2University Hospitals Coventry and Warwickshire, Coventry, United Kingdom, 3Royal Free Hospital, London, United Kingdom, 4Royal Free and University College Medical School, London, England, 5UCL Medical School, London, United Kingdom, 6Kings College Hospital, London, United Kingdom, 7National Jewish Health, Denver, 8Royal Brompton Hospital, United Kingdom

Background/Purpose: Autoantibodies occur in 75-95% of Systemic Sclerosis (SSc) patients. Studies have shown that the presence of particular SSc-specific autoantibodies (anti-centromere, anti-topoisomerase-1, anti-RNA polymerase III, anti-U3RNP, anti-U1/U2 RNP and anti-ToTh) correlates with distinct clinical subsets of patients. Additionally, SSc-related autoantibodies (PmScI, Ku, Ro60, La and U1RNP) can be found in a variety of other connective tissue diseases including SSc patients with overlap features. However, despite this vast array of SSc associated autoantibodies, there still remains a minority of patients that appear to be autoantibody negative. Here we report a novel SSc-specific autoantibody in 7 SSc patients.

Methods: Serum and clinical data were available from 379 patients with SSc investigated for interstitial lung disease (ILD) at the Royal Brompton Hospital and a separate 169 unselected SSc patients (Bath). Serum was also available from a control population consisting of 171 patients with other forms of connective tissue disease (dermatomyositis, polyomysitis, systemic lupus erythematosus and rheumatoid arthritis), 141 patients with idiopathic ILD and 88 healthy normal controls. All sera were tested by routine serological techniques followed by radiolabelled protein immunoprecipitation (IPP) for samples negative for anti-centromere, anti-topoisomerase 1 and anti-RNA polymerase III. Patients’ sera immunoprecipitating a novel 30 kDa band were further analyzed by indirect immunofluorescence and IPP using depleted cell extracts, to establish a common reactivity. A combination of non-radio-labelled IPP and mass spectrometry (MS) was used to identify the novel autoantigen and findings were confirmed using a commercial antibody in both immunodepletion and IPP-western blotting assays.

Results: A novel autoantigen at 30 kDa was recognized by sera from 7 sera from patients with SSc and by no controls. None of the 7 positive sera contained other known SSc-specific autoantibodies, although one patient co-immunoprecipitated SSC-associated Ro60 autoantigens. All 7 sera resulted in a cytoplasmic speckled pattern on IIF. Immunodepletion experiments indicated that all 7 serum samples immunoprecipitated the same autoantigen and MS analysis identified the novel autoantigen as EIF2B (Eukaryotic Initiation Factor 2B, subunit β). These findings were confirmed by both IPP and IPP-western blotting using a commercial anti-EIF2B antibody. Clinically, 6 anti-EIF2B positive patients had confirmed ILD, whilst the 7th patient did not have a chest CT, but had a reduced pulmonary gas transfer, demonstrating an association between anti-EIF2B and ILD (p = 0.018). Six of the patients had diffuse cutaneous involvement (p = 0.008) and four had overlap features with other autoimmune diseases (two polyomysitis and two RA). None of the patients had Raynaud’s phenomenon or a history of systemic sclerosis.

Conclusion: The novel autoantibody is detectable in the serum of GCA subjects. Mice infected with the organism develop vasculitis. BpGCA appears to be a critical factor in the pathogenesis of GCA.

Disclosure: Z. Betteridge, None; F. Woodhead, None; C. Bunn, None; C. D. Denton, None; D. J. Abraham, None; S. Desai, None; R. du Bois, None; A. U. Wells, None; N. McHugh, None.

ACR Concurrent Abstract Session

Vasculitis: Pathogenesis

Sunday, November 11, 2012, 4:30 PM - 6:00 PM

Identification of a Burkholderia -Like Strain From Temporal Arteries of Patients with Giant Cell Arteritis

Curry L. Koeing, Bradley J. Katz, Jose Hernandez-Rodriguez, Marc Corbera-Bellalta, Maria C. Cid, Herbert P. Schweizer, Dean Li, Jerry Kaplan, Gary S. Hoffman and Ivana De Domenico, 1Salt Lake City Veterans Administration, Salt Lake City, UT, 2University of Utah, Salt Lake City, UT, 3Hospital Clinic. University of Barcelona. IDIBAPS, Barcelona, Spain, 4Vasculitis Research Unit Hospital Clinic. University of Barcelona. IDIBAPS, Barcelona, Spain, 5Colorado State University, Fort Collins, CO, 6Cleveland Clinic, Cleveland, OH

Background/Purpose: Giant cell arteritis (GCA) is a granulomatous vasculitis of large- and medium-sized arteries. An infectious organism has been hypothesized to cause GCA. We used 16S rRNA analysis to amplify a bacterial genomic sequence unique to the temporal arteries of GCA subjects. Identification of the bacteria allowed us to detect the organism’s lipo polysaccharide (LPS) in the serum of these subjects and isolate the bacteria from temporal arteries of GCA patients.

Methods: Frozen and paraffin-embedded temporal arteries from biopsy-proven GCA subjects and controls were used for analysis. GCA subjects fulfilled the 1990 ACR criteria for GCA. DNA and RNA were isolated from frozen temporal arteries. 16S RNA analysis was performed using primers to the conserved regions of bacterial 16S rRNA. Multi locus sequence typing (MLST), a PCR-based method of bacterial identification, was performed to type the organism. A Burkholderia anti-LPS monoclonal antibody was used to perform immunohistochemistry (IF) and ELISA. Burkholderia was cultured from a temporal artery and the isolate was injected into C3H/HeN mice. Infected mice were sacrificed and organs were analyzed by light microscopy for vasculitis. Student’s t-test was used to compare mean values.

Results: 16S rRNA analysis identified a genomic sequence within an affected artery that was 100% homologous to the genus Burkholderia. Primers specific for the bacteria identified the organism in 9/10 GCA arteries but in none of the controls (p < 0.01). MLST analysis identified the organism as B. pseudomallei (like) (BpGCA). RT-PCR confirmed the absence of type III secretion factors, a genetic profile that conveys an attenuated phenotype for many species of Burkholderia. If of paraffin-embedded temporal arteries identified BpGCA-LPS in GCA arteries but not controls. ELISA detected BpGCA-LPS at high levels in the serum of GCA subjects (n = 61, mean 373 ± 8 pg/ml, SEM 36.7) but not healthy controls (n = 102, mean 28.1 pg/ml, SEM 3.8, p < 0.0001). BpGCA was cultured from the temporal artery of a subject with GCA and the isolate was used to infect C3H/HeN mice. Mice injected with the organism developed inflammation of pulmonary blood vessels.

Conclusion: An attenuated newly identified species of Burkholderia has been isolated from temporal arteries of GCA subjects. LPS of the organism is detectable in the serum of GCA subjects. Mice infected with the organism develop vasculitis. BpGCA appears to be a critical factor in the pathogenesis of GCA.

Disclosure: C. L. Koeing, None; B. J. Katz, None; J. Hernandez-Rodriguez, None; M. Corbera-Bellalta, None; M. C. Cid, None; H. P. Schweizer, None; D. Li, None; J. Kaplan, None; G. S. Hoffman, None; I. De Domenico, None.

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Am80, a Retinoic Acid Receptor Agonist, Ameliorates Murine Vasculitis through the Suppression of Neutrophil Migration and Activation

Chie Miyabe, Yoshishige Miyabe, Noriko Miura, Kei Takahashi, Yuya Terashima, Etsuko Toda, Fumiko Honda, Tomohiro Morio, Naohito Ohno, Jun-ichi Suzuki, Mitsuaki Isobe, Kouji Matsushima, Ryoji Tsubori, Nobuyasu Miyasaka, and Yoshihiro Nanki, 1Tokyo Medical and Dental University, Tokyo, Japan, 2School of Pharmacy, Tokyo University of Pharmaceutical Science, Tokyo, Japan, 3Tohoku University Ohashi Medical Center, Tokyo, Japan, 4The University of Tokyo, Tokyo, Japan, 5Tokyo Medical University, Tokyo, Japan

Background/Purpose: Vasculitis is characterized by leukocyte infiltration in the vessel walls with destructive damage to mural structures. Retinoids are compounds that bind to retinoic acid receptors (RARs) and have biological activities of vitamin A, including modulatory effects on cell proliferation and differentiation. Synthetic retinoid, Am80, is a specific ligand for RAR-α/β but not RAR-γ and is characterized by higher stability, fewer potential adverse effects, and superior bioavailability compared with all-trans retinoic acid. Previously we showed that Am80 ameliorated murine collagen-induced arthritis and experimental autoimmune myositis. In this study, we examined the therapeutic effects of Am80 on a murine model of vasculitis induced by Candida albicans water-soluble fraction (CAWS).

Methods: Vasculitis was induced in B AL/Bc mice by intraperitoneal injection of CAWS from day 1 for 5 days. Neutrophils were depleted by injection of anti-neutrophil serum. Am80 was administrated orally once daily from day 1 for 5 weeks or from day 8 for 4 weeks. Vasculitis was histologically evaluated. Number of migrated cells of labeled-adaptively transfer cells was counted. Chemotaxis was analyzed using cell mobility analysis system as 3D gel. Activities of vitamin A, including modulatory effects on cell proliferation and differentiation were measured through the suppression of neutrophil migration and activation. Concentrations of elastase, CCL2 and IL-6 were measured by enzyme-linked immunosorbent assays.

Conclusion: An attenuated newly identified species of Burkholderia has been isolated from temporal arteries of GCA subjects. LPS of the organism is detectable in the serum of GCA subjects. Mice infected with the organism develop vasculitis. BpGCA appears to be a critical factor in the pathogenesis of GCA.
Results: Administration of CAWS induced vasculitis in the coronary arteries and aortic root with abundant neutrophil infiltration. Depletion of neutrophils reduced CAWS-induced vasculitis. Treatment with Am80 from day 1 significantly attenuated the experimental vasculitis. In addition, administration of Am80 from day 8, after the onset of vasculitis, also ameliorated the vasculitis. Am80 inhibited migration of transferred neutrophils into the site of vasculitis. In vitro, Am80 suppressed N-formyl-methionyl-leucyl-phenylalanine (fMLP)-induced chemotaxis of human peripheral blood neutrophils. In vivo, Am80 reduced CCL2 and IL-6 production from GCA patients for molecular elements that regulate inhibitory death-1 receptor (PD-1), with its ligand PD-L1. We have screened T cells stimulated with fMLP and LPS. Moreover, Am80 reduced CCL2 and IL-6 production from human umbilical vein endothelial cells-stimulated with TNF-α or IL-1β.

Conclusion: Am80 significantly suppressed CAWS-induced vasculitis presumably through inhibition of neutrophil migration and activation.

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Impairment of the Inhibitory PD-1-PD-L1 Axis in Giant Cell Arteritis (GCA). Mazen Nasrallah1, Augusto Vaglio2, Shalini Mohan1, Bjorn Hartmann1, Joyce Liao1, Kenneth J. Warrington1, Jorg J. Goronzy2 and Cornelia M. Weyand3, 1Stanford University, Stanford, CA, 2University of Halle-Wittenberg, Halle, Germany, 3Stanford University School of Medicine, Stanford, CA.

Background/Purpose: Giant cell arteritis (GCA) is an autoimmune syndrome characterized by granuloma formation in the media of medium and large arteries. In a healthy immune system, excessive immune stimulation is counteracted by negative costimulatory signals which oppose T cell activation and promote T cell tolerance. An important inhibitory molecule within the B7/CDS2 family is the programmed death-1 receptor (PD-1), with its ligand PD-L1. We have screened T cells from GCA patients for molecular elements that regulate inhibitory pathways and have tested the functional role of co-inhibitory molecules in vitro and in vivo models of vasculitis.

Methods: Peripheral blood T cells from 45 patients with biopsy-proven GCA and 54 age-matched controls were profiled for the expression of positive and negative costimulatory receptors which critically adjust T cell responsiveness. Transmural migration of activated T cells was studied in 3-dimensional cellulose fiber-based scaffolds populated with endothelial cells or vascular smooth muscle cells and assembled into walls mimicking human medium arteries. Disease-relevant functions of patient-derived CD4 T cells were studied in vivo in humanized chimera mice engrafted with human arteries.

Results: GCA patients have significantly increased frequencies of PD-1+ CD4 T cells when compared to controls (30.5 % vs. 19.7 %; p=0.02). The PD-1 ligand PD-L1, normally strongly expressed on endothelial cells of the vasa vasorum was barely detectable in GCA-affected temporal arteries. PD-1-PD-L1 interactions were critically involved in regulating transfer of T cells across the endothelial barrier in the 3D-custom made arterial walls. Antibody-mediated blockade of PD-1 doubled the number of CD4 T cells crossing the endothelial layer (n=7 distinct T cell donors; p=0.04) and enhanced pooling of intrawall T cells. To explore the significance of negative signaling in arteritis, human artery-SCID chimeras were treated with the PD-1 blocking PD-L1 fusion protein. Disrupting PD-1 signaling effectively accelerated vessel wall inflammation; by enhancing T cell pooling and DC activation and boosting the production of innate and adaptive cytokines.

Conclusion: The PD-1-PD-L1 pathway protects the vessel wall from inflammatory attack. Several steps of the immune activation cascade relevant for GCA underlie regulation by this negative signaling pathway. T cells from GCA patients receive insufficient inhibitory signals due to a lack of PD-L1 expression. Reestablishing negative signaling may be necessary to prevent detrimental immune responses in GCA and to restore the immune privilege of the arterial wall.
Endothelin-1 (ET-1) Induces Extracellular Matrix Protein Production by Human Temporal Artery Derived Myointimal Cells. A Mechanism Potentially Leading to Intimal Hyperplasia and Vascular Occlusion in Giant-Cell Arteritis. Esther Planas-Rigol1, Marc Corbera-Bellalta1, Marco A. Alba2, Iztiau Tabera-Bahillo2, Sergio Prieto-Gonzalez2, Georgina Espigol-Frigole2, Jose Hernandez-Rodriguez2, Ester Lozano2 and Maria C. Cid1,2.

Vascular Research Unit, Hospital Clinic. University of Barcelona. IDIBAPS, Barcelona, Spain, Hospital Clinic University Barcelona, Barcelona, Spain, Hospital Clinics. University of Barcelona. IDIBAPS, Barcelona, Spain, Hospital Clinic University Barcelona.

Background/Purpose: Endothelin-1 (ET-1) is the main isoform of the Endothelin family. It is also the most powerful vasoconstrictor identified. ET-1 is constitutively produced in blood vessels by endothelial cells and vascular smooth muscle cells (VSMC). VSMC express two endothelin receptors: Endothelin receptor A and B (ETAR and ETBR) but the main effect of vasoconstriction may be the result of the interaction between ET-1 and ETAR. Transforming Growth Factor β1 is a fibrogenic cytokine and recent studies suggest that ET-1 contributes to the fibrogenic effect of TGFβ by fibroblasts.

To investigate whether ET-1 and TGFβ may contribute to vascular occlusion by inducing pro-fibrotic responses in cultured vascular myointimal cells.

Methods: VSMC were obtained from cultured human temporal artery sections obtained for diagnostic purposes as described (Ann Rheum Dis. 2008 Nov; 67(11):1581–8). ET-1, TGFβ, collagen type 1 (COL1) and type III (COL3) expression was assessed by quantitative real-time PCR (Taqman® Gene Expression Assay) from Applied Biosystems. COL1 and COL3 protein production was determined by ELISA (Takara and USBN Biological) kits respectively.

Results: ET-1 and TGFβ up regulated COL1, COL3 expression by VSMC at the mRNA and protein level. This increase was inhibited by ETAR receptor antagonist BQ123 and partially abrogated by ALK5 inhibitor SB25334.

ET-1 induced indeed a remarkable early expression of TGFβ and TGFβ induced, in turn, a later induction of ET-1. A double blockade of these cytokines enhanced the inhibition of COL1 and COL3 expression suggesting that collagen production by VSMC may be dependent of both ET-1 and TGFβ.

Phenotypic changes in ET-1-treated-VSMC were also observed. These cells became adherent earlier than untreated ones. Treatment with BQ123 reverted this phenotype suggesting that ET-1 may have an important role in the regulation of VSMC adhesion and migration.

Conclusion: ET-1 may contribute to intimal hyperplasia directly by inducing collagen type I and III by human medium-size artery derived VSMC whereas the combined treatment with BAFF, IL-21 and Cpg-ODN induced proliferation in 57.8% of B cells.

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ARHP Concurrent Abstract Session Pediatrics: Disease Flares
Sunday, November 11, 2012, 4:30 PM–6:00 PM

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Background/Purpose: Walking programs are effective in adult arthritis but have not been studied in adolescents with arthritis. The study’s objective was to evaluate the impact of a family based pedometer (PED) walking program and an educational program on the exercise tolerance of adolescent juvenile idiopathic arthritis (JIA) patients (Pts) with lower extremity involvement.

Methods: 27 Pts with lower extremity JIA were prospectively studied in a 2 phase exercise program. In the 1st 6 week (wk) phase Pts were given general guidance from a rheumatologist and physical therapist to increase their activity with daily walking. Data was obtained at baseline, and after the 1st and 2nd 6wk phases. In the 2nd 6wk phase all Pts and family members received a PED to record their daily steps and were randomized into 2 groups. One group Pts were given the PED and the other group received a printout of the number of steps walked. Both groups received a 15 minute educational program on the importance of daily walking. The study’s primary outcome was to measure program effectiveness. Secondary outcome measures included body mass index (BMI), Childhood Health Assessment Questionnaire (CHAQ), and visual analogue scale (VAS) for pain.

Results: 27 Pts (23 F: 4 M) 11–19 yrs old (mean 16 yrs) participated. 19 were in clinical remission at baseline (Lat). In combination with IL-2 enhance ANCA production in vitro. Recent studies have highlighted the role of IL-21 in plasma cell formation and antibody production by synergizing with B cell activating factor (BAFF). This study aimed to assess the involvement of Cpg-ODN, IL-21, and BAFF in the mechanisms that contribute to ANCA production in AAV patients.

Methods: Twenty two patients with PR3-AAV (18 in clinical remission, 4 with active disease) and 8 healthy controls (HC) were included in the study. Peripheral blood mononuclear cells (PBMC) were isolated and cultured in vitro for 12 days in the presence of BAFF and IL-21, with or without Cpg-ODN. IgG production was measured in culture supernatants by ELISA and PR3-ANCA production was quantified by Phadia EliA and expressed in response units (RU). The percentage of circulating IL-21 producing CD4+ T cells was analyzed by flow cytometry in blood samples stimulated ex vivo with phorbol-myristate-acetate and calcium ionophore in the presence of brefeldin A. CFSE Cell Proliferation Kit was used to assess the effect of BAFF, IL-21, and Cpg-ODN on B cell proliferation.

Results: PBMC stimulation with Cpg-ODN and IL-21 significantly increased in vitro production of IgG in both HC and patients (P = 0.0004) whereas PR3-ANCA production was detected in patient samples only (RU median 0.85 (range 0.00–36.72), compared to 0.10 (0.00–0.14) in HC). Stimulation with BAFF and IL-21 also significantly increased IgG production in HC and patients (P = 0.0001) and ANCA production in patient samples (median 0.90 (range 0.00–58.80) versus 0.11 (0.00–0.12) in HC), which could be further augmented by addition of Cpg-ODN (median 1.06 (range 0.00–140.00) versus 0.17 (0.10–0.26) in HC). Compared to HC, the proportion of IL-21 producing CD4+ T cells was significantly increased in the circulation of AAV patients. Preliminary data indicate that stimulation with BAFF, IL-21 or the combination of BAFF/IL-21 does not induce B cell proliferation. In contrast, stimulation with Cpg-ODN alone induced proliferation in 11.6% of B cells, whereas the combined treatment with BAFF, IL-21 and Cpg-ODN induced proliferation in 57.8% of B cells.

Conclusion: IL-21, BAFF and Cpg ODN synergize in promoting IgG and PR3-ANCA production from PBMCs of AAV patients in vitro. This effect was associated with substantial B cell proliferation. The increased percentage of IL-21 producing CD4+ T cells in AAV patients suggests the involvement of IL-21 in ANCA production in vivo. Overall, these data indicate that the interplay between endogenous B cell stimuli and bacterial products may contribute to PR3-ANCA reactivation in AAV via B cell activation and proliferation.

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Interleukin-21, B Cell Activating Factor and Unmethylated CpG Oligodeoxynucleotides Synergize in Promoting Anti-Proteinase 3 Autoantibody Production in Vitro. Nikola Lepse1, Judith Land1, Abraham Rutgers1, Cees G.M. Kallenberg1, Coen A. Stegeman1, Peter Herreinga2 and Wayel H. Abdulahad1.

Background/Purpose: Anti-neutrophil cytoplasmic autoantibody (ANCA)-associated vasculitides (AAV) are characterized by the presence of circulating autoantibodies that are often directed against proteinase 3 (PR3). Although the mechanisms that lead to ANCA production in AAV are not clear, bacterial infections have been linked to disease development. We have reported that unmethylated CpG oligodeoxynucleotides (Cpg-ODN), which resemble bacterial DNA, in combination with IL-2 enhance ANCA production in vitro. Recent studies have highlighted the role of IL-21 in plasma cell formation and antibody production by synergizing with B cell activating factor (BAFF). This study aimed to assess the involvement of Cpg-ODN, IL-21, and BAFF in the mechanisms that contribute to ANCA production in AAV patients.
significant differences were noted between Pts that discontinued and completed the study, those that discontinued had a trend towards higher BMI, shorter 6MWT, smaller HR change and higher VAS scores possibly reflecting a less motivated group.

13 pts (7 Lat) with mean age of 16 ± 2 yrs completed the study (12F: 1M). They generally had mild disease with a mean CHAQ of 0.65 ± 0.79 and mean VAS of 2.5 ± 3.6 cm. Pts had active JIA at the initial visit and 3 other Pts had active JIA over the course of the study. There was a significant increase in 6 MWT distance from baseline (458.0 ± 70.8 m) to the end (501.4 ± 59.8 m) of the 6wk initial phase (p = 0.029). During the interventional 2nd phase, Pts maintained their improved exercise tolerance with a modest trend toward increased 6 MWT from 501.4 ± 59.8 m to 504.7 ± 60.6 m (p = 0.76). There were no differences in the 6 MWT between the Pts that received the education program (n = 9) to those that did not (n = 4) possibly due to small sample size (p = 0.93). However, the WVE EP group at baseline visit appeared to have an overall higher exercise tolerance (6 MWT 478.1 ± 78.5 m vs 417.8 ± 27.2 m) and had a healthier initial BMI (23.5 ± 26.3 vs 23.5 ± 26.3). In addition, Pts in the WVE EP group overall walked more steps per day while using their PED (2978 ± 5602 steps vs 1968 ± 1472 steps), although this was not statistically significant.

Conclusion: In motivated adolescents with JIA, an exercise program with consistent support from a physical therapist and rheumatologist significantly increased exercise tolerance. The addition of a PED and modified WVE EP to a walking program helped Pts maintain or increase exercise tolerance.

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University Hospital Leuven, KU Leuven, Leuven, Belgium, 3University Hospital Leuven, Leuven, Belgium, 4University Hospital Gent, Ghent, Belgium, 5KU Leuven, Leuven, Belgium

Background/Purpose: To date, there is no structured or systematic approach in Belgium for transferring adolescents with juvenile idiopathic arthritis from pediatric rheumatology to an adult rheumatology setting. We explored the impact of a transition program for adolescents with JIA on patient- and parent-related outcomes.

Methods: Using a one-group pretest-posttest design with a non-equivalent posttest only comparison group, we included literate, Dutch-speaking adolescents (14–16 years of age) with JIA, treated and followed-up at the department of pediatric rheumatology of the University Hospitals of Leuven in the experimental group. The intervention consisted of five key components: introduction of the transition coordinator (TC), focus upon health behavior, adolescent-information day, transfer plan and transition adult rheumatology care under the guidance of the TC. The comparison group comprised adolescents aged 17–23 years, who have recently been transferred to the adult rheumatology program without a specific transition program. Outcomes were operationalized in terms of medication adherence (VAS, SHCS-AQ), illness related knowledge (modified PKQ), functional status (CHAQ), health status (PedsQL), global quality of life (LAS), fatigue (MVI-20), and patients’ knowledge (modified PKQ). In parents, we measured promotion of independence (PI Scale), support of autonomy (Autonomy Support Scale), psychological control (Psychological Control Scale), health status (PedsQL for parents) and functional status of their child (CHAQ). A total of 33 patients in the intervention group and 45 patients in the comparison group participated.

Overall, 23 patients could be matched with controls on gender, JIA subtype, clinical remission, medication prescription and disease activity with comparison patients. Effect sizes in outcomes of the experimental group were measured at baseline and after transfer to the adult program (longitudinal study). Effect sizes in outcomes between the experimental group and the matched comparison group of patients transferred to the adult program without a specific self-management/transition program were measured (comparative study).

Results: Longitudinal study: A large positive effect was calculated for the improved psychosocial health. A medium positive effect was found in the improvement of quality of life of patients. Medium negative effects were found in improved health status rheumatology, perceived by parents. Comparative study: For patients in the experimental group, a large positive effect was found in reduction of parental expectations. Medium positive effects were found in improved psychosocial health and reduction in behavioral control. Medium negative effects were found in reduction of psychological control.

Conclusion: Implementation of a transition program can improve the psychosocial health and quality of life of adolescents with JIA during the transition process. It is important to involve the parents into the transition process in order to promote self-management of the adolescent with JIA.

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Employment of a Needs Assessment Survey to Shape a Novel Web-Based Pediatric Rheumatology Curriculum for Primary Care Providers. Amy L. Woodward and Z. Leah Harris. Vanderbilt University School of Medicine, Nashville, TN

Background/Purpose: Pediatric rheumatology faces many challenges due to the shortage of board certified physicians in the field and the imbalance in their geographic distribution. This shortage has required primary care physicians and adult rheumatologists to assume the care of children with rheumatologic diseases, though these physicians report significant discomfort doing so. We are addressing this issue through the development of a novel web-based curriculum aimed at primary care physicians, employing a needs assessment survey to help guide the curriculum.

Methods: Tenants of adult learning theory stress activating the learners’ prior knowledge and engaging the learner in determining personal educational goals. We therefore distributed a needs assessment survey to Vanderbilt Pediatric residency graduates (1981–2010) working in primary care who kept an address on file with the Vanderbilt Medical Alumni Association. Our goals were to understand perceptions of what the needs are and what educational interventions would be most effective.

Results: Of 152 surveys sent successfully via Survey Monkey, we received 28 responses (18.4%). When asked the question “On completion of your residency training were you comfortable recognizing the following diseases in children?”, the self-reported ability to recognize chronic arthritis on completing residency was high (71.4%), while confidence in recognizing other chronic autoimmune diseases was low, with only 63.4% comfortable recognizing lupus, the majority uncomfortable recognizing juvenile dermatomyositis (53.6%), localized scleroderma (75%), systemic sclerosis (82.1%), Behçet’s Disease (75%) and sarcoidosis (82.1%). (Figure 1) We also found primary care physicians to have interest in practical, problem oriented educational resources, including action plans for common rheumatologic complaints (71.4%) and emergencies by specific disease (67.9%) (Figure 2).

Specific autoimmune disease  Yes  No
Chronic arthritis 71.4% (20) 28.6% (8)
Systemic lupus erythematosus 64.3% (18) 35.7% (10)
Juvenile dermatomyositis 46.4% (13) 53.6% (15)
Hench-Schoenlein purpura 100% (28) 0.0% (0)
Kawasaki Disease 92.9% (26) 7.1% (2)
Localized Scleroderma 25.0% (7) 75.0% (21)
Systemic sclerosis (systemic scleroderma) 17.9% (5) 82.1% (23)
Behçet’s Disease 25.0% (7) 75.0% (21)
Sarcoidosis 17.9% (5) 82.1% (23)

Conclusion: Our needs assessment survey of primary care physicians found a high self-reported ability to recognize chronic arthritis when leaving
residency training, though low confidence in recognizing rarer but potentially more serious or life-threatening autoimmune diseases. Our results also indicate that primary care physicians have interest in practical, problem oriented educational resources to assist them in caring for children with rheumatologic diseases. We will utilize our survey results to develop a learner centered web-based curriculum in pediatric rheumatology, with the ultimate goal of improving care for children with autoimmune diseases.

Disclosure: A. L. Woodward, None; Z. L. Harris, None.

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Will I Waste Your Time? Delays in Help-Seeking for RA Flares, Caroline A. Flurey1, Marianne Morris1, Jon Pollock1, Rodney A. Hughes2, Pamela Richards3 and Sarah Hewlett1. 1University of the West of England, Bristol, United Kingdom, 2St. Peters Hospital, Chertsey Surrey, United Kingdom, 3University of Bristol, Bristol, United Kingdom

Background/Purpose: Anecdotal evidence suggests that patients vary in how long they wait before seeking medical help for an RA flare. The aim of this research is to explore why, and their tipping points for seeking help.

Methods: Q-Methodology: 29 RA patients sorted 23 statements (generated in previous qualitative interviews) about their help seeking behaviours when in a flare, across a forced distribution in ranked order of agreement. Data were analysed using centroid factor analysis with varimax rotation (i.e. the participants and not the items are the variables). Demographic and clinical data were collected and patients completed comments booklets about their rationale for sorting the statements.

Results: Consensus was reached on 9 statements and two factors were produced, which explained 51% of the study variance and accounted for 22 of the 29 participants. None of the Q-sorts were confounded (loading on more than one factor). A participant loading of 0.54 reached significance at p<.01.

Consensus: “When I just don’t know what to do anymore”: The top 3 of the 9 consensus statements are ‘when the pain becomes too intense’, ‘when the Flare has gone on longer than expected’ and ‘when the symptoms become uncontrollable’, suggesting these are the tipping points for seeking help.

Factor A: Definite Decision: “It won’t go away, so I won’t wait”: Sixteen participants: mean disease duration 15.2yrs (SD 10.3), age 54.8yrs (SD 9.6), HAQ score 1.360 (SD 0.8), 69% female, 69% on biologic therapies.

These patients will seek help quickly when they are in a flare, they know that their medical team can help and that their flare won’t go away on its own. They don’t worry about wasting their own or the Rheumatologist’s time and will not wait until their next scheduled appointment for help. Tipping points for seeking help for these patients are worries about long term damage to their joints, knowing their flare needs to be controlled by new medication and their quality of life being affected.

Factor B: Cautious Indecision: “Lying down and not moving until it goes”: Six participants: mean disease duration 18.7yrs (SD 13.9), age 50.5yrs (SD 15.4), HAQ score 1.23 (SD 0.9) 69% female, 69% on biologic therapies.

These patients want to contact the medical team when they are in a flare. They are reluctant to seek help as they hope the flare will go away on its own and do not believe it will last until they seek medical help. They don’t like asking for help and worry about wasting the Rheumatologist’s time. They may wait until their next scheduled appointment before seeking help and will try to manage their symptoms themselves. These patients need to be prompted by a friend or family member to seek help.

Conclusion: Whilst consensus indicates pain is a tipping point, for some patients a complex interaction of beliefs hinders their help-seeking behaviour. Health care professionals should be aware that some patients delay help-seeking due to fears of time wasting, thus potentially risking further damage.

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Background/Purpose: Many RA patients have variable disease activity over time due to disease flare, reduction in efficacy of current medications and other disease mediating changes. Understanding these transitions and the factors associated with these transitions are important in the treatment of RA. Appropriate analytic models for estimating these transitions are needed.

Methods: Modeling methods were explored for estimating transitions from various disease states defined by low, moderate and severe using CDAI. The framework needed to provide intuitive estimates of the probability of transitioning between states, stability using variable time intervals, allow repeated measures within patients, and a method of estimating associations of patient and treatment characteristics with transition probabilities. A Markov modeling framework was examined. To test the models we used RA patient disease data from the CORRONA RA registry and examined multiple visits per patient. There were over 160,000 visits from over 24,000 RA patients available for analysis.

Results: Starting with a simple transition model (Figure 1a), a first order Markov process was assumed and a logistic regression model that incorporates a single prior state produced stable estimates for variable time between visits. Transition probabilities differed by 0.07 for large differences in visit intervals, 3 mos vs 1 yr. A single logit equation can estimate the impact of the prior state (Yi−1), covariates (xi), and the transitions and test if different covariate associations are dependent on prior state:

\[ \text{logit} \Pr(Y_{i} = 1 | Y_{i-1} = y_{i-1}) = \beta y_{i} + x_{i} \alpha_{x} \]

where

\[ \pi_{i-1} = \Pr(Y_{i} = 1 | Y_{i-1} = y_{i-1}) \]

Figure 1b illustrates estimated transition probabilities.

The modeling framework is able to accommodate additional complexities. A multinomial logistic model provides estimates for more than two states. The models allow the use of higher order Markov processes to estimate the influence of disease state at earlier visits.

Conclusion: Markov models and logistic or multinomial models of the transition probabilities provides a framework for analyzing patient disease states, the population transition probabilities and covariates associated with those transitions.

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Background/Purpose: Telomere length is considered a marker of cellular aging and has been linked to an increased risk for morbidity and mortality. Psychosocial factors associated with shortened telomeres (e.g., obesity, depression, anxiety, trauma) are also common in chronic pain; yet, little is known about telomere length in pain populations. Thus, a preliminary investigation was conducted in fibromyalgia.

Methods: Leukocyte telomere length was evaluated in 66 women with fibromyalgia and 22 healthy female controls. Participants were from a convenience sample of individuals who underwent a blood draw and completed questionnaires including the Brief Pain Inventory (BPI) and Center for Epidemiologic Studies Depression Scale (CESD). A subgroup of fibromyalgia patients underwent quantitative sensory testing (QST; n = 12) and neuroimaging (voxel-based morphometry; n = 12). Telomere length was measured using the quantitative polymerase chain reaction method.

Results: Although patients had shorter telomere length than controls, the difference was not statistically significant. However, higher levels of pain within fibromyalgia were associated with shorter telomere length (r(12) = −2.67, p = 0.039). In a comparison of patients categorized as having higher levels of pain (BPI ≥5/10; n = 30) and lower levels of pain (BPI <5/10; n = 31), those with higher levels of pain were more likely to have shorter telomere length than those with low levels of pain despite chronological age (F = 5.39, p = 0.024). In a similar comparison of telomere length between those with likely depression (CESD scores ≥19; n = 24) and those likely without depression (CESD scores < 19; n = 42), no significant group differences were detected (p = 0.175). However, when pain and depression were combined, patients categorized as high-pain/high-depression had an age-adjusted telomere length 265 base pairs shorter than those with low-pain/low-depression (p = 0.043); a difference consistent with over six years of chronological aging. In the subset tested, telomere length was also related to experimentally-induced pain threshold (r(partial) = 0.642, p = 0.045) and slightly intense pressure pain (r(partial) = 0.706, p = 0.023), as well as gray matter volume (e.g., primary somatosensory cortex; r = 0.725, p < 0.05 corrected), such that patients with shorter telomeres tended to be more sensitive to evoked pressure pain and have less gray matter volume in pain processing regions of the brain.

Conclusion: Our data suggest that pain in fibromyalgia is associated with shortened telomere length. These effects are largely independent of other factors commonly associated with telomere shortening. Interestingly, short telomere length was directly related to evoked pain sensitivity and altered brain structure. Although these findings are preliminary, they suggest that pain may accelerate cellular aging.

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Events That Trigger the Onset of the Fibromyalgia Syndrome (FMS).

Robert S. Katz1, Sharon M. Ferbert2, Alexandra Small2 and Susan Shott2. 1Rush University Medical Center, Chicago, IL, 2Advocates for Funding Fibromyalgia Treatment, Education and Research(AFFTER), Libertyville, IL, "University of Illinois Medical School

Background/Purpose: Triggering events – those that are followed by the onset or rapid increase in FMS symptoms – have a significant impact in some cases. In order to learn more about the nature and impact of triggering events, we asked FMS patients about traumatic experiences in their lives, and whether these events affected the onset of their FMS symptoms.

Methods: As a part of an Internet survey administered by the volunteer community fibromyalgia organization, AFFTER, 763 female self-identified FMS patients and 115 female controls without FMS responded to questions about emotionally stressful or life-changing events and whether any of these events suddenly triggered FMS, as well as follow-up questions on the pace of onset of FMS symptoms before and after triggering events. Only women’s responses were analyzed to eliminate confounding by gender.

To validate the Internet Survey, an identical rheumatology office questionnaire was administered to 115 FMS patients and 63 control patients with other rheumatic diseases. The chi-square test of association and Fisher’s exact test were used to compare percentages, and the Mann-Whitney test was done to compare FMS and control patients with respect to age. A 0.05 significance level was used and all tests were two-sided.

Results: In the Internet survey the mean respondent age was 49.8 ± 11.4 years. 78.0% of FMS respondents reported that they had experienced a significant life-changing event or emotional stressor, vs. 35.7% of controls (p < 0.001). Specific traumatic events experienced by FMS patients vs. controls included major surgery (70.4% vs. 45.3%, p < 0.001), major or long lasting illness (44.7% vs. 18.3%, p < 0.001), and accidents 26.9% vs. 12.2, p = 0.001).

Post-traumatic symptoms included startling easily (32.2%), intrusive memories of the trauma (18.1%), nightmares (17.7%), reluctance to sleep or think about the trauma (14.5%), and symptoms of hypervigilance and post-traumatic stress disorder (30.2%) indicated that their FMS began suddenly after one of these events. These post-traumatic episodes generally began as either back pain (50.4%), neck pain (50.0%) or both.

In the rheumatology office practice questionnaire 81.7% of FMS patients and 61.9% of control patients were women (p = 0.004). The mean age was 48.1 ± 12.3 years for FMS patients and 50.7 ± 13.6 for control patients (p = 0.092). 88.7% of FMS patients and 76.2% of control patients reported that they had experienced at least one very stressful or life-changing event (p = 0.028). Some of the FMS patients who reported a traumatic FMS trigger also reported other post-trauma symptoms: starting easily (15.4%), intrusive memories of the trauma (10.3%), reluctance to sleep or think about the trauma (10.3%), and nightmares (7.7%).

Conclusion: Surgery, severe illness, and accidents precipitated the onset of fibromyalgia in some patients. In the Internet survey, 30.2% of fibromyalgia patients experienced FMS onset after a traumatic event. Fibromyalgia symptoms usually began with neck or back pain. Some of the FMS patients experienced symptoms consistent with hypervigilance and post-traumatic stress disorder.

Disclosure: R. S. Katz, None; S. M. Ferbert, None; A. Small, None; S. Shott, None.
were significantly higher in Behçet’s disease compared to other types of vasculitis (13.5 vs 10.7, 4.0 vs 3.2, p<0.05). Compared to other chronic diseases, patients with vasculitis perceived greater negative impact disease on function and emotional well-being (Table). Younger age (OR = 1.04; 95% CI 1.02–1.06), depression (OR = 4.94; 95% CI 2.90–8.41), active disease status (OR = 2.05; 95% CI 1.27–3.29), and poor overall health (OR = 3.92; 95% CI 0.88–17.56) were significantly associated with negative illness perception.

Table 1. Mean IPO-R Dimension Scores in Vasculitis and Other Chronic Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vasculitis*</th>
<th>Diabetes</th>
<th>Hypertension*</th>
<th>Osteoarthritis*</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>692</td>
<td>164</td>
<td>514</td>
<td>241</td>
</tr>
<tr>
<td>Identity*</td>
<td>10.7 (±5.1)</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>Timeline</td>
<td>4.1 (±0.8)</td>
<td>3.9 (±0.8)</td>
<td>3.6 (±0.4)</td>
<td>4.2 (±0.8)</td>
</tr>
<tr>
<td>Cyclical</td>
<td>3.2 (±1.0)</td>
<td>2.8 (±0.7)</td>
<td>3.2 (±0.8)</td>
<td>3.6 (±0.8)</td>
</tr>
<tr>
<td>Consequences***</td>
<td>3.8 (±0.8)</td>
<td>2.9 (±0.6)</td>
<td>2.6 (±0.6)</td>
<td>2.8 (±0.8)</td>
</tr>
<tr>
<td>Emotional reactivity***</td>
<td>3.1 (±1.0)</td>
<td>2.0 (±0.6)</td>
<td>2.6 (±0.7)</td>
<td>2.4 (±0.8)</td>
</tr>
<tr>
<td>Personal control</td>
<td>3.3 (±0.8)</td>
<td>3.9 (±0.5)</td>
<td>3.5 (±0.7)</td>
<td>3.1 (±0.6)</td>
</tr>
<tr>
<td>Treatment control</td>
<td>3.3 (±0.7)</td>
<td>4.6 (±0.9)</td>
<td>3.5 (±0.6)</td>
<td>2.8 (±0.6)</td>
</tr>
<tr>
<td>Illness coherence</td>
<td>3.4 (±1.0)</td>
<td>3.5 (±0.9)</td>
<td>NR</td>
<td>3.6 (±0.8)</td>
</tr>
</tbody>
</table>

* Vasculitis types include Behçet’s disease (n=48), central nervous system vasculitis (n=21), Takayasu’s arteritis (n=21), giant cell arteritis (n=21), Henoch-Schönlein purpura (n=12), microscopic polyangiitis (n=42), polyarteritis nodosa (n=36), Takayasu’s arteritis (n=57), and granulomatosis with polyangiitis (n=32).

** Identity was scored on scale from 0–22. All other dimensions were scored on a scale from 1–5.

*** Difference between vasculitis and all other diseases (p<0.05). NC = not comparable across diseases due to disease-specific modifications to IPO-R. NR = not reported. n = Sample size. ** = Blijdorp, J. Psychosom Res, 2007; b = Ross, J. Hum Hypertension, 2004; c = Blijdorp, A&R, 2009.

Conclusion: Patients with vasculitis have a unique set of illness perceptions. Clinicians should be aware that younger age, a history of depression, active disease status, and poor overall health are risk factors for negative illness perceptions in systemic vasculitis. Given the similarities in illness perceptions across the vasculitides, ongoing efforts to derive patient-reported outcome measures in vasculitis should focus on measures that are universally applied to different types of vasculitis.

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869 Concepts Which Determine Health in a Positive Way Are Important to People with Rheumatoid Arthritis and Are Covered by Some Patient-Reported Outcome Instruments, MonaDIR1, Michaela Coenen2, Josef S. Smolen3 and Tanja A. Stamm1. 1Medical University of Vienna, Vienna, Austria, 2Ludwig-Maximilians-University, Munich, Germany, 3Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: Rheumatoid arthritis is a chronic autoimmune disease that has a major impact on functioning, health and well-being. Concepts which determine health in a positive way are often not addressed in disease that has a major impact on functioning, health and well-being. PROs’ coverage was based on the model of the WHO International Classification of Functioning, Disability and Health (ICF).

Methods: We conducted a qualitative narrative biographic study consisting of three steps (see figure): people with RA were asked to tell their life stories which were analysed with the biographical narrative interpretative method afterwards. Hereafter, we linked concepts which determine health in positive way derived from a systematic literature search to the perspective of patients. Finally, we explored whether these concepts were covered by PROs identified in another systematic literature search. The evaluation of the PROs’ coverage was based on the model of the WHO International Classification of Functioning, Disability and Health (ICF).

Results: 15 people with RA with a median age of 52.5 years (IQR 35.75 – 62.5) and median disease duration of 24.50 months (IQR 10 – 59.25) participated in the qualitative study. Occupational balance, social support, participation and coping were the most frequently mentioned meaningful concepts (see table). While coping was mentioned by a higher number of men (83% of all men), optimism and vocational gratification were only important for women (76% resp. 67%). The concept of work-life balance did not appear in the qualitative data. Secondary gain from illness was found in only 2 participants (13%). 28 PROs were derived from the systematic literature search. The concepts coping, self-efficacy, participation, optimism and social support were covered particularly.

Table 1. Frequency of concepts in a ranked der per sex

<table>
<thead>
<tr>
<th>Concept</th>
<th>RA %</th>
<th>Women %</th>
<th>Men %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Balance</td>
<td>80</td>
<td>89</td>
<td>67</td>
</tr>
<tr>
<td>Social support</td>
<td>67</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>Participation</td>
<td>63</td>
<td>44</td>
<td>50</td>
</tr>
<tr>
<td>Coping</td>
<td>60</td>
<td>44</td>
<td>83</td>
</tr>
<tr>
<td>Optimism</td>
<td>47</td>
<td>78</td>
<td>0</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>47</td>
<td>67</td>
<td>17</td>
</tr>
<tr>
<td>Vocational gratification</td>
<td>40</td>
<td>67</td>
<td>0</td>
</tr>
<tr>
<td>Sense of Coherence</td>
<td>40</td>
<td>44</td>
<td>33</td>
</tr>
<tr>
<td>Job satisfaction</td>
<td>33</td>
<td>56</td>
<td>0</td>
</tr>
<tr>
<td>Resilience</td>
<td>27</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>Social acceptance</td>
<td>27</td>
<td>33</td>
<td>17</td>
</tr>
<tr>
<td>Secondary illness gain</td>
<td>13</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Work-Life Balance</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

n per group 15 9 6

Conclusion: Several concepts which determine health in a positive way show a gender difference. Social support and coping should get more attention in clinical routine and research of people with RA. Therefore the use of MOS Social support survey (Sherbourne & Stewart 1991) and the arthritis self-efficacy scale (Lorig et al. 1989) is recommended.

Disclosure: M. Dir, None; M. Coenen, None; J. S. Smolen, None; T. A. Stamm, None.

870 To Love and to Hold: Men Describe Parenting in the Presence of Inflammatory Arthritis, Catherine L. Backman1 and Alana Longson2. 1University of British Columbia, Vancouver, BC, 2Arthritis Research Centre of Canada, Vancouver, BC

Background/Purpose: Inflammatory arthritis (IA) may limit participation in life roles such as parenting. Surprisingly little research has investigated the impact of IA on parenting tasks and experiences of fathers. This descriptive pilot study adapted a mail survey used in a cross-sectional study of mothers to an online format to (a) examine feasibility of the tool and items for use with men, and (b) assess self-reported performance of parenting tasks, parenting satisfaction, and parenting efficacy in fathers with rheumatoid arthritis (RA), psoriatic arthritis (PsA), or ankylosing spondylitis (AS).

Methods: Men with IA were recruited through rheumatologists’ offices, arthritis consumer newsletters and web sites, and public education forums on arthritis. Eligibility criteria included a diagnosis of IA confirmed by a rheumatologist and at least one child ≤18 yrs living with them. Volunteers were sent a web link and password to access the survey. The Parenting Disability Index (PDI) and Parenting Sense of Competency Scale (PSOC) were used to measure parenting outcomes. Surveys also inquired about employment, household work, social support, family quality of life, health status, demographics, and survey feasibility questions. Descriptive statistics
were used to assess numeric responses and thematic content analysis used to examine text responses.

Results: Twelve men volunteered and 10 submitted complete surveys, and reported taking 15 to 60 minutes to do so. They ranged in age from 38 to 59 years, and had 1 to 5 children ranging in age from 4 months to late 20s. Eight were married, 2 were separated/divorced. Four had RA, 4 had AS, and 2 had PsA, from 1 to 32 years in duration (mean = 17.5). Seven were employed. Health Assessment Questionnaire II scores ranged from 0 to 1.5 (mean = .53, median = .40); the common functional limitation was lifting and moving heavy objects. They reported few limitations in parenting tasks, with PDI scores ranging from 2.0 to 2.82 (0 to 6 scale; mean = 2.28, SD = .29), while parenting sense of efficacy subscale ranged from 1.67 to 3.56 (mean = 2.32, SD = .60) and parenting satisfaction subscale ranged from 1.50 to 2.75 (mean = 2.22, SD = .38). Men reported many joys in parenting (“to love and to hold” their children), and several challenges (“communicating the fact I’m in pain in a way that doesn’t make my 7 year old worried or overly protective; I also don’t want to downplay it”). A key motivator for participating in the survey was “most seminars and clinics are directed at or attended by women, so a men’s questionnaire is a must!”

Conclusion: The online parenting survey was relevant to the participating men. Although this sample is too small to generalize, findings suggest men with IA experience specific limitations in parenting, but experience great satisfaction with this role. Assessment of parenting task performance may be important to assess in both practice and research settings when selecting outcomes that are meaningful to people living with arthritis.

Disclosure: C. L. Backman, None; A. Longson, None.

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Depression Predicts Mortality in RA, Christina Bode1, Chris Tonner2, Laura Trupin3 and Patricia P. Katz4, 1University of Twente, Enschede, Netherlands, 2UCSF, San Francisco, CA, 3UC San Francisco, San Francisco, CA, 4University of California San Francisco, San Francisco, CA

Background/Purpose: Depression rates are elevated among individuals with rheumatoid arthritis (RA). Studies in cardiovascular disease and among elderly populations have found that depression is a risk factor for mortality, but the risk of mortality from depression in RA has received little attention.

Methods: Data were derived from a longitudinal cohort study of individuals with RA recruited from community rheumatology practices and interviewed annually by telephone. To be eligible for the current analysis, participants had to have an interview in either 2002 or 2003 and have at least one follow-up interview (n= 530). Subjects were followed until 2009. Cox regression models estimated the association of depression with the risk of all-cause mortality. Depression was defined as a score ≥5 on the 15-item Geriatric Depression Scale (GDS). Using a time-dependent value, depression was defined as GDS≥5 in the last interview prior to death or censorship. In separate analyses we also examined the risk of a 2-point increase in GDS score from the penultimate to the last interview prior to death or censorship. Analyses controlled for age, gender, disease duration, and presence of any cardiovascular disease risk factors. Separate analyses also examined the conjoint effects of gender and depression.

Results: Mean age (±SD) was 60 (±13), mean disease duration was 19 (±12) years, 84% were female, and 46% reported at least one cardiovascular risk factor. Subjects were followed for a mean of 4.9 (±1.6) years until death or censorship. 63 (12%) participants died during the follow-up period. In bivariate analyses, depression was associated with an increased risk of death (HR = 3.5 [95% CI 2.1, 5.8]). Worsening of GDS score by ≥2 points was also associated with an increased mortality risk (HR = 2.5 [1.5, 4.2]). Controlling for covariates, both depression and an increase in GDS remained significant predictors of mortality (see Table). Interaction models showed men with depression had 5 times the risk of death compared to women with no depression. Men without depression also had a greater mortality risk than women with no depression after controlling for covariates.

Table 1. Depression and increase of depression proximal to death as a risk factor for death among individual with RA

<table>
<thead>
<tr>
<th>Model</th>
<th>Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1 Baseline GDS &lt; 5</td>
<td>(referent)</td>
</tr>
<tr>
<td>Baseline GDS ≥ 5</td>
<td>2.3 (1.4, 3.9)</td>
</tr>
<tr>
<td>Model 2 GDS increase &lt; 2 points</td>
<td>(referent)</td>
</tr>
<tr>
<td>GDS increase ≥ 2 points</td>
<td>1.9 (1.1, 3.3)</td>
</tr>
<tr>
<td>Model 3 Baseline GDS &lt; 5 Women (ref)</td>
<td>(referent)</td>
</tr>
<tr>
<td>Baseline GDS ≥ 5 Women</td>
<td>2.5 (1.4, 4.6)</td>
</tr>
<tr>
<td>Baseline GDS &lt; 5 Men</td>
<td>3.1 (1.4, 6.5)</td>
</tr>
<tr>
<td>Baseline GDS ≥ 5 Men</td>
<td>5.9 (2.7, 13.1)</td>
</tr>
<tr>
<td>Model 4 GDS increase &lt; 2 points Women (ref)</td>
<td>(referent)</td>
</tr>
<tr>
<td>GDS increase ≥ 2 points Women</td>
<td>2.1 (1.1, 3.9)</td>
</tr>
<tr>
<td>GDS increase &lt; 2 points Men</td>
<td>3.0 (1.5, 6.0)</td>
</tr>
<tr>
<td>GDS increase ≥ 2 points Men</td>
<td>5.1 (2.2, 11.8)</td>
</tr>
</tbody>
</table>

All models controlled for age, disease duration, cardiovascular disease risk factors. Models 1 and 2 also controlled for gender.

Conclusion: Depression and increase in depressive symptoms are significant risk factors for all-cause mortality in RA. Men with either of these characteristics are particularly at risk. These findings provide additional evidence of the importance of identifying and treating depression among persons with RA. Strategies to motivate men for treatment of depression are especially needed.

Disclosure: C. Bode, None; C. Tonner, None; L. Trupin, None; P. P. Katz, None.
Monocyte Chemoattractant Protein-1 and Eotaxin Are Associated with Parameters of Cardiac Dysfunction in Juvenile Dermatomyositis. Thomas Schwartz1, Ivar Sjøsaatd2, Berit Flats3, Maria Vistnes3, Geir Christensen4 and Helga Sanner5. 1Institute for Clinical Medicine, University of Oslo, Oslo, Norway, 2Institute for Experimental Medical Research, Oslo University Hospital, Oslo, Norway.

Background/Purpose: Juvenile dermatomyositis (JDM) is a vasculopathic disease affecting not only skeletal muscle and skin, but other organs as well. Previously we have shown that JDM patients can have cardiac dysfunction (measured by E/e’). Considering the systemic nature of the disease, it is reasonable to believe that inflammation of the myocardium can occur, similar to what is seen in skeletal muscle. Increased abundance of pro-inflammatory cytokines has been shown in cardiac and rheumatic diseases. We examined associations between cytokine levels and cardiac parameters in patients with JDM and matched controls.

Methods: 54 JDM patients (estimated to represent the vast majority of known cases in Norway diagnosed from 1970–2006) were clinically examined, follow-up time median 16.8 years (range 2–38 years) after disease onset, and compared with 54 age- and sex-matched controls. Disease activity score (DAS) and myocardial damage index (MDI) were assessed at follow-up by clinical examination and at 1 year post-diagnosis by chart review (DAS and MDI 1 year). Cytokines were analyzed by Lumines technology. Echocardiography with tissue Doppler was performed and analyzed blinded to patient information.

Results: Early diastolic tissue velocity (E’) that reflects diastolic cardiac function, was lower in JDM patients than in controls (11.2 vs.12.6 cm/s, p<0.004), suggesting diastolic dysfunction in JDM. E’ correlated with MDI 1 year, MDI at follow-up and DAS 1 year (r=0.46, r=0.59 and r=0.60, all p<0.001). Also, DAS 1 year predicted a low E’ (diastolic dysfunction), at follow up after correcting for gender and age in a linear regression model (standardized β=0.38, p<0.001). In patients, the serum level of the two CC chemokines, monocyte chemoattractant protein-1 (MCP-1) and eotaxin, correlated with e’ (r=0.65 and r=0.59, both p<0.001) (Figure). For MCP-1, association with e’ was also present after adjusting for disease duration and gender in a linear regression model (standardized β=0.36, p=0.001). No correlations were seen between the two CC chemokines and systolic parameters. MCP-1 and eotaxin also correlated with diastolic blood pressure (r=0.46 and r=0.50 both p<0.001). In controls, the CC chemokines did not correlate with any echocardiographic or clinical parameters.

Conclusion: Patients with JDM had subclinical diastolic dysfunction (measured by e’ ) compared to controls, and those with sustained early disease activity seemed to be at risk later in life to develop diastolic dysfunction. Considering the correlation with e’, MCP-1 and eotaxin might be involved in an inflammatory response in JDM, leading to myocardial fibrosis and subsequently diastolic dysfunction. The findings give new insight in the mechanism of myocardial affection and indicate that CC chemokines should be further studied to clarify a role as biomarkers or novel therapeutic targets in JDM.

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Imbalance Between Histone Acetyl Transferase and Histone Deacetylase Activities and Modulation of HDAC Activity and Tnfa Production by HDAC Inhibitors in Patients with Ankylosing Spondylitis or Rheumatoid Arthritis. Eric Toussirot1, Wasim Abbas2, Kahuif Aziz Khan1, Marion Tissot1, Alicia Jeudy2, Lucile Bau2, Ewa Bertolini2, Daniel Wending2, Georges Herbein1 and CIC Biothery2. 1CIC Biothery 506 and Rheumatology and EA 4266 Pathogens and Inflammation, Besançon, France, 2EA 4266 Pathogens and Inflammation, Besançon, France, 3EA Pathogens and Inflammation, Besançon, France, 4Rheumatology, Besançon, France, Minijoz University Hospital, Besançon, France, 5Virology and EA 4266 Pathogens and Inflammation, Besançon, France, University Hospital, Besançon, France.

Background/Purpose: TNFα is a major cytokine involved in conditions such as ankylosing spondylitis (AS) and rheumatoid arthritis (RA). Epigenetic regulation corresponds to different processes including modifications in histone proteins. These mechanisms regulate the transcription of genes coding for inflammatory cytokines such as TNFα. The acetylation of histone proteins (dependent on histone acetyl transferase-HAT-) promotes gene transcription while deacetylation (controlled by histone deacetylase) prevents this reaction. Limited data are available on HAT and HDAC activities in AS or RA. HDAC inhibitors (HDACI) are currently in development and may be of interest in modulating TNFα production in RA or AS.

Objectives: To determine the levels of HAT and HDAC activities in patients with AS or RA compared to healthy controls (HC) and to evaluate the ex vivo effects of HDACI (trichostatin A-TSA- and sirtinol -Sirt-) on HAT and HDAC activities and TNFα production by PBMC.

Methods: 21 patients with AS (New York criteria, 18 M, mean age ±SEM 44.3 ± 3.2 years, disease duration 14.1 ± 2.2 years), 52 patients with RA (ACR 1987 criteria, 16 M, mean age 56.9 ± 1.6, disease duration 11.3 ± 1.2) and 38 healthy controls (HC) (12 M, mean age 34.6 ± 1.8) were evaluated. No patient received biologics. HAT and HDAC activities were assessed on nuclear extracts of PBMC isolated by Ficoll hypaque using a colorimetric assay (EpiQuick HAT Activity/inhibition Assay kit, and Epigenet). These activities were measured prior and after ex vivo treatment of PBMC by HDAC inhibitors. TNFα was evaluated in PBMC culture supernatants after 1 and 3 days (TNFalpHa Quantikine ELISA kit, R&D Systems).

Results: HAT activity was decreased in patients with AS compared to HC (68.2 ± 8.1 vs 111.3 ± 15.5 ng/h/mg) (p=0.05) while RA patients had increased HAT activity (126.8 ± 16.4 vs 111.3 ± 15.5 ng/h/mg; NS). Compared to HC, HDAC activity was decreased in both AS (p=0.01) and RA (NS) (HC vs AS vs RA: 4778.9 ± 752 vs 1984, 6 ± 249 vs 3915.9 ± 790 pmol/min/mg). No correlation was observed between clinical disease assessment in RA or AS and HAT or HDAC activity. Ex vivo addition of TSA or Sirt to PBMC reduced HDAC activity by 51.1% in RA and by 37.7% in RA but had no effect in AS. HAT activity was not modulated by HDACI. TNFα production by PBMC was down regulated by the addition of TSA or Sirt to cell culture in HC and RA but this regulation was only obtained with Sirt in PBMC culture from patients with AS.

Conclusion: HAT and HDAC activities are dysregulated in AS and RA with a balance between HDAC and HAT favoring HAT activity and promoting gene transcription. Ex vivo treatment of PBMC by HDAC inhibitors may regulate HDAC activity and TNFα production especially in HC and RA but seems less effective in AS.

Disclosure: E. Toussirot, None; W. Abbas, None; K. Aziz Khan, None; M. Tissot, None; A. Jeudy, None; L. Baud, None; E. Bertolini, None; D. Wending, None; G. Herbein, None; C. Biothery, None.


Background/Purpose: The non-resolving character of synovial inflammation in rheumatoid arthritis (RA) is a conundrum. To identify the
contribution of fibroblast-like synoviocytes (FLS) to the perpetuation of synovitis, we investigated the molecular mechanisms that govern the TNFα-driven inflammatory program in human FLS.

**Methods:** FLS obtained from synovial tissues of patients with RA or osteoarthritis were stimulated with TNFα and assayed for gene expression and cytokine production by qPCR and ELISA. NF-κB signaling and chromatin accessibility were evaluated using Western blotting and restriction enzyme accessibility (REA) assays.

**Results:** In FLS, TNFα induced prolonged transcription of IL-6 and progressive accumulation of IL-6 protein over four days (Figure 1A). Similarly, induction of IL-8, CCL5, MMP1 and MMP3 mRNA, after TNFα stimulation, was sustained for several days (data not shown). This contrasted with the macrophage response to TNFα, which characteristically involved a transient increase in the expression of pro-inflammatory genes (Figure 1B). In FLS, TNFα induced prolonged activation of NF-κB signaling (Figure 2A) and a sustained increase in chromatin accessibility at the IL-6 promoter (Figure 2B). Furthermore, FLS expressed low levels of the feedback inhibitors ABIN3, IRAK-M, ATF3 and SOCS3 that terminate inflammatory responses in macrophages (Figure 3).

**Conclusion:** TNFα signaling is not effectively terminated in FLS, leading to an uncontrolled inflammatory response. The results suggest that prolonged and sustained inflammatory responses by FLS, in response to synovial TNFα, contribute to the persistence of synovial inflammation in RA.

**Disclosure:** A. Lee, None; G. Grigoriev, None; J. Chen, None; L. B. Ivashkiv, None; G. D. Kalliolias, None.
Aberrant Expression of BAFF Receptor (BR3) in Peripheral Monocytes of Patients with Primary Sjögren’s Syndrome Impacts Abnormal Activation of BAFF Signaling Through IKK-Alpha and IKK-Beta. Keiko Yoshimoto1, Makoto Hattori1, Shigeyuki Itoh1, Takayuki Kameda1, Katsuya Suzuki1, Tohru Abe2 and Tsutomu Takeuchi1. 1Keio University School of Medicine, Tokyo, Japan, 2Saitama Medical School, Kawagoe-shi Saitama, Japan

Background/Purpose: B cell activating factor belonging to the TNF superfamily (BAFF) regulates proliferation, differentiation and survival of B cells and plays a pivotal role in the pathogenesis of autoimmune diseases such as primary Sjögren’s syndrome (pSS). BAFF is a ligand for three TNF receptor family members; i.e., BAFF receptor (BR3), TACI and BCMA. Several lines of evidence demonstrate that BR3 is the receptor that mediates BAFF-dependent B cell biology and that BAFF activates alternative NF-kB signaling in B cells. However, the regulatory mechanisms of BAFF signaling in other immune cells, such as monocytes, are not well understood.

In our previous study, we revealed that BAFF induced robust increase in the production of IL-6 by pSS monocytes. We also found that the expression levels of BR3 and several transcription factors such as NF-IL-6 and NF-kB2 were enhanced in pSS monocytes compared to normal monocytes. These data suggest that BAFF signaling is abnormal in pSS monocytes. The purpose of the present study is to elucidate these possible abnormalities.

Methods: Whole blood was prepared from pSS patients and age-matched normal individuals, and the expression level of BR3 on monocytes was analyzed by FACS. Peripheral monocytes were stimulated in vitro with soluble BAFF (sBAFF), and the production of IL-6 by the cells was measured by ELISA. The expression levels of IKK-alpha and IKK-beta, which are involved in NF-kB pathways, were analyzed by western blotting analysis.

Results: In accordance with our previous findings with quantitative PCR, FACS analysis showed that the expression level of BR3 was significantly elevated in pSS monocytes compared to normal monocytes. Interestingly, the expression level of BR3 on monocytes was positively correlated with the amount of IL-6 produced by pSS monocytes triggered by sBAFF. When the monocytes were cultured with sBAFF in the presence of NF-kB activation inhibitor, the production of IL-6 by the cells was strongly suppressed in a dose-dependent manner. In addition, phosphorylation level of IKK-alpha was elevated in pSS monocytes compared to normal monocytes without stimulation, whereas that of IKK-beta was not significantly different between pSS and normal monocytes. Moreover, phosphorylation levels of IKK-alpha and IKK-beta in the monocytes were enhanced upon stimulation with sBAFF.

Conclusion: BAFF acts through BR3 to activate the expression of the IL-6, and that IKK-alpha and IKK-beta are involved in the signal transduction pathway triggered by sBAFF.

Disclosure: K. Yoshimoto, None; M. Tanaka, None; M. Kojima, None; H. Ogata, None; H. Kameda, None; K. Suzuki, None; T. Abe, None; T. Takeuchi, None.

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Differential Regulation of Cytokines by Extracellular-Signal Regulated Kinase and e-Jun N-Terminal Kinase in Map Kinase Kinase-3 and -6 Deficiency. Deepa Hammaker, Katharyn Topolewski, Monica Guma, David L. Boyle and Gary S. Firestein. UCSD School of Medicine, La Jolla, CA

Background/Purpose: p38 inhibitors have limited efficacy in rheumatoid arthritis (RA), possibly because p38 blockade suppresses IL-10 production and increases JNK and ERK phosphorylation in macrophages. This positive feedback mechanism elevates IL-6 levels and decreases IL-10 production. In contrast, bone marrow derived macrophages (BMDM) deficient in upstream p38 regulators (MKK3 or MKK6) have normal ERK and JNK responses and near normal IL-10 gene expression. The goals of this study were (1) to determine if dual ERK and JNK inhibition avoids reflex increases in pro-inflammatory cytokines and (2) to dissect the consequences of IL-10 regulation in MKK-deficient and p38 inhibitor treated BMDM.

Methods: Bone marrow derived macrophages from wild type (WT), MKK3−/− and MKK6−/− mice were pre-treated with p38 inhibitor SB203580 (SB), JNK inhibitor SP600125 (SP) and/or ERK inhibitor PD98059 (PD) and stimulated with LPS. Supernatant IL-6 and IL-10 levels were measured by ELISA and normal naïve T-cell expressed and secreted (RANTES) and IL-10 promoter activity was measured using the human microvascular endothelial cell line (HMEC-1) and human dermal microvascular endothelial cells (HMVECs), real time polymerase chain reaction (RT-PCR) was performed. To block the expression of IL-10, HMECs were transfected with full length vector (fut1) or an (1,2)-fucosyltransferase transferrase responsible for synthesis of the H blood group and Lewis α antigens. However, a direct role for fut1 in RA has not been demonstrated. In this study, we examined the expression of fut1 in RA synovial tissue (ST) and determined the functional consequences of fut1 expression.

Disclosure: D. Hammaker, None; K. Topolewski, None; M. Guma, None; D. L. Boyle, None; G. S. Firestein, None.

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Fucosyltransferase 1 (fut1) Is Overexpressed in Rheumatoid Arthritis Synovial Tissue and Modifies Cytokine Production. Takeo Isozaki1, Jefrey H. Ruth1, M. Asif Amin1, Phillip L. Campbell1, Steven E. Domin0, G. Kenneth Haines II2 and Alisa E. Koch3. 1University of Michigan, Ann Arbor, MI, 2Yale University, New Haven, CT, 3University of Michigan Medical School, Ann Arbor, MI

Background/Purpose: Rheumatoid arthritis (RA) is a systemic autoimmune disease characterized by inflammation and joint destruction. Angiogenesis and cytokine production are involved in the pathogenesis of RA. We have shown that soluble H and Lewis α antigens are mediators of angiogenesis and are upregulated in the RA joints compared to normal (NL) or osteoarthritis (OA) joints. Fucosyltransferase 1 (fut1) is an enzyme responsible for synthesis of the H blood group and Lewis α antigens. However, a direct role for fut1 in RA has not been demonstrated. In this study, we examined the expression of fut1 in RA synovial tissue (ST) and determined the functional consequences of fut1 expression.

Methods: Fut1 expression was determined in RA, OA and NL ST samples by immunohistological staining. To determine whether fut1 was expressed by the human microvascular endothelial cell line (HMEC-1) and human dermal microvascular endothelial cells (HMVECs), real time polymerase chain reaction (RT-PCR) was performed. To block the expression of fut1, HMEC-1s and HMVECs were transfected with fut1 sense or antisense oligonucleotides (ODNs). After treatment, cells were stimulated with interleukin-1β (IL-1β), IL-17 or phorbol 12-myristate 13-acetate (PMA) to stimulate cytokine expression. We examined monocyte chemotactic protein (MCP)-1/CCL2 expression as this chemokine has been shown to be decreased in mouse KRN arthritis induced fut1 knockout joints. We also examined angiogenic vascular endothelial growth factor (VEGF) and regulated upon activation, normal T-cell expressed and secreted (RANTES)/CCL5 expression, as these cytokines have been shown to be important in RA pathogenesis. In addition, we isolated endothelial cells (ECs) from wild type (wt) and fut1 knockout mice. To confirm the role of fut1 in angiogenesis, we
performed EC chemotaxis using wt and fut1 knockout ECs in modified Boyden chambers.

**Results:** RA STs contained a greater percentage of fut1 ECs than did OA or NL STs [mean ± SEM; RA ST (n=18) 34 ± 8%; OA ST (n=18) 14 ± 6% and NL ST (n=18) 11 ± 4%, p<0.05 between RA ST and OA ST; RA ST and NL ST]. To determine if fut1 expression was inducible by inflammatory cytokines, we stimulated ECs with IL-1β and found that fut1 mRNA was upregulated (3.2-fold) in HMEC-1s and HMVECs. Fut1 antisense ODN transfected HMEC-1s and HMVECs had significantly decreased expression of GAPDH/CCL2 and RANTES/CCL5 compared to fut1 sense ODN transfected cells stimulated with IL-1β, IL-17 or PMA at the mRNA and protein levels (p<0.05). Fut1 knockout mouse ECs stimulated with IL-1β expressed less VEGF mRNA than wt ECs (p<0.05). These results indicate that fut1 regulates EC expression of cytokines important in RA pathogenesis. Finally, fut1 knockout mouse ECs had decreased migration to VEGF compared with wt mouse ECs (10 ± 1 vs. 16 ± 1 cells migrated, n=6 experiments, p<0.05).

**Conclusion:** These data show that fut1 is overexpressed in RA ST, and that by blocking fut1 expression, we can modify the production of many proinflammatory cytokines. In addition, we show that fut1 regulates EC migration, a facet of angiogenesis in response to VEGF. Hence, fut1 may be an important new target for RA therapy.

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**Interferon Regulatory Factor 8 Regulates BAFF Production in Murine Macrophages and Is a Nexus for Cross Talk Between IFN-γ and TGF-β.** Wei-Jia Yuan, Sanjay Gupta, Jane E. Salmon and Alessandra B. Perini. Hospital for Special Surgery, Weill Cornell Medical College, New York, NY.

**Background/Purpose:** Lupus is a systemic autoimmune disease that can lead to severe end-organ damage characterized by unabated inflammation and aberrant tissue repair. Macrophage dysregulation plays a key role in mediating this tissue damage. Interferon regulatory factor 8 (IRF8) is a crucial controller of macrophage function and has been identified as a susceptibility locus for lupus. The cellular pathways regulated by IRF8 may be important in tissue damage in lupus. IRF8 is known to regulate macrophage activation in response to IFN-γ, inhibiting macrophages stimulated by IFN-γ produce B-cell activating factor (BAFF) which may perpetuate local immune responses. TGF-β, a cytokine linked to tissue repair via Rho-kinase (ROCK), can augment BAFF production. Here we use the regulation of BAFF as a model to dissect the cross talk between IFN-γ and TGF-β and identify a novel and crucial role for IRF8 in this process.

**Methods:** Bone marrow derived macrophages (BMDM) were stimulated with IFN-γ and/or TGF-β. In selected experiments a ROCK inhibitor, Y-27632, was added. Cytokine production was evaluated by ELISA and/or by qPCR. ROCK activity was assessed by kinetic assay. Chromatin immunoprecipitation (ChIP) assays were performed to determine the binding of IRF8 to the BAFF promoter.

**Results:** TGF-β augmented IFN-γ-induced BAFF production in BMDM (untreated: 24 ± 5 pg/ml; IFN-γ: 508 ± 181, TGF-β: 57 ± 13, IFN-γ + TGF-β: 990 ± 291, n=5, p<0.01). This amplification was specific for BAFF and was not seen when TNF-α or CTGF was examined. IFN-γ increased the expression of IRF8, which was not further increased by the addition of TGF-β. In the absence of IRF8, BAFF production by macrophages was markedly diminished (C57/B6 IFN-γ: 505 ± 207 pg/ml, IRF8 KO IFN-γ: 17 ± 10, n=4, p<0.002; C57/B6 IFN-γ + TGF-β: 867 ± 336, IRF8 KO IFN-γ + TGF-β: 14 ± 6, n=4, p<0.02). IRF8 KO BMDM exhibited normal differentiation and maintained the capacity to upregulate CTGF in response to TGF-β. In line with these results, we found that IRF8 directly binds to the BAFF promoter upon IFN-γ stimulation. Interestingly, the binding of IRF8 to the BAFF promoter was augmented by the concomitant addition of TGF-β. Given that TGF-β did not change the expression of IRF8, we explored the possibility that TGF-β could modulate IRF8 function by post-translational mechanisms. TGF-β, but not IFN-γ, activated the serine-threonine kinases ROCK1 and ROCK2 in BMDM. ROCK inhibitor Y-27632 decreased BAFF production by BMDM stimulated with IFN-γ and TGF-β and diminished the binding of IRF8 to the BAFF promoter.

**Conclusion:** We have shown that IRF8 is a critical regulator of BAFF production in BMDM. Our data indicate that while IFN-γ increases IRF8 expression, TGF-β may modulate its function via ROCK activation. We speculate that activated ROCK phosphorylates IRF8 and that increased binding of phosphorylated IRF8 to the BAFF promoter leads to the enhanced BAFF production when macrophages are simultaneously exposed to IFN-γ and TGF-β. The pathways that mediate the cross talk between IFN-γ and TGF-β uncovered by this study identify novel processes that could lead to aberrant macrophage function in chronic inflammatory state and define new targets to ameliorate tissue damage in SLE.

**Disclosure:** W. Yuan, None; S. Gupta, None; J. E. Salmon, None; A. B. Perini, None.

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**MiceRNA-155 Regulates Chemokines and Chemokine Receptors in Rheumatoid Arthritis Monocytes.** Aziza Elmesrani, Derek S. Gilchrist, Alasadair R. Fraser, Diane Vaughan, Ross McQueenie, Gerard J. Graham, James Brewer, Iain B. McInnes and Mariola Kurowska-Stolarska. Institute of Infection, Immunology and Inflammation, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, United Kingdom.

**Background/Purpose:** Rheumatoid arthritis (RA) is characterized by synovial tissue inflammation leading to joint destruction. Monocytes/macrophages are major effector cells in RA synovitis, principally by releasing TNF-α, IL-6 and other inflammatory cytokines and chemokines. MicroRNAs are a recently discovered class of post-transcriptional regulators–in particular miR-155 is upregulated in RA synovial macrophages where it regulates cytokine expression. We hypothesized that miR-155 regulates recruitment of monocytes by modulating the chemokine and chemokine receptor system.

**Methods:** Peripheral blood (PB) was obtained from healthy controls and RA patients who met the 2010 ACR/EULAR diagnostic criteria. Purified CD14+ PB monocytes were obtained by magnetic bead isolation were transfected with miR-155 mimic or scrambled mimic using an N-TER nanoparticle delivery system. Cytokine and Chemokine Gene Expression in the conditioned media of transfected monocytes was analyzed by qPCR. CCR1, CCR2, CCR3, CCR5, and CXCR4 expression was upregulated in PB monocytes transfected with miR-155. These data show that fut1 is overexpressed in RA ST, and that by blocking fut1 expression, we can modify the production of many proinflammatory cytokines. In addition, we show that fut1 regulates EC migration, a facet of angiogenesis in response to VEGF. Hence, fut1 may be an important new target for RA therapy.

**Results:** RA PB and SF monocytes showed higher copy number of miR-155 compared with healthy controls. Overexpression of miR-155 induced the production of chemokines CCL4, CCL5, CCL8 and CCL22 in RA monocytes and CCL3 in both RA and healthy controls. However, overexpression of miR-155 in healthy control and RA monocytes did not affect the production of CCL2, CCL7, CCL21, CXCL5, CXCL8, CXCL17, CXCL10 and CXCL1. Analysis of chemokine receptors in BM of miR-155−/− and WT mice revealed significantly higher levels of CCR1, CCR2, CCR5 and CXCR4 in miR-155 deficient cells suggesting that miR-155 can act as a negative regulator of these receptors in homeostatic state. TLR-4 ligand significantly suppressed expression of these receptors in both WT and miR-155−/− cells. Analysis of 3’UTRs of chemokine and chemokine receptor (TargetScan) suggests that miR-155 likely interferes with signaling pathways implicated in chemokine and chemokine receptor system expression.

**Conclusion:** Deregulation of miR-155 in RA monocytes can contribute to the production of pro-inflammatory chemokines by these cells and to their accumulation at sites of inflammation.

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**Anti-Inflammatory Effects of Phosphodiesterase 4 Inhibition Are Mediated by Mitogen-Activated Protein Kinase Phosphatase-1.** Riku Korkonen, Tuja Hofmøller, Mirka Laavola, Tiina Keränen, Mari Häimäläinen and Eeva Moilanen. University of Tampere School of Medicine and Tampere University Hospital, Tampere, Finland.

**Background/Purpose:** MAP kinase phosphatase-1 (MKP-1) is a nuclear tyrosine/threonine phosphatase that limits p38 MAP kinase activity. MKP-1 KO mice display excessive inflammatory response, and exhibit increased disease severity and more extensive bone destruction in experimental arthritis models. Anti-inflammatory effects of glucocorticoids are partly mediated by increased MKP-1 expression. Phosphodiesterase (PDE) 4 is expressed in several inflammatory and immune cells, and it hydrolyzes cAMP to S’AMP down-regulating CAMP signalling in cells. PDE4 inhibitors are under investigation for treatment of arthritis, and they have already entered the clinics in the treatment of COPD as an anti-inflammatory remedy. In the present study,
we found that a PDE4 inhibitor rolipram enhanced MKP-1 expression which was involved in the anti-inflammatory effects of rolipram.

**Methods:** The effect of MKP-1 and a PDE4 inhibitor rolipram on inflammatory gene expression was investigated in mouse J774 and human THP-1 macrophage cell lines, and in primary mouse peritoneal macrophages (PM) from wild-type (WT) and MKP-1(-/-) mice. In cell lines, MKP-1 expression was silenced by siRNA. We also investigated the effect of rolipram on carrageenan-induced paw inflammation in WT and MKP-1(-/-) mice.

**Results:** TNF and IL-6 production was increased in macrophages with impaired MKP-1 (that is in cells transfected with MKP-1 siRNA or macrophages from MKP-1 KO mice), and it was related to increased p38 MAP kinase phosphorylation. p38 MAP kinase phosphorylation was inhibited by rolipram and by a cAMP analog 8-Br-cAMP. LPS-induced MKP-1 expression was enhanced by rolipram, by a non-selective PDE inhibitor IBMX and by 8-Br-cAMP in J774 and THP-1 cells and in PMs. Rolipram, IBMX, and 8-Br-cAMP also inhibited TNF production in J774 and THP-1 cells. p38 MAP kinase inhibitor BIRB 796 inhibited TNF production in macrophages, as expected. Rolipram inhibited TNF production in PMs from WT mice (63% inhibition), but, interestingly, the inhibition of TNF production by rolipram was greatly attenuated (27% inhibition) in PMs from MKP-1(-/-) mice. Furthermore, rolipram attenuated carrageenan-induced paw inflammation in WT but not in MKP-1(-/-) mice.

**Conclusion:** The results showed that a PDE4 inhibitor rolipram suppressed p38 MAP kinase pathway, and inhibited TNF production and carrageenan-induced inflammation, and these effects were mediated by MKP-1. The results suggest that the anti-inflammatory effects of PDE4 inhibitors are, at least partly, mediated by MKP-1. The findings emphasize MKP-1 as a potential mediator of anti-inflammatory drug effects. Compounds that enhance MKP-1 expression and/or MKP-1 activity hold potential as novel anti-inflammatory drugs.

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**Role of Phospholipase D1 (PLD1) in the Expression of Proinflammatory Genes in Rheumatoid Arthritis Synovial Fibroblasts (RASF).** Sean C. Friday1 and David A. Fox2. 1The University of Michigan, Ann Arbor, MI, 2Univ of Michigan Med Ctr, Ann Arbor, MI.

**Background/Purpose:** Interleukin-17 (IL-17) and Tumor Necrosis Factor alpha (TNFα), when co-applied to RASF, induce synergistic expression of proinflammatory genes such as IL-6 and IL-8. Work from our laboratory using co-cultures of cytokine-activated T cells and RASF has demonstrated that this synergy is largely contact-dependent (Tran et al., 2007). Recently, Hot et al. (2011) showed that PLD1 mRNA was similarly upregulated by IL-17A and the less potent IL-17F in RASF. Another recent report (Setu et al., 2010), used a mouse model of peritonitis to show that blocking PLD1 mitigates TNFα production in vivo. In light of these observations, we sought to examine the potential role of PLD1 in pro-inflammatory gene expression by RASF stimulated with IL-17A and/or TNFα.

**Methods:** We used quantitative real-time PCR to characterize the cytokine-mediated effects on mRNA levels for a cluster of genes encoding cytokines, chemokines, and tissue remodeling enzymes important in the pathogenesis of RA. Also, secretion of IL-6, IL-8, and CCL20 was measured by ELISA. To investigate the relevance of PLD1 activity, we added various cytokines, chemokines, and tissue remodeling enzymes important in the regulation of pro-inflammatory genes such as IL-6 and IL-8. Work from our laboratory has shown that IL-1β and TNFα, when co-applied to RASF, induce synergistic expression of proinflammatory genes such as IL-6 and IL-8.

**Results:** PLD1 mRNA was weakly induced by IL-17 and/or TNFα (<2-fold increase). 1-butanol had complex effects on cytokine-induced target gene mRNA expression, in a manner that was dose-dependent and biphasic for all targets except ICAM1, IL-8, and MMP-14. Compared with the 10 other targets studied, including PLD1 itself, ICAM1 mRNA expression showed the least sensitivity to treatment with 1-butanol. When RASF were transfected with PLD1-specific siRNA, there was an effect on induction of mRNA and secreted protein, particularly for induction of IL-6, IL-8, and CCL20 when IL-17 was co-applied with TNFα. Effects on mRNA and secreted protein were not always positively correlated. For example, interference with PLD1 activity resulted in increased CCL20 mRNA, but inhibited CCL20 secretion. Effects of PLD1 knockdown were in part distinct from effects of 1-butanol.

**Conclusion:** PLD1 might be an important modulatory target for regulation of cytokine-evoked expression of proinflammatory genes by RASF, because it exhibits gene-specific effects on mRNA levels and effects on efficacy of regulated secretion/exocytosis. Stability of mRNAs and modulation of tran-scription efficiency are likely mechanisms by which PLD1 affects cytokine-induced expression of proinflammatory genes. The effects of 1-butanol may reflect inhibition of not only PLD1 but also PLD2 and possibly other enzymes.

**Disclosure:** S. C. Friday, Johnson & Johnson, 2; D. A. Fox, None.

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**Receptor Activator of Nuclear Factor-κB Ligand-Mediated Osteoclastogenesis Is Augmented by Interleukin-1α Via up-Regulation of Endoplasmic Reticulum Stress Signals.** Myung-Joo Hong1, Kyung-Soon Sung1, Eum-Gyeong Lee1, Yoon-Kyun Hong1, Chang-Hoon Lee1, Myung Soo Lee1, and Wan-Hee Yoo1. 1Department of Internal Medicine, Chonbuk National University Medical School and Research Institute of Clinical Medicine, Jeonju, South Korea, 2Department of Internal Medicine, School of medicine, Wonkwang university, Iksan, Chonbuk, South Korea, 3Reumatology, Iksan, Chonbuk, South Korea.

**Background/Purpose:** Interleukin-1β (IL-1β) and thapsigargin (TG)-augmented endoplasmic reticulum (ER) stress modulate the receptor activator of nuclear factor kappa-B ligand (RANKL)-mediated osteoclastogenesis. However, the mechanism by which IL-1β and TG affect osteoclastogenesis remains elusive. Thus, we investigated the relationships between RANKL-mediated osteoclast specific pathways and ER stress relevant signals in osteoclast differentiation of bone marrow-derived cells.

**Methods:** Bone marrow cells (BMCs) were obtained from 5-week-old male ICR mice. The cells were cultured to be differentiated into osteoclasts with macrophage-colony stimulating factor (M-CSF) and RANKL in the presence or absence of IL-1β, thapsigargin (TG, ER stress inducer), or 4-phenoxybutyric acid (PBA, ER stress inhibitor). The formation of osteoclasts was evaluated by tartrate-resistant acid phosphatase (TRAP) staining and resorption pit assay with dentine slice. The molecular mechanisms of IL-1β and ER stress in osteoclastogenesis of BMCs were investigated using reverse transcription-polymerase chain reaction (RT-PCR) and immunoblotting. Osteoclast specific and ER stress relevant signaling molecules were analyzed. Transfections of small interfering RNA (siRNA) for glucose-regulated protein 78 (GRP78), protein kinase RNA-like ER kinase (PERK) and inositol-requiring enzyme 1 (IRE1) were performed to knockdown ER stress initiating signals to verify the relationships between osteoclast specific pathways and ER stress signals.

**Results:** The formation of osteoclasts was increased by IL-1β and TG augmented ER stress. PBA significantly inhibited IL-1β and TG induced osteoclasts formation. The expressions of osteoclast specific pathways such as c-Fos and NFATc1, and ER stress associated signals such as PERK, IRE1, GRP78, and elf2α were significantly increased by IL-1β and TG which was inhibited by PBA. Inhibition of ER stress initiating signals by siRNA inhibited the expression of above mentioned osteoclast specific signals, thus reduced IL-1β and/or TG-induced osteoclastogenesis.

**Conclusion:** IL-1β and/or TG-augmented ER stress significantly increased osteoclast formation which was inhibited by PBA. The mechanisms for interaction of ER stress modulation on RANKL-mediated osteoclast specific pathways and ER stress relevant signals such as GRP78, PERK, and elf2α are likely mediated by IRE1. Thus the modulation of ER stress signals affecting osteoclast formation might be a new therapeutic strategy to prevent inflammatory and destructive arthritis diseases such as rheumatoid arthritis (RA) and diverse osteoporotic diseases.

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### 885

**Interferon α and Self-Organized Criticality Theory.** Shunichi Shiozawa1, Yumi Miyazaki2 and Ken Tsuniyama3. 1Kyushu University Beppu Hospital, Beppu, Japan, 2Kyushu University Beppu Hospital/ Kobe University Graduate School of Health Sciences, Beppu/ Kobe, Japan.

**Background/Purpose:** One of the biggest obstacle we face in elucidating the pathogenesis of autoimmunity today is the mechanism how autoreactive lymphocyte clones could survive or emerge beyond the firewall called ‘forbidden clone’ of Burnet. We have proposed that autoreactive clones emerge via de novo T cell receptor (TCR) revision from thymus-passed non-autoreactive clones at periphery, and we named this T cell as autointeractive-body-inducing CD4 (aCD4) T cell (Tsuniyama K et al. PLoS ONE 4(12):e3832, 2009). Our novel ‘self-organized criticality theory’ explains that systemic autoimmunity or systemic lupus erythematosus (SLE) necessarily
Table 2. Association between SLICC/ACR Damage Index and Neutrophil Gene Expression in SLE

<table>
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<th>Low Neutrophil (%, N = 107)</th>
<th>Med Neutrophil (%, N = 92)</th>
<th>High Neutrophil (%, N = 93)</th>
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</table>

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Microrna-155 Protects Against Pulmonary Fibrosis by Targeting the Transcription Regulator LXR Alpha. Mariola Kurowska-Stolarzka, Manahl Hasoo1, Derek G. Gilchrist2, Eva Ruzicska3, Darren Asquith4, David Welsh5, Lynn Crawford6, Nik Hiran7, Iain B. McNiel8 and Charles McSharry2, 1 Institute of Infection, Immunity and Inflammation, College of Medical, Veterinary and Life Sciences University of Glasgow, Glasgow, United Kingdom, 2University of Glasgow, Glasgow, United Kingdom, 3Western Infirmary, Glasgow, United Kingdom, 4University of Edinburgh, Edinburgh, United Kingdom

Background/Purpose: MicroRNAs (miRs) are a novel class of post-transcriptional regulators. A single miR can have profound effects on cell activation due to its ability to modulate multiple pathways at once. We have previously shown that miR-155 is upregulated in rheumatoid arthritis (RA) synovial macrophages and promotes the development of autoimmunity and joint inflammation. Pre-clinical arthritis may be associated with lung changes e.g. bronchial wall thickening, thus the aim of this study was to investigate the contribution of miR-155 regulated pathways to lung homestasis.

Methods: Normal human lung tissue was tested in **in situ** hybridisation with miR-155 and control probes. To model the fibrotic response, WT and miR-155-/-mice were given bleomycin (0.06 unit/mouse) intrasurally. Intervention included intraperitoneal injections of the Liver X Receptor (LXR) agonist (GW3965 daily; 40 mg/kg). End-points included bronchial lavage (BAL) cytology, lung tissue histology, evaluation of the expression of inflammatory and fibrotic genes by qPCR and concentrations of soluble mediators in serum and BAL fluid by multiplex assays. The validation of miR-155 binding to LXR, and the LXR response element in collagen gene promoters were performed with reporter assays.

Results: In **in situ** hybridisation showed an abundant expression of miR-155 in the normal human lung suggesting that this miR may contribute to normal lung homestasis. miR-155-/- mice developed more severe bleomycin-induced lung fibrosis compared to WT mice, as seen by increased collagen 1a3a mRNA expression and protein deposition in the lungs, as well as accumulation of macrophages and lymphocytes in BAL. Gene expression analysis of lung extracts revealed an increase in the M2 pro-fibrotic macrophage markers Arginase 2, IL-13R and Ym1. In addition, the levels of pro-fibrotic cytokines such as VEGF and bFGF were significantly higher in BAL and serum of miR-155-/- mice. Primary lung fibroblast lines derived from miR-155-/- mice showed higher proliferation rates and motility compared to WT cells in wound healing assays. Computational analysis followed by functional luciferase assays revealed that the transcription activator LXR alpha is a direct target of miR-155 in the lungs. Expression of...
LXR alpha was significantly upregulated in the lungs of naïve miR-155−/− mice and was further increased in mice given bleomycin compared to similarly treated WT controls. Injection of the LXR agonist to WT mice increased LXR expression and mirrored the same phenotypic response to bleomycin as the miR-155 deficient mice; shown by increased collagen deposition and M2 macrophage and fibroblast activation. Promoter analysis revealed that LXRs could directly induce collagen production by binding to cox2 and colα promoters.

Conclusion: miR-155 appears important for lung homeostasis, likely by fine tuning levels of LXRs thereby protecting from excessive remodelling. Given this and the emerging contribution of miR-155 to development of autoimmunity, this miR may act as a master-switch determining the duration of inflammation and the initiation of remodelling, as well as the balance between the immune and auto-immune responses.

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Plasma Cells Express the Novel Cytokine Interleukin-36α in Psoriatic and Rheumatoid Arthritis Synovium. Anja Derer1, Silke Frey1, Maria-Elena Messbacher1, Serena Bugatti2, D. Baeten3, Carlomaurizio Montecucco3, Georg A. Schett1 and Axel J. Hueber1. 1University of Erlangen, Erlangen, Germany, 2Division of Rheumatology, University of Pavia School of Medicine, IRCCS Policlinico San Matteo Foundation, Pavia, Italy, 3Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands.

Background/Purpose: IL-36α is a recent described IL-1 cytokine family member with proinflammatory and clear pathogenic properties in psoriasis.

Aim of this study was to determine IL-36α expression in psoriatic arthritis (PsA) compared to rheumatoid (RA) and osteoarthritis (OA).

Methods: Synovial tissue gathered from arthritis patients were stained for IL-36α, IL-36 receptor (IL-36R) and IL-36 antagonist (IL-36Ra) by immunohistochemistry and immunofluorescence. Lysates were tested for IL-36α by western blot analysis. Synovial fibroblasts (FLS) stimulated with IL-36α were assessed for cytokine expression.

Results: The IL-36R and its ligands IL-36α and IL-36Ra could be detected in inflammatory arthritis in the synovial lining layer as well as cellular infiltrates. IL-36α was significantly higher expressed in PsA and RA synovium compared to OA (p=0.0011 and p>0.0001, respectively). No differences were seen in IL-36β and IL-36Ra. The expression of IL-36α was confirmed by western blot analysis. IL-36α induced expression of IL-6 and IL-8 in FLS. CD138-positive plasma cells were determined as major cellular source for IL-36α.

Conclusion: We described that the novel cytokine IL-36α is upregulated in PsA and RA synovium mainly expressed by plasma cells. This insight needs further studies to determine if the IL-36 family can function as a potential target for arthritis therapy.

Disclosure: A. Derer, None; S. Frey, None; M. E. Messbacher, None; S. Bugatti, None; D. Baeten, None; C. Montecucco, None; G. A. Schett, None; A. J. Hueber, None.

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The Role of Adipocytokines in Osteophyte Formation in Osteoarthritis. Susann Junker1, Grit Krumbholz2, Klaus Frommer3, Angela Lehr2, Stefan Rehau1, Jürgen Steinneyer4, Markus Rickert5, Georg A. Schett1, Ulf Müller-Ladner5 and Elena Neumann6. 1Justus-Liebig University of Giessen, Kerckhoff-Klinik, Bad Nauheim, Germany, 2Markus Hospital, Frankfurt, Germany, 3University Hospital Giessen and Marburg, Giessen, Germany, 4University Hospital Giessen and Marburg, Giessen, Germany, 5Department of Internal Medicine III and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 6Justus-Liebig-University of Giessen, Kerckhoff-Klinik, Bad Nauheim, Germany.

Background/Purpose: Obesity is an established risk factor in osteoarthritis (OA), but there is not much known about the interaction between bone formation and the so-called adipocytokines. Adipokines, such as adiponectin (Ad), visfatin (Vis) or resistin (Res), are adipose tissue-derived factors, which are associated with the pathogenesis of rheumatoid arthritis (RA) and OA. Adipokines can be produced by other cell types, e.g. fibroblasts, osteoblasts, osteoclasts and chondrocytes. However, in contrast to their joint-destructive effects in RA, their role in joint remodelling in OA, specifically in osteophyte formation, is still unclear. Therefore, the expression of adipokines in osteophyte development and cells of bone formation and their effect on these cells were analyzed.

Methods: Osteophytes, cartilage and osteoblasts were obtained from OA patients during joint replacement surgery. Serial sections of bone tissue were stained (Masson trichrome, TRAP) and scored from grade one (no ossification, mainly connective tissue and cartilage) to five (ossified, mineralized osteophyte, <10% connective tissue). For analysis of adipokine localization, immunohistochemistry was performed to detect alkaline phosphatase, collagen-type II, Ad, Vis and Res stained. Osteoblasts and chondrocytes were stained with anti- osteoblast and isolated primary chondrocyte lysates. Osteoblast cultures were stimulated with Ad or Res and measurements of IL-6, IL-8, and MCP-1 were performed in cell culture supernatants.

Conclusion: These data support the applicability of a novel model in which causal alleles can be identified by combining expression and association datasets to delineate the molecular mechanisms by which anti-Ro60 antibody mediates cardiac injury. The identification of RXFP1 and the further confirmation of TNF provide important targets for consideration.
Results: Ad, Res and Vis were detectable in all osteophyte grades. In osteophytes without ossification (grade 1), especially Ad and, to a lower extent, Res and Vis were localized in connective tissue fibroblasts. In ossified osteophytes (grade 2–5), Res and Vis protein expression was co-localized with osteoblasts and osteoclasts. Vis was detectable additionally in chondrocytes in osteophytes of all grades (50 % stained chondrocytes). Vis expression in human cartilage and cultured chondrocytes was confirmed on protein and mRNA level. Ad was detectable in co-localization with osteoblasts as well as around blood vessels.

Vis expression in osteoblasts was confirmed on mRNA level. Immunocytochemistry on cultured osteoblasts confirmed the expression of Ad, Res and Vis. Stimulation of osteoblasts with Ad and Res led to an increased IL-6, IL-8 and MCP-1 release when compared to unstimulated controls (Ad: 5.7-fold, 9.5-fold, 3.6-fold, respectively; Res: 1.7-fold, 1.6-fold, 1.3-fold, respectively). The immunomodulatory effect of Ad on osteoblasts was stronger than the effect of Res.

Conclusion: The expression of Ad and Vis in osteophyte connective tissue and cartilage suggests an involvement in early osteophyte formation. Res and Vis expression by osteoblasts and osteoclasts in ossified osteophytes suggests a role in bone remodeling of osteophytes at later stages. Osteoblasts respond to the stimulation with Ad and Res with an increased secretion of inflammatory mediators. Therefore, adipokines are most likely involved in osteophyte formation at different stages of OA and affect different cell types of cartilage and bone formation.

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Fatty Acids Promote Secretion of Proinflammatory and Prodestructive Factors by Synovial Fibroblasts, Klaus W. Frommer1, Andreas Schäffler2, Stefan Rehart1, Angela Lehe3, Ulf Müller-Ladner1 and Elena Neumann1, Justus-Liebig-University of Gießen, Bad Nauheim, Germany, 1University of Regensburg, Regensburg, Germany, 2Markus-Hospital, Frankfurt, Germany.

Background/Purpose: Due to their role in inflammatory metabolic diseases, we hypothesized that free fatty acids (FFA) are also involved in primary inflammatory joint diseases including rheumatoid arthritis (RA) and psoriatic arthritis (PsA) as well as in degenerative joint diseases with secondary inflammatory properties, specifically osteoarthritis (OA). To test this hypothesis, we analyzed the effect of FFA on synovial fibroblasts (SF), a key cell type in the pathophysiology of arthritis. We also investigated whether FFA need to be internalized to have an effect and if the innate immune system is involved in the modulation of this effect.

Methods: RASF, OASF and PsASF were stimulated in vitro with different saturated and unsaturated FFA within their physiological range of concentrations. Immunoassays were used to quantify FFA-induced protein secretion. Sulfosucinimidyl oleate sodium (SSO) was used to inhibit the fatty acid translocase (FAT), which is responsible for transporting long-chain fatty acids into the cell. In addition, TLR4 signaling, which can contribute to driving arthritis, was inhibited intracellularly and extracellularly.

Results: In RASF, FFA dose-dependently enhanced the secretion of the proinflammatory cytokine IL-6, the chemokines IL-8 and MCP-1, as well as the matrix-degrading enzymes MMP-1 and MMP-3. Cell population, cell source (RA, OA or PsA) and the respective molecular parameters were factors that influenced the changes of protein secretion (e.g. for lauric acid [100 μM] with RASF/IL-6: 9.1-fold increase; IL-8: 14.9-fold increase; MCP-1: 2.4-fold increase; pro-MMP1: 5.1-fold increase; MMP-3: 83.6-fold increase). At equal concentrations, both saturated and unsaturated fatty acids showed similar effects, while responses to FFA were generally stronger for OASF and PsAS than for RASF (e.g. for palmitic acid [10 μM] with RASF/IL-6: 2.8-fold increase; with OA/SF: 15.2-fold increase; with PsASF: 39.3-fold increase). Pre-incubation of RASF with SSO almost completely abrogated the effect of palmitic acid on IL-8 secretion. However, both intracellular and extracellular TLR4 signaling inhibition blocked the palmitic acid-induced IL-8 secretion of RASF.

Conclusion: The data show that FFA are not only metabolic substrates but also directly contribute to articular inflammation and degradation in various joint diseases. Moreover, the data support the hypothesis that FFA-induced joint destruction is mediated through the innate immune system.

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The Epigenetically Repressed Long Noncoding RNA Hotair Influences the Expression of Matrix Metalloproteases in Synovial Fibroblasts, Michelle Trekmann1, Matthias Brock2, Renate E. Gay1, Beat A. Michel1, Laura E. Huber3 and Steffen Gay1, 1Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland, 2Department of Internal Medicine, University Hospital Zurich, Zurich, Switzerland, 3Department of Rheumatology, University Hospital Zurich, Zurich, Switzerland

Background/Purpose: Long noncoding RNAs (lncRNA, >200nt) have recently been emerged as regulators of gene expression functioning as signals, decoys, guides or scaffolds for transcription factors and/or the epigenetic machinery of the cell. The repressive epigenetic mark trimethylated histone 3 lysine 27 (H3K27me3) is transferred by the histone methyltransferase EZH2 which is up regulated in rheumatoid arthritis (RA) synovial fibroblasts (SF) and inducible by tumor necrosis factor (TNF)-α (Trekmann M et al., ARD, 2011). The lncRNA HOX transcript antisense RNA (HOTAIR) has been shown to be associated with cancer and metastasis; it was shown to interact with EZH2 and proposed to guide H3K27 trimethylation of target genes (Wang KC and Chang HY, Mol Cell, 2011). Here, we studied expression, regulation and function of HOTAIR in SF.

Methods: Gene expression in SF was measured by SYBR Green or TaqMan real-time PCR with normalization to GAPDH. SF were stimulated with TNFs (10ng/ml; n=11) and interleukin (IL)-β (1ng/ml; n=5). Osteoarthritis (OA)SF were transfected with a vector encoding EZH2 (n=4) or siRNA targeting HOTAIR (n=11). Chromatin from SF was precipitated with antibodies for histone 3 (H3), H3 methylation H3K4me3 and H3K27me3, and H3 acetylation (Ac), and the HOTAIR promoter was analyzed for epigenetic regulation.

Results: The expression of HOTAIR was strongly decreased (12.7-fold) in RASF (n=9) compared to OASF (n=13) (ΔCt 14.3±3.3 vs. 10.6±1.7; p<0.005). EZH2 over expression in OA SF reduced the expression of HOTAIR by 30±17% (p<0.05) suggesting that EZH2-mediated methylation of H3K27 may regulate HOTAIR expression. Indeed, HOTAIR levels in RASF and OA SF inversely correlated with the repressive H3K27me3 epigenetic marker in the promoter of HOTAIR (Spearman R=−0.8725; p<0.001). In detail, the H3K27me3 to H3 ratio in RASF was 0.51±0.35 whereas the HOTAIR promoter in OA SF showed much less H3K27 trimethylation (ratio to H3 0.25±0.23; p<0.039). Interestingly, neither in RASF nor in OA SF H3K4me3 or H3-Ac could be detected at the HOTAIR promoter in OA SF with TNFs for 24h and 48h decreased HOTAIR levels by 63±16% and 56±26% (p<0.0001). IL-β-stimulation reduced HOTAIR expression by 54±10% and 63±6%, respectively (p<0.0005). To identify a functional role for HOTAIR repression in RASF, we silenced HOTAIR in OA SF using RNA interference. The silencing of HOTAIR significantly increased mRNA levels of the matrix metalloproteases (MMP) 3, 13 and 14 (MMP3 by 1.8±0.7-fold; MMP13 by 4.3±1.1-fold and MMP14 by 2.1±0.7-fold; p<0.05); in contrast, results for MMP1 were inconsistent. The TNF-α-induced expression of MMP3 (51.6±21.2-fold) and MMP13 (6.9±2.6-fold) was further increased by silencing of HOTAIR (71.3±28.6-fold and 18.8±8.6-fold, p<0.05) whereas the IL-β-stimulated expression was not significantly changed (n=5 each).

Conclusion: This is the first report of a differential expression of a lncRNA in RA. The expression of HOTAIR is strongly reduced in RASF via the repressive epigenetic mark H3K27me3. We demonstrate that HOTAIR silencing may account for the up regulation of matrix-degrading enzymes indicating a potential role for HOTAIR repression in the activated, matrix-destructive phenotype of RASF.

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Nuclear Factor-xB Activation by Type II Collagen Peptide in Osteoarthritis Chondrocytes: Its Inhibition by Hyaluronan Via CD44, Tadashi Yasuda. Tenri University, Tenri, Japan

Background/Purpose: Some proteolytic products of cartilage matrix may contribute to cartilage destruction through their catabolic activities. Recently, we have found that a 24-mer synthetic peptide of type II collagen named CB12-II stimulates type II collagen cleavage with induction of matrix metalloproteinase (MMP)-13 in cartilage explant culture. Although the intracellular signaling that leads to cartilage destruction is mediated by a
cluster of catabolic pathways including nuclear factor-κB (NF-κB), the effect of CB12-II on NF-κB remains unclear. Hyaluronan (HA) of high molecular weight is widely used in the treatment of osteoarthritis (OA) by intra-articular injection. An increasing body of evidence indicates that HA suppresses catabolic actions by proinflammatory cytokines like interleukin-1 and matrixes such as fibronectin fragments. However, little is known of HA effect on actions of CB12-II through interaction with HA receptor such as CD44. This study was aimed to examine activation of NF-κB in association with MMP-13 production by CB12-II and its inhibition by HA in chondrocytes. Methods: Cartilage explants harvested from OA knee joints or isolated chondrocytes in monolayer were incubated with CB12-II or its scramble peptide with or without pretreatment with 2700 kDa HA. In another set of experiments, following pretreatment with anti-CD44 antibody or nonspecific IgG, cartilage explants were incubated with or without HA, followed by coincubation with CB12-II or the scramble peptide. Enzyme-linked immunosorbent assays for phosphorylated p65 NF-κB and MMP13 were performed using total cell lysates and culture supernatants.

Results: When cartilage explants or chondrocytes in monolayer were incubated with CB12-II, the type II collagen peptide activated NF-κB in association with enhanced MMP-13 production. Inhibition studies with the specific inhibitor indicated the requirement of NF-κB for CB12-II-induced MMP-13 production. Pretreatment with HA resulted in significant suppression of CB12-II-stimulated MMP-13 production in cartilage as well as in chondrocyte monolayer cultures. HA suppressed NF-κB activation by CB12-II, leading to a decrease in MMP-13 production. Anti-CD44 antibody reversed HA effect on CB12-II action.

Conclusion: The present study clearly demonstrated that HA suppressed CB12-II-activated NF-κB via CD44 in OA articular chondrocytes, leading to decreased MMP-13 production. HA could down-regulate the catabolic action of type II collagen fragments in osteoarthritic joints through the mechanism demonstrated in this study.

Disclosure: T. Yasuda, None.

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Genetic Variants in the IL-4 and IL-4 Receptor Genes in Association with the Severity of Joint Damage in Rheumatoid Arthritis: A Study in Seven Cohorts. A. Krabben1, A. G. Wilson2, R. Knevel3, A. Zhernakova4, E. Brouwer4, E. Lindqvist4, T. Saxne4, G. Stoeken-Rijssbergen5, J. A. B. van Nies1, D. P. C. de Rooy1, T. W. J. Huizinga1, B. P. C. Koeleman5, R. E. M. Toes1, None; 2University of Sheffield, Sheffield, United Kingdom, 3University of Groningen, University Medical Center, Groningen, Netherlands, 4Leiden University Medical Center, Leiden, Netherlands, 5University of Sheffield, Sheffield, United Kingdom. 6None; 7University of Groningen, University Medical Center, Groningen, Netherlands, 8University Medical Center Utrecht, Utrecht, Netherlands, 9Kempe Institute Medical Research and North Shore-Long Island Jewish Health System, Manhasset, NY.

Background/Purpose: The severity of RA is reflected by the severity of radiological joint destruction. It is highly variable between patients and up to 58% of this variation is explained by genetic factors. In order to increase the understanding of the processes underlyng joint damage progression, it is relevant to identify individual risk factors. In vitro studies and mice studies showed that IL-4 has a role in suppressing arthritis severity. The effect of IL-4 is mediated by a heterodimeric receptor composed of the IL-4R alpha chain. Several genetic variants in IL-4 and IL-4R have been described to associate with RA severity, though these findings have not been replicated. Together these data prompted us to investigate the association between IL-4 and IL-4R tagging SNPs and progression rate of joint damage in a multi-cohort candidate gene study.

Methods: IL-4 and IL-4R tagging SNPs (8 and 39, respectively) were genotyped in 600 RA patients of whom 2,846 sets of hands and feet X-rays were collected during 7 years follow-up. Subsequently, significantly associated SNPs were genotyped in 3,523 X-rays of 2,064 patients of several European and North-American cohorts. These concerned data-sets from Lund (Sweden) (781 X-rays in 147 patients), Sheffield (UK) (391 X-rays in 391 patients), Groningen (NL) (872 X-rays in 280 patients), NARAC (USA) (385 X-rays in 385 patients), Wichita (USA) (337 X-rays in 101 patients) and NDB (USA) (757 X-rays in 757 patients). Three SNPs of phase-2 were not available for the latter two cohorts. In all cohorts X-rays were scored with high reproducibility. The relative increase in progression rate per year in the presence of a genotype was determined, as this outcome measure is comparable between cohorts. Subsequently, since the individual replication cohorts had less number of X-rays than the discovery cohort, an inverse variance weighting meta-analysis was done on the cohorts that together formed the replication phase.

Results: In the discovery phase none of the IL-4 SNPs and seven of the IL-4R SNPs were significantly associated with joint damage progression rate.

In the replication phase, two SNPs in IL-4R gene were significantly associated with joint damage progression rate (rs1805011, \( p = 0.017 \) and rs1119132, \( p = 0.001 \)). After Bonferroni correction for testing seven SNPs in phase-2 rs1119132 remained significantly associated with joint progression rate (\( p_{\text{corrected}} = 0.007 \)). Leiden RA-patients carrying both minor alleles of rs1119132 had a 1.09 fold rate of joint destruction compared to other patients, which corresponds to 81% higher rate of joint destruction over a period of 7 years compared to other patients.

Conclusion: rs1119132 in IL-4R was identified as well as independently replicated to associate with progression rate of joint damage in RA.

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Transcriptomics of Synovial Tissue of Early Human (CHECK) and Experimental OA Identify Pathways Associated with Cartilage Damage. Arjen B. Blom1, Peter L.E.M. van Lent2, Martijn H. van den Bosch3, Hans van den Berg4, M. van der Kooij5, Wim B. van de Water6, 1University Nijmegen Medical Centre, Nijmegen, Netherlands, 2Sint Maartenskliniek, Nijmegen, Netherlands, 3Rheumatology Research and Advanced Therapeutics, Department of Rheumatology, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands.

Background/Purpose: Many osteoarthritis (OA) patients show synovial inflammation, even relatively early during the disease. Mechanisms through which synovial activation contributes to the joint pathology that characterizes OA, are not known. The objective of this study is to identify common pathways in the synovium that determine cartilage damage during OA.

Methods: From patients that entered the CHECK Cohort study (Cohort Hip and Cohort Knee) and from controls (n = 7) synovial biopsies were collected. CHECK is a prospective 10-year follow-up study on participants with early osteoarthritis-related complaints. Kellgren&Lawrence score (KL) was determined at inclusion (n = 18). In addition, biopsies of 7 control synovia were collected. A longitudinal expression analysis was performed on murine synovial tissue at day 7, 21 and 42 after induction of collagenase induced OA (CIA). CIAOA was induced by intra-articular injection of collagenase and contra lateral knee joints served as controls. Microarray experiments were performed on all synovial tissues. Functional annotation clustering (FAC) and pathway analysis was done using DAVID.

Results: Gene expression profiles of control synovia were compared to CHECK synovia. Enrichment analysis revealed several annotations, including regulation of macrophage differentiation, innate immune responses, cell migration, TGFβ, BMP, and wnt-signaling. This signifies clear activation of the synovium in CHECK patients compared to controls. Next we compared synovial tissue of patients with radiological damage (KL=1) with patients without damage (KL=0). Genes that showed the strongest association with cartilage damage were MMP-1, MMP-3, S100A8 and cartilage glycoprotein-39 (18, 10, 6 and 10-fold), all of which have been associated with cartilage damage. Response to wounding, chemotaxis, innate immune response and metalloproteases were strongly and significantly enriched and thus associated with joint damage. Pathway analysis demonstrated that in the synovium of patients with joint damage the complement-activation pathway, TGFβ and BMP-signaling and TLR-activation were significantly upregulated. These results were underlined by analysis of synovium from CIAOA. Among the genes that were strongly upregulated on all time points after induction were MMP-3, MMP-13, MMP-14 and COMP (6, 16, 6 an 13-fold).

Conclusion: These data suggest an active role for the synovium in OA pathology, and identify pathways that are likely to be involved. In particular the association of cartilage damage with the complement pathway was strong.
In addition, TGFβ-, BMP- and wnt-signalizing in the synovium, may contribute to further joint damage. The enhanced expression of cartilage damaging MMP-1, MMP-3 and MMP-13 suggests an active role of the synovium in OA pathology.

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Tyro3, Axl, MerTK-Receptor Activation by Gas6 or Pros1 Gene Delivery ameliorates Collegen-induced arthritis. Fons A.J. van de Loo1, Ben T. van Den Brand1, Shahla Abdollahi-Roodsaz2, Eline A. Vermeij3, Miranda B. Bennink2, Onno J. Arntz2 and Wim B. van den Berg1, 1Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 2Nijmegen, Netherlands

Background/Purpose: Insufficient controlled activation of innate immunity by cytokines and pattern recognition receptors could develop into autoimmune diseases. Stimulation of dendritic cells via the Axl receptor in conjunction with IFNAR leads to upregulation of suppressor of cytokine signaling (SOCS) proteins 1 and 3 and broadly inhibit both Toll-like Receptor (TLR) signaling and TLR-induced cytokine-receptor cascades (Rothlin et al. Cell 2007). This study evaluated whether Tyro3 Axl MerTK (TAM)-receptor stimulation by Growth arrest specific 6 (Gas6) and Protein S (Pros1) as natural negative feedback for Toll-Like Receptor and cytokine signaling can be used to treat collagen-induced arthritis.

Methods: Adenoviruses (1 × 10^7 PFU) overexpressing Gas6 and Pros1 were injected intravenously (i.v.) or 3 × 10^8 PFU intra-articularly (i.a.) into mice before onset of collagen-induced arthritis. Splenic T-helper subsets of intravenously injected were studied by flow cytometry and knee joints of mice injected i.v. and i.a. were assessed histologically. Messenger RNA expression was analyzed in synovium of i.a. injected mice. Circulating cytokines were measured on a Luminex-100 System (Luminex corp.) using a magnetic bead-based multiplex immunoassay (Milliplex, Merck Millipore). Joint inflammation was imaged using the ProSense probe with the IVIS Luminia (Caliper Life Sciences), using the Cy5 filter.

Results: Gas6 or Pros1 did not affect arthritis incidence in either IV or IA injected animals. However, Pros1 did significantly reduce ankle joint swelling, and circulating levels of KC and IL-6. Histological analysis of knee joints revealed a moderate reduction of joint pathology and a significant reduction of splenic T-helper 1 cells when Pros1 was overexpressed systemically. Local overexpression of Gas6 decreased joint inflammation (as assessed histologically or imaged by ProSense) and joint pathology. Pros1 treatment showed a similar trend of protection. Consistently, Gas6 and Pros1 markedly reduced cytokine (IL-1β, IL-6, and TNFα) production in synovium. Moreover, IL-12 and IL-23 mRNA levels were reduced by Gas6 and Pros1, corresponding to a decrease in IFNγ and IL-17 production in synovium. This provides the first evidence that TAM receptor stimulation by Gas6 and Pros1 can be used to ameliorate arthritis when applied systemically or locally. TAM receptor stimulation limits proinflammatory signaling and the adaptive immunity. This pathway provides a novel strategy to combat rheumatoid arthritis.

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IL-33 Promotes Mast Cell Survival Via Inhibition of Apoptosis Associated with Enhanced Expression of Bel-2. Shinjiro Kaieda1, Jun-Xia Wang1 and Peter A. Nigrovec2, 1Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 2Brigham and Women’s Hospital, Boston, MA

Background/Purpose: Mast cells (MCs) are potent innate immune cells that frequently accumulate in chronically inflamed tissues, including the arthritic synovium. The factors that regulate MC persistence and survival in such tissues are unknown. Recent studies have found that the mesenchymal-derived cytokine IL-33 exerts potent effects on MC phenotype and function. Knowing that IL-33 can inhibit apoptosis in cardiac myocytes and hepatocytes, we tested the hypothesis that IL-33 might also regulate MC proliferation and survival, including the development of synovial mastocytosis in the context of inflammatory arthritis.

Methods: Murine bone marrow derived MCs (mBMMCs) were generated from wild-type (WT) mice and animals lacking the IL-33 receptor IL1RL1. Cell viability, proliferation and apoptosis were examined after exposure to IL-33, and compared with exposure to IL-3, a known survival factor for MCs. Expression of the anti-apoptotic molecules Bel-2 and Bel-X1 were determined both as mRNA and as protein. To examine the role of IL-33 in vivo, fluorescently-labeled mixed WT and IL1RL1−/− mBMMCs were transferred into the peritoneum of IL1RL1−/− mice. Following 6 days of treatment with IL-33 (100ng/d/mouse, i.p.), peritoneal MCs were harvested and analyzed using flow cytometry. WT and IL1RL1−/− mBMMCs were sorted and the levels of Bel-2 and Bel-X1 mRNA were determined by qRT-PCR. Synovial tissue MCs were enumerated in WT and IL1RL1−/− animals at baseline and after induction of K/BxN serum transfer arthritis.

Results: While the viability of WT and IL1RL1−/− mBMMCs was similar in IL-3-supported culture, exogenous IL-33 was able to support the survival of WT but not IL1RL1−/− mBMMCs after IL-3 withdrawal. CFSE dilution studies confirmed that this effect did not reflect enhanced proliferation, but rather arose via inhibition of apoptosis as evident by a reduction in the number of Annexin V positive cells. Exploring the mechanism of this effect, we found that IL-33 increased expression of Bel-X1, but not Bel-2, unlike IL-3 which supported mBMMC survival via enhanced Bel-2 but not Bel-X1. Correspondingly, WT mBMMC persisted better than IL1RL1−/− BMMC in IL-33-treated recipients, an effect again mediated not by proliferation but by impaired apoptosis and Bel-X1 expression. While WT and IL1RL1−/− mice also exhibited less inflammation, the density of MC was similar in both strains, suggesting the IL-33 is not uniquely required for maintaining these cell populations in vivo.

Conclusion: These findings identify a novel role for IL-33 as a promoter of murine MC viability, an effect likely mediated by enhanced expression of the anti-apoptotic protein Bel-X1. This effect could represent a new mechanism by which IL-33-producing cells, such as fibroblasts, support the maintenance of tissue mastocytosis. However, at least in the short term K/BxN arthritis model, other pathways appear sufficient to enable and maintain tissue MCs even when this mechanism is interrupted by genetic deletion of the IL-33 receptor IL1RL1.

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Nuclear Receptor Related 1 Induces Synovial Hyperplasia Via Transcriptional Regulation of Novel Target Genes. Kimberlee S. Mix. Loyola University New Orleans, New Orleans, LA

Background/Purpose: Nuclear receptor related 1 (NURR1/NR4A2) is an orphan member of the nuclear receptor super-family that functions as a constitutively active transcription factor. This receptor has critical functions in the central nervous system, where it is required for the proper development of dopaminergic neurons. Furthermore, recent studies suggest that NURR1 regulates inflammatory diseases such as cancer, multiple sclerosis, and diabetes. We have documented over-expression of NURR1 in inflamed synovial tissues and cartilage from patients with rheumatoid arthritis and osteoarthritis. NURR1 is rapidly and potently induced by inflammatory cytokines, suggesting that this receptor may promote disease progression and tissue destruction. We have recently demonstrated that NURR1 induces a hyperplastic phenotype in fibroblast-like synoviocytes by increasing proliferation, anchorage-independent growth, and invasion. In the current study, we seek to elucidate the molecular mechanisms of NURR1 and identify downstream transcriptional targets of this receptor that may contribute to synovitis and cartilage degradation.

Methods: To achieve elevated levels of NURR1 similar to those observed in inflamed synovial tissues, NURR1 cDNA was transduced into normal human synovocytes. Transcriptional activity was confirmed by the activation of a consensus NURR1 reporter construct. Quantitative RT-PCR arrays were used to identify genes that were differentially regulated by NURR1.

Results: Paralleling the effects of TNF-alpha, NURR1 regulates a subset of genes involved in angiogenesis, proliferation, and apoptosis. NURR1 potently induces expression of prolactin (300-fold), a peptide hormone that enhances synoviocyte activation and lymphocyte recruitment. Angiopoietin-1, a ligand for endothelium-specific tyrosine kinase receptors enhances synoviocyte activation and lymphocyte recruitment. NURR1 is rapidly and potently induced by inflammatory cytokines, suggesting that this receptor may promote disease progression and tissue destruction. We have recently demonstrated that NURR1 induces a hyperplastic phenotype in fibroblast-like synoviocytes by increasing proliferation, anchorage-independent growth, and invasion. In the current study, we seek to elucidate the molecular mechanisms of NURR1 and identify downstream transcriptional targets of this receptor that may contribute to synovitis and cartilage degradation.
synergistically repressed by NURR1 and TNF-alpha, suggesting that NURR1 may block DNA repair mechanisms and prevent apoptosis of synoviocytes.

**Conclusion:** Taken together, we have identified a novel set of NURR1 target genes that converge on multiple pathways regulating synovial hyperplasia. We hypothesize that antagonizing NURR1 activity with a small molecule inhibitor may provide an innovative strategy to block pannus formation and tissue destruction.

**Disclosure:** K. S. Mix, None.

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**A Role for Soluble Interleukin-6 Receptor As an Antagonist of Interleukin-27 Signaling,** Misato Hashizume, Keiko Esaki and Yoshihiro Matsumoto. Chugai Pharmaceutical Co., Ltd., Gotemba, Japan

**Background/ Purpose:** Recently, it has been reported that interleukin (IL)-27 treatment reduces inflammation and ameliorates arthritis in collagen-induced arthritis mice. IL-27 is a heterodimeric cytokine composed of IL-27p28, which is similar to IL-6, and EBI3, which is similar to soluble IL-6 receptor (sIL-6R). Notably, each subunit is produced independently, allowing IL-27 to associate with other proteins. sIL-6R is highly concentrated in serum from patients with rheumatoid arthritis (RA). We elucidated the role of sIL-6R in regulating IL-27 signaling.

**Methods:** Surface Plasmon Resonance analysis was used to examine the binding of IL-27 to sIL-6R. Competitive ELISA was performed to evaluate the binding to IL-27p28 and the dissociation of EBI3 from IL-27p28 in the presence of sIL-6R. CD14+ cells were isolated from peripheral blood mononuclear cells of healthy subjects. CD14+ cells were incubated with IL-27 and sIL-6R for 20 minutes, and phosphorylation of STAT3 was measured by FACS. CD14+ cells were incubated with M-CSF, TNF-α, IL-27, and sIL-6R for 48 hours, and MCP-1 production from CD14+ cells was measured by ELISA. CD14+ cells were cultured with RANKL and M-CSF in the presence of IL-27 and sIL-6R for 4 days, and the number of osteoclasts was counted after tartrate-resistant acid phosphatase (TRAP) staining. Concentrations of IL-27p28/sIL-6R complex and IL-27p28/EBI3 complex in serum from healthy subjects and those with RA were determined by ELISA.

**Results:** Surface Plasmon Resonance analysis showed that binding curves were generated from experiments in which IL-27 was exposed to a high-density of sIL-6R coated on a sensor chip. sIL-6R promoted the dissociation of EBI3 from IL-27p28 and the formation of IL-27p28/sIL-6R complex in a dose-dependent manner. Anti-IL-6 receptor antibody (tocilizumab) inhibited the formation of IL-27p28/sIL-6R complex. To examine the effect of sIL-6R on IL-27 signaling, we measured phosphorylation of STAT3, which is increased by IL-27, after stimulating sIL-6R and IL-27, and found that sIL-6R decreased phosphorylation of STAT3. Next, we examined whether sIL-6R inhibited the IL-27-mediated anti-arthritic effect. Whereas IL-27 reduced phosphorylation of STAT3, which is decreased in the presence of sIL-6R. CD14+ cells were isolated from peripheral blood mononuclear cells of healthy subjects. CD14+ cells were incubated with IL-27 and sIL-6R for 20 minutes, and phosphorylation of STAT3 was measured by FACS. CD14+ cells were incubated with M-CSF, TNF-α, IL-27, and sIL-6R for 48 hours, and MCP-1 production from CD14+ cells was measured by ELISA. CD14+ cells were cultured with RANKL and M-CSF in the presence of IL-27 and sIL-6R for 4 days, and the number of osteoclasts was counted after tartrate-resistant acid phosphatase (TRAP) staining. Concentrations of IL-27p28/sIL-6R complex and IL-27p28/EBI3 complex in serum from healthy subjects and those with RA were determined by ELISA.

**Conclusion:** Deletion of RBP-J in the myeloid compartment does not lead to phenotypic differences in K/BxN serum-induced inflammatory arthritis, though selective modulation of pro-inflammatory cytokine gene expression in vivo does occur. Decreased gene expression of FoxP3 and fewer CD4+CD25+FoxP3+ cells in RBP-J deleted mice may contribute to this selective modulation. The functional significance of these findings, coupled with differences in myeloid cell composition and trafficking observed, remain undefined and will be further studied.

**Disclosure:** S. D. Chakravarty, None; K. Au, None; X. Hu, None; L. B. Iwashki, None.

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**900**

**Deletion of RBP-J in a Murine Model of Inflammatory Arthritis Reveals Differential Pro-Inflammatory Cytokine and FoxP3 Gene Expression.** Soumya D. Chakravarty, Karmen Au, Xiaoyu Hu and Lionel B. Iwashkiv. Hospital for Special Surgery, New York, NY

**Background/ Purpose:** The DNA-binding protein RBP-J serves as the DNA-binding protein necessary for transcription of Notch target genes. RBP-J-dependent suppression of effector T cells noted in vivo, with augmented proliferation and function of effector T cells noted in vivo, raising the possibility that dysregulation in the frequency or function of regulatory T cells may contribute to RBP-J’s selective modulation of pro-inflammatory mediators. Here, we evaluated the in vivo effects of RBP-J’s conditional deletion in the myeloid cell compartment on pro-inflammatory cytokine expression, as well as lymphoid tissue immuneocyte composition, using a K/BxN serum transfer model of inflammatory arthritis.

**Methods:** RBP-Jflox/flox Ly5-M-Cre knock-out (KO) mice with littermate RBP-Jflox/flox Ly5-M-Cre controls (n = 5 for each group) were used. After treatment with K/BxN serum, the clinical course of arthritis was followed by measuring total joint thickness up to 14 days, at which point the mice were sacrificed. Total joint RNA from each mouse was obtained for gene expression analyses by qPCR. Spleen tissue was harvested from each mouse for gene expression analyses by qPCR, as well as pooled collectively for each group for immunophenotyping through flow cytometry. The latter was also done for superficial inguinal and draining popliteal lymph node (LN) tissue. Statistical analysis was done using the unpaired student’s t-test with p < 0.05 considered significant.

**Results:** Preliminary findings showed no significant difference in clinical phenotype of K/BxN serum-induced arthritis between KO and control mice. Gene expression profiling of whole joint tissue showed decreases in TNFa, IL-6, IFN-γ expression, as well as selective Notch target gene expression, while maintaining comparable IL-1, CXCL10, and IL-12p40 levels. Surprisingly, expression levels of FoxP3 in KO mice vs. controls were significantly decreased in both joint and splenic tissue (p = 0.0244 and p = 0.0286, respectively). Immunophenotyping of splenic and LN tissue showed increased proportions of total CD4+ T cells in KO mice vs. controls, but a markedly lower proportion of the CD4+CD25+FoxP3+ subset. Lower proportions of F4/80+ and Ly6G+ cell populations in splenic and draining LN tissue of KO mice vs. controls, but higher populations of Ly6C+ cells, were also significantly decreased.

**Conclusion:** Deletion of RBP-J in the myeloid compartment does not lead to phenotypic differences in K/BxN serum-induced inflammatory arthritis, though selective modulation of pro-inflammatory cytokine gene expression in vivo does occur. Decreased gene expression of FoxP3 and fewer CD4+CD25+FoxP3+ cells in RBP-J deleted mice may contribute to this selective modulation. The functional significance of these findings, coupled with differences in myeloid cell composition and trafficking observed, remain undefined and will be further studied.

**Disclosure:** S. D. Chakravarty, None; K. Au, None; X. Hu, None; L. B. Iwashki, None.
expression was significantly upregulated in macrophages differentiated in M-CSF compared to IL-34, while CXCL7, CXCL9, CXCL10, CXCL11, CXCL12, LAMA1, and MMP2 were significantly downregulated. M-CSF or IL-34 had no effect on RA synovial explant IL-6 production, but anti-CSF1R Ab dose-dependently reduced IL-6 production. Treatment with anti-CSF1R Ab in CIA significantly reduced paw swelling and joint destruction.

**Conclusion:** M-CSF and IL-34 are expressed in topographically distinct regions of inflamed synovial tissue and differentially affect macrophage capacity to attract inflammatory cells and remodel tissue. Simultaneous inhibition of CSF1R interactions with both M-CSF and IL-34 suppresses inflammatory activation of RA synovial tissue and pathology in CIA, suggesting a novel therapeutic strategy for the treatment of RA.


**902**

**Activation of NF-Kb Via Poly(I:C)-Induced Monocyte-Derived Microparticles Decreases TRAIL-Induced Apoptosis of Rheumatoid Arthritis Synovial Fibroblasts.** Mojca Frank Bertoncej1, Blaz Rozman2, Beat A. Michel3, Renate E. Gay1, David S. Psisetsky4, Oliver Distler5, Steffen Gay6, L. Long1, K. A. Reedquist1, Stefan Uderhardt1, Georg A. Schett2 and Gerhard Kronke3.

**Center of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHP), Zurich, Switzerland, 2Department of Rheumatology and Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland, 3Department of Rheumatology, University Medical Center Ljubljana, Ljubljana, Slovenia, 4Department of Rheumatology, University Hospital Zurich, Zurich, Switzerland, 5Duke University Medical Center, Durham, NC, 6Department of Rheumatology and Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland, 6Center of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHP), Zurich, CH-8091, Switzerland

**Background/Purpose:** Decreased sensitivity of rheumatoid arthritis (RA) synovial fibroblasts (SF) to apoptosis leads to synovial hyperplasia and destruction of joints in RA. Activation of NF-kb was shown to modulate apoptotic pathways in different target cells. Based on our recent finding that microparticles (MP) from monocytes, stimulated with Toll-like receptor 3 ligand Poly(I:C) (PIC), increase the resistance of RASF to TRAIL-induced apoptosis and enhance the production of NF-kb-dependent cytokines IL-6 and IL-8, the aim of the present study was to examine the role of NF-kb signaling in the resistance of RASF to TRAIL-induced apoptosis mediated via MP.

**Methods:** MP were isolated by differential centrifugation from supernatants of untreated or PIC-stimulated (16h) U937 cells or peripheral blood mononuclear cells (PBMC) and were analysed by nanoparticle tracking analysis (DropletTRACER, Ossila), flow cytometry and BCA Protein Assay. RASF were treated with MP±TRAIL for 24h. To investigate direct effects of PIC on the apoptosis, RASF were stimulated with PIC±TRAIL for 24h. Apoptosis of RASF was measured by flow cytometry using Annexin V/propropidium iodide staining. SC-514, a selective inhibitor of IkB kinase 2, was used to test the role of NF-kb signaling in MP actions in RASF. NF-kb activity was determined by luciferase reporter gene assay in RASF treated with MP for 6h.

**Results:** PIC-induced MP, but not MP from untreated U937 cells, significantly decreased TRAIL-induced apoptosis of RASF (9±2% vs TRAIL: 18±6%, p=0.003, n=8), and similar effects were observed with PIC-induced MP derived from PBMC (18±27% vs 35±27%, n=3). In contrast, a direct stimulation with PIC alone significantly increased apoptosis of RASF (11±5.4% vs 6.5% in untreated RASF, p=0.03, n=6), however it did not affect TRAIL-induced apoptosis of RASF. Number (MP from untreated cells: 3.0±10^5/mL vs PIC-induced MP: 3.1±10^5/mL; n=2 each), size (median diameter 207 vs 199nm, n=2 each), surface annexin V binding (66±10% vs 63 ± 9%, n=3 each) and total protein content (330±50 vs 325±38 ng/mL, n=3 each) did not differ significantly between MP from untreated and PIC-stimulated U937 cells. SC-514 significantly increased TRAIL-induced apoptosis of RASF in the presence of PIC-induced MP (20±3% vs 9±3% in the absence of SC-514, p=0.002, n=8). PIC-induced MP from U937 cells led to activation of NF-kb signaling in RASF (median fold-change: 11 untreated RASF, 3.0 in PIC-induced MP). PIC-induced MP from U937 cells also induced activation of NF-kb signaling (median fold-change: 11 untreated RASF, 3.0 in PIC-induced MP).

**Conclusion:** Most interestingly, we could show that the activation of NF-kb plays a major role in the resistance of RASF to TRAIL-induced apoptosis mediated via PIC-induced MP. This observed effect may reflect a specific composition of PIC-induced MP. Alternatively, the effects of MP could result from small amounts of PIC associated with MP although its activity would differ from that in the free state.

**Disclosure:** M. Frank Bertoncej, Articium, Masterswitch-FP7, BMI BT cure, IAR, 2; B. Rozman, None; B. A. Michel, None; R. E. Gay, Masterswitch-FP7, 2; D. S. Psisetsky, Pfizer Inc, 5, Bio-Rad, 5; O. Distler, Actelion, Pfizer, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrum, Boehringer Ingelheim Pharma, Novartis, 4 D Science, Bayer, and Active Biotec, 2; S. Gay, IAR, 2; A. Juengel, IAR, Masterswitch-FP7, BMI BT cure, 2.

**903**

**NR4A1 Mediates Anti-Inflammatory Effects of Apoptotic Cells.** Natacha Ipseiz1, Stefan Uderhardt1, Georg A. Schett2 and Gerhard Kronke3.

**1University of Erlangen, Erlangen, Germany, 2Department of Internal Medicine III and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

**Background/ Purpose:** The nuclear receptor NR4A1 has been implicated as negative feedback regulator of NF kappa B signalling and as key regulator during the differentiation of Ly6C-low resident monocytes. Apoptotic cells are known to exert anti-inflammatory effects on macrophages but the underlying mechanisms are still poorly understood. Here we studied a potential role of NR4A1 as mediator of the macrophage response to apoptotic cells.

**Methods:** We analysed the effect of apoptotic thymocytes on wild type and NR4A1−/− peritoneal resident macrophages, and determined the consequences on intracellular signalling, gene expression and cytokine profile. Moreover, we examined the consequences of the lack of NR4A1 during maintenance of self tolerance by using the pristine-induced model of murine systemic lupus erythematosus.

**Results:** Expression of NR4A1 was rapidly and highly induced in resident macrophages after incubation with apoptotic thymocytes. NR4A1−/− resident macrophages showed an exacerbated pro-inflammatory profile as well as an increased activity of NF-kB. Moreover, the anti-inflammatory effects of apoptotic cells were reduced in NR4A1−/− macrophages. In the pristine model of murine lupus, NR4A1−/− mice displayed increased levels of autoantibodies such as ds-DNA antibodies.

**Conclusion:** Our data show for the first time that NR4A1 is an important mediator of the anti-inflammatory effects of apoptotic cells in tissue resident macrophages and thereby contributes to the maintenance of self-tolerance.

**Disclosure:** N. Ipseiz, None; S. Uderhardt, None; G. A. Schett, None; G. Kronke, None.

**ACR/ARHP Poster Session B**

**Epidemiology and Health Services Research: Epidemiology and Outcomes of Rheumatic Disease II**

Monday, November 12, 2012, 9:00 AM–6:00 PM

**904**

**Perinatal Characteristics, Maternal Reproductive History and Juvenile Idiopathic Arthritis: A Case-Control Study.** Samantha W. Bell1, Beth A. Mueller2, J. Lee Nelson2, Parveen Bhatti3 and Susan Shenot4.

**1University of Washington, Seattle, WA, 2Fred Hutchinson Cancer Resc, Seattle, WA, 3Seattle Children’s Hospital, University of Washington, Seattle, WA

**Background/ Purpose:** Juvenile Idiopathic Arthritis (JIA) is a heterogeneous group of chronic inflammatory arthritis conditions in children with onset before 16 years of age, and is the leading cause of acquired short and long-term disability in childhood. The etiology of JIA is largely unknown, however there is increasing evidence that autoimmune diseases, including JIA, may be associated with maternal reproductive or early childhood exposures.

**Methods:** We conducted a case-control study of JIA cases identified at a regional children’s hospital in the Seattle-Puget Sound area, using linked birth certificate data from 1980 – 2009. Potential cases included all children <20 years with relevant ICD codes who had received inpatient or outpatient care. Their records were linked to Washington State birth records for 1980–2009 to identify those with a Washington State birth certificate (N=1,518). For comparison, control children were randomly selected in a ratio of 4:1 from the remaining birth records, frequency matched on year of birth (N=6,072). Review of medical records further refined case ascertainment based on
specific clinical criteria (N=1,254) and allowed categorization of cases into JIA subtypes. Multivariable logistic regression was used to estimate adjusted odds ratios (OR) and 95% confidence intervals (CI) for the associations of JIA/JIA subtypes with maternal and early life exposures as measured in the birth certificates.

Results: Decreased ORs were observed for JIA in relation to greater maternal parity (2 prior live births; OR 0.70, 95% CI 0.58, 0.85; 4+ prior live births; OR 0.80, 95% CI 0.48, 0.97), a finding also observed for the persistent oligoarthritis JIA subtype. Fewer cases (11.4%) than controls (13.3%) had a birth weight >4000 g (OR 0.81, 95% CI 0.67, 0.98). Mothers of cases (52.2%) were slightly more likely than those of controls (41.1%) to have had preclampsia during their pregnancy (OR 1.29, 95% CI 0.96, 1.73).

Conclusion: To our knowledge, no studies to date in the United States have knowledgeable these exposures in relation to JIA. Greater maternal parity, specifically having 2 or more prior live births, was significantly associated with a decreased OR for JIA, finding consistent with both the hygiene and microchimerism hypotheses.

Disclosure: S. W. Bell; None; B. A. Mueller; None; J. L. Nelson; None; P. Bhatti; None; S. Shenoi; None.

905

The Association Between Lower Body Mass Index and Increased Risk of Giant Cell Arteritis Is Not Explained by Differences in Physical Activity. Karin Jakobsson1, Lennart T.H. Jacobsson1, Kenneth J. Warrington2, Eric L. Matteson3, Kimberly P. Liang4, Olle Melander5 and Carl Turesson1, 1Lund University, Malmö, Sweden, 2Mayo Clinic, Rochester, MN, 3University of Pittsburgh, Pittsburgh, PA

Background/Purpose: There is limited data on predictors of giant cell arteritis (GCA). Low body mass index (BMI), a history of smoking and several hormonal factors have been associated with GCA in a retrospective case-control study, and we have confirmed the association with low BMI in a prospective study. Potential explanations for the association between BMI and GCA include a difference in the level of physical activity. To our knowledge, the impact of physical activity on the risk of GCA has not been studied previously.

Our purpose was to examine potential influence of physical activity as a risk factor of GCA in a nested case-control study based on a prospective health survey.

Methods: Incident cases of GCA among participants in a population based health survey, in which 30,447 subject (12,121 men and 18,326 women) were included between 1991 and 1996, were used for the present study. As part of the health survey, information on medical history and life style factors was obtained using standard physical examinations and self-administered questionnaires. Information on physical activity were obtained by asking participants to estimate the number of minutes per week, for each of the four seasons of the year, they spent performing 17 different physical activities. The answer was multiplied by an intensity factor depending on the activity creating a physical activity score. This method was adapted from the Minnesota physical activity questionnaire, and has been validated against accelerometer-monitoring, an objective measure of physical activity, in a subset of the present health survey population.

Individuals who developed GCA after inclusion was identified by linking the health survey database to the local patient administrative register and the national hospital discharge register. A structured review of the medical records of all identified cases was performed. Four controls for each validated case, matched for sex, year of birth and year of screening, who were alive and free of GCA when the index person was diagnosed with GCA, were selected and GCA, include a difference in the level of physical activity. To our knowledge, the impact of physical activity on the risk of GCA has not been studied previously.

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Individuals who developed GCA after inclusion was identified by linking the health survey database to the local patient administrative register and the national hospital discharge register. A structured review of the medical records of all identified cases was performed. Four controls for each validated case, matched for sex, year of birth and year of screening, who were alive and free of GCA when the index person was diagnosed with GCA, were selected and matched in controls (mean 24.7 vs 26.1 kg/m2). There was no association found between level of physical activity and development of GCA (mean score in cases and controls: 8349 vs 8134; p=0.95). The association between higher BMI and reduced risk of GCA was similar in bivariate analysis (OR 0.91 per kg/m2; 95% CI 0.84–0.99) and in multivariate analysis adjusted for physical activity (OR 0.92 per kg/m2; 95% CI 0.84–1.00).

Conclusion: GCA was predicted by a lower BMI, and this could not be explained by the level of physical activity at baseline. Physical activity did not influence the risk of GCA. Other factors, such as diet, genetics or hormonal factors, may explain the association between low BMI and GCA.

Disclosure: K. Jakobsson; None; L. T. H. Jacobsson; None; K. J. Warrington; None; E. L. Matteson; None; K. P. Liang; None; O. Melander; None; C. Turesson; None.

906

Patient-Rheumatologist Communication Concerning Medication and Disease Risks. Susan J. Blalock. University of North Carolina at Chapel Hill, Chapel Hill, NC

Background/Purpose: Medications play an important role in the management of rheumatoid arthritis. Principles of informed consent, informed and shared decision-making, and professional ethics highlight the importance of patients’ understanding both the risks and benefits of different treatment options. Thus, the work described in this presentation is designed to increase current understanding of patient-rheumatologist communication about the risks associated with medications used to manage rheumatoid arthritis.

Methods: We are content analyzing approximately 1000 audiotapes of rheumatoid arthritis patient-rheumatologist office visits that were collected in a previous study. The current study is guided by fuzzy-trace theory. This theory suggests that when an individual is exposed to information (e.g., a statement made by one’s physician) two representations of the information are encoded: a verbatim representation and a gist representation. Verbatim representations capture the precise information that was provided; whereas, gist representations reflect the essential meaning of the information to the person, including its emotional meaning. A central tenet of fuzzy-trace theory is that, when making judgments and decisions, people tend to rely on gist representations that are stored in memory and retrieve verbatim representations only when required by the task at hand. Thus, using fuzzy-trace theory as a guiding framework, we have developed a detailed 2-level coding scheme that captures the types of information concerning medication and disease risks that may be exchanged between patients and rheumatologists during office visits.

Results: A total of 3,588 medication risks were identified in the transcripts. The most common medication risks were: methotrexate-GI problems (n=219); methotrexate-mouth/nose sores (n=190); methotrexate-need to monitor, but labs not specified (n=167); methotrexate-liver toxicity (n=141); methotrexate-pulmonary problems (n=109); and prednisone-implied risks by decoded in memory, a verbatim representation and a gist representation. An average of 3.87 medication risks were discussed per office visit. Lower patient medication satisfaction was associated with: discussion of more medication risks (p<0.03), patient and physician expression of medication safety concerns (p<0.05 and 0.0001, respectively) and lack of patient and physician endorsement of medication need/efficacy (p<0.0001 and 0.03, respectively).

Conclusion: By examining the manner in which medication and disease risks are discussed in combination, the findings from this study promise to provide a richer understanding of the risk communication that takes place during rheumatology office visits.

Disclosure: S. J. Blalock; None.

907

Use of Patient Preferences to Inform the Development of Disease Modifying Drugs for Osteoarthritis. Liana Fraenkel1, Charles Cunningham2, Gillian A. Hawker3, and Lisa G. Suter4. 1Yale University School of Medicine, Veterans Affairs Connecticut Healthcare System, New Haven, CT, 2McMaster University, Hamilton, ON, 3Women’s College Research Institute, University of Toronto, Toronto, ON, 4Yale University, New Haven, CT

Background/Purpose: Considerable efforts are currently being directed at developing robust and efficient trial designs to study the efficacy of disease modifying drugs (DMOADs) for osteoarthritis (OA). As part of this effort, an understanding of patients’ preferences is needed.

Methods: We administered a conjoint analysis survey to a convenience sample of 304 patients attending outpatient clinics. The survey was composed of 4 attributes each having 3 levels: (1) administration (pill, injection (SC), infusion (IV)), (2) benefit (prevents progression in 40%, 60%, or 80%), (3) risk (mild: < 1 week and reversible, moderate: 1–2 weeks and requires treatment, serious: requires hospitalization), and (4) cost (easy, somewhat, hard to afford). All subjects were provided with a detailed description of each attribute before performing the survey. The survey included 12 choice tasks each with 3 medications and a “None” option (Figure). We performed Latent Class Segmentation analysis and simulations to estimate preferences for 4
options: Best Case (pill, prevents progression in 80%, mild side effects, easy to afford), Worst Case (IV, prevents progression in 40%, serious side effects, hard to afford), SC (SC, prevents progression in 40%, moderate risk, somewhat hard to afford), IV (same as previous except IV).

**Results:** 304 subjects participated; median (range) age=57 (34–89); 55% female; 69% Caucasian, 45% employed; 37% college graduates; 29% reported knee pain often or very often; 30% reported physician diagnosed knee arthritis. Segmentation analysis revealed 4 distinct groups of patients. The relative importances of the attributes are presented in Table 1. Treatment preferences are described in Table 2. Group 1 (5%) do not want to perform injections and only consider DMOADs under the Best Case scenario; Group 2 (19.4%) are most influenced by risk and fewer prefer DMOADs under more realistic scenarios; Group 3 (16.4%) consistently reject DMOADs, and Group 4 (59.2%) strongly prefer DMOADs regardless of risk or cost.

If these were your only options, which would you choose? Choose by marking one of the buttons below:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Group 1 (N=15)</th>
<th>Group 2 (N=59)</th>
<th>Group 3 (N=50)</th>
<th>Group 4 (N=180)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>11.5</td>
<td>11.8</td>
<td>2.9</td>
</tr>
<tr>
<td>2. Benefit</td>
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<td>22.9</td>
<td>27.5</td>
<td>50.6</td>
</tr>
<tr>
<td>3. Risk</td>
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<td>35.7</td>
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<tr>
<td>4. Cost</td>
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<td>29.8</td>
<td>32.2</td>
<td>22.1</td>
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</table>

**Table 2. Percent Preferring Each Hypothetical Treatment Option**

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<tr>
<th>Scenario</th>
<th>Best Case</th>
<th>Worst Case</th>
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<th>IV</th>
</tr>
</thead>
<tbody>
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<td>0.7</td>
<td>5.3</td>
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<tr>
<td>Group 2 (N=59)</td>
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<td>4.4</td>
<td>67.2</td>
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<tr>
<td>Group 3 (N=50)</td>
<td>18.4</td>
<td>7.6</td>
<td>12.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Group 4 (N=180)</td>
<td>89.8</td>
<td>85.4</td>
<td>86.3</td>
<td>86.1</td>
</tr>
</tbody>
</table>

**Conclusion:** Almost 60% of patients surveyed are willing to accept substantial risk in order to prevent progression of OA. These findings should help inform future drug development.

**Disclosure:** L. Frencken, None; C. Cunningham, None; G. A. Hawker, None; L. G. Suter, None.

909

**Determinants of Patient Preferences for Total Knee Replacement: A Comparison of Whites and African-Americans.** C. Kent Kwoh1, Robert M. Boudreau2, Yona Cloonan2, Said Ibrahim3, Michael J. Hannon3, Ernest R. Vina2, and Said Ibrahim4. 1University of Pittsburgh and VA Healthcare System, Pittsburgh, PA; 2University of Pittsburgh, Pittsburgh, PA; 3University of Pennsylvania Perelman School of Medicine, Philadelphia, PA; 4University of Pittsburgh School of Medicine, Pittsburgh, PA

**Background/Purpose:** TKR is a cost-effective treatment option for end-stage knee osteoarthritis (OA). Although it is one of the fastest growing elective surgeries, there are marked racial disparities in the utilization of TKR. Patient’s preferences have been found to be an important consideration in TKR disparities. However, determinants of patients’ preference regarding TKR remain unclear. We sought to identify whether determinants of patients’ preference for TKR differ by race.

**Methods:** Our sample consisted of 514 whites (59% female) and 285 AAs (73% female) with chronic, frequent knee pain and radiographic evidence of knee osteoarthritis (OA). Structured interviews were conducted to collect sociodemographic information, socio-cultural determinants, disease severity (i.e., WOMAC), and treatment preferences. We performed hierarchical logistic regression, stratified by race, to identify determinants of patients’ preference for TKR. Clinical and socio-cultural factors were entered simultaneously into race stratified models. Stepwise selection identified factors for inclusion in the final models, using a criterion of p<0.20. All models were adjusted for age, sex, income level, disease severity (WOMAC), and study site.

**Results:** Among AA participants, 22.8% were married, as compared with 33.5% of white participants (p<0.001). The mean numbers of close friends/relatives reported by AA and white patients were 7.52 ± 8.88 and 10.31 ± 13.13, respectively (p<0.001). Half of AA patients reported living alone, as compared with 33.5% of white patients (p<0.001). MOS-SSS scores were lower in AA (13.44 ± 5.26) as compared with white (15.17 ± 4.79) participants (p<0.001). Compared to white patients with knee OA, AA patients with knee OA were less willing to undergo TKR surgery (80.0% vs. 62.4%, p<0.001).

The odds of willingness to undergo TKR surgery was less in white females compared to white males when adjusted for recruitment site, age, income and WOMAC score (OR 0.57, 95% CI 0.34–0.96), but this difference was no longer significant when further adjusted for marital status, number of close friends/relatives and MOS-SSS score (OR 0.60, 95% CI 0.35–1.02). The odds of willingness to undergo TKR surgery was also less in AA females (OR 0.33, 95% CI 0.18–0.60) and AA males (OR 0.26, 95% CI 0.13–0.52) compared to white males when adjusted for sociodemographic and clinical factors. These differences in odds remained significant when further adjusted for all social support measures (OR 0.35, 95% CI 0.19–0.64, in AA females; OR 0.28, 95% CI 0.14–0.54, in AA males).

**Conclusion:** We found lower preference for TKR surgery in AA compared to white patients with knee OA. AA patients also reported less structural and functional social support than white patients. There was a race and gender interaction in patient preferences for TKR surgery. In white patients, social support accounted for the gender difference in willingness to consider TKR. Social support, though, did not mediate the racial difference in patient preferences for TKR.

**Disclosure:** E. R. Vina; None; Y. Cloonan; None; S. Ibrahim; None; M. J. Hannon; None; R. M. Boudreau; None; C. K. Kwoh, AstraZeneca, 2, Beverage Institute, 2.
OR for Willingness to Undergo TKR

<table>
<thead>
<tr>
<th>Knowledge Regarding TKR</th>
<th>Whites OR (95% CI)*</th>
<th>Whites OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understands TKR</td>
<td>1.80 (0.97, 3.35)</td>
<td>1.80 (0.97, 3.35)</td>
</tr>
<tr>
<td>Prolonged Length of Stay After TKR</td>
<td>0.81 (0.58, 1.13)</td>
<td>0.81 (0.58, 1.13)</td>
</tr>
<tr>
<td>Residual Pain After TKR</td>
<td>0.73 (0.39, 1.35)</td>
<td>0.73 (0.39, 1.35)</td>
</tr>
<tr>
<td>Residual Difficulty Walking After TKR</td>
<td>0.66 (0.37, 1.16)</td>
<td>0.66 (0.37, 1.16)</td>
</tr>
<tr>
<td>Ever Discuss TKR with a physician</td>
<td>1.96 (1.05, 3.68)</td>
<td>1.96 (1.05, 3.68)</td>
</tr>
<tr>
<td>Referred to Surgeon</td>
<td>0.56 (0.32, 0.99)</td>
<td>0.56 (0.32, 0.99)</td>
</tr>
</tbody>
</table>

Expectations Regarding TKR**

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Whites OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>1.85 (0.76, 4.51)</td>
</tr>
<tr>
<td>Third</td>
<td>2.82 (1.30, 6.15)</td>
</tr>
<tr>
<td>Highest</td>
<td>2.08 (0.91, 4.79)</td>
</tr>
</tbody>
</table>

Religiosity**

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Whites OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>2.52 (0.93, 4.84)</td>
</tr>
<tr>
<td>Third</td>
<td>2.12 (0.43, 3.42)</td>
</tr>
<tr>
<td>Highest</td>
<td>0.85 (0.32, 2.26)</td>
</tr>
</tbody>
</table>

Trust in Healthcare System**

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Whites OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>2.69 (1.26, 5.76)</td>
</tr>
<tr>
<td>Third</td>
<td>1.94 (0.91, 4.13)</td>
</tr>
<tr>
<td>Highest</td>
<td>1.58 (0.75, 3.31)</td>
</tr>
</tbody>
</table>

* adjusted for sex, age, income level, WOMAC and site; ** Lowest Quartile is reference group.

Conclusion: Although expectations regarding surgical outcomes are associated with preference for TKR in both AA and white patients, they differed with regard to which other clinical and socio-cultural determinants impact the preference to undergo TKR. Interventions to reduce or eliminate racial disparities in the utilization of TKR should consider and target these factors.

Disclosure: C. K. Kwoh, AstraZeneca, 2, Beverage Institute, 2; R. M. Boudreaux, None; Y. Chouan, None; M. J. Hannon, None; E. R. Vina, None; S. Ibrahim, None.

910
The Cost-Effectiveness of Total Joint Arthroplasty: A Systematic Review of Published Literature. Meghan E. Daigle, Alexander M. Weinstein, Jeffrey N. Katz and Elena Losina, Brigham and Women’s Hospital, Boston, MA

Background/Purpose: Utilization of total hip arthroplasty (THA) and total knee arthroplasty (TKA) has nearly doubled in the last decade. These procedures are increasingly performed in younger, more active individuals. We sought to summarize the state of the literature evaluating the cost-effectiveness of these highly efficacious, costly procedures and identify areas where further work is needed.

Methods: We conducted a systematic review of cost-effectiveness analyses of elective THA and TKA that were published between January 1980 and February 2012. To limit our search to high-quality publications, we selected among papers included in the Cost-Effectiveness Analysis Registry (created by the Center for the Evaluation of Value and Risk in Health); we augmented our search with papers listed in PubMed. Only papers reporting incremental cost-effectiveness ratios (ICERs) as the change in cost over the change in quality-adjusted life expectancy between alternative treatment strategies were included. We abstracted the analysis perspective, time horizon, and ICERs (converted to 2011 USD) from the selected papers.

Results: Seven TKA and six THA studies met the criteria for our review. All economic evaluations of TKA were published between 2006 and 2012, whereas THA studies spanned 1996 to 2008. Out of the 13 included studies, four assumed the societal perspective, eight the payer perspective, and in one study the perspective was unclear. Seven studies spanned the lifetime horizon. Studies of both THA and TKA that have assumed a societal perspective and lifetime horizon have estimated ICERs below $50,000/Quality-Adjusted Life Year (QALY) in cohorts with mean age 69 years or older. Hip resurfacing has been shown to be dominated by THA (more costly, less effective) in a cohort aged 65 years and younger. Unciondylar knee arthroplasty (UKA) has been shown to be cost effective or cost-saving among cohorts of mean age 65–75 years.

Comparison* Paper Perspective ICER ($/QALY: 2011 USD) Time Horizon

Total Hip Arthroplasty

<table>
<thead>
<tr>
<th>Comparison*</th>
<th>Paper</th>
<th>Perspective</th>
<th>ICER ($/QALY: 2011 USD)</th>
<th>Time Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>THA vs. No Surgery</td>
<td>Chang 1996</td>
<td>Societal</td>
<td>$10,402</td>
<td>Lifetime</td>
</tr>
<tr>
<td>Improved Implant (reduced revision rate, increased cost) vs. Standard Implant</td>
<td>Briggs 1998</td>
<td>Payer</td>
<td>$17,671</td>
<td>Lifetime</td>
</tr>
</tbody>
</table>

THA vs. Hip Resurfacing

<table>
<thead>
<tr>
<th>Comparison*</th>
<th>Paper</th>
<th>Perspective</th>
<th>ICER ($/QALY: 2011 USD)</th>
<th>Time Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>THA vs. Hip Resurfacing</td>
<td>Bozic 2006</td>
<td>Not clear</td>
<td>cost saving</td>
<td>60 yrs</td>
</tr>
<tr>
<td>Cementless vs. Ceramic</td>
<td>McKenzie 2003</td>
<td>Payer</td>
<td>THA dominates</td>
<td>20 yrs</td>
</tr>
</tbody>
</table>

Total Knee Arthroplasty

<table>
<thead>
<tr>
<th>Comparison*</th>
<th>Paper</th>
<th>Perspective</th>
<th>ICER ($/QALY: 2011 USD)</th>
<th>Time Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery vs. TKA</td>
<td>Novak 2007</td>
<td>Payer</td>
<td>$54,234</td>
<td>15 yrs</td>
</tr>
<tr>
<td>UKA vs. TKA</td>
<td>Slover 2006</td>
<td>Payer</td>
<td>cost saving</td>
<td>Lifetime</td>
</tr>
<tr>
<td>Cementless vs. Ceramic</td>
<td>Xie 2010</td>
<td>Societal</td>
<td>$71,731</td>
<td>2 yrs</td>
</tr>
<tr>
<td>TKA vs. UKA</td>
<td>Losina 2009</td>
<td>Societal</td>
<td>$11,548</td>
<td>Lifetime</td>
</tr>
<tr>
<td>TKA vs. No Surgery</td>
<td>Dabin 2012</td>
<td>Payer</td>
<td>$12,566</td>
<td>5 yrs</td>
</tr>
</tbody>
</table>

*The first strategy listed is the primary intervention studied, and the second strategy is the reference comparator; that is, ICERs refer to the cost-effectiveness of the first treatment option listed.

Conclusion: THA and TKA have been found to be highly cost-effective in a number of high-quality studies. Further analyses of the cost-effectiveness of alternative surgical options, including knee osteotomy, among young individuals are needed. Future economic evaluations should address the expanding indications of THA and TKA to younger, more physically active individuals.

Disclosure: M. E. Daigle, None; A. M. Weinstein, None; J. N. Katz, None; E. Losina, None.

911
Race- and Sex-Specific Estimates of 10-, 20-, 30-Year, and Lifetime Risk of Diagnosed Symptomatic Knee Osteoarthritis and the Need for TKR in the US. Elena Losina, Meghan E. Daigle, Sara A. Burbine and Jeffrey N. Katz, Brigham and Women’s Hospital, Boston, MA

Background/Purpose: A growing body of evidence suggests that females are more likely to be diagnosed with knee osteoarthritis (OA) and that obesity increases the risk of knee OA. Population-based studies suggest that Black and Hispanic females have a greater likelihood of being obese than White females. Sex- and race/ethnicity-specific risks of diagnosed symptomatic knee OA and the need for TKR have not been estimated.

Methods: We combined the OAPol Model – a validated state-transition, computer simulation model – with published data on the incidence of OA, stratified by sex and obesity. Obesity prevalence, stratified by sex and race/ethnicity, was derived from published literature and ranged from 19% for White males to 34% for Black females. The increased risk of symptomatic knee OA conferred by obesity was derived from published studies (RR = 1.7). Rates of progression of knee OA were derived from the Johnston County Osteoarthritis Project and calibrated to published data. The annual incidence of TKR among persons with advanced knee OA (Kellgren-Lawrence grade 3 or 4) was derived using data from two national longitudinal studies of persons with knee OA (Multicenter Osteoarthritis Study and Osteoarthritis Initiative). Input parameters related to mortality, obesity, comorbidities, non-surgical OA treatments, and implant failure were obtained from national survey data and published literature. Using the OAPol Model we estimated the 10-year, 20-year, 30-year and lifetime risks of diagnosed symptomatic knee OA and TKR from age 40, stratified by race and sex.

Results: In persons free of knee OA at age 40, the lifetime risk of diagnosed symptomatic knee OA ranged from 10% among White males to 17% among Black females (Figure). The 20-year risk of diagnosed symptomatic knee OA ranged from about 6% in males (race/ethnicity did not affect the rate meaningfully) to 8% in Black females. By age 65, 11.3%, 10.5%, and 10% of Black, Hispanic, and White females, free of knee OA at age 40, will be diagnosed with symptomatic knee OA (Figure). Lifetime need for TKR ranged from 3.8% for Hispanic males to 6.8% for Black females.
Conclusion: Lifetime risk of diagnosed symptomatic knee OA varies by age and race/ethnicity. Black females are more likely to be obese, which corresponds with their having the greatest lifetime risk of being diagnosed with knee OA and needing TKR. Race- and sex-tailored weight management programs may reduce the lifetime risk of knee OA.

Disclosure: E. Losina, None; M. E. Daigle, None; S. A. Burbine, None; J. N. Katz, None.

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Clinical Features Associated with Progression of Knee Radiographic Osteoarthritis: Data From the Osteoarthritis Initiative. Michelle S. Yau1, Laura Yerges-Armstrong1, Braxton D. Mitchell1 and Marc C. Hochberg2.
1University of Maryland School of Medicine, Baltimore, MD, 2University of Maryland, Baltimore, MD

Background/Purpose: A better understanding of the factors associated with structural progression of knee osteoarthritis (OA) may help identify individuals not only at risk for more rapid OA progression who can benefit from early intervention, but also help classify high-risk OA patients for inclusion in clinical trials of new treatments. Using the complete 4-year follow-up data from the Osteoarthritis Initiative (OAI), we tested baseline measures from six domains [1) knee examination, 2) anthropometric characteristics, 3) sociodemographic characteristics, 4) medical and family history, 5) physical functioning, and 6) self-reported pain and symptoms] for their association with radiographic knee OA (RKOA) progression.

Methods: Subjects with evidence of RKOA in one or both knees at baseline and with at least 1 follow-up exam over the 4-year period (n = 3,204) were eligible for analysis; knees with end-stage disease were excluded from the analysis. We defined RKOA progression as an increase in Kellgren-Lawrence (KL) grade or osteophyte score or joint space narrowing score. We used Cox regression models to test the association of individual level measures with RKOA progression, adjusting for age, gender, and race. Within each of the six domains, we performed univariate and multivariable stepwise analyses. Significant predictors from all domain-level multivariable models were then included in an overall multivariable analysis with stepwise selection. We also conducted knee-specific analyses with the same approach, but included a robust sandwich estimate of the covariance matrix to account for non-independence of two knees within an individual.

Results: 51% of subjects with baseline RKOA (KL grade 1–3) experienced RKOA progression in one or both knees. Progressors were 58% female, 19% Black, and had mean (SD) age of 61 (9) years and mean body mass index of 29.5 (5) kg/m². Subjects with no RKOA progression had a similar profile. In the multivariable model for each domain, the following baseline factors were found to be significantly associated with RKOA progression: knee joint effusion, pain on flexion, patellofemoral crepitus, patellar grind, and flexion contracture; number of hand bony enlargements, history of knee injury, and use of analgesics; repeated chair stand pace, 400-meter walk pace, and pain during 400-meter walk; KOOS sports and recreational activities score and KOOS symptoms score. Similar results were obtained with the knee-specific analyses with the additional significant finding of KOOS pain score. Final, overall multivariable models for the individual and knee-specific analyses are presented in Table 1.

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1Department of Orthopedics, Clinical Sciences Lund, Lund University, Lund, Sweden, 2Division of Occupational and Environmental Medicine, Lund University, Lund, Sweden

Background/Purpose: To estimate the prevalence of subjects with osteoarthritis (OA) having led to doctor consultation.

Methods: The Skåne Health Care Register (SHCR) is a legislative, mandatory register based on physicians’ International Classification of Diseases (ICD) 10 diagnostic codes. The register covers all in- and outpatient health care in southern Sweden (total population 1.3 million). We identified all adult (20 years of age or older) patients having received the diagnosis of knee OA (ICD-10: M17), hip OA (M16), hand OA (M15.1, M15.2, M18, M19.0D, M19.1D, M19.2D, M19.9), spine OA (M47) and OA in other locations, i.e., elbow, foot, shoulder, or other joints, during the years 1999 until 2011. We obtained point estimates of consultation prevalence by Dec 31st 2011 by cross referencing with the population register to exclude subjects who had relocated from the county or were deceased. To obtain valid prevalence estimates and confidence intervals in presence of missing data on ICD-10 codes (mainly in private care and in primary care before the year 2004), we used the multiple imputation technique. The variables included in the imputation model were age, sex and clinic and their interactions, year, if consulted physiotherapist, if consulted primary care before the year 2004, and presence of consultation.

Results: Out of the six domains investigated, four domains yielded significant measures associated with RKOA progression. These measures may help identify individuals at increased risk of RKOA progression who may benefit from early intervention.

Conclusion: Lifetime risk of diagnosed symptomatic knee OA varies by age and race/ethnicity. Black females are more likely to be obese, which corresponds with their having the greatest lifetime risk of being diagnosed with knee OA and needing TKR. Race- and sex-tailored weight management programs may reduce the lifetime risk of knee OA.

Disclosure: M. S. Yau, None; L. Yerges-Armstrong, None; B. D. Mitchell, None; M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Biogen Idec, Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma A.G., Pfizer Inc., Stryker LLC, Xomna., 5.

Table 1. Hazard Ratios for Associations with RKOA Progression

<table>
<thead>
<tr>
<th>Domain Parameter</th>
<th>Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee exam</td>
<td></td>
</tr>
<tr>
<td>Knee joint effusion</td>
<td>1.34 (1.14–1.58)</td>
</tr>
<tr>
<td>Patello-femoral crepitus</td>
<td>1.58 (1.36–1.83)</td>
</tr>
<tr>
<td>Knee flexion contracture</td>
<td>1.02 (1.00–1.04)</td>
</tr>
<tr>
<td>Knee flexion pain/ tenderness</td>
<td>1.26 (1.06–1.49)</td>
</tr>
<tr>
<td>Medical and family history</td>
<td>1.03 (1.00–1.05)</td>
</tr>
<tr>
<td>Number of bony enlargements in hands</td>
<td>1.04 (1.01–1.06)</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>1.33 (1.12–1.59)</td>
</tr>
<tr>
<td>Pain during 400-meter walk</td>
<td>0.99 (0.99–0.99)</td>
</tr>
<tr>
<td>Self-reported pain/symptoms KOOS sports and recreational activities score</td>
<td>0.99 (0.99–1.00)</td>
</tr>
<tr>
<td>KOOS Pain Score</td>
<td>0.99 (0.99–1.00)</td>
</tr>
<tr>
<td>Adjusted covariates</td>
<td></td>
</tr>
<tr>
<td>Black race</td>
<td>1.04 (0.86–1.26)</td>
</tr>
<tr>
<td>Asian race</td>
<td>0.74 (0.72–2.00)</td>
</tr>
<tr>
<td>Other race</td>
<td>0.63 (0.33–1.22)</td>
</tr>
<tr>
<td>Male gender</td>
<td>0.94 (0.81–1.09)</td>
</tr>
<tr>
<td>Age</td>
<td>1.00 (0.99–1.01)</td>
</tr>
</tbody>
</table>

Conclusion: Out of the six domains investigated, four domains yielded significant measures associated with RKOA progression. These measures may help identify individuals at increased risk of RKOA progression who may benefit from early intervention.
Results: In the conservative scenario which solely depends on changes in age distribution of the population, the consultation prevalence of knee OA in adults (aged 20+ years) will increase from 9.0% in 2011 to 9.9% in 2030. The hip OA consultation prevalence will increase from 4.0% in 2011 to 4.6% in 2030. Assuming the second scenario, i.e., an increase in age-specific prevalence, the consultation prevalence of knee and hip OA in adults will increase to 13.6% and 6.1% in 2030, respectively.

Conclusion: There is a risk for a 50% increase in OA prevalence in 20 years from now. Results suggest that fighting the negative impact of obesity will be of primary importance to reduce the occurrence of the OA in the future.

Disclosure: A. Turkiewicz, None; I. F. Petersson, None; J. Björk, None; L. E. Dahlberg, None; M. Englund, None.

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Incidence of Knee, Hip, and Hand Clinical Osteoarthritis: A Population-Based Cohort Study. Daniel Prieto-Alhambra, Ana Pagès-Castells, M. Kassim Javaid, Andrew Judge, Cytus Cooper, Nigel K. Arden, and Adolfo Diez-Pérez. 1URFOA-IMIM, Parc de Salut Mar; Idiap Jordi Gol; University of Oxford; University of Southampton, Barcelona, Spain; 2IDAP Jordi Gol; Institut Català de la Salut, Barcelona, Spain; 3Oxford NIHR Musculoskeletal Biomedical Research Unit, University of Oxford, Oxford, UK; Oxford, United Kingdom; 4Oxford University, Oxford, United Kingdom; 5University of Oxford; Southampton General Hospital, Southampton, United Kingdom; 6Hospital del Mar-IMIM, Universitat Autònoma de Barcelona, Barcelona; and RETICEF, ISCIII Madrid; Spain, Barcelona, Spain

Background/Purpose: Data on age-specific effects of gender, obesity and previous osteoarthritis (OA) on incident OA at other joints are scarce. We aimed to calculate age and gender-specific incidence of joint-specific clinical OA. Secondly, we studied the age-dependent effect of gender, and the excess risk related to obesity and previous OA on newly diagnosed OA at the knee, hip and hand.

Methods: We screened computerized medical records in the SIDIAP Database (www.sidiap.org) to identify those aged 40 years or older with an incident diagnosis of OA of the knee, hip and hand using ICD-10 codes in the period 2006–2010. SIDIAP contains the anonymised medical records of >3,100 GPs in Catalonia (North-East Spain) with information on an 80% of the total population. Age and gender-specific incidence rates (IR), Male Rate Ratios (RR), and 95%Confidence Intervals (99%CI) were calculated assuming a Poisson distribution. Cox regression was used to compute adjusted (for age, gender, and body mass index(BMI)) hazard ratios (HR) for a new diagnosis of OA according to BMI (WHO categories) and to prevalent joint-specific OA status.
Results: We identified 26,381, 12,567 and 10,092 incident cases of knee, hip and hand OA respectively. Age-specific IRs for knee, hip, and hand OA are shown [Figure]. Female:Male RRs peaked at age 70–75 years for hip and knee, and at the age of 50–55 years for hand OA [Figure]. Adjusted HRs for BMI categories were highest for knee OA (overweight = HR 2.00 (99%CI 1.94–2.06), obesity 1 = HR 3.19 (3.09–3.29), obesity 2 = HR 4.72 (4.56–4.89)), followed by hip OA (HR 1.46 (1.39–1.52); 1.75 (1.66–1.84); 1.93 (1.82–2.05)), and lower for hand OA (HR 1.22 (1.17–1.27), 1.30 (1.25–1.36) and 1.31 (1.24–1.38)).

Adjusted HR for prevalent knee OA on hip OA was 1.35 (1.28–1.43); HR for previous hip OA on incident knee OA was 1.15 (1.08–1.23). Hand OA predicted both knee and hip OA (HR 1.20 (1.14–1.26) and 1.23 (1.15–1.34) respectively).

Conclusion: Age, gender, BMI and history of OA affecting other joints are related differently to incident knee, hip and hand OA: both the effect of age and gender are greatest in the elderly for knee and hip OA, but around menopause for hand OA. The effect of overweight and obesity is strongest on knee OA, and weakest but significant on hand OA. Finally, a history of knee or hip OA predict incidence of each other, and previous hand OA is related to increased risk of knee and hip OA, all independently of age, gender and BMI.

Disclosure: D. Prieto-Alhambra, None; A. Pagès-Castella, None; M. K. Javaid, None; A. Judge, None; C. Cooper. Amgen, ABBV, Novartis, Pfizer, Merck Sharp and Dohme, Eli Lilly, Servier, S. N. K. Arden, None; A. Diez-Pérez, None.

916 Population Incidence of Soft Tissue Knee Injury: Estimates From a Swedish Health Care Register. Charlotte Bergknut1, George Peat2, Richard Frobell3 and Martin Englund3. 1Lund University, Lund, Sweden, 2Arthritis Research UK Primary Care Centre, Keele University, United Kingdom, 3Department of Orthopedics, Clinical Sciences Lund, Lund University, Sweden, Sweden

Background/Purpose: Soft tissue knee injury is a well-established and potent risk factor for development of knee osteoarthritis. However, there is a paucity of epidemiological data from the general population. Our aim was to address this gap using data from a large, regional health care register, i.e., to estimate the annual incidence of clinically diagnosed soft tissue knee-injured subjects in the entire population.

Methods: In Sweden, in- and outpatient health care is registered using each individuals’ unique personal identifier. This register includes information on date of visit and the International Classification of Diseases (ICD) 10 diagnostic code(s) as determined by physicians’ clinical examination. For the calendar years 2004–2011, we studied the population in southern Sweden, Skåne County (approx. 1.2 million individuals). We identified residents who had at least one visit to a physician with clinically diagnosed knee contusion (S80.0) or knee dislocation/distortion (S83 and all subdiagnoses). Consequently, knee fractures were not included. To calculate the annual cumulative incidence of clinically diagnosed soft tissue knee-injured subjects, stratified by age- and sex, the number of diagnosed patients during the calendar year formed the numerator of the rate and the population at risk at the start of the year, compensated for patients seeking private care (due to missing diagnostic codes), was the denominator. We then calculated the mean annual cumulative incidence over the 8-year period. In a second step, we investigated potential seasonal variations.

Results: The overall incidence of clinically diagnosed soft tissue knee-injured subjects was 718 per 100,000 per year (672 per 100,000 women and 766 per 100,000 men). The most frequently diagnosed injuries were contusion of knee (31.3% of subjects) followed by sprain and strain of knee (27.7%), injury to multiple structures of knee (22.3%), tear of meniscus (11.3%), collateral ligament injury (10.7%), and cruciate ligament injury (9.9%). The highest incidence of knee-injured subjects was found in those aged 15 to 19 years for both sexes (1424 per 100,000 women and 1658 per 100,000 men). After this age, there was a general decline but with an increase again in the incidence in the most elderly (figure). We found substantial seasonal variations in both genders with peaks in March-May and August-October.

Conclusion: Clinically diagnosed soft tissue knee injury occurs with marked age and seasonal variations. The high incidence among young people warrants further attention as the potential induction point for many cases of post-traumatic knee osteoarthritis.

Disclosure: C. Bergknut, None; G. Peat, None; R. Frobell, None; M. Englund, None.

917 Feasibility of Remote Activity and Functional Status Monitoring of Patients with Hip or Knee Pain. Pim Jetanalin1, Hyeon Eui Kim1, Zia Aguaf1, Nathanial Heintzman1, Lucila Ohno-Macado1 and Susan J. Lee1. 1University of California, San Diego, La Jolla, CA, 2San Diego Veterans Affairs Medical Center, San Diego, CA

Background/Purpose: The incidence of total hip and knee arthroplasties has risen over the past decade and by 2030, the demand of these arthroplasties is estimated to increase by 137% and 601%, respectively. Early ambulation is critical for timely recovery of functional independence. However, not all patients have access to rehabilitation due to lack of money, transportation, and/or time. Accelerometer has been validated in analyzing gait and physical activities among patients with arthritis. We assessed the feasibility of a wireless system that remotely monitors patient’s physical activities, functional status, and pain among patients with hip or knee arthritis. This information can then provide feedback to patients to facilitate their post-operative rehabilitation regimen.
Methods: Patients with hip or knee arthritis who had internet access were asked to complete web-based patient-derived questionnaires and wear the SenseWear® armband (SWA) for 14 day except during sleep and shower. SWA collects heat flux, Galvanic Skin Response (GSR), 3-axis accelerometer, and skin temperature. Data on demographics (age, sex, highest level of education, marital status, and yearly household income) and baseline functional status using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were obtained. The web-based questionnaire comprised of WOMAC, visual analog scale (VAS) for pain, and self-reported duration of daily exercise. The web-based questionnaire was developed using a HIPAA compliant commercial survey tool called SurveyGizmo (www.surveymizgo.com).

Results: Convenient sample of 14 patients were recruited with 9 patients (64%) completing the study. The 2 most common reasons for incompletion were difficulty downloading the SWA software and inconvenience of wearing daily SWA. The majority of the completers were Caucasians (56%) and female (89%) with a mean age and body mass index (BMI) of 52.4 ± 12.3 years and 37.5 ± 9.2, respectively. Education level ranged from junior high to post-graduate levels with 77% having completed at least college. Majority (77%) had annual household income ≤ $40,000. Non-completers were older (70.0 ± 10.9 years) with lower BMI (29.5 ± 5.7). The majority of patients had significant arthritis with baseline VAS pain of 56.7 ± 26.9 and WOMAC of 48.2 (92% of 97). The SWA (EA 4360, F=54000, score correlated well with intraclass coefficient (ICC) of 0.885 (p=0.0015). Patients wore SWA for mean 12hrs 25min daily with mean duration of exercise >3MET for 40min daily. The mean self-reported duration of exercise was higher than actual duration measured by SWA (94min vs 40min). There was no correlation between the level of pain and the duration of SWA-measured exercise.

Conclusion: As patients tend to overestimate their levels of physical activity, a wireless activity-monitoring tool such as SWA serves as a valuable tool to better assess the level of physical activity. This study demonstrated the feasibility of our activity and functional status monitoring system, which can be used to facilitate earlier return to independence after joint arthroplasties by providing a means to assist patients with home-based rehabilitation program.

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Impact of Comorbidities On Measuring Indirect Utility by the Medical Outcomes Study Short Form 6D in Lower-Limb Osteoarthritis.

Kossar Hossein1, Cécile Gaugouix-Viala2, Joel Coste1, Jacques Pouchot1, Bruno Faurel1, Anne-Christine Rat1 and Francis Guillemin1.

1Université de Lorraine, Nancy, France, 2Université de Lorraine, Paris Descartes University, APEMAC, EA 4360, F-54 000, Nancy; Paris 6 – Pierre et Marie Curie University; Rheumatology, Pitié-Salpêtrière Hospital, Paris, France, 3Paris VI University, Paris, France

Background/Profile: Comorbidities refer to chronic co-occurring disorders and are inversely and negatively correlated with HRQoL. Because indirect utility measurement involves HRQoL, comorbidities probably affect utility assessment. We investigated the impact of comorbidities to assess indirect utility measured by the Medical Outcomes Study Short Form 6D (SF-6D) in patients with osteoarthritis (OA).

Methods: The 878 patients of the KOHALA (Knee and Hip OsteoArthritis Long term assessment) cohort were included in the study. KOHALA cohort is a multi-regional population based study of patients aged 45-75 years with symptomatic knee or/and hip OA. comorbidities were assessed by the Functional Comorbidity Index (FCI) and grouped in 9 categories. Limitation in activities and pain was measured by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

Two separate linear regression models, using the number of comorbidities or the different categories of comorbidities of the FCI, were fitted to determine predictors of utility score.

Results: For the 878 patients included, the mean (SD) utility score was 0.66 (1.1; range 0.32–1.00) and mean number of comorbidities 2.05 (1.58). In the first multivariate model, for each additional comorbidity (range 0–9) the mean utility score decreased of 0.01 point (beta= -0.010, p<0.0001). In the second model, including comorbidities by categories, only psychiatric disease (beta= -0.043, p<0.0001) and degenerative disc disease (beta= -0.014, p=0.018) predicted low utility score. In both regression models a worsened function (increased WOMAC function score) significantly decreased the utility score. The number of comorbidities explained 2% of the variance in utility score (partial R-square=0.02) and psychiatric and degenerative disc diseases explained 2% (partial R-square=0.025) and 0.7% (partial R-square=0.007), respectively, of the variance in utility score, whereas the WOMAC function score explained 38% of the variance in both models (partial R-square=0.38).

Conclusion: Compared to greater negative effect of functional impairment, comorbidities have a negative but relatively marginal impact on indirect utility score. This suggests that clinically, considering the functional severity of OA remains a first priority.

Disclosure: K. Hossein, None; C. Gaugouix-Viala, None; J. Coste, None; J. Pouchot, None; B. Faurel, None; A. C. Rat, None; F. Guillemin, None.

919 Sedentary Time, Physical Activity, and Concurrent Blood Pressure in Osteoarthritis Initiative Participants. Min-Woong Sohn1, Rowland W. Chang1, Grace Ahn2, Linda S. Ehrlich-Jones3, Marc C. Hochberg4, Jungwha Lee5, Michael C. Nevitt6, Pamela A. Semanick7, Jing Song8, Kai Sun9 and Dorothy D. Dunlop1.

1Northwestern University, Chicago, IL, 2Rehabilitation Institute Chicago, Chicago, IL, 3University of Maryland, Baltimore, MD, 4University of California-San Francisco, San Francisco, CA, 5Northwestern University, IL, 6Northwestern University, Feinberg School of Medicine, Chicago, IL

Background/Profile: The inactivity physiology hypothesis suggests that sedentarism is a cardiovascular risk factor independent of time spent in moderate-vigorous activity (MV). Previous research suggests that sedentary time may be associated with increased blood pressure. But research findings to date are mixed.

Methods: The Osteoarthritis Initiative accelerometer ancillary study includes 1760 with objective measures of physical activity, sedentary time, and blood pressure at the 48 month exam. Participants were classified into four quartile groups according to accelerometer measures of the percentage of wear time that was sedentary (<100 activity counts per minute). Systolic and diastolic blood pressures (SBP and DBP) were modeled as a function of sedentary quartiles, demographic factors (age, gender, race, income), health behaviors (average daily MV minutes, alcohol use) and general health (osteoarthritis status, Charlson comorbidity score, BMI, NSAID and antihypertensive medication use during the month preceding the 48 month visit).

Results: Of 1,760 adults, 60% had knee OA, 42% used ≥1 antihypertensive medications within 30 days prior to the 48 month visit, and 24.4% had elevated BP (≥ 140/90 or 130/80 for diabetic or renal patients). BP values (see Table) show lowest SBP in the least sedentary group, while DBP is similar across all groups. Adjusted analyses found the least sedentary group on average had SBP 1.82 mm Hg lower (95% CI, 0.04 – 3.59) than the other combined groups. Also, SBP was significantly elevated in adults with OA (2.3 mm Hg), blacks (5.7 mm Hg), and obesity (3.3 mm Hg). But time spent in MV activity, NSAID use, and alcohol use were not associated with BP. The effect of sedentary time on SBP was primarily observed among adults not taking antihypertensive medications. Sedentary and MV activity were not associated with DBP in adjusted analyses.

Disclosure: None; None; None; None; None; None; None; None; None.

Blood Pressure

<table>
<thead>
<tr>
<th>Blood Pressure (mm Hg)</th>
<th>Quartile 1 (Least Sedentary)</th>
<th>Quartile 2</th>
<th>Quartile 3</th>
<th>Quartile 4 (Most Sedentary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP</td>
<td>122.0 (15.8)</td>
<td>124.9 (16.9)</td>
<td>124.2 (15.9)</td>
<td>126.4 (16.5)</td>
</tr>
<tr>
<td>DBP</td>
<td>74.5 (10.1)</td>
<td>75.4 (9.8)</td>
<td>74.3 (9.8)</td>
<td>73.8 (10.7)</td>
</tr>
</tbody>
</table>

Unadjusted Analysis

Systolic, mean (SD) 122.0 (15.8) 124.9 (16.9) 124.2 (15.9) 126.4 (16.5) Diastolic, mean (SD) 74.5 (10.1) 75.4 (9.8) 74.3 (9.8) 73.8 (10.7)

Multiple Regression Analysis

Systolic, Adjusted* Mean Difference Reference 2.44 (0.37–4.51) 1.03 (0.12–3.17) 1.83 (0.48–4.14) p = 0.045**

Diastolic, Adjusted* Mean Difference Reference 1.23 (0.05–2.50) 0.42 (0.09–1.73) 0.29 (0.11–1.71) p = 0.187**

* Adjusted for demographic factors (age, gender, race, income), health behaviors (average daily MV minutes, alcohol use) and general health (osteoarthritis status, Charlson comorbidity score, BMI, NSAID and antihypertensive medication use during the month preceding the 48 month visit).

** Least sedentary Quartile 1 versus more sedentary Quartiles 2–4

Conclusion: Objectively measured sedentary time was significantly associated with increased SBP, while MV activity was not, in the model adjusted for all covariates. This finding supports the inactivity physiology hypothesis that, independent of MV physical activity, sedentary time is...
associated with deleterious effect on cardiovascular risk. This is the first study to test this hypothesis using objectively measured sedentary time and simultaneously controlling for antihypertensive medication use.

Disclosure: M. W. Sohn, None; R. W. Chang, None; G. Ahn, None; L. S. Ehrlich-Jones, None; M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Bioserica S.A., Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma A.G., Pfizer Inc., Stryker LLC, Xoma, 5; J. Lee, None; M. C. Nevitt, None; P. A. Semanik, None; J. Song, None; K. Sun, None; D. D. Dunlop, None.

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A Multimodal Intervention to Improve Osteoporosis Care in Home Health Settings: Results From a Cluster Randomized Trial, Meredith Kilgore1, Kenneth G. Saag2, Jeroan Allison3, Elizabeth Kitchin4, Julie L. Locher1, Amy Mudano5, Ryan C. Outman1 and Jeffrey R. Curtis2. 1University of Alabama at Birmingham, Birmingham, AL, 2University of Massachusetts Medical School, 3University of Alabama-Birmingham, Birmingham, AL, 4University of Massachusetts Medical School, 5Birmingham, AL

Background/Purpose: Although very effective osteoporosis treatments are available, the rates of use are low, even among individuals who have already experienced a fracture and are thus at very high risk for a subsequent fracture. Since many patients commonly receive home health services care post-fracture, the home health setting is a promising venue for improving osteoporosis care. To assess the utility of a home health care based strategy for osteoporosis care improvement, we developed a multimodal intervention for home health care patients with a fracture history. Our intervention targeted nurses, physicians, and patients involved in home health care.

Methods: We conducted a cluster randomized trial of a multimodal intervention targeted at patients receiving care in a state-wide home health care agency in Alabama. The intervention included an educational component and a computerized nursing care plan for nurses, prepared order sheets to facilitate osteoporosis prescription medications ordering for physicians, and patient education materials for patients. Offices throughout the state were randomized to receive the intervention or to continue usual care. Following the randomized controlled study, we delivered the intervention to the offices randomized to the usual care arm. At that time, we implemented an automatic prompt for nurses in each office that identified those patients at high risk for a subsequent fracture and required the nurse to decide to activate the care plan. This allowed us to evaluate the additional effect of the automatic prompt compared with nurse identification alone. The primary outcome was the proportion of patients with a fracture history prescribed osteoporosis medications.

Results: For the randomized trial, among the offices in the intervention arm the average proportion of eligible patients receiving osteoporosis medications post-intervention was 19.1%, compared with 15.7% in the usual care arm (difference in proportions 3.4%, 95% CI: −2.6–9.5%). The difference was not statistically significant. Within the intervention arm, a secondary analysis among the patients who had the care plan activated (27.5%) found 37.7% received osteoporosis medications compared with 11.6% of those who did not have the care plan activated (p < 0.0001). The implementation of the automatic prompt improved overall rates of prescription of osteoporosis medications (14.8% prior to activation vs. 17.6% after activation), but the difference was not significant.

Table 1. Enrollment and Drug Treatment Rates in Usual Care & Intervention Arms of the Home Health Care Osteoporosis Trial

<table>
<thead>
<tr>
<th>Usual Care Offices</th>
<th>Intervention Offices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture Cases*</td>
<td>Fracture Cases*</td>
</tr>
<tr>
<td>48</td>
<td>46</td>
</tr>
<tr>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>21%</td>
<td>18%</td>
</tr>
<tr>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>11%</td>
<td>18%</td>
</tr>
<tr>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td>25%</td>
<td>16%</td>
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<tr>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>11%</td>
<td>28%</td>
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<td>29</td>
<td>31</td>
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<tr>
<td>10%</td>
<td>16%</td>
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<td>28</td>
<td>28</td>
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<td>11%</td>
<td>18%</td>
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<td>25</td>
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<td>20%</td>
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<td>23%</td>
<td>10%</td>
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<td>19</td>
<td>16</td>
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<td>11%</td>
<td>19%</td>
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<td>15</td>
<td>13</td>
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<td>13%</td>
<td>38%</td>
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<tr>
<td>Averages</td>
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</tr>
<tr>
<td>31</td>
<td>30%</td>
</tr>
<tr>
<td>16%</td>
<td>19%</td>
</tr>
</tbody>
</table>

*Number of patients with fracture diagnoses who were eligible for the intervention
†Proportion of fracture patients receiving prescription osteoporosis medications during follow up after the intervention

Conclusion: The cluster randomized controlled trial conducted in a state-wide home health care agency did not significantly improve rates of prescribed osteoporosis medications. This was also the case for the before and after comparison of rates with respect to the activation of the automated alert feature in the EMR. Treatment rates did significantly improve when the nursing care plan was activated.

Disclosure: M. Kilgore, Amgen, 2; K. G. Saag, Amgen, 2; Eli Lilly and Company, 2; Merck Pharmaceuticals, 2; Amgen, 5; Eli Lilly and Company, 5; Merck Pharmaceuticals, 5; J. Allison, None; E. Kitchin, None; J. L. Locher, Amgen, 2; A. Mudano, None; R. C. Outman, None; J. R. Curtis, Amgen, 5; Merck Pharmaceuticals, 5; Eli Lilly and Company, 5; Amgen, 2; Merck Pharmaceuticals, 2; Eli Lilly and Company, 2.

921
Association Between Metabolic Syndrome and Bone Mineral Density in a Community-Dwelling Older Women: The São Paulo Ageing & Health Study (SPAHI), Luana G. Machado, Diogo S. Domiciano, Jaqueline B. Lopes, Camille P. Figueiredo, Valéria Caraparo, Lilian Takayama and Rosa M.R. Pereira. University of São Paulo, São Paulo, Brazil

Background/Purpose: Recent studies have shown a link between metabolic syndrome (MS) and bone mass. However, these results are uncertain about the positive/negative effect of the components of MS on bone mineral density (BMD) and risk of fragility fractures. Furthermore, the higher prevalence of MS among subjects with higher body mass index (BMI) is a confounding factor, since previous findings have demonstrated that obesity could be a protective factor against bone loss. In this way, the aim of this study was to evaluate the prevalence of MS in a community-dwelling older women with high frequency of overweight/obesity and its association with bone parameters.

Methods: 343 community-dwelling older women were evaluated by specific questionnaire (including history of clinical fractures and cardiovascular risk factors). Lumbar spine, femoral neck and total hip BMD were evaluated by DXA. Laboratory tests, including calcium, phosphorus, creatinine, lipid profile, insulin, glucose and uric acid were also performed. Thoracolumbar spine X-rays were assessed to identify vertebral fractures. National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATPIII) criteria were used to define MS. Logistic regression models were used to analyze the relationship between MS and bone parameters.

Results: The prevalence of MS was high (62.1%). Women with MS had higher BMI (30.7±4.9 vs. 27.2±4.9kg/m², P<0.001), body fat percentage (37.7±5.0 vs. 34.9±6.5%, P<0.001), serum levels of creatinine (0.9±0.2 vs. 0.8±0.2mg/dl, P=0.003), insulin (12.7±10.7vs. 8.7±14.2U/mL, P=0.004), uric acid (5.6±1.5 vs. 51.3±1.3mg/dl, P=0.001), lumbar spine BMD (0.88±0.171 vs. 0.837±0.178g/cm², P=0.025), femoral neck BMD (0.684±0.120 vs. 0.629±0.121g/cm², P<0.001) and total hip BMD (0.814±0.131 vs. 0.743±0.140g/cm², P<0.001) compared to women without MS. After adjustments for BMI, logistic regression analyses demonstrated that hip BMD remained as an independent factor associated with MS (OR:10.73 95% CI:1.33–86.55, P=0.026). No significant difference concerning the prevalence of vertebral or nonvertebral fractures was observed between the women with and without MS.

Conclusion: A positive association between total hip BMD and MS was found in our community-dwelling older women, even after adjustment for BMI. Nevertheless, the frequency of vertebral and nonvertebral fractures was similar in women with and without MS. Taken together, these results suggest that higher BMI per se does not explain the positive association between higher BMD and MS and does not protect against osteoporotic fractures. Further studies are necessary to elucidate the effect of MS on bone mass and fracture risk, possibly related to bone quality.

Disclosure: L. G. Machado, None; D. S. Domiciano, None; J. B. Lopes, None; C. P. Figueiredo, None; V. Caraparo, None; L. Takayama, None; R. M. R. Pereira, None.

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Risk of Fracture Among Treated and Untreated Men with Osteoporosis, Karen Tomic1, Joanne Lafleur2, Lisa Palmer1, David M. Smith1, Carly J. Domiciano3, Irene Agodoa3 and Nicole Yurgin3. 1Truven Health Analytics, Washington, DC, 2University of Utah College of Pharmacy, Salt Lake City, UT, 3Amgen Inc, Thousand Oaks, CA

Background/Purpose: Osteoporosis (OP) affects an estimated 2 million men in the United States. The relationship between treatment and fracture outcomes has been reported from clinical trial populations, but little is known
about the impact of treatment on fracture risk among men with OP in the real-world setting.

Methods: The MarketScan® Medicare Supplemental and Coordination of Benefits Database was used to identify treated (received an OP medication) and untreated (had an OP diagnosis or fragility fracture but no OP medication) men with OP between 1/1/04 and 4/30/10 and at least 12 months pre-period and 3 months post-period follow-up in the database. Patients were matched on pre-period fracture and age (+/- 2 years). Follow-up time was variable and ended with fracture, inpatient death, end of health plan eligibility, or on 4/30/10, whichever came first. Fracture incidence rates and time to fracture were reported. A Cox proportional hazards model was used to assess whether treated men had a lower risk of fracture compared to untreated men after controlling for demographic and clinical characteristics.

Results: Of the 3,072,696 men aged over 65 years in the database, a total of 31,696 men met the inclusion and match criteria (15,848 in each cohort). In both cohorts, the mean age was 78 years and 55% had a pre-period fracture. 1990 treated men had a follow-up fracture [incidence = 5.98/100 person-years (p-y)] over 33,274 p-y of follow-up, compared to 2,231 untreated men with a follow-up fracture [incidence = 8.03/100 p-y] over 27,785 p-y. Treated men also had longer mean time to fracture (588 days, SD 426) than untreated men (401 days, SD 372, p < 0.001). The adjusted risk of fracture was lower among treated men compared to untreated men (adjusted hazards ratio = 0.83, 95% CI: 0.78 to 0.89). Other pre-period factors associated with an increased risk of fracture were urban residence, no bone mineral density test, use of benzodiazepines, and a higher number of comorbidities and concomitant medications.

Conclusion: The fracture incidence rate was lower and time to fracture was longer for men with OP who received treatment than for those without treatment. After controlling for prior fracture and other risk factors, treated men had a lower adjusted risk of fracture. To better characterize the benefit of OP treatment, more research is needed into the role of medication adherence and risk of fracture among men with OP.

Disclosure: K. Tomic, Amgen, 5; J. Lafleur, Agency for Healthcare Research and Quality, Amgen, Anolux, Genentech, United States Centers for Disease Control, United States Department of Defense, 5; Amgen, 6; L. Palmer, Amgen, 5; D. M. Smith, Amgen, 5; C. J. Paoli, Amgen, 1, 3; L. Takayama, Amgen, 1, 3; N. Yurgin, Amgen, 1, Amgen, 3.

923 Low Bone Mineral Density and Higher Parathyroid Hormone Levels As Independent Factors to All-Cause Mortality in Community-Dwelling Older Adults: the São Paulo Ageing & Health Study (SPAH). Diogo S. Domiciano, Luana G. Machado, Jaqueline B. Lopes, Camille P. Figueiredo, Valeria Caparbo, Lilian Takayama, Elosa Bonfa and Rosa M.R. Pereira. University of São Paulo, São Paulo, Brazil

Background/Purpose: Previous studies have shown a relationship between osteoporosis and increased risk of death. Moreover, secondary hyperparathyroidism has been linked to mortality in osteoporotic patients. However, none of these studies performed a concomitant evaluation of the parathormone (PTH)-calcium-D-axis and bone mass, and this is essential to determine more accurately the contribution of each of these parameters to survival in community-dwelling older subjects. The aim of this study was, therefore, to investigate the association between serum PTH status, calcium, vitamin D and bone mineral density (BMD) and all-cause mortality during a 5-year period in a community-dwelling older population.

Methods: 759 community-dwelling subjects (446 women and 293 men), aged over 65 years, were prospectively studied. Clinical data (including history of non-vertebral fractures and cardiovascular events as previous myocardial infarction, unstable angina, stroke) were assessed by specific questionnaire. Serum 25(OH)D level, intact PTH, total calcium, phosphorus, creatinine, and alkaline phosphate were also measured. BMD of the lumbar spine and hip were evaluated by DXA. Spine X-ray (T4-L4) was performed to identify vertebral fractures by the semiquantitative method. All analysis was done at baseline and after a 5-year period. Mortality was recorded during 5-year follow-up. Multivariate Cox regression analysis was used to compute hazard ratios for all-cause mortality.

Results: After 5-year follow-up, there were 104 (14.1%) deaths. Comparing with individuals who were alive at the end of follow-up, subjects who died were older (75.9 ± 6.8 vs. 72.6 ± 4.8 years, P < 0.001), had lower weight (64.4 ± 15 vs. 67.6 ± 13.1 kg, P = 0.03), lower glomerular filtration rate (GFR) (52.3 ± 25.3 vs. 59.0 ± 18.4 ml/min, P < 0.001), higher PTH level (45.8 ± 23.2 vs. 38.1 ± 16.0 pg/dl, P = 0.003) and lower 25(OH)D level (17.8 ± 10.4 vs. 20.2 ± 10.2 ng/ml, P = 0.005). There was also difference between the groups (deceased vs. alive) related to frequency of diabetes mellitus (36.5 vs. 19.1%, P < 0.001), prevalence of any cardiovascular event (26.0 vs. 13.1%, P = 0.001) and low BMD (T-score ≤ -2. 74.0 vs. 61.3%, P = 0.01). After adjustments for age, sex and GFR, low BMD (HR: 1.8095% CI: 1.11–2.9, P = 0.02), PTH level (HR: 1.1295% CI: 1.01–1.23, P = 0.003), diabetes mellitus (HR: 2.77 95% CI: 1.71–4.50, P < 0.001) and any cardiovascular event (HR: 1.97 95% CI: 1.16–3.36, P = 0.01) remained independently associated to all-cause mortality.

Conclusion: Low BMD and higher PTH level, but not vitamin D per se, were significantly associated with mortality in community-dwelling older adults. These findings support the notion that a careful screening of these bone parameters might improve the outcomes of elderly population.

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924 Methods to Link a U.S. Arthritis Cohort with Medicare Administrative Claims Data. Jeffrey R. Curtis1, Lang Chen1, Timothy Beukelman1, Asem Bharat2, Fenglong Xie2, Kenneth G. Saag1 and Elizabeth S. Delzell2. 1Univ of Alabama-Birmingham, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Linkages between clinical and administrative data may provide a valuable resource for pharmacoepidemiologic and health services research.

Objective: To describe methods and validity of a linkage between a de-identified national arthritis registry and U.S. Medicare data.

Methods: Data from 2006-9 for rheumatoid arthritis (RA) patients participating in the Consortium of Rheumatology Researchers of North America (CORRONA) was linked to Medicare (100% sample selected using ICD-9 codes). Deterministic linkage was performed using age (in years), sex, provider identification number, and U.S. state of the CORRONA site. Medicare data were restricted to rheumatology claims or with an RA diagnosis occurring in CORRONA provider’s state. Visit dates from CORRONA were matched to Medicare visit dates. At least 1 visit date was required to match exactly.

An ‘all-visit match’ was defined when a CORRONA participant had all CORRONA visits match to all Medicare visits. If a CORRONA participant had an all-visit match to > 1 Medicare beneficiary, unique matches selected to be the beneficiary with the greatest number of matched CORRONA visits. In the event of ties, the participant was considered not matched. A fuzzy match was done for CORRONA participants without any all-visit match allowing date mismatches of +/– 2 week, or +/– 1 digit in month, day or year.

Linkage accuracy was evaluated in a sub-cohort with more complete information (including full date of birth [DOB]); exact match on full DOB was attempted. 

Results: CORRONA participants with self-reported Medicare coverage at any time (n=9326) were identified to be matched to 32,788 Medicare beneficiaries with arthritis treated by CORRONA physicians. A total of 7,441 CORRONA participants matched exactly on at least 1 visit, and 4413 (59%) had an all-visit match to 1 or more beneficiaries; 4013 (54%) were uniquely matched when using a median (IQR) of 3 (2, 6) matched visits. For those without any all-visit matches (n=3028), only 346 (11.4%) were able to achieve at least 1 all-visit match after fuzzy matching.

For the 837 participants in the validation subcohort with an all-visit match to a single Medicare beneficiary, match accuracy was 95% for patients with > 2 matched visits, 57% for patients with exactly 2 matched visits, and 73% for those with exactly 1 matched visit. For additional patients who initially matched exactly on at least one but not all visit dates and achieved an all-visit match after fuzzy matching (n=162), linkage accuracy was ≤ 15%. Ongoing work is refining the linkage strategy for resolution of ties and improvement of matching validity and to expand the validation sample.

Conclusion: A novel linkage between a national, de-identified outpatient arthritis registry and U.S. Medicare claims data on multiple non-unique identifiers appears both feasible and valid.

Disclosure: J. R. Curtis, Roche/Genentech, UCB, Centocor, CORRONA, Amgen Pfizer, BMS, Crescendo, Abbott, 5; Roche/Genentech, UCB, Centocor, CORRONA, Amgen Pfizer, BMS, Crescendo, Abbott; C. J. Paoli, None; L. G. Machado, None; T. Beukelman, Pfizer Inc, None; L. Takayama, None; C. P. Figueiredo, None; V. Caparbo, None; L. Takayama, None; E. Bonfa, None; R. M. R. Pereira, None.

Disclosures: D. S. Domiciano, None; L. G. Machado, None; J. B. Lopes, None; C. P. Figueiredo, None; V. Caparbo, None; L. Takayama, None; E. Bonfa, None; R. M. R. Pereira, None.
Use of Rheumatology Services for Arthritis: The Role of SES and Geographic Availability of Rheumatologists and Primary Care Physicians. E. M. Badley, Maylee Canizares, Aileen M. Davis. 1Division of Health Care and Outcomes Research, Toronto Western Research Institute; Dalla Lana School of Public Health, University of Toronto, Toronto, ON, 2Division of Health Care and Outcomes Research, Toronto Western Research Institute, Toronto, ON, Toronto, ON, 3Division of Health Care and Outcomes Research, Toronto Western Research Institute, Departments of Rehabilitation Science and Health Policy, Management and Evaluation, University of Toronto, Toronto, ON

Background/Purpose: Access to rheumatology is critical for timely treatment of new onset inflammatory arthritis (IA). Barriers to timely care include patient characteristics, the need for a referral from another physician (usually a primary care physician (PCP)), and the availability of a rheumatologist to be referred to. Treating patients with IA also needs to be balanced against the role of rheumatologists as the medical specialist with expertise in arthritis in general. There is a shortage of rheumatologist as well large area variations in their availability. The objectives of this population-based study is to examine access to rheumatologists for IA and arthritis overall (AO) taking into account access to PCP, availability of rheumatologists, and population characteristics.

Methods: A population-based multilevel study of individuals aged 18+ living in 105 residential areas in Ontario, Canada (total population about 13 million) which has a publicly funded health care system covering all physician visits. The physician billing database was used to identify the number of patients seeing rheumatologists for IA and AO and to derive a measure of PCP availability by residential area. Census data were used to calculate indicators of socio-economic status (SES), population age and rurality. Data from a survey of rheumatologists gave postal code for practice locations and the number of clinic hours per week. Geographic Information System analysis was used to calculate a weighted measure of rheumatologist availability taking into account amount of clinic hours and distance to rheumatologist locations for each residential area. Multilevel Poisson regression was used to estimate rate ratios for visits to rheumatologists for IA and AO by rheumatologist availability, PCP access, and SES.

Results: 142,600 patients made at least one visit to rheumatologists (13.4 per 1000 population); only 47.7% of visits were for IA, with a seven-fold variation across residential areas. Comparing the highest to lowest quintiles of rate of visits for IA were higher in areas of high SES (RR 1.395% CI 1.1–1.6) and areas with high PCP access (RR 1.295% CI 1.0–1.5). There was no association with area-level rheumatologist availability. However higher rheumatologist availability was associated with visits for AO (RR 1.2 95% CI 1.0–1.4), as were high SES (RR 1.4 95% CI 1.2–1.6) and high PCP access (RR 1.4 95% CI 1.2–1.7).

Conclusion: The lack of association with area-level rheumatologist availability for IA suggests that priority is given to these patients. The association of higher rheumatologist availability with patients seen with AO, raises questions of whether these patients go for care when no rheumatologist is available. For both IA and AO, lack of PCP access may be a barrier to referral. This study also indicates that residents of high SES areas are more likely to see rheumatologists, suggesting inequalities in access to care. Models of care that incorporate the location and amount of rheumatologist and PCP resources are crucial to improve access to care for people with all types of arthritis particularly in areas of low SES.

Disclosure: E. M. Badley, None; M. Canizares, None; A. M. Davis, None.

Accuracy of Canadian Health Administrative Databases in Identifying Patients with Rheumatoid Arthritis Using a Random Sample of 7500 Patients Seen in Primary Care. Jessica Widdifield, Claire Bombardier, Maylee Canizares, Jonathan M. Canfield, Vincent Thibodeau, Roger A. Levy, J. M. Paterson.

Table 1. Test characteristics of selected algorithms

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
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<tr>
<td>1 H ever</td>
<td>22</td>
<td>100</td>
<td>88</td>
<td>99</td>
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<td>100</td>
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<tr>
<td>3 P in 3 years</td>
<td>80</td>
<td>100</td>
<td>59</td>
<td>100</td>
</tr>
<tr>
<td>1 Ever by a specialist</td>
<td>81</td>
<td>99</td>
<td>51</td>
<td>100</td>
</tr>
<tr>
<td>2 P in 1 year at least 1 P by a specialist</td>
<td>78</td>
<td>100</td>
<td>65</td>
<td>100</td>
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<tr>
<td>2 P in 2 years at least 1 P by a specialist</td>
<td>78</td>
<td>100</td>
<td>65</td>
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<tr>
<td>2 P in 3 years at least 1 P by a specialist</td>
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<td>3 P in 1 year at least 2 P by a specialist</td>
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<td>3 P in 2 years at least 2 P by a specialist</td>
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<td>3 P in 3 years at least 2 P by a specialist</td>
<td>75</td>
<td>100</td>
<td>81</td>
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<tr>
<td>1 H or 3 P in 1 year at least 1 P by a specialist</td>
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<td>1 H or 3 P in 3 years at least 1 P by a specialist</td>
<td>78</td>
<td>100</td>
<td>76</td>
<td>100</td>
</tr>
</tbody>
</table>

H: Hospitalization code; P: physician diagnostic code; Specialist = rheumatologist, internal medicine, orthopedic surgeon

Conclusion: The RA case definition algorithms that we tested had excellent specificity. To our knowledge, this is the first study to rigorously evaluate the accuracy of RA administrative data algorithms in a random sample from family physician records. We are independently validating these algorithms in a random sample of patients from rheumatology clinics to support the findings of this work.

Disclosure: J. Widdifield, None; C. Bombardier, None; S. Bernatsky, None; J. M. Paterson, None; J. Young, None; D. Green, None; J. C. Thorne, None; N. Ivers, None; D. Butt, None; R. L. Jaakkimainen, None; M. Wang, None; V. Alhuwalia, None; G. A. Tomlinson, None; K. Tu, None.


Background/Purpose: This cross-sectional study aimed to analyze the willingness for shared decision making (SDM) of rheumatologic patients.

Disclosure: None; D. Butt, None; R. L. Jaakkimainen, None; M. Wang, None; V. Alhuwalia, None; G. A. Tomlinson, None; K. Tu, None.
Methods: All rheumatic disease patients assisted at a specialty care unit were invited to participate in this study. A three parts questionnaire was applied (demographic, clinical data and 3 scenarios that simulate a clinical encounter). The scenarios presented the 3 typical steps of a consultation: 1) Diagnostic statement; 2) treatment options discussion; 3) decision-making. Each scenario was presented according to SDM process. For each step, interviewee was argued 3 questions: (a) To identify weather each part was similar to his/her clinical encounter or not; (b) to define weather SDM can be a feasible approach and (c) to answer if he/she wanted to be assisted in SDM process, justifying it. The outcomes were defined by the justification about the williness for SDM. Descriptive and multiple correspondence analysis (MCA) techniques were performed to explore data.

Results: Demographic data (N = 160): 89% female, 60% < 8 years of school, 76% < 3 folds the minimum wage (income), 24.3% employed and 10.6% retired due to the disease; 75% of participants had a rheumatic diagnosis clearly defined, of which 48.8% had < 4 years of diagnosis and 30%, > 8 years of diagnosis. The first scenario showed that 97% would like to have SDM approach on their real clinical practice. They justified its desire according to ‘communication empowerment’ (75%) and ‘patients’ right relationship’ (23%). For the scenario two, 98% would like to have this approach, although 65% declared that it never happen in his/her real life. They justified according to ‘communication empowerment’ (63%). Decision-making scenario showed that 65% of the participants never took part in the decision process. However, 98% would like to do it, justifying according to ‘patients’ right relationship’ (30%), and ‘communication empowerment’ (28%). Despite these answers, 13% answered that the whole decision belongs to the physician because they have the technical knowledge. MCA plot illustrates that diagnostic statement correlates to communication empowerment’, retired because of disease, and low literacy. To understand treatment option, communication empowerment and a practice of a patient’s right was correlated with those who had < 4 years of diagnosis or > 8 years; > two rheumatic conditions, and low literacy. Finally, the desire for SDM was correlated among ‘communication empowerment’ and ‘patient’s right’ with those with < 4 years of diagnosis, active working status, and age between 50–59 years-old.

Conclusion: Communication empowerment and patient’s right were the most common reasons for the williness for SDM.

Disclosure: R. Battisti, None; T. D. Baumgratz, None; M. Cuziol, None; A. C. R. Janini, None; R. A. Levy Sr., None; M. M. Abreu, None.

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Is There an Optimal Treatment Strategy for Disease-Modifying-Antirheumatic Drug Naive Patients with Rheumatoid Arthritis? Roopa Akkineni1 and Daniel A. Albert. 1Dartmouth Hitchcock Medical Center, Lebanon, NH; 2Dartmouth-Hitchcock Med Ctr, Lebanon, NH

Background/Purpose: There is a lack of head-to-head clinical trial data to determine the most effective treatment for rheumatoid arthritis (RA). However, these trials have had similar patient entry criteria and outcome measures allowing for meta-analysis. Patients with RA fall into three therapeutic groups: DMARD naïve (no prior exposure to conventional or biologic disease-modifying anti-rheumatic drugs [DMARD]), Biologic naïve (prior exposure to conventional DMARDs but not biologic DMARDs) and Biologic second-line (prior exposure to biologic DMARDs).

A decision analysis was designed to identify an optimal treatment strategy for DMARD naïve patients with RA.

Methods: A total of 270 studies were identified on ClinicalTrials.gov and Medline, of which 193 were eliminated in the abstract review phase. Seventy-seven studies were screened in full text and seventy were excluded for reasoning including lack of randomization, uncertain diagnoses, and non-standard treatment. Seven clinical trials were included for the DMARD naïve group corresponding to twelve treatment options. The treatment options included placebo, methotrexate, biologic drugs alone and methotrexate plus biologic drugs. Drug effectiveness was measured by the ACR 20 and ACR 50 criteria and the rate of serious adverse events was modeled across different therapeutic options. Sensitivity analyses were conducted for probability of serious adverse drug reactions and the ACR 20 and ACR 50 effectiveness measures.

Results: In the biologic drugs group alone, treatment with etanercept 25mg bi-weekly resulted in the maximum quality-adjusted-life-year (QALY) gain of 23.24 years compared to placebo at 21.55 years (1 year and 8 months) and methotrexate at 22.12 years (1 year and 1 month). In the methotrexate plus biologic group, treatment with etanercept 50mg plus methotrexate resulted in 23.20 QALYs. Adalimumab 40mg (21.79 QALYs), Infliximab 3mg plus methotrexate (21.83 QALYs) and triple therapy (21.76 QALYs) resulted in the lowest QALY gain. Sensitivity analyses were performed at different success criteria and etanercept alone is preferred, while at ACR 50 criteria etanercept plus methotrexate is the preferred treatment option. At base case methotrexate was not a preferred treatment, however if methotrexate’s ACR 50 response rate exceeds 34% then it would become the optimal treatment strategy if all other factors were held constant. By contrast, treatment with etanercept 25mg on a bi-weekly basis and etanercept 50mg plus methotrexate are no longer the favored treatment options if their adverse drug reaction rates increase from 6% and 12% to 9% and 13% respectively.

Conclusion: Biologic therapy alone and biologic therapy plus methotrexate appear to be the favorable treatment strategies for the DMARD naïve group. The QALY gains for biologic therapy in rheumatoid arthritis are similar to that of biologic therapy in psoriasis and interferon therapy for multiple sclerosis (0.20–3.3 QALYs). The decision depends in part on the side effect profile and costs. Decision aids to elicit patient preferences and drug costs may override differences in drug effectiveness.

Disclosure: R. Akkineni, None; D. A. Albert, None.

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Background/Purpose: Studies indicate that 11% of adult hospitalizations are related to systemic lupus erythematosus (SLE), with an average charge of $10,000 US per hospitalization and a 1 in 30 chance of death (1). There are few studies describing the hospitalization experience in pediatric SLE, and no national estimates for inpatient healthcare utilization. We aimed to characterize national US trends in inpatient healthcare utilization and mortality associated with pediatric SLE.

Methods: We performed a retrospective, serial, cross-sectional analysis of a nationally representative sample of pediatric SLE patients. Using the Kids’ Inpatient Database (KID) for years 2000, 2003, 2006 and 2009, we identified patients with SLE by an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code of 710.0 listed as a primary or secondary diagnosis. The main outcome measures were: SLE hospitalization rate, length of stay (LOS), total hospitalization charges and mortality. Patient-specific demographic variables included: age, race, sex and insurance status. Hospital-specific variables included: type (general or children’s), teaching status, location (urban or rural) and region (Northeast, Midwest, South or West). We used KID reported sampling weights to calculate national estimates of the main outcome measures and multivariate regression to evaluate for trends over time.

Results: An estimated 27,076 (SE 1509) pediatric SLE discharges were identified in the KID for the years of study, with a hospitalization rate of 7.9 per 100,000 children (SE 0.5). The median LOS was constant from 2000–2009. The average charges per hospitalization from 2000–2009 (inflation to 2009 USD) were $29,304 for 2000, $36,987 for 2003, $41,664 for 2006 and $42269 for 2009. (p value for trend < 0.001). Factors associated with increased total charges were: male sex (p = 0.03); age > 18 years (p = 0.03); Black race (p = 0.02) and Hispanic ethnicity (p = 0.003); urban location (p = 0.001); and West region (p = 0.001). The death rate during hospitalization was 1% for 2000, 1.1% for 2003, 1.2% for 2006, 0.6% for 2009, which was statistically different across years (p = 0.03). Risk factors associated with death were: male sex OR = 1.6 (p = 0.03), age > 18 years OR = 3 (p = 0.01); Black race OR = 2.6 (p = 0.002); other race OR = 2.5 (p = 0.01); South region OR = 2.1 (p = 0.006) and West region OR = 1.8 (p = 0.03).
Conclusion: The length of stay for pediatric SLE has remained stable from 2000 to 2009. Total hospital charges have significantly increased, and mortality has decreased over time, with estimates differing by age, race, sex, hospital location and region. Further studies are needed to investigate the drivers of these differences in healthcare utilization and outcomes.


Disclosure: A. Knight, None; P. Weiss, None; K. Morales, None; R. Keren, None.

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Disease Burden and Cost of Illness in SLE During 8 Years Follow up.

Andreas Jönsen1, Anders A. Bengtsson2, Frida Hjalte1, Minna Willim3, Ragnar Ingvarsson2, Ulf Persson2, Ingemar F. Petersson2 and Ola Nived5.

1Section of Rheumatology, Lund, Sweden, 2Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden, 3Lund, Sweden, 4Musculoskeletal Sciences, Department of Orthopedics, Clinical Sciences, Lund, Sweden, 5University Hospital - Lund, Lund, Sweden

Background/Purpose: To study the annual direct and indirect costs in SLE in a cohort, from a defined area in southern Sweden, and to find potential predictors of cost.

Methods: All 127 prevalent and incident cases of clinically confirmed SLE, all with at least 4 ACR classification criteria, being alive between January 1st 2003 and December 31st 2010 in a defined area with an adult population of 175,000, were included. Demographics, date of diagnosis, follow up period, phenotype, disease activity (SLEDAI), organ-damage (ACR/SLICC DI) and costs for SLE specific therapy was collected from the database of the rheumatology unit. From the population registry 508 individuals matched for age and sex constituted a reference group. For both cases and references the local Health Authorities database provided all costs for inpatient days, outpatient visits by sex, race/ethnicity, region, and county-level SES. Indirect costs were calculated as loss of productivity, with indirect costs constituting 72 percent. Independent predictors of costs were age, disease activity and organ-damage.

Results: Of the 34,339 adults with SLE enrolled in Medicaid, 1,475 (4.4%) developed ESRD during the study period. 86% were female, the mean age of ESRD onset was 30.7 years (SD 11.6), and 58.9% were African American, 17.4% were White and 16.1% were Hispanic. The mean number of months in Medicaid prior to ESRD was 23.4 (SD 16.4). There were an average of 2.2 (SD 3.2) ED visits, 10 (SD 9.5) outpatient visits and 2.3 (SD 3.0) inpatient visits per year. In multivariate models, men had significantly fewer annual outpatient visits than women (p<0.001). Asian patients had nearly 1 less ED visit per year (p=0.03) and 2.4 fewer outpatient visits per year (p=0.05), compared to Whites. There were more annual ED visits in the Midwest (p=0.01), and outpatient visits in the Midwest (p<0.001) and West (p<0.001), compared to the Northeast. Patients in the lowest county-level SES group had significantly more ED visits per year than the highest SES group (p=0.02). There were no significant differences in inpatient visits according to the sociodemographic groups examined by multivariate analysis.

Conclusion: In this nationwide cohort of Medicaid enrollees with SLE who developed ESRD, we observed significant variation in ED and outpatient visits by sex, race/ethnicity, region, and county-level SES. Increased ED visits in low SES areas may indicate a lack of sustained access to subspecialty care. Further studies are needed to determine whether differences in health care utilization, particularly in underserved areas, contribute to increased rates of progression to ESRD in this high-risk population.

Disclosure: C. H. Feldman, None; L. T. Hiraki, None; G. S. Alarcon, None; J. Yazdany, None; J. Liu, None; M. A. Fischer, None; W. C. Winkelmayer, None; K. H. Costenbader, None.
Background/Purpose: Systemic lupus erythematosus (SLE) is a chronic autoimmune disease that affects multiple organs including the heart, lungs, kidneys, as well as the nervous system. The economic burden has been explored for specific organ systems in SLE with high associated morbidity (e.g. renal), less is known about the economic impact of other organ systems associated with SLE, particularly those with less perceived serious morbidity (e.g. musculoskeletal, etc.). The objective of this analysis was to describe the annual direct medical costs associated with SLE cases in a commercially-insured population in the United States.

Methods: This study employed a retrospective, observational design. Adults ages 18–64 years with at least one SLE-related inpatient or emergency department (ED) claim or at least two SLE-related outpatient visits with a rheumatologist at least 30 days apart between 7/1/2004 and 12/31/2008, and at least 6 months of pre-index and 12 months of post-index continuous medical/prescription coverage were identified in the MarketScan Commercial Claims database. Non-SLE controls were matched to SLE cases using propensity score matching. Mild, moderate, and severe flares were identified in the follow-up period for the SLE patients using a claims-based algorithm and patients were categorized according to their highest degree of flare. A log transformation was applied to the medical expenditures to accommodate specific observed data properties (e.g., skewness). A subsequent linear model was used to adjust for any remaining imbalances from matching and to estimate the incremental annual economic burden (all-cause direct medical cost, in 2010 U.S dollars) associated with SLE for different levels of flare severity for SLE patients in comparison to their matched non-SLE controls.

Results: 13,460 SLE cases (mean age: 45.6 years; female: 91.6% female; average length of follow-up: 2.9 years) were matched to 13,460 non-SLE controls (mean age: 47.1 years; 88.9% female; average length of follow-up: 2.0 years). During the follow-up period, SLE cases had a significantly higher overall comorbidity burden, (Charlson Comorbidity Index score 1.5, vs. 1.0; p<0.001) and a higher proportion had hospitalizations (49.7% vs. 27.7%; p<0.001) and ER visits (66.7% vs. 43.7%; p<0.001) compared to non-SLE controls. Among SLE cases with no flares, mild/moderate and severe flares as highest flare severity, annualized all-cause direct medical costs were $14,945, $21,606 and $64,578 respectively. In multivariable models comparing non-SLE controls, incremental adjusted annualized direct medical costs for SLE cases with no flares, mild/moderate and severe flares respectively were $441, $3,606 (p<0.05) and $18,953 (p<0.05).

Conclusion: Significantly greater proportions of patients with SLE had a hospitalization or ER visit over a 1-year follow-up than their matched non-SLE counterparts. The direct medical costs of patients with SLE were significantly higher than controls, with costs increasing substantially as the severity of flares increase.

Disclosure: S. Narayanan, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc.; 3. E. Durden, Human Genome Sciences, Inc. and GlaxoSmithKline, 2; A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; P. Juneau, Human Genome Sciences, Inc. and GlaxoSmithKline, 2; K. L. Wilson, Human Genome Sciences, Inc. and GlaxoSmithKline, 2.

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Direct Medical Cost Associated with Organ System Involvement in aCommercially Insured Population with Systemic Lupus Erythematosus in the United States.

A. A. Clarke, MedImmune, LLC, 3; W. Greth, MedImmune LLC, 9; S. Narayanan, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc.; 3. E. Durden, Human Genome Sciences, Inc. and GlaxoSmithKline, 2; A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; P. Juneau, Human Genome Sciences, Inc. and GlaxoSmithKline, 2; K. L. Wilson, Human Genome Sciences, Inc. and GlaxoSmithKline, 2.
days). During the follow-up period, cardiovascular (49.0%) and musculoskeletal (40.3%) comorbidities were observed most frequently, followed by neuropsychiatric (16.7%), renal (14.2%), mucocutaneous (5.4%) and pulmonary (3.4%) comorbidities. Total annual, mean all-cause costs were $30,369 ± $58,344 in the overall SLE population. Among patients with evidence of SLE-related organ damage, annual mean costs were highest for pulmonary ($74,433; SD = $97,787) and renal ($65,442; SD = $11.541) comorbidities (all p-values < 0.001). Compared to the overall SLE population, costs were also higher among SLE patients with cardiovascular ($44,066; SD = $75,161), neuropsychiatric ($43,820; SD = $62,646), mucocutaneous ($41,841; SD = $104,766), and musculoskeletal ($38,986; SD = $66,986) comorbidities (all p-values < 0.001).

Conclusion: As expected, organ system involvement associated with high morbidity were associated with highest annual costs on a per diem basis. However, other comorbidities such as cardiovascular and musculoskeletal manifestations, also represent a substantial impact to the health care system, particularly given their higher prevalence.

Disclosure: A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; E. Durden, Human Genome Sciences, Inc. and GlaxoSmithKline, 2; S. Narayanayam, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; F. Juneau, Human Genome Sciences, Inc. and GlaxoSmithKline, 2; K. L. Wilson, Human Genome Sciences, Inc. and GlaxoSmithKline, 2.

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Primary Care Preventive Services in Patients with Systemic Lupus Erythematosus Compared to Others in Their Community. Cristina Drenkard, Kimberly Rask, Gaobin Bao, Ganesh Patel, Suparna Bagchi and S. Sam Lim. 1Emory University, Atlanta, GA, 2Georgia Department of Public Health, Atlanta, GA

Background/ purpose: Systemic lupus erythematosus (SLE) is a chronic illness frequently complicated by infections, cardiovascular disease (CVD) and cancer. Primary care preventive services (PCS) are recommended to prevent these complications among individuals at risk. Yet, the utilization of PCS in the US may be more challenging for SLE patients, especially given the worse SLE outcomes among ethnic minorities and those with low socioeconomic status. We compared the likelihood that a cohort of SLE patients from a large metropolitan area in Atlanta, GA, US received recommended PCS relative to the baseline rates of PCS in the same community from a national population-based survey.

Methods: The Georgians Organized Against Lupus (GOAL) is a cohort of validated SLE patients predominantly derived from the Georgia Lupus Registry, a population-based registry of lupus in the Atlanta metropolitan area. GOAL includes the full sociodemographic spectrum of SLE patients and collects self-reported measures on health care utilization and health conditions. Eleven self-reported PCS were assessed in 765 SLE GOAL participants (94% women, 78% blacks, 18% uninsured) and 3 representative samples of the same community, 938 of them with diabetes, and similar to CVD. Over 78% of SLE received recommended cancer screening services, which was comparable to the other BRFFS groups. However, only 65% of SLE participants were adequately screened for cholesterol, a lower proportion than in the BRFFS samples. Counseling on hypertension was reported by less than 50% of SLE, similar to the BRFFS groups. Less than 20% of SLE responders received all recommended PCS. Further research is needed to identify factors associated with gaps in the utilization of primary care among SLE patients.

Disclosure: C. Drenkard, None; K. Rask, None; G. Bao, None; G. Patel, None; S. Bagchi, None; S. S. Lim, Human Genome Sciences, Inc., 2, GlaxoSmithKline, 2.

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Autoimmune Diseases: Declining Mortality Between 1999 and 2008 However Continuing to be a Leading Cause of Death in Children— A 10-Year Retrospective Review. Eric Y. Yen and Deborah K. McCurdy. Mattel Children’s Hospital, University of California at Los Angeles, Los Angeles, CA

Background/Purpose: Autoimmune diseases are chronic illnesses that cause significant and chronic disability in children and may lead to death. Using mortality data from 1995, Walsh and Rau showed that autoimmune disease deaths were the leading causes of death among young women. The objective of this study is to examine the trends in crude mortality rate in children for autoimmune diseases in the United States.

Methods: We selected 24 autoimmune diseases (Table 1) chosen by Jacobson et al using the criteria of Rose and Bona, who defined autoimmune diseases as having direct proof or indirect evidence of autoimmune pathogenesis. Every autoimmune disease was classified with ICD-10 diagnosis code(s). Using the information provided by the Center for Disease Control (CDC), we reviewed all mortality data from the period of 1999–2008 in 3 year intervals. CDC reports that >99% of all deaths in the United States are registered. Each death certificate that lists an autoimmune disease as the underlying cause of death was identified and counted. Age groups, crude mortality rates per 100,000 persons (= number of deaths/population*100,000), and total mortality changes (percent change) between 1998 and 2008 were defined and calculated. We also compared the number of autoimmune disease deaths to the top ten leading causes of death by age in 2008.

Table 1. Autoimmune Diseases (ICD-10 codes).

<table>
<thead>
<tr>
<th>Disease (ICD-10)</th>
<th>Crude Mortality Rate (Deaths/Population*100,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addison’s disease (E27.1, E27.2, E27.4)</td>
<td>Relapsing polychondritis (M94.1)</td>
</tr>
<tr>
<td>Autoimmune hemolytic anemia (D59.1)</td>
<td>Polymyositis/dermatomyositis (M33)</td>
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<tr>
<td>Chronic active hepatitis (K73)</td>
<td>Primary biliary cirrhosis (K74.3)</td>
</tr>
<tr>
<td>Glomerulonephritis (N00, N01, N03, N05, N18)</td>
<td>Rheumatic fever and Rheumatic heart disease</td>
</tr>
<tr>
<td>Goodpasture’s syndrome (M31.0)</td>
<td>Scleroderma (M34, L94.0, L94.1)</td>
</tr>
<tr>
<td>Graves’ disease/hyperthyroidism (E05.0)</td>
<td>Scleroderma (M34, L94.0, L94.1)</td>
</tr>
<tr>
<td>Idiopathic thrombocytopenia purpura (D69.3)</td>
<td>Scleroderma (M34, L94.0, L94.1)</td>
</tr>
<tr>
<td>Insulin dependent diabetes (E10)</td>
<td>Sjogren’s (M35.0)</td>
</tr>
<tr>
<td>Multiple sclerosis (G35)</td>
<td>Systemic lupus erythematosus (M32)</td>
</tr>
<tr>
<td>Myasthenia gravis (G70.0)</td>
<td>Thyroiditis (E06.3)</td>
</tr>
<tr>
<td>Myocarditis (I40.1, I40.8, I40.9, I51.4, I51.8)</td>
<td>Uveitis (H20.0, H21.0, H20.8, H20.9, H20.9)</td>
</tr>
<tr>
<td>Pemphigus vulgaris (L01.0)</td>
<td>Viniti (L80)</td>
</tr>
<tr>
<td>Pernicious anemia (D51.0)</td>
<td></td>
</tr>
</tbody>
</table>

Results: Table 2 presents the crude mortality rates of autoimmune diseases except from 1999, 2002, 2005, and 2008 and the percent change between 1999 and 2008. Mortality rates decreased from 5% to 33% in all age groups except for children younger than 5 years old. The absolute numbers of autoimmune disease death did not increase over time. Likewise, mortality rates for all causes decreased for all age group under 20 years old. Despite a sharp decline in mortality rates, autoimmune diseases continue to be a leading cause of death among children (Table 3).

Table 2. Trends in crude mortality rates for autoimmune diseases and all causes of death. Crude mortality rates are expressed per 100,000 persons.

<table>
<thead>
<tr>
<th>Age</th>
<th>Crude Mortality Rate (Deaths/Population*100,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoimmune Diseases</td>
<td></td>
</tr>
<tr>
<td>1–4</td>
<td>0.33</td>
</tr>
<tr>
<td>5–9</td>
<td>0.19</td>
</tr>
<tr>
<td>10–14</td>
<td>0.26</td>
</tr>
<tr>
<td>15–19</td>
<td>0.60</td>
</tr>
<tr>
<td>20–24</td>
<td>1.05</td>
</tr>
<tr>
<td>All Causes of Death</td>
<td></td>
</tr>
<tr>
<td>1–4</td>
<td>3.44</td>
</tr>
<tr>
<td>5–9</td>
<td>1.68</td>
</tr>
<tr>
<td>10–14</td>
<td>2.09</td>
</tr>
<tr>
<td>15–19</td>
<td>6.86</td>
</tr>
<tr>
<td>20–24</td>
<td>9.08</td>
</tr>
</tbody>
</table>


Background/Purpose: Data from other large SLE cohorts have suggested improving survival among SLE patients in recent years with protective effects from antimarial use and less favorable prognoses among males. We investigated whether a change in survival has occurred among patients with SLE in our large academic lupus center over the past 41 years.

Methods: Our lupus registry contains data on 5,030 patients seen in our lupus center for potential SLE (ICD-9 billing code 710.0) since the 1960s. For this study, we included 1,009 patients who had validated SLE per both treating rheumatologist and an SLE expert, ≥ 4/11 of the 1997 ACR Criteria for Classification of SLE, date of diagnosis on or after January 1, 1970, and ≥ 2 visits to our center. Data ascertained from the medical record included age at SLE diagnosis, validated history of lupus nephritis, clinical manifestations, serologies, hematology and renal laboratories, medication use and date of death. Individuals were followed for ten years, or until death or end of follow-up period (April 30, 2101). Kaplan Meier curves with log rank tests and multivariable Cox proportional hazards models, adjusted for age at diagnosis, race, sex, nephritis and hydroxychloroquine use, were used to estimate the risk of death over time, and to investigate potential predictors of mortality in our cohort.

Results: The 1,009 SLE patients were divided into two periods at a point where each group contributed equal person-time. Date ranges were January 1, 1970-August 31, 1993 (54,000 person-months) and September 1, 1993-April 30, 2011 (54,000 person-months). Clinical characteristics of the patients diagnosed in each period are compared in Table 1A. All patients were ANA positive and approximately 60% in both periods were anti-dsDNA positive. More SLE patients in the recent periods were non-White. They were also older at diagnosis and a higher proportion was anti-dsDNA positive. More SLE patients in the recent periods were ANA positive and approximately 60% in both periods were anti-dsDNA positive. More SLE patients in the recent periods were

Table 1A. Comparison of Clinical Characteristics of SLE Patients Diagnosed in Early vs. Late Periods

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age at Diagnosis (SD)</td>
<td>29.4 (12.2)</td>
<td>27.0 (11.3)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Male, (%)</td>
<td>30.7 (6.7)</td>
<td>53.9 (9.5)</td>
<td>0.01</td>
</tr>
<tr>
<td>White, (%)</td>
<td>283 (62.8)</td>
<td>226 (40.5)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>ANA Positive, (%)</td>
<td>451 (100)</td>
<td>558 (100)</td>
<td>0.50</td>
</tr>
<tr>
<td>Anti-dsDNA Positive, (%)</td>
<td>268 (59.4)</td>
<td>336 (60.2)</td>
<td>0.85</td>
</tr>
<tr>
<td>Lupus Nephritis, (%)</td>
<td>145 (32.2)</td>
<td>167 (29.9)</td>
<td>0.45</td>
</tr>
<tr>
<td>Hydroxychloroquine Use, (%)</td>
<td>338 (75.3)</td>
<td>483 (86.6)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

* t-tests and Fisher exact tests

Conclusion: Although mortality rates from autoimmune diseases appear to be declining in children 5–20 years of age, autoimmune diseases continue to rank within the top ten leading causes of death.

Disclosure: E. Y. Yen, None; D. K. McCurdy, None.

938

Hospitalizations in Systemic Lupus Erythematosus: A Longitudinal Study, Hong Fang, Jie Xu and Michelle Petri. Johns Hopkins University School of Medicine, Baltimore, MD

Background/Purpose: Hospitalizations are one of the major direct costs in SLE. A review of studies looking at the contributions of different medical components to the economic burden of SLE revealed that hospitalizations may count for 50% of the direct costs in SLE. Identification of predictors of hospitalizations could lead to targeted interventions to reduce costs.

Methods: The medical resource use questionnaire was distributed to SLE patients in the Hopkins Lupus Cohort that covered the last 3 months before the baseline visit and then at the following two quarterly clinic visits. 359 patients (91% female, 55% Caucasian, 36% African-American, 9% other ethnicities, mean age at baseline 46±12 years) were included in the analysis. Exclusion criteria were diagnosis with lupus less than 6 months ago, age younger than 18 or older than 75, pregnant at baseline, and active HIV patients.

Results: Univariate analysis identified prednisone, disease activity (mean Physician’s global assessment, SLEDAI), and renal lupus as predictors of hospitalization over the next 6 months (Table 1). In the multivariate model for number of hospitalizations, use of prednisone at baseline and mean SLEDAI were associated (Table 2).

Table 1. Predictors of hospitalizations (any vs none)—univariate analysis.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>SE</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at baseline (years)</td>
<td>≤ 40 (n=134)</td>
<td>11 (8.2)</td>
<td>0.21</td>
</tr>
<tr>
<td>Gender</td>
<td>Female (n=327)</td>
<td>35 (10.7)</td>
<td>0.77</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>African-American (n=131)</td>
<td>19 (14.5)</td>
<td>0.096</td>
</tr>
<tr>
<td>Family income ($)</td>
<td>≤ 50k (n=165)</td>
<td>21 (12.7)</td>
<td>0.30</td>
</tr>
<tr>
<td>Education (years)</td>
<td>&lt; 12 (n=24)</td>
<td>2 (8.3)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Use of prednisone at baseline</td>
<td>No (n=224)</td>
<td>17 (7.6)</td>
<td>0.010</td>
</tr>
<tr>
<td>PGA at baseline</td>
<td>Yes (n=135)</td>
<td>22 (16.3)</td>
<td>0.41</td>
</tr>
<tr>
<td>Mean PGA over year</td>
<td>≤ 1 (n=310)</td>
<td>32 (10.3)</td>
<td>0.018</td>
</tr>
<tr>
<td>Mean SLEDAI at baseline</td>
<td>≤ 2 (n=265)</td>
<td>23 (8.7)</td>
<td>0.026</td>
</tr>
<tr>
<td>Meand SLEDAI over year</td>
<td>≤ 2 (n=242)</td>
<td>19 (7.9)</td>
<td>0.0083</td>
</tr>
<tr>
<td>Anti-dsDNA at baseline</td>
<td>Negative (n=271)</td>
<td>28 (10.3)</td>
<td>0.39</td>
</tr>
<tr>
<td>C3 or C4 at baseline</td>
<td>Positive (n=80)</td>
<td>11 (13.8)</td>
<td>0.50</td>
</tr>
<tr>
<td>Increased ESR at baseline</td>
<td>No (n=179)</td>
<td>15 (8.4)</td>
<td>0.11</td>
</tr>
<tr>
<td>Urine Pr-Cr ratio at baseline</td>
<td>≤ 0.2 (n=314)</td>
<td>31 (13.9)</td>
<td>0.049</td>
</tr>
<tr>
<td>Baseline history of hospitalizations</td>
<td>No (n=327)</td>
<td>34 (10.4)</td>
<td>0.37</td>
</tr>
</tbody>
</table>

1PGA: Physician’s global assessment (0–3 scale)
Table 2. Multivariate Linear Regression Model.

<table>
<thead>
<tr>
<th>Effect on number of hospitalizations</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at baseline (per 10 years)</td>
<td>0.04 ± 0.02</td>
</tr>
<tr>
<td>Ethnicity (African-American)</td>
<td>0.06 ± 0.06</td>
</tr>
<tr>
<td>Education (&lt;12 years)</td>
<td>−0.05 ± 0.10</td>
</tr>
<tr>
<td>Use of prednisone at baseline</td>
<td>0.14 ± 0.06</td>
</tr>
<tr>
<td>Mean SLEDAI (per unit)</td>
<td>0.03 ± 0.01</td>
</tr>
<tr>
<td>Urine Pr-Cr ratio at baseline (per unit)</td>
<td>0.01 ± 0.04</td>
</tr>
</tbody>
</table>

We next looked at hospitalizations due to lupus. In a multivariate linear regression model, baseline hospitalizations and mean SLEDAI were predictive.

Conclusion: Total hospitalizations are associated with prednisone use and disease activity. Hospitalizations due to SLE were also associated with disease activity captured by SLEDAI. Targeted therapies that reduce SLEDAI would thus be expected to reduce hospitalizations and direct costs.

Disclosure: H. Fang, None; J. Xu, None; M. Petri, HGS, 5, GlaxoSmithKline, 5, MedImmune, 5, UCB, 5, Anthera, 5, Pfizer Inc, 5, TEVA, 5.

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Shared High Risk of Intensive Care Unit Admission in Three Autoimmune Inflammatory Diseases. Christine Peschken, Carol A. Hitchon, Allan Garland, Charles N. Bernstein, Randy Fransoo and Ruth Ann Marrie, University of Manitoba, Winnipeg, MB

Background/Purpose: Little is known about the influence of autoimmune inflammatory diseases on the risk of critical illness, as defined by Intensive care unit admissions (ICU). Using a large, population-based database we determined the incidence of ICU admissions in rheumatoid arthritis (RA), multiple sclerosis (MS) and inflammatory bowel disease (IBD). These conditions are highly prevalent in Western countries and often managed with immunomodulatory therapies.

Methods: In a stable population of over 900,000 adults, hospital claims from an administrative database were linked to a population based ICU database to determine the incidence of ICU admissions from 2000–2010. RA, MS, and IBD patients were compared to cohorts from the general population, matched on sex, year of birth and region of residence, with up to 5 controls per case. Individuals with any diagnostic codes (ICD-9/10) for autoimmune inflammatory disease were excluded from the control cohorts. We used previously published and validated definitions for RA, MS, and IBD. Annual incidence rates were estimated by age group, sex, and geographic region (number of persons in each cohort with at ≥ 1 ICU admission/ number of persons alive in that cohort at year-end). Results were age and sex standardized to the general Canadian population.

Results: The incidence of ICU admission between the disease specific cohorts and matched cohorts were compared using incidence rate ratios (IRR). The 10 year cumulative incidence of ICU admission for the period 2000–2010 was compared: (number of persons with disease who had ≥ 1 episode of critical illness/ person-years at risk). Hazard ratios for the 10 year period were calculated after adjustment for age, sex, socioeconomic status and comorbidities.

Incidence rate is higher among women than men: 9.4 versus 1.5 per 100,000 patient*years. It reaches a maximum between 45 and 54 years of age, with age in men; 25% (294) of the incident cases were documented in the HES database only.

Conclusion: The risk of ICU admission is significantly increased in RA, MS and IBD patients compared to the general population. Close to 1% of adults with these diseases develop critical illness each year; representing a substantial cost to the healthcare system. The risks between the 3 diseases are remarkably similar, suggesting shared risks from chronic inflammation and/or immunomodulatory therapy.

Disclosure: C. Peschken, None; C. A. Hitchon, None; A. Garland, None; C. N. Bernstein, None; R. Fransoo, None; R. A. Marrie, None.

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Incidence of Systemic Lupus Erythematosus in England, 1998–2010. Herve Caspard1, Amy Steffey2, Jie Li2 and Trung N. Tran2. 1MedImmune LLC, Gaithersburg, MD, 2MedImmune, Gaithersburg, MD

Background/Purpose: Systemic Lupus Erythematosus (SLE) is a chronic auto-immune disease associated with a wide spectrum of clinical manifestations and increased mortality. The most recent data about incidence of SLE in England date back to 1999.

It has been suggested that the incidence of SLE and other auto-immune diseases has increased over time.

Our purpose was:

* To estimate the incidence of SLE in England from 1998 to 2010 and to describe the incidence rate distribution by demographic factors.
* To discuss the hypothesis that the incidence of SLE increased from 2001 to 2010.

Methods: We investigated the incidence of SLE among individuals documented in the Clinical Practice Research Database (CPRD) and linked with the Hospital Episode Statistics (HES) database. CPRD is a database of anonymized longitudinal medical records from primary care from over 600 practices in the United Kingdom. HES is a database documenting all admissions to the National Health System hospitals in England that can be linked with CPRD since 1997. All individuals documented in CPRD and HES prior to October 1st, 2010 and aged 18 years or older were retained in the analysis.

Patients with SLE were identified as individuals with at least one relevant diagnosis code in CPRD or HES (list of codes available upon request).

Incident cases were defined as patients with at least 12 months of registration in CPRD prior to the date of first diagnosis. Incidence rates were estimated each calendar year from January 1st 1998 to October 1st 2010.

Results: The incidence rate for the 2001–2010 time period is 5.5 per 100,000 patient*years (table 1); this estimate is very close to the 1998–2000 estimate (5.6 per 100,000 patient*years) and falls within the 95% confidence interval of each calendar year point estimate from 2001 to 2010.

Table 1. Incidence rate estimates per calendar year

<table>
<thead>
<tr>
<th>Calendar year</th>
<th>Population exposed (patient*years)</th>
<th>Incident cases</th>
<th>Incidence rate (per 100,000 patient*years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998–2000</td>
<td>4,213,018</td>
<td>237</td>
<td>5.6 [4.9;6.3]</td>
</tr>
<tr>
<td>2001</td>
<td>1,504,620</td>
<td>83</td>
<td>5.1 [4.3;6.7]</td>
</tr>
<tr>
<td>2002</td>
<td>1,585,560</td>
<td>89</td>
<td>5.6 [4.6;6.8]</td>
</tr>
<tr>
<td>2003</td>
<td>1,639,386</td>
<td>87</td>
<td>5.3 [4.2;6.4]</td>
</tr>
<tr>
<td>2004</td>
<td>1,682,720</td>
<td>82</td>
<td>4.9 [3.8;5.9]</td>
</tr>
<tr>
<td>2005</td>
<td>1,720,965</td>
<td>88</td>
<td>5.1 [4.0;6.2]</td>
</tr>
<tr>
<td>2006</td>
<td>1,768,140</td>
<td>101</td>
<td>5.7 [4.6;6.8]</td>
</tr>
<tr>
<td>2007</td>
<td>1,812,779</td>
<td>109</td>
<td>6.0 [4.9;7.1]</td>
</tr>
<tr>
<td>2008</td>
<td>1,850,292</td>
<td>111</td>
<td>6.0 [4.9;7.1]</td>
</tr>
<tr>
<td>2009</td>
<td>1,859,559</td>
<td>93</td>
<td>5.0 [4.0;6.0]</td>
</tr>
<tr>
<td>2010 (through September 30)</td>
<td>1,359,960</td>
<td>79</td>
<td>5.8 [4.5;7.1]</td>
</tr>
<tr>
<td>2001–2010</td>
<td>16,784,884</td>
<td>922</td>
<td>5.5 [5.1;5.8]</td>
</tr>
</tbody>
</table>

Incidence rate is higher among women than men: 9.4 versus 1.5 per 100,000 patient*years. It reaches a maximum between 45 and 54 years of age in women (12.2 per 100,000 patient*years) while it keeps growing slightly with age in men; 25% (294) of the incident cases were documented in the HES database only.

Conclusion: These incidence rates of SLE in England from 1998 to 2010 are consistent with prior estimates and with estimates in other western countries.

We did not observe any significant change in the incidence of SLE in England from 2001 to 2010.

Disclosure: H. Caspard, None; A. Steffey, None; J. Li, None; T. N. Tran, None.
Validity and Reliability of the Systemic Lupus Erythematosus (SLE) Disease Activity, such as the SLE Disease Activity Index 2000 (SLEDAI-2K) and the Systemic Lupus Erythematosus (SLAM), rely on a physician-obtained history, physical examination, and laboratory evaluation and thus may prove impractical and costly especially for large epidemiologic studies. The Systemic Lupus Activity Questionnaire (SLAQ) was developed based on the SLAM as a more economical way of following and tracking large groups of SLE patients who may be at a distance from a center in epidemiologic studies. The purpose of the present study was to translate and adapt the SLAQ to Japanese and further investigate its validity and reliability using a prospective observational cohort of SLE patients followed at a single university clinic while their physicians score the SLEDAI-2K.

Methods: The English version of the SLAQ was translated, back-translated and culturally adapted to Japanese using standard methodology. Japanese SLE patients who had 4 or more revised American College of Rheumatology (ACR) criteria for SLE were approached during their outpatient attendance in our university clinic. Some of the hospitalized patients during the study period were also eligible to the study. Patients were asked to complete the SLAQ and other related demographic questionnaires such as Medical Outcomes Study Short Form-36 (SF-36) and physicians were asked to complete the SLEDAI-2K and the Systemic Lupus International Collaborating Clinics (SLICC)/ACR Damage Index (SDI). Laboratory items were omitted from SLEDAI-2K scores in this study and the instrument will be called SLEDAI-2K-nolab. Patients were prospectively followed for repeat assessment next year.

Results: A total of 246 patients and 30 physicians (all rheumatologists) participated. The acceptability of the SLAQ was high, with most of items having 100% response rate. The distribution of the SLAQ, the SLEDAI-2K, and the SLEDAI-2K-nolab all skewed to the right. The median SLAQ score was 5 (range 0–32) and the median SLEDAI-2K score was 2 (range 0–18). The SLAQ had a weak correlation with the SLEDAI-2K-nolab (Spearman’s ρ = 0.18, p = 0.005) but not with SLEDAI-2K (p = 0.71). The SLAQ demonstrated acceptable internal consistency, with a Cronbach’s alpha of 0.78. The SLAQ showed weak correlation with the SDI, and moderate correlation with physical and mental component summary scores of the SF-36 (Spearman’s ρ = 0.17, −0.53, and −0.54, respectively). Twenty-five patients with stable disease were asked to repeat the SLAQ after 2 weeks and the intraclass correlation coefficient was 0.85, which means good test–retest reliability. These figures come from the first year research and the second year gave similar results. The SLAQ demonstrated a good responsiveness: standardized response mean 0 = 0.40 and effect size = 0.32 in patients with worsened SLE.

Conclusion: We have successfully translated, adapted and validated the Japanese version of the SLAQ. There is evidence of acceptable reliability and validity of the Japanese version of the SLAQ among Japanese patients with SLE. Our study provides evidence of the cross-cultural validity of this tool and can be used to assess SLE-related damage among Japanese patients with SLE.

Disclosure: Y. Okamoto, None; Y. Katsunuma, None; Y. Kawaguchi, None; S. Baba, None; K. Takagi, None; H. Ichida, None; T. Gono, None; M. Hanaoka, None; Y. Ota, None; H. Yamanaka, None.

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Impact of Systemic Lupus Erythematosus On Work Productivity and Income in the United States. Alan Oglesby1, Ellen Sulcs2, Siva Narayanan1, Mchele Lee3 and Cindy Garris4. 1GlaxoSmithKline, Research Triangle Park, NC, 2Harris Interactive Inc., Rochester, NY, 3Human Genome Sciences, Inc., Rockville, MD

Background/Purpose: Systemic lupus erythematosus (SLE) is a complex, chronic autoimmune disorder characterized by fluctuating periods of disease activity affecting multiple organ systems. This study was conducted to evaluate the impact of SLE on patients’ employment and productivity.

Methods: A longitudinal cohort of employed SLE patients in the United States, recruited through a patient advocacy association and the Harris Interactive Illness Panel, was surveyed online (IRB approved) between Dec 2010 and Aug 2011. Inclusion criteria were 18 years old, self-reported SLE diagnosis, and ≥1 SLE flare in prior 3 months requiring medical attention (taking medications, calling or visiting a physician, or going to the ER or hospital). A control group of employed patients without SLE recruited from Harris PollOnline (HPOL) were demographically matched (age, sex, race, income, and education) to the employed SLE cohort. Controls met the above inclusion criteria excluding the SLE related criteria and were also surveyed online. A group of unemployed SLE patients were also recruited for research, but not included in this analysis of employed cohorts. Both the employed SLE patients and controls completed baseline and follow-up surveys at the end of 6 months. Questions for the SLE cohort included perceived SLE disease activity over the past 3 months using a 10-point scale (mild: 0–3, moderate: 4–6, severe: 7–10), impact of SLE on work productivity and absenteeism. The control group answered similar questions about the impact of any health conditions on work. Employed and unemployed SLE patients were compared to controls by dependent sample t-tests. Cohens’s d effect size and 300 employed controls completed the survey; of the 300 control group respondents, 69% reported having ≥1 health condition(s). The mean age in the employed SLE group and control groups was 39.8 and 41.1 years, respectively (p<0.05). Of all surveyed respondents, 96% was subsequently translated into Spanish, Portuguese and French. The purpose of the present study was to translate and adapt the LDQ to Japanese and further investigate its validity and reliability using a prospective observational cohort of SLE patients followed at a single university clinic.

Methods: The English version of the LDQ was translated, back-translated and culturally adapted to Japanese using standard methodology. Japanese SLE patients who had 4 or more revised ACR criteria for SLE were approached during their outpatient attendance in our university clinic. Some of the hospitalized patients during the study period were also eligible to the study. Patients were asked to complete the LDQ and other related demographic questionnaires such as Medical Outcomes Study Short Form-36 (SF-36) and physicians were asked to complete the SDI and the SLE Disease Activity Index 2000 (SLEDAI-2K). Patients were prospectively followed for repeat assessment next year.

Results: A total of 250 patients and 30 physicians (all rheumatologists) participated. The acceptability of the LDQ was high, with most of items having 100% response rate. The distribution of the LDQ and SDI both skewed to the right. The median LDQ score was 2 (range 0–12) and the median SDI score was 1 (range 0–9). The LDQ had a substantial correlation with the SDI (Spearman’s ρ = 0.71, p < 0.001). Cohen’s kappa coefficient, a statistical measure of agreement for qualitative items, between the individual SDI and LDQ items varied between 0.07–1.00. The damage domains of the LDQ were not associated with each other, which was reflected in low Cronbach’s alpha (0.53). The LDQ showed poor correlation with the SLEDAI-2K, and mental component summary scores of the SF-36, but had moderate correlation with physical component summary scores of the SF-36 (Spearman’s ρ = −0.08, −0.11, and −0.41, respectively). Twenty-five patients with stable disease were asked to repeat the LDQ after 2 weeks and the intraclass correlation coefficient was 0.85, which means good test–retest reliability. These figures come from the first year research and the second year gave similar results. The LDQ demonstrated a good responsiveness: standardized response mean 0 = 0.40 and effect size = 0.32 in patients with worsened SLE.

Conclusion: We have successfully translated, adapted and validated the Japanese version of the LDQ. There is evidence of acceptable reliability and validity of the Japanese version of the LDQ among Japanese patients with SLE. Our study provides evidence of the cross-cultural validity of this tool and can be used to assess SLE-related damage among Japanese patients with SLE.

Disclosure: Y. Okamoto, None; Y. Katsunuma, None; Y. Kawaguchi, None; S. Baba, None; K. Takagi, None; H. Ichida, None; T. Gono, None; M. Hanaoka, None; Y. Ota, None; H. Yamanaka, None.
were female and 79% were Caucasian (no significant differences across groups). The employed SLE cohort reported fewer overall hours worked per week (25.3 vs 32.8) and more lost work hours per week due to SLE (6.9 hours) than the employed control group due to any health condition (1.6 hours) (all p-values<0.05). While at work, patients reported significantly greater impact on productivity due to SLE (45%) compared to controls for any health reason (13%, p<0.05). In the SLE employed group, the number of work hours missed increased incoveniently and self-reported disease severity worsened from mild, moderate, to severe (2.0, 4.2, and 7.9 hours, respectively (p<0.05). Hourly employees with SLE (52.3% of SLE cohort) reported losing an average of $346 per week due to their lupus. Similarly, lost income per week increased as SLE activity increased ($49 in mild to $522 in severe, p<0.05).

Conclusion: Patients with SLE reported significantly reduced ability to work due to their disease burden. For hourly employees with SLE, increased disease activity may have significant detrimental impacts to their earning potential.

Disclosure: A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; E. Sules, Harris Interactive, 3; N. Narayanan, Human Genome Sciences, Inc, 1, Human Genome Sciences, Inc, 3; N. Lee, Harris Interactive, 3; C. Garris, GlaxoSmithKline, 1, GlaxoSmithKline, 3.

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Job-Related Burden and Effort-Reward Imbalance in Patients with Systemic Lupus Erythematosus.
Jutta G. Richter, Thomas Muth, Ralph Brinks, Tobias Koch, Johannes Siegrist, Nicole Hoffmann, Peter Angerer and Matthias Schneider. Heinrich-Heine-University, Duesseldorf, Germany

Background/Purpose: Working life factors influence patients’ (life) satisfaction and well being. Effort at work is part of a social contract that patients’ perceptions of their job-related burden to develop appropriate support strategies. The corresponding questionnaire in pts capable for work. Effort reward ratio (ERR) was assessed by self-administered questionnaires was applied to SLE pts. ERI was assessed by strategies. Results: pts’ perceptions of their job-related burden to develop appropriate support strategies. Did not differ in ERI and OCS subgroups. Further study data analysis will address pts’ perceptions of their job-related burden to develop appropriate support strategies. Did not differ in ERI and OCS subgroups. Further study data analysis will address pts’ perceptions of their job-related burden to develop appropriate support strategies.

Discussion: A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; E. Sules, Harris Interactive, 3; N. Narayanan, Human Genome Sciences, Inc, 1, Human Genome Sciences, Inc, 3; N. Lee, Harris Interactive, 3; C. Garris, GlaxoSmithKline, 1, GlaxoSmithKline, 3.

945
Work Loss in Systemic Lupus Erythematosus, the General Public, and Other Chronic Conditions.
S. Sam Lim1, Greg Dennis2, Hong Kan3, Priti M. Jinigran2, Charles T. Moita1, Gaobin Bao1 and Cristina Drenkard1.
1 Emory University, Atlanta, GA; 2Human Genome Sciences, Inc., Rockville, MD, 3GlaxoSmithKline, Research Triangle Park, NC, 4GlaxoSmithKline R&D, Research Triangle Park, NC, 5GlaxoSmithKline, Philadelphia, PA

Background/ Purpose: Systemic lupus erythematosus (SLE) predominately develops in young groups, when many are establishing themselves in the workforce and can have a devastating impact on employment. We studied the impact of sociodemographic factors on work loss in SLE, the general public, and other major chronic conditions.

Methods: The Georgians Organized Against Lupus (GOAL) cohort is derived predominantly from the population-based Georgia Lupus Registry and collects annually self-reported measures from validated patients with SLE. The Behavioral Risk Factor Surveillance System (BRFSS) survey samples representative individuals from the general population on self-reported health conditions and behaviors. We studied GOAL SLE participants who lived in the Atlanta metropolitan area surveyed between August 2011 and April 2012, and 4 BRFSS samples (general population and self-reported diabetes, asthma, and cardiovascular disease (CVD)) from the same geographic area, surveyed between 2005-10. The effect of sociodemographic factors on being unemployed/disabled at survey completion in SLE and BRFSS participants aged >18 and <65 was analyzed with logistic regression. We reported the adjusted odds ratios (OR) of being unemployed/disabled for each sociodemographic variable within SLE and 4 BRFSS samples.

Results:

<table>
<thead>
<tr>
<th></th>
<th>SLE n=232</th>
<th>General n=783</th>
<th>Diabetes n=244</th>
<th>Asthma n=723</th>
<th>CVD n=244</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean</td>
<td>45</td>
<td>41</td>
<td>49</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Female %</td>
<td>94</td>
<td>52</td>
<td>51</td>
<td>57</td>
<td>49</td>
</tr>
<tr>
<td>White %</td>
<td>19</td>
<td>59</td>
<td>51</td>
<td>61</td>
<td>46</td>
</tr>
<tr>
<td>Median</td>
<td>81</td>
<td>42</td>
<td>49</td>
<td>59</td>
<td>39</td>
</tr>
<tr>
<td>Median EHS</td>
<td>35</td>
<td>23</td>
<td>28</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Unemployed/disabled % (95% CI)</td>
<td>47 (45–50)</td>
<td>12 (11–13)</td>
<td>23 (18–28)</td>
<td>19 (14–23)</td>
<td>33 (25–42)</td>
</tr>
<tr>
<td>OR (95% CI) of unemployed/disabled</td>
<td>1.1 (1.0–1.2)</td>
<td>1.2 (1.0–1.3)</td>
<td>1.1 (1.0–1.3)</td>
<td>1.0 (0.7–1.2)</td>
<td>1.0 (0.7–1.2)</td>
</tr>
<tr>
<td>Gender (Male vs Female)</td>
<td>1.0 (0.8–1.2)</td>
<td>1.2 (0.9–1.5)</td>
<td>0.9 (0.5–1.7)</td>
<td>1.0 (0.6–1.5)</td>
<td>1.0 (0.5–1.5)</td>
</tr>
<tr>
<td>Race (Black vs White)</td>
<td>2.7 (1.4–4.9)</td>
<td>1.9 (1.2–3.0)</td>
<td>1.0 (0.6–1.6)</td>
<td>1.0 (0.3–3.2)</td>
<td>1.0 (0.5–3.1)</td>
</tr>
<tr>
<td>Marital Status (Married vs other)</td>
<td>0.5 (0.4–0.7)</td>
<td>0.4 (0.3–0.6)</td>
<td>0.4 (0.2–0.7)</td>
<td>0.3 (0.2–0.7)</td>
<td>0.2 (0.1–0.4)</td>
</tr>
</tbody>
</table>

Conclusion: The burden of unemployment/disability was significantly higher in SLE than in other chronic diseases, even when the mean age of SLE and the education level were similar across groups. Less than 1/3 of individuals with diabetes, asthma and CVD were unemployed, as compared to 60% of SLE. Black race was associated with unemployment/disability in SLE and the general population, but not in other chronic diseases. Lower education and not being married increased the risk of unemployment/disability in all groups. Important factors, such as disease severity, treatment response, or access to care in black patients with SLE must be further explored in order to reduce the burden of work loss in SLE.

Disclosure: S. S. Lim, Human Genome Sciences, Inc., 2, GlaxoSmithKline, 2; G. Dennis, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; H. Kan, GlaxoSmithKline, 1, P. M. Jinigran, GlaxoSmithKline, 3; C. T. Moita, GlaxoSmithKline, 1, GlaxoSmithKline, 3; G. Bao, None; C. Drenkard, GlaxoSmithKline, 2, Human Genome Sciences, Inc., 2.
Methods: A longitudinal cohort of employed SLE patients in the U.S. meeting the following inclusion criteria were recruited between Dec 2010 and March 2011 through a patient advocacy association and the Harris Interactive. The Harris Interactive conducted a screening test for connective tissue diseases (CTDs). The sensitivity of ANA testing in 3 CTDs (SLE, MCTD, SSC), and mixed connective tissue disease (MCTD) was significantly higher than that of other CTDs. The sensitivities of ANA (SLE, MCTD, SSC) and Skindex-29 QoL scores. These parameters were measured at the initial and last visits. CLASI damage scores (dyspnoea and scarring) also did not have a significant effect on Quality of Life.

Conclusion: In conclusion, disease damage does not affect quality of life, as measured by the Skindex-29.Differences were found in CLE patients with different disease activity. African American patients with CLE do exhibit a high rate of DLE, but experience damage earlier in their disease course, frequently in conjunction with disease activity.

Disclosure: S. M. Verma, None; J. Okawa, None; K. Propert, None; V. P. Werth, None.

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Antibody-Based Prediction Rules for Connective Tissue Disease: Analysis of 12,555 Patients with Antinuclear Antibody Testing. Ryo Rokutanda1, Mitsumasa Kishimoto2, Yasuharu Tokuda3, Ken-ichi Yamaguchi4, Hisanori Shimizu2, Yasuhito Suyama2, Yuki Ohara2, Yoychiro Haji1, Chisun Min1, Akira Takeda1, Yukiyo Matsui1 and Masato Okada1. 1St. Luke’s International Hospital, Tokyo, Japan; 2University of Tsukuba, Ibaraki, Japan.

Background/Purpose: Antinuclear antibody (ANA) is widely used as a screening test for connective tissue diseases (CTDs). The sensitivity of ANA in CTDs varies between 0.58 and 0.94. ANA testing has been used as a screening test to identify individuals with CTDs. The sensitivity of ANA in CTDs is significantly higher than that of other CTDs. The sensitivities of ANA for SLE, SSC, MCTD, SS, PM/DM were 98.6%, 95.9%, 100%, 83.3%, and 69.6%, respectively. The positive predictive value (PPV) of ANA for diagnosing each CTD was significantly higher than that of other CTDs. Nonetheless, in combination with other antibody testing, our prediction rules reveal a high specificity and PPV for CTDs. We then performed classification and regression tree (CART) analysis to develop prediction rules for each CTD. Potential predictors included ANA titers, ANA staining patterns, and specific antibody tests.

Results: Of 12,461 patients with ANA testing, 665 patients (5.3%) were diagnosed as having at least one of the 6 CTDs of interest. Area under the ROC curve for ANA testing was 0.943, 0.977, 0.926, 0.840, and 0.740 for SLE, MCTD, SSC, and PM/DM, respectively. The sensitivities of ANA (≥40) for SLE, SSC, MCTD, SS, PM/DM were 96.6%, 95.9%, 100%, 83.0%, and 69.6%, respectively. The positive predictive value (PPV) of ANA for each CTD was significantly higher than that of other CTDs. The sensitivities of ANA for SLE, SSC, MCTD, SS, PM/DM were 98.6%, 95.9%, 100%, 83.0%, and 69.6%, respectively. The positive predictive value (PPV) of ANA for each CTD was significantly higher than that of other CTDs. The sensitivities of ANA (≥40) for SLE, SSC, MCTD, SS, PM/DM were 98.6%, 95.9%, 100%, 83.0%, and 69.6%, respectively. The positive predictive value (PPV) of ANA for each CTD was significantly higher than that of other CTDs.

Conclusion: ANA testing demonstrates substantial sensitivity, but has low PPV for CTDs. Nonetheless, in combination with other antibody testing, our prediction rules reveal a high specificity and PPV for diagnosing CTDs.

Disclosure: R. Rokutanda, None; M. Kishimoto, None; Y. Tokuda, None; K. Yamaguchi, None; H. Shimizu, None; Y. Suyama, None; Y. Ohara, None; Y. Haji, None; C. Min, None; A. Takeda, None; Y. Matsui, None; M. Okada, None.

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The Inverse Association Between Obesity and Anti-Nuclear Antibodies Is Modified by Systemic Inflammation and Maybe Associated with Body Composition. Irene Blanco, Monalyn Labitigan and Matthew Abramowitz.

Background/Purpose: Obesity and abdominal adiposity have been frequently associated with inflammation. However, an association of obesity with a decreased likelihood of anti-nuclear antibodies (ANAs) was recently reported in the general population. We used data from adult participants ≥20 years of age in the National Health and Nutrition Examination Survey 1999–2004 to further explore this association.

Methods: To rule out a possible previous history of autoimmune disease, participants were excluded if they reported a history of arthritis other than osteoarthritis, thyroid or liver disease, or steroid use. ANAs were screened in a subset of participants, and the subset was defined as having ANAs if they were positive for at least one of the following antibodies: anti-DNA antibody (anti-DNA), anti-ribonucleic acid (anti-RNA), anti-Smith (anti-Sm), anti-Ro/SS-A, anti-La/SS-B, or anti-Jo-1. The presence of ANAs was determined using an enzyme-linked immunosorbent assay (ELISA) method. ANAs were defined as positive if the antibody titer was ≥1:40. ANAs were not defined as positive if the antibody titer was <1:40. ANAs were defined as positive if the antibody titer was ≥1:40.

Results: 223 patients were analyzed at baseline, with 141 of these patients completing more than one study visit. The majority of patients were Caucasian (67.5%), followed by African Americans (29.1%) and Asian Americans (4.0%). African Americans accounted for a disproportionate percentage of both local (50%) and generalized (46.9%) cases of DLE. Median CLASI damage scores significantly differed between African Americans and Asian Americans (4.0, 7.0) (Kruskal-Wallis p=0.0001) and last visit (10.0, 6.0, 8.5) (Kruskal-Wallis p=0.001), Dunn’s Multiple Comparison p=0.0001, p<0.01). CLASI damage scores in African Americans correlated with CLASI activity scores (Spearman’s r=0.45, p=0.0003). There was no significant correlation between CLASI activity scores and Skindex domains overall. Individually, dyspnoea and scarring also did not have a significant effect on Quality of Life.

Conclusion: In conclusion, disease damage does not affect quality of life, as measured by the Skindex-29.Differences were found in CLE patients with different disease activity. African American patients with CLE do exhibit a high rate of DLE, but experience damage earlier in their disease course, frequently in conjunction with disease activity.

Disclosure: S. M. Verma, None; J. Okawa, None; K. Propert, None; V. P. Werth, None.
using indirect immunofluorescence (IF). Titors were done on samples with IF > 3+. We subsequently strictly defined positive ANA as an ANA titer ≥ 1:160. Overweight and obesity were classified by traditional BMI criteria. High and low C-reactive protein (CRP) were defined using the 75th percentile cutpoint as ≥ 0.42 and < 0.42 mg/dL, respectively. Dual-energy X-ray absorptiometry (DEXA) was used to determine body composition. Logistic regression models were created to examine associations with ANA status and were adjusted for demographics, comorbidities, smoking status, and total cholesterol.

Results: 2552 participants were included in our analyses. Obese participants were older (p < 0.001), more likely to be men (p = 0.004) and to have comorbidities, and had higher levels of CRP (p < 0.001). After multivariable adjustment, obesity was associated with a decreased odds of having ANAs (OR 0.78, 95%CI 0.62–0.99). However when adding log-transformed CRP into our model, this association was no longer significant (OR 0.85, 95%CI 0.62–1.15), and there was evidence of effect modification by CRP (p = 0.12). To study the effect of systemic inflammation, as measured by CRP, we then stratified our models based on the CRP cutpoint. Among participants with low CRP (< 0.42), obesity was again associated with a reduced likelihood of ANA positivity (OR 0.69, 95%CI 0.48–0.99), but a trend was seen in the opposite direction among those with high CRP (≥ 0.42) (OR 1.77, 95%CI 0.81–3.88). When looking specifically at the 1143 obese and overweight participants with low CRP, ANA positivity was associated with a higher prevalence of cardiovascular disease (p = 0.02) and higher % total body fat (p = 0.007), trunk fat (p = 0.02), and non-trunk fat (p = 0.004). This association, however, was not found in the high CRP group.

Conclusion: In the general population the association of obesity with ANA is modified by the presence of systemic inflammation as measured by CRP, where the inverse association previously found is eliminated when controlling for CRP. While this inverse relationship remains among obese participants with low CRP, when these obese and overweight participants are ANA positive, it is associated with greater total body and trunk fat. Therefore it is possible that body composition, particularly fat distribution, is driving autoimmunity in the general population even in the absence of systemic inflammation. Further studies are needed to determine if in fact this is the case.

Disclosure: I. Blanco, None; M. Lablitgan, None; M. Abramowiz, None.

950 Performance of Various Anti-Nuclear Antibody Methodologies in the Assessment of Autoimmune Connective Tissue Diseases. Xiaoli Deng, Cynthia S. Crowson, Helen Khun, Melissa R. Snyder and Kevin G. Molder. Mayo Clinic, Rochester, MN

Background/Purpose: The anti-nuclear antibody (ANA) is the classic biomarker associated with autoimmune connective tissue diseases (CTDs). ANA testing is often ordered as part of the evaluation of patients with suspected CTD. Different methods, including indirect immunofluorescence assays (IFAs), enzyme immunosassays (EIAs), and multiplex immunosassays (MIAs) are currently used by clinical labs for general ANA screening. However, because the methodologies are very different, discordance between results may be observed, leading to challenges in interpretation. The purpose of this study is to analyze the performance of these methods in a subset of patients referred for rheumatology consultation.

Methods: A cohort of patients who had an ANA ordered for clinical assessment and a rheumatology consultation at our institution in 2010–2011 were enrolled. ANA testing was performed by IFA (Zeus Scientific), EIA (Biorad), and MIA (Biorad). A titer of ≥ 1:40 for the IFA and a value ≥ 1.0 for the EIA were identified as positive. Autoantibodies to dsDNA, chromatin, ribosome P, SS-A, SS-B, Sm, Sm/RNP, RNP, ScI-70, Jo-1 and centromere B were detected as positive at a titer of ≥ 1:40 for at least 1 specific autoantibody identified the ANA as positive. Sensitivities and specificities were computed and compared using McNemar’s test.

Results: In the study cohort (n = 327; 81% female; mean age 52 [sd: 16] years), a subset had no identifiable autoimmune disease (non-auto; n = 87) and the remaining patients had a diagnosed autoimmune CTD (auto CTD; n = 240), including systemic lupus erythematosus (SLE; n = 51), Sjogren syndrome (SS; n = 34), mixed CTD/undifferentiated CTD (MCTD/UCTD; n = 51), rheumatoid arthritis (RA; n = 33), and various other miscellaneous CTDs (n = 71). Sensitivities and specificities of the IFA, EIA and MIA within these groups are shown in the table.

In the auto CTD group overall, IFA and EIA had similar sensitivities (p = 0.83), both of which were significantly higher than MIA (p < 0.001). However, in the non-auto group, the MIA demonstrated significantly improved specificity compared to both the IFA and EIA (p < 0.001). In specific CTD groups, all SS patients were ANA positive by all 3 methods. In SLE patients, the EIA and IFA had similar sensitivities (p = 0.32); the specificity of the MIA was significantly lower than the IFA (p = 0.046), and marginally lower than the EIA (p = 0.08). In the MCTD/UCTD group, the EIA and IFA were positive in all patients, and the MIA had significantly lower sensitivity (p = 0.003).

Conclusion: The sensitivities of IFA, EIA, and MIA vary significantly depending on the specific diagnostic category. Although the sensitivities of IFA and EIA tend to be improved over the MIA, the specificities of these methods are a significant issue. Further comparisons of methods used for ANA screening can provide valuable information that could lead to improved interpretation and utilization of lab testing.

Disclosure: X. Deng, None; C. S. Crowson, None; H. Khun, None; M. R. Snyder, Bio-Rad Laboratories, S, Inova Diagnostics, Inc., S, K. G. Molder, None.

951 A Systematic Review of Quality of Prognosis Studies in Systemic Lupus Erythematosus. Lily Siok Hoon Lim1, Senq-J Lee1, Brian M. Feldman2, D. D. Gladman1, Eleanor Pullenayegum3 and Earl D. Silverman1. 1Hospital for Sick Children, Toronto, ON, 2The Hospital for Sick Children, Toronto, ON, 3Toronto Western Hospital and University of Toronto, Toronto, ON, 4McMaster University, Hamilton, ON, 5Pediatric Rheumatology Collaborative Study Group (PRSCG), Toronto, ON

Background/Purpose: Prognosis studies study future outcomes and/or seek to identify predictive or associative factors associated with outcomes. Strong and consistent prognostic factors can be used to individualize management and better outcomes of patients. Many prognostic factors have been identified in SLE but few have been consistent. We hypothesize that this is due to flawed study design. We aim to systematically assess methodological quality of prognosis studies in SLE.

Methods: A systematic search of prognosis studies in SLE was performed in MEDLINE and EMBASE, from January 1990 to June 2011. Non-English literature, non-original research, non-full length reports and animal studies were excluded. Of 5419 articles subjected to a title and abstract screen, 1039 articles were found. A representative sample of 150 articles was selected using a random number generator and assessed by 2 reviewers. Studies were classified according to design and the clarity of research question was assessed. Each study was assessed by a risk-of-bias tool “QUality In Prognosis Studies” (QUIPS) in 6 domains: study participation, study attrition, measurement of prognostic factors, measurement of outcomes, measurement/adjustment for confounders and appropriateness of statistical analysis. Information on missing data was also collected.

Results: Of 150 articles, 15 were pediatric studies, 3 made comparisons of pediatric and adult patients and the remainder were adult studies. The majority were published in rheumatology journals (69%). Cohort design was used in 67% of studies; the remainder used cross-sectional (21%), case-control (5%) and other designs (7%). The research question clearly included study population in 92%, prognostic factor in 54% and outcome in 61% of studies. High risk of bias (QUIPS) was noted in 57% of studies for study participation, 57% for attrition, 20% for prognostic factor, 18% for outcome, 65% for confounders and 36% for statistical analyses. Confounders were named in the methods section in only 12% of studies. Some consideration for confounding was built into the design of 21% of studies. The amount of missing data could not be assessed in 39% of studies.

Conclusion: Inadequate articulation of research questions for prognostic factors, poor design addressing confounding, study participation and attrition and inadequately reported information on missing data limited the quality of prognosis studies in SLE. Future prognosis studies should be designed with better consideration to the above factors to improve methodological rigor.

Disclosure: L. S. H. Lim, None; S. J. Lee, None; B. M. Feldman, None; D. D. Gladman, None; E. Pullenayegum, None; E. D. Silverman, None.
Cognitive Behavioral Therapy and Milnacipran in Combination Appears to Be More Efficacious Than Either Therapy Alone. Dennis C. Ang, Mark P. Jensen, Jennifer L. Steiner, Janna Hilligoss, Richard Gracey and Chandan Saha. Indiana University, Indianapolis, IN, 2Seattle, WA, 3Indianapolis, IN, 4Chapel Hill, NC, 5Indiana University

Background/Purpose: The two treatment options that have received the significant attention in fibromyalgia (FM) management are cognitive behavioral therapy (CBT) and medications. Given the fact that either therapy alone appears to only produce modest improvements in clinical symptoms, we concluded a 3-arm randomized attention-controlled trial whose primary aim was to obtain preliminary estimates of the effects of combined CBT and milnacipran on primary clinical endpoints: changes in weekly average pain intensity (daily electronic recording of pain scores) and physical function (SF-36 physical component summary score).

Methods: Fifty eight patients with FM were randomized to one of the 3 treatment arms: (1) combination therapy (n=20), (2) drug + education attention (n=19), and (3) placebo + CBT (n=19). Throughout the 21-week study, subjects received either milnacipran (50 mg BID) or placebo (BID). Subjects also received 8 sessions of telephone-delivered CBT or educational instructions, but only from baseline to week 9. Assessments were conducted at baseline, week 9 and 21. Secondary clinical endpoints included changes in PHQ-8 depression severity (0–24), and evoked (thumb) pressure pain scores (0–20), a measure of pain sensitivity.

Results: Characteristics of the 58 FM subjects: mean age = 46.6 (10.4) years; female =93%; whites = 81%; high school graduates = 71%; concomitant opioid analgesics = 43%; PHQ-8 depression = 10.55 (4.79); evoked pressure pain = 8.8 (0.59); weekly average pain intensity = 6.31 (1.27); and SF-36 physical function = 45.26 (22.4).

Compared to drug alone, combination therapy demonstrated a medium effect on reducing weekly average pain intensity (effect size ES = 0.67) and in improving SF-36 physical function (ES = 0.60). The magnitude of change in the pain intensity score in the combination group was more than twice the magnitude of change in the drug monotherapy group. Compared to drug alone, CBT alone was marginally efficacious in improving SF-36 physical function. No significant between group differences were seen in improvement in depression severity and change in evoked pain scores. Interestingly, subjects in the drug groups (i.e., combination and drug alone) became less sensitive to pressure stimuli compared to subjects in the CBT monotherapy group, albeit this difference was not statistically significant.

Table 1. Severity status of patients with fibromyalgia or chronic widespread pain

<table>
<thead>
<tr>
<th>Variable</th>
<th>Not Widespread</th>
<th>Widespread 20%</th>
<th>Widespread 33%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Widespread pain Mean (95% C.I.)</td>
<td>FMS Mean (95% C.I.)</td>
<td>FMS Mean (95% C.I.)</td>
<td></td>
</tr>
<tr>
<td><strong>Vas Pain</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
</tr>
<tr>
<td><strong>Fatigue</strong></td>
<td></td>
<td></td>
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<tr>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
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<tr>
<td><strong>Cbt Drug vs. Cbt Mono</strong></td>
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<tr>
<td><strong>Sex</strong></td>
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<td>(0–10)</td>
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<td>(0–10)</td>
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<td><strong>Cohens d (Effect size)</strong></td>
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<td>(0–20)</td>
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<td><strong>Secondary Outcomes</strong></td>
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<tr>
<td>PHQ-8 depression</td>
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<td>(0–19)</td>
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<tr>
<td><strong>Evoked pain scores</strong></td>
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<tr>
<td>(0–20)</td>
<td>(0–20)</td>
<td>(0–20)</td>
<td>(0–20)</td>
</tr>
</tbody>
</table>

Conclusions: Based on the observed effect sizes, our preliminary data justifies pursuing a larger definitive trial to test the superiority of combination therapy vs. monotherapy. Additionally, a direct comparison of CBT vs. drug monotherapy is warranted to inform future health care decisions.

Disclosure: D. C. Ang, None; M. P. Jensen, None; J. L. Steiner, None; J. Hilligoss, None; R. Gracey, None; C. Saha, None.

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Comparative Symptom Severity of Patients Satisfying Chronic Widespread Pain and Fibromyalgia Criteria. Frederick Wolle1, Brian Wallitt1, Robert S. Katz1 and Winfried Häuser1. National Data Bank for Rheumatic Diseases, Witchita, KS, 2Washington Hospital Center, Baltimore, MD, 3Rush University Medical Center, Chicago, IL, 4Klinikum Saarbrücken, Saarbrücken, Germany

Background/Purpose: Chronic widespread pain (CWP) is often used as a surrogate for fibromyalgia in epidemiological research, particularly in Europe and in whiplash-related injuries. This CWP substitution occurred because it was operationally impossible to perform tender point examinations in epidemiological and survey research. CWP is a requirement for fibromyalgia diagnosis when the American College of Rheumatology (ACR) 1990 criteria are used. 20–35% of patients with CWP will also satisfy fibromyalgia criteria. Despite the common use of CWP, it is not clear how closely CWP positive patients resemble those with fibromyalgia, and whether CWP is a valid substitution for fibromyalgia. In this report we determined the relative severity of patients satisfying the CWP and fibromyalgia criteria.

Methods: We studied 6,583 rheumatic disease patients who completed a research questionnaire that contained assessments of criteria and severity variables. Fibromyalgia was diagnosed using the 2010 American College of Rheumatology (ACR) criteria for fibromyalgia, as modified for survey research. Widespread pain used the 1990 ACR definition: pain above and below the waist, on the left and right sides of the body, and involving the axial skeleton. Severity measures included the Polysymptomatic Distress Scale (PSD) and the Symptom Severity (SS) scale from 2010 criteria. In addition, we employed other standard assessments of severity, including measures of pain, sleep, fatigue and quality of life. We categorized patients as a) without CWP, b) with fibromyalgia, c) with CWP assuming 20% of CWP cases had FM, and d) with CWP assuming 33% of CWP cases had fibromyalgia (Table 1).

Table 1. Comparative Symptom Severity of Patients Satisfying Chronic Widespread Pain and Fibromyalgia Criteria

<table>
<thead>
<tr>
<th>Variable</th>
<th>Not Widespread</th>
<th>Widespread 20%</th>
<th>Widespread 33%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Widespread pain Mean (95% C.I.)</td>
<td>FMS Mean (95% C.I.)</td>
<td>FMS Mean (95% C.I.)</td>
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<tr>
<td><strong>Vas Pain</strong></td>
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<tr>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
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<tr>
<td><strong>Fatigue</strong></td>
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<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
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<tr>
<td><strong>Cbt Drug vs. Cbt Mono</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
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<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
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<tr>
<td><strong>Component</strong></td>
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<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
<td>(0–10)</td>
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<tr>
<td><strong>Cohens d (Effect size)</strong></td>
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<td></td>
<td></td>
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<tr>
<td>(0–20)</td>
<td>(0–20)</td>
<td>(0–20)</td>
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<tr>
<td><strong>Secondary Outcomes</strong></td>
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<td></td>
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<tr>
<td>PHQ-8 depression</td>
<td></td>
<td></td>
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<tr>
<td>(0–19)</td>
<td>(0–19)</td>
<td>(0–19)</td>
<td>(0–19)</td>
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<tr>
<td><strong>Evoked pain scores</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(0–20)</td>
<td>(0–20)</td>
<td>(0–20)</td>
<td>(0–20)</td>
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Results: Figure 1 shows the relation of both measures to PSD in the overall sample. X and y lines cross when probability of diagnosis is >= 0.5. This occurs at 9.3 and 13.3 on the PSD scale for CWP and FM, respectively. Table 1, adjusted for age and sex, demonstrates that patients with fibromyalgia have more severe symptoms than those with CWP at 20% and 33% prevalence levels. For the 3 clinicalVAS scales, fibromyalgia patients are approximately 30% more severe than those with CWP.
Conclusion: Patients satisfying fibromyalgia criteria have a more severe illness than those with CWP. The use of CWP as a surrogate measure of fibromyalgia substantially underestimates fibromyalgia severity, but still identifies a group of severe patients.

Disclosure: F. Wolfe, None; B. Wallitt, None; R. S. Katz, None; W. Häuser, None.

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Post–Surgical Outcome Is Correlated with Pre–Surgical Symptoms of Fibromyalgia in Patients Undergoing Spinal Surgery. Jacob N. Ablin1, Mark Berman1, Eyal Behrbalk2, Dan Buskila1, Gilad Regev2 and Zvi Lidar2.

1Tel Aviv Sourasky Medical Center, Tel Aviv, Israel, 2Department of Neurosurgery and Orthopedic, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel, 3Beer-Sheva, Israel

Background/Purpose: Chronic pain is a major symptom for which patients undergo spinal surgery. At the same time, chronic pain is considered an entity in and of itself, often constituting part of the clinical spectrum of central sensitization (e.g. fatigue, cognitive impairment etc) thus overlapping with the fibromyalgia syndrome (FMS).

The impact of surgical intervention on chronic pain is not well known. While such interventions may remove a local “pain generator” they may simultaneously constitute a form of physical trauma, as well as entailing prolonged immobilization, both potentially detrimental for fibromyalgia patients.

The aim of this study was to evaluate patients who undergo spinal surgery for presence of central pain and central sensitization symptoms and evaluate the correlation between these symptoms and the surgical outcomes.

Methods: Participants were patients scheduled for spinal surgery. Pre-surgical evaluation included physical examination and manual dolorimetry, documenting the 1990 ACR FMS classification criteria. In addition, patients filled out the widespread pain index (WPI) and the Symptom Severity Scale (SSS) which are part of the suggested 2010 diagnostic criteria of fibromyalgia, as well as the fibromyalgia–Impact Questionnaire (FIQ) and SF-36.

Eight weeks after surgery, patients underwent follow–up evaluation. Statistics: Spearman correlations were calculated between the pre–surgery parameters (WPI and SSS) and the change in SF-36 items. P values under 0.05 were considered significant.

Results: Twenty eight patients (18 male, 10 female) were recruited. The average age was 56.3 (23–85). The average BMI was 26.7 kg. Three patients fulfilled ACR 1990 fibromyalgia criteria (10.7%), whereas 8 patients fulfilled the 2010 diagnostic criteria (28.6%). Thirteen patients were available for post–surgical evaluation.

Table 1 presents the correlations calculated between the pre–surgical WPI and SSS and the change in the SF-36 domains: Physical Functioning (PF), Role–Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional (RE), Mental Health (MH) as well as the SSS and the delta of the GH and RE items.

<table>
<thead>
<tr>
<th>ΔPF</th>
<th>ΔRP</th>
<th>ΔBP</th>
<th>ΔGH</th>
<th>ΔVT</th>
<th>ΔSF</th>
<th>ΔRE</th>
<th>ΔMH</th>
<th>ΔPCS</th>
<th>ΔMCS</th>
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</thead>
<tbody>
<tr>
<td>0.63</td>
<td>0.27</td>
<td>0.72</td>
<td>0.62</td>
<td>0.30</td>
<td>0.96</td>
<td>0.34</td>
<td>0.84</td>
<td>0.31</td>
<td>0.77</td>
</tr>
<tr>
<td>0.07</td>
<td>0.00</td>
<td>0.28</td>
<td>0.06</td>
<td>0.28</td>
<td>0.06</td>
<td>0.28</td>
<td>0.06</td>
<td>0.28</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Conclusion: FMS symptoms were highly prevalent among patients scheduled for spinal surgery (28.6%). A negative correlation was observed between pre-surgical severity of FMS symptoms and components of the post-surgical SF-36. Patients with symptoms of FMS may have a poor outcome after spinal surgery. The clinical utility of surgical intervention in such patients should be carefully evaluated and treatment specific for FMS considered, before embarking on a surgical course.

Disclosure: J. N. Ablin, Pfizer Inc, 5, MSD, S; M. Berman, None; E. Behrbalk, None; D. Buskila, None; G. Regev, None; Z. Lidar, None.

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1Rush University Medical Center, Chicago, IL, 2University of Illinois Medical School, 3Rheumatology Associates, Chicago, IL

Background/Purpose: Fibromyalgia patients are reported to have central sensitization and abnormal central processing of sensory input. Fibromyalgia patients also have more neurocognitive complaints and abnormalities on certain types of neurocognitive testing, especially the Stroop test for naming speed and a distraction test, the Auditory Consonant Trigram. To evaluate other possible central nervous system dysfunction, we asked fibromyalgia patients and patients with other rheumatic diseases in a questionnaire whether or not they had symptoms and features of a learning disability.

Methods: Office patients and controls were asked to complete a questionnaire about difficulties in reading, writing, body awareness/spatial relationships, and oral expressive language. A score consisting of the percentage of items for which the respondent reported difficulty was obtained for each of these areas. Four diagnosis groups were compared with respect to questionnaire responses: 85 FMS patients, 39 RA patients, 21 SLE patients, and 14 controls without rheumatic diseases. The Kruskal-Wallis and Mann-Whitney tests were used to compare scores and the chi-square test of association was used to compare frequencies.

Results: Compared to controls, FMS patients had significantly worse reading and oral expressive language scores (p = 0.001). FMS patients had significantly worse scores for all four areas than the RA and SLE groups (RA 0.001; SLE 0.001). There were no statistically significant differences between the RA, SLE, and control groups with respect to any of the endometriosis and FMS patients were significantly more likely to report the following difficulties: making mistakes when reading like skipping words or lines (FMS 43%, controls 0%, RA 3%, SLE 5%, p < 0.001); reading the same line twice (FMS 57%, controls 14%, RA 15%, SLE 19%, p < 0.001); difficulty understanding the main idea or identifying the important details from a story (FMS 7%, controls 0%, RA 5%, SLE 14%, p = 0.007); problems remembering what was read (FMS 59%, controls 0%, RA 11%, SLE 24%, p < 0.001); difficulty expressing self in words (FMS 42%, controls 7%, RA 8%, SLE 5%, p < 0.001); trouble finding the right words to say in a conversation (FMS 57%, controls 8%, RA 11%, SLE 24%, p < 0.001); and trouble talking about a subject or getting to the point of a conversation (FMS 43%, controls 7%, RA 5%, SLE 5%, p < 0.001).

Conclusion: Fibromyalgia patients, compared to rheumatic disease controls, are found to have problems in reading, writing, body awareness, and spatial relationships and problems in oral expressive language. Fibromyalgia patient responses suggested frequent symptoms of a learning disability.

Learning disability may be another part of central nervous system dysfunction in fibromyalgia patients. Patients, practitioners and educators should be made aware of the association between fibromyalgia and learning disabilities.

Disclosure: R. S. Katz, None; A. Small, None; C. Katz, None; S. Shott, None.

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Key Psychological Processes Associated with the Fibromyalgia Phenotype Exist On a Continuous Spectrum with Asymptomatic People. Katrina Malin1 and Geoffrey O. Littlejohn2. 1Monash University, Clayton, Australia, 2Monash Medical Centre and Monash University, Clayton, Victoria, Australia

Background/Purpose: The core features of the fibromyalgia phenotype, the widespread pain and widespread tenderness, represent one extreme of a continuous spectrum with asymptomatic people at one end and those meeting criteria for fibromyalgia at the other. A number of key central processes associate with fibromyalgia, such as personality [neuroticism and Type A] and psychological characteristics, including attitude, control, coping, catastrophizing and stress-reactivity. We hypothesized that these psychologically linked processes also exist on this single continuous spectrum from normal in asymptomatic people to abnormal in fibromyalgia, and that increasing the “gain” of these processes will increase the features contributing to the fibromyalgia phenotype.
Prevalence of Spondyloarthropathy in Fibromyalgia Patients.

Methods: We identified 98 women with fibromyalgia diagnosed according to standard ACR criteria. Applied questionnaires included the Big 5 Personality Inventory, Type A scale, Fibromyalgia Impact Questionnaire, Perceived Control of Internal States, Mastery scale, the Coping Scale and Perceived Stress scale and the depression, anxiety, confusion and optimism scales of the Profile of Mood States questionnaire. Normality assessment using Shapiro-Wilk test and correlations and regression modelling and comparisons between smallest and largest tertiles were used to explore the relationships between personality and psychological variables in both the healthy controls and in the patients with fibromyalgia.

Results: There was a significant relationship between lower and higher tertiles of neuroticism, internal and external control, attitude, coping and stress and the characteristic fibromyalgia phenotype features of fatigue, sleep and confusion, in both the healthy control and the fibromyalgia groups [p all <0.001]. Pain was also significantly different in the healthy controls [p<0.001] but showed a non-significant ceiling effect between lowest and highest tertiles in the fibromyalgia group. Personality and psychological variables also correlated significantly in both healthy controls and fibromyalgia with depression and anxiety [p<0.001]. The absolute levels of all characteristics in healthy controls and fibromyalgia patients differed significantly [p<0.001].Normality plots indicated that the psychological characteristics examined existed on a spectrum with healthy controls at one end and fibromyalgia patients at the other.

Conclusion: The personality and psychological variables that associate with fibromyalgia exist on a continuous spectrum, linking normal asymptomatic persons to the fibromyalgia phenotype. Increasing certain centrally important psychological variables will increase fibromyalgia clinical features. This is suggestive of a key role for central psychological factors in the pathogenesis of fibromyalgia.

Disclosure: K. Malin, None; G. O. Littlejohn, None.

958 Prevalence of Spondyloarthropathy in Fibromyalgia Patients. A. Efdal Yucel, Derya Kaskari and Muhtesem Agydere. Baskent University, Ankara, Turkey

Background/Purpose: Most of the tender points typical for fibromyalgia syndrome (FMS) are also entesis points. Besides, FMS and spondyloarthritis (SpA) can co-exist. Both disease groups have negative effects on the life syndrome (FMS) are also entesis points. Besides, FMS and spondyloarthropathy can co-exist. Both disease groups have negative effects on the life quality of patients. Our aim is to document the prevalence of SpA in patients diagnosed as FMS by physical therapy specialists and to emphasize evaluation of spondyloarthritis before diagnosing with FMS.

Methods: We identified 98 women with fibromyalgia diagnosed according to the American College of Rheumatology (ACR) criteria. ACR criteria were applied to diagnose SpA. We included patients with FMS in the department of Physical Therapy and Rehabilitation at our center between 2006 and 2011 and who were diagnosed with SpA according to the ACR criteria. We excluded patients who had a history of another musculoskeletal disorder for which an effective treatment strategy still remains absent.

Results: There is a meaningful percentage of patients who have clinically insidiously progressive SpA among the patients who were thought to be diagnosed as FMS or the patients who were diagnosed as FMS according to ACR’s criteria.

Conclusion: Treatment of Lateral Epicondylitis with Injection of Platelet-Rich Plasma or Corticosteroid Versus Saline: A Randomized, Double-Blind, Placebo-Controlled Trial. Thoger Krogh1, Urichi Fredberg2, Kristian Stengaard-Pedersen1, Pia Jensen1, Robin Christensen1 and Torkell Ellingsen1.

Background/Purpose: Lateral epicondylitis (LE) is a common musculoskeletal disorder for which an effective treatment strategy still remains absent. The objective is to examine whether one injection with Platelet-rich plasma (PRP) is more effective than saline and corticosteroid (CS) in reducing pain in adults with LE.

Methods: A block randomized, double-blind, placebo-controlled trial with primary outcome assessed at 3 months, and with a 12 months follow-up, conducted between January 2009, and June 2011. Patients who did not achieve a satisfying treatment response (assessment made by patient and doctor) at 3 month had the option to discontinue the study and receive other treatment. In total, 60 patients with chronic LE were randomized (1:1:1) to receive either a blinded injection of PRP, saline or CS. The primary outcome was change in pain compared to baseline using the Patient Rated Tennis Elbow Evaluation (PRTEE) questionnaire at 3 months. Secondary endpoints were all assessed at 1 month, plus ultrasonographic changes in tendon thickness and color Doppler activity at 3 months.

Results: The 60 enrolled patients in the intention to treat population had an average PRTEE pain score at baseline of 26.8 (SD 7.6). All randomized patients completed the study. At endpoint 3 months from baseline pain reduction was observed in all three groups, with no statistical significant difference between the groups. CS vs. saline – 3.76 (95% CI – 9.94 to 2.42), PRP vs. saline – 2.64 (95% CI – 8.80 to 3.52) and CS vs. PRP – 1.12 (95% CI – 7.23 to 4.99). However, at one month CS reduced pain more efficiently than both saline and PRP. The mean difference at one month between CS and saline was –8.11 (95% CI –14.29 to –1.93), between CS and PRP –9.27 (95% CI –15.38 to –3.16). CS was more efficient than PRP and saline in reducing both color Doppler activity and tendon thickness at three months. Only 16 of 60 patients completed the entire 12 months follow-up. The huge attrition rate was due to lack of treatment efficacy.

Disclosure: A. E. Yucel, None; D. Kaskari, None; M. Agydere, None.

959 Treatment of Lateral Epicondylitis with Injection of Platelet-Rich Plasma or Corticosteroid Versus Saline: A Randomized, Double-Blind, Placebo-Controlled Trial. Thoger Krogh1, Urichi Fredberg2, Kristian Stengaard-Pedersen1, Pia Jensen1, Robin Christensen1 and Torkell Ellingsen1.

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Disclosure: A. E. Yucel, None; D. Kaskari, None; M. Agydere, None.

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Figure. Changes in pain from baseline at 1 and 3 months using the PRTEE (Patient-Rated Tennis Elbow Evaluation) in patients treated with 1 injection of PRP (platelet-rich plasma), glucocorticoid, or saline. Values are Least Squares Means ± Standard Error.
Conclusion: This RCT showed no superiority of either PRP or CS compared to saline in pain reduction in LE at primary endpoint. However, anticipating immediate relief, CS had a short term pain reducing effect at one month in contrast to the other therapies. At 6 and 12 months the attrition rates in all treatment arms were too high for any meaningful conclusions to be made.

Disclosure: T. Krogh. None; U. Fredberg. None; K. Stengaard-Pedersen. None; P. Jensen. None; R. Christensen. None; T. Ellingsen. None.

Cerebral Grey and White Matter Changes in Fibromyalgia Depend On Patients’ Age, Marta Ceko, Mary-Ann Fitzcharles, M. Catherine Bushnell and Petra Schweinhardt. McGill University, Montreal, QC

Background/Purpose: Fibromyalgia (FM) patients show accelerated age-related decrease of grey matter (GM). Similarly, brain imaging studies in other chronic pain populations suggest interaction between age and GM changes. We investigated the relationship between age and GM alterations in FM patients categorized according to age.

Methods: This female study cohort comprised 29 FM patients and 29 controls matched for handedness, education, physical activity, and socioeconomic status. The sample was split at median age (50 yrs) into younger and older groups [mean age (SD)] in FM vs controls. 42.4 (5.9) vs. 43.1 (5.3), p=0.07, and 54.9 (2.8) vs. 55.7 (3.7), p=0.5. FM age groups were similar for disease duration, pain intensity, and medication use. All subjects underwent magnetic resonance imaging (MRI) in a 3 T Siemens Trio scanner. T1-weighted images were obtained for GM analysis and diffusion-weighted images for interrogation of white matter. GM was analyzed using voxel-based morphometry (VBM) (SPM8, Wellcome Trust for Neuroimaging, London, UK), as well as cortical thickness analysis (CIVET 1.9.9 and Surfstat (MNI, Montreal, Canada)). Diffusion data were analysed with FSL (FMRIB, Oxford, UK). For all analyses, voxel-wise differences between groups were examined using independent sample t-tests controlling for age.

Results: The GM in the medial prefrontal cortex (MPFC), left superior frontal gyrus (SFG), and premotor cortex (PMC) was reduced in FM patients compared to controls. Total GM was negatively correlated with age in FM (p=0.009), but not in controls (p=0.6). Similar relationships with age were observed for the changes in MPFC (FM r=0.42, p=0.03; controls r=0.2, p=0.9) and SFG (FM r=0.02, p=0.9; controls r=0.4). Older FM patients compared to controls showed pronounced GM decreases, while younger FM patients showed less GM decrease compared to controls. There were no regions where older FM patients had more grey matter. White matter adjacent to the posterior cingulate showed decreased fractional anisotropy (FA) in older FM patients. In contrast, younger FM patients showed exclusively grey matter increases compared to matched controls in the left putamen/insula, right putamen/globus pallidum, and IFG, with no region showing decreased GM. White matter adjacent to the left putamen showed increased FA.

Conclusion: FM-related brain changes depend on age with findings driven predominantly by older, postmenopausal patients. Younger, premenopausal patients showed regions of increased GM compared to age-matched controls, in line with previous findings in younger pain patients (Schweinhardt et al., 2008). Furthermore, GM alterations were partly paralleled by alterations of the adjacent white matter. White matter changes were more pronounced in older FM patients compared to matched controls.

Disclosure: M. Ceko. None; M. A. Fitzcharles. Pfizer Inc, Lilly, Purdue, Valeant, 5; M. C. Bushnell. None; P. Schweinhardt. None.

Pain, Sleep Disturbance, and Depression Mediate the Association Between Body Mass Index and Fatigue in Fibromyalgia, Mary O. Whipple \(^1\), Loren L. Toussaint \(^2\), Daniel J. Clauw \(^3\), David A. Williams \(^4\), Terry H. Oh \(^5\), Jeffrey M. Thompson \(^1\), Connie A. Luedtke \(^1\) and Ann Vincent \(^1\). \(^1\)Mayo Clinic, Rochester, MN, \(^2\)Luther College, Decorah, IA, \(^3\)University of Michigan, Ann Arbor, MI, \(^4\)Univ of MI Hlth System-Lobby M, Ann Arbor, MI, \(^5\)Univ of MI Hlth System-Lobby M, Ann Arbor, MI

Background/Purpose: Previous research and clinical observation suggest that patients with chronic disease who are obese report significant fatigue. Our objective was to explore similar relationships in patients with fibromyalgia and the extent to which pain, sleep disturbance, and depression mediated this relationship. Methods: 917 patients who consented to be part of a fibromyalgia registry were included in this analysis. Registry measures included demographics, body mass index (BMI), the modified 2010 American College of Rheumatology Fibromyalgia Survey Criteria, and selected items from the Multidimensional Assessment of Fatigue. Data were analyzed using the INDIRECT macro for SPSS which allows multiple mediator models to be specified. All analyses controlled for age and sex. INDIRECT provides unstandardized regression coefficients (reported below as “B”) which are the preferred metric in mediation models.

Results: BMI was positively associated with fatigue (B =0.03, p<.0001). BMI was also positively associated with pain (B =0.06, p<0.0001).

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University of Michigan, Ann Arbor, MI, Swedish Medical Center and University of Washington, Seattle, WA, Forest Research Institute, Jersey City, NJ

Background/Purpose: Patients with fibromyalgia (FM) who received up to 3.25 years of milnacipran (MLN) in a flexible-dose (≥200 mg/d) open-label (OL) study were eligible to continue into this randomized, double-blind (DB), placebo (PBO)-controlled discontinuation study, which demonstrated loss of therapeutic effect after withdrawal of long-term MLN treatment in patients who had achieved ≥50% pain improvement. The present analysis was conducted to determine whether patients from this study who met lower thresholds of pain improvement also experienced loss of therapeutic effect after discontinuing long-term MLN treatment.

Methods: After 4 weeks (OL) of continuing MLN treatment at the dose received in the prior long-term study, patients were evaluated for pain response and randomized (2:1) to continue MLN or discontinue treatment (ie, switch to PBO) for the 12-week DB withdrawal period. In patients who had received MLN ≥100 mg/d, 3 subgroups were identified based on percent of pain reduction from pre-MLN exposure: 1) ≥50%, n=150; 2) 30 to <50%, n=61; and 3) <30%, n=110. Efficacy assessments included visual analog scale pain (VAS, 0–100 mm), SF-36 Physical Component Summary (SF-36 PCS), Fibromyalgia Impact Questionnaire Revised (FIQR), and Beck Depression Inventory (BDI).

Results: In both subgroups of patients with clinically meaningful pain relief (≥50% and 30 to <50% subgroups), mean worsening of VAS pain scores from randomization to end of the DB withdrawal period was significantly greater (P<.05) in patients switched to PBO (≥50%: +17.7 mm; 30% to <50%, +8.5 mm) than in patients continuing MLN (≥50%, +8.3 mm; 30% to <50%, +0.5 mm). The absolute difference between treatment arms was similar in both subgroups (≥50%, −9.4 mm; 30 to <50%, −9.0 mm), as was the percentage of lost treatment effect after withdrawal (≥50%, 37.7%; 30 to <50%, 31.2%). Patients with ≥50% pain response also experienced notable worsening in SF-36 PCS and FIQR total scores after treatment withdrawal (P<.01, MLN vs PBO; both measures). In the subgroup with <30% pain improvement, no worsening in pain was observed in either treatment arm at endpoint (PBO, −1.1 mm; MLN, −5.3 mm; P=14). However, patients in this subgroup experienced significant worsening in FIQR scores after withdrawal from MLN relative to those who continued treatment (P<.001). Additionally, patients in this subgroup who were withdrawn from MLN had worsened SF-36 PCS and BDI scores while patients continuing MLN experienced no worsening in these domains.

Conclusion: Significant worsening in pain after drug withdrawal was found in both subgroups of FM patients that had shown clinically meaningful responses to long-term MLN therapy (≥50%, 30 to <50% pain improvement), suggesting that the traditional ≥30% pain responder cutoff may be adequate to demonstrate efficacy in randomized withdrawal studies. Patients with <30% pain response did not worsen in pain following withdrawal, but did experience worsening in other symptoms, suggesting that these patients may have received long-term benefit from milnacipran treatment for some FM symptom domains despite only modest improvements in pain.

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Background/Purpose: Calcific tendonitis (CT) and noncalcific tendonitis (NCT) of the shoulder is a common cause of shoulder pain and can be unresponsive to conventional therapies. Based on several randomized controlled studies (RCTs), extracorporeal shock wave therapy (ESWT) has been considered an effective alternative treatment. We performed an updated meta-analysis using all available data to analyze the efficacy of ESWT on CT and NCT.

Methods: We searched Medline, Cochrane database, and Google Scholar from inception to 2012 for RCTs comparing ESWT versus placebo for shoulder pain due to CT or NCT. We hand searched review articles, manuals, and medical journal supplements for additional references. Inclusion criteria were outcome measures of pain (VAS score; low score = less pain), functional assessment (Constant score; high score = better function), and resolution of calcifications (for CT trials). Two reviewers independently determined eligibility, assessed the quality of each trial, and extracted means and variances for these outcome measures. We computed effect sizes for mean change from baseline to 6 months or 3 months if not reported, using Hedges’ g statistic. Effect sizes were pooled using random effects models. We assessed heterogeneity and performed sensitivity analyses removing the outlier trials. Subgroup analyses for CT and NCT, and high energy (HE) and low energy (LE) trials were also performed. Fifteen trials met inclusion criteria; 11 for CT, 4 for NCT. Overall, there were 1221 participants with mean age of 51 years (range 46–56). The proportion of women was 56% (range 39%–76%). Among all trials, the effect size (ES) for VAS pain favored HE (−2.17; 95%CI [−2.85, −1.49]; F2 51%, p=0.15) and LE showed no effect (−1.15; [−2.63, 0.32]; F2 96%, p=0.00) and the ES for Constant score favored HE (1.77; [1.41, 2.14]; F2 29%, p=0.24) and LE (0.53; [0.16, 0.89]; F2 28%, p=0.24). In CT trials, any level of ESWT improved VAS scores (−2.18; [−3.55, −0.8]; F2 95%, p=0.00) and Constant scores (1.39, [0.81, 1.97]; F2 84%, p=0.00). In NCT trials, any level of ESWT had no effect on VAS scores (−0.15; [−0.57, 0.27]; F2 0%, p=0.35) or Constant scores (0.65; [−0.51, 1.82]; F2 75%, p=0.04). Among CT, effect sizes for VAS, Constant score and resolution of calcifications favored HE over LE (VAS: −0.57; [−1.10, −0.03]; F2 74%, p=0.01; Constant: 0.57; [0.28, 0.87]; F2 56%, p=0.03; Resolution of calcifications: 3.95; [1.55, 10.03]; F2 70%, p<0.01). Sensitivity analysis removing outlier trials yielded comparable results. The overall trial quality was moderate.

Table 1. Characteristics of included studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>N</th>
<th>Age (Mean, Years)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcific Tendonitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cacchi, 2006</td>
<td>0.28 ml/m2, 1500 pulses</td>
<td>0.09 ml/m2, 1500 pulses</td>
<td>100</td>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>Leve, 1999</td>
<td>0.3 ml/m2, 2000 pulses</td>
<td>0.1 ml/m2, 2000 pulses</td>
<td>80</td>
<td>48</td>
<td>88</td>
</tr>
<tr>
<td>Coutts, 2003</td>
<td>0.2 ml/m2, 1200 pulses</td>
<td>0.08 ml/m2, 1200 pulses</td>
<td>70</td>
<td>52</td>
<td>61</td>
</tr>
<tr>
<td>Gentileman, 2003*</td>
<td>0.02 ml/m2, 1500 pulses</td>
<td>0.08 ml/m2, 1500 pulses</td>
<td>144</td>
<td>50</td>
<td>90</td>
</tr>
<tr>
<td>Pertel, 2005</td>
<td>0.4 ml/m2, 2000 pulses</td>
<td>0.2 ml/m2, 2000 pulses</td>
<td>48</td>
<td>46</td>
<td>35</td>
</tr>
<tr>
<td>Poles, 2004</td>
<td>0.44 ml/m2, 1500 pulses</td>
<td>0.15 ml/m2, 1500 pulses</td>
<td>90</td>
<td>52</td>
<td>61</td>
</tr>
<tr>
<td>Planet, 2004</td>
<td>0.28 ml/m2, 2000 pulses</td>
<td>0.15 ml/m2, 2000 pulses</td>
<td>45</td>
<td>52</td>
<td>72</td>
</tr>
<tr>
<td>Cacchi, 2006</td>
<td>0.1 ml/m2, 2000 pulses</td>
<td>0.1 ml/m2, 2000 pulses</td>
<td>90</td>
<td>56</td>
<td>59</td>
</tr>
<tr>
<td>Albert, 2007</td>
<td>0.40 ml/m2, 2500 pulses</td>
<td>0.20 ml/m2, 2500 pulses</td>
<td>80</td>
<td>47</td>
<td>76</td>
</tr>
<tr>
<td>Hsu, 2008</td>
<td>0.05 ml/m2, 1500 pulses</td>
<td>0.04 ml/m2, 1500 pulses</td>
<td>46</td>
<td>56</td>
<td>51</td>
</tr>
<tr>
<td>Farr, 2011</td>
<td>0.3 ml/m2, 2000 pulses</td>
<td>0.15 ml/m2, 2000 pulses</td>
<td>40</td>
<td>55</td>
<td>47</td>
</tr>
<tr>
<td>Nonscalcific Tendonitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scherer, 2002</td>
<td>0.11 ml/m2, 1500 pulses</td>
<td>0.08 ml/m2, 1500 pulses</td>
<td>39</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Spaul, 2002</td>
<td>0.12 ml/m2, 1500 pulses</td>
<td>0.04 ml/m2, 1500 pulses</td>
<td>74</td>
<td>52</td>
<td>58</td>
</tr>
<tr>
<td>Schols, 2009</td>
<td>0.3 ml/m2, 1500 pulses</td>
<td>0.11 ml/m2, 1500 pulses</td>
<td>40</td>
<td>55</td>
<td>53</td>
</tr>
<tr>
<td>Galasso, 2012</td>
<td>0.064 ml/m2, 1500 pulses</td>
<td>0.06 ml/m2, 1500 pulses</td>
<td>20</td>
<td>51</td>
<td>48</td>
</tr>
</tbody>
</table>

*Trial also included placebo group: Energy level 0 ml/m2, pulses and dosing equivalent to treatment 1 group.

Low Energy ≤ 0.27 ml/m²

Conclusion: High energy shock wave therapy is effective for improving pain and shoulder function in patients with chronic calcific shoulder tendinitis, and can result in complete resolution of calcifications. Limitations include...
Increased Number of Painful Body Sites Is Associated with Worse Pain and Disability-Associated Outcomes Among Returning Operations Enduring Freedom/Operation Iraqi Freedom Service Members. Dennis C. Ang1, Jingwei Wu2, Samantha Outcalt3, Zhangsheng Yu4 and Matthew Bair5.

Background/Purpose: Chronic pain is a critical health problem among Operations Enduring Freedom/Operation Iraqi Freedom service members. The deleterious impact of chronic pain on quality of life and function are well described in the literature. However, little is known about the relationship between the number of chronically painful body sites and pain severity and disability-associated outcomes. In this secondary data analysis of a randomized clinical trial of a stepped-care intervention for OEF/OIF veterans with chronic musculoskeletal pain, we evaluated the association between the number of chronically painful body sites with long term pain-related outcomes.

Methods: We analyzed 222 subjects (92% of the original cohort) with available data at baseline and at the last follow-up visit (i.e., month 9). Consistent with the 2010 ACR criteria for fibromyalgia*, we dichotomized the number of chronically painful body sites (primary independent variable) as ≥3 (yes or no). We measured baseline to month 9 changes on our two primary outcomes: 1) pain intensity (as measured by Graded Chronic Pain Scale/GCPS) and 2) pain-related disability (as measured by Brief Pain Interference (BPI)). Secondary outcomes included changes in SF-36 Physical Component Summary (SF-36 PCS), depression (PHQ-9) and anxiety (GAD-7) measures. We used multiple linear regression analyses to determine the relationships of the number of painful body sites with the outcome measures.

Results: Characteristics of the 222 subjects at study entry: mean age (SD) = 37.3 (10.2) years; male = 88%; whites = 78%; married =57%; # comorbidity = 1.0 (1.0); GCPS pain intensity = 65.6 (13.7); BPI pain interference = 5.3 (2.2); SF-36 PCS = 37.6 (7.2); PHQ-9 = 10.8 (5.8); GAD-7 = 8.5 (5.2); # of pain-related medications = 1.7 (1.2); # of physical symptoms = 2.0 (1.8); and 69% (n = 154) had ≥ 3 painful body sites.

Table 1.

<table>
<thead>
<tr>
<th>Baseline Predictors</th>
<th>Improvement in GCPS pain intensity</th>
<th>Improvement in BPI pain interference</th>
<th>Improvement in SF-36 PCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of painful sites ≥3 (reference group: &lt;3)</td>
<td>–4.9 (2.4), p = 0.0396</td>
<td>–1.0 (0.3), p = 0.0016</td>
<td>4.2 (1.0), p &lt; 0.0001</td>
</tr>
<tr>
<td>Treatment group Stepped care (vs. usual care)</td>
<td>6.9 (2.2), p = 0.0017</td>
<td>0.9 (0.3), p = 0.0362</td>
<td>1.9 (0.9), p = 0.0362</td>
</tr>
<tr>
<td>Number of comorbidity</td>
<td>–2.2 (1.2), p = 0.0636</td>
<td>–0.3 (0.2), p = 0.0911</td>
<td>0.3 (0.1), p = 0.0362</td>
</tr>
<tr>
<td>Response variable at study entry</td>
<td>0.2 (0.1), p = 0.0172</td>
<td>0.4 (0.1), p = 0.0001</td>
<td>0.3 (0.1), p = 0.0001</td>
</tr>
</tbody>
</table>

Conclusion: Compared to veterans with <3 painful body sites, veterans with ≥3 painful body sites improved significantly less during the 9 months of the trial. Our findings suggest more aggressive treatment interventions are needed in this population of veterans with multiple pain sites.

Disclosure: G. T. Jones, None; P. Paudyal, None; G. J. Macfarlane, None.


Background/Purpose: Approximately one-quarter of the UK population uses complementary or alternative treatments (CAM) each year, and this is higher among persons with pain, or musculoskeletal conditions such as arthritis. A recent review has summarised the evidence relating to the use of CAM medicines (anything taken orally or applied topically) in the treatment of fibromyalgia. The aim of the current study was to review the evidence relating to CAM therapies (treatments delivered by a practitioner).

Methods: Randomised controlled trials (RCTs), published in English up to May 2011, were identified using systematic searches of bibliographic databases and searching of reference lists. Data were extracted by a single reviewer, and checked by a second, and the Jadad (J) score was used to assess methodological quality of the RCTs (0=poor; 5=high quality). All outcomes were considered but with a focus on patient global assessment and pain reporting.

Results: From 525 articles, 25 RCTs were identified, examining 14 therapies. The effectiveness of biofeedback has been tested in five RCTs (median J = 3), ranging from 30 to 143 patients. One RCT that compared biofeedback against anti-depression medication reported positive findings in terms of pain and fatigue. However, four RCTs comparing biofeedback with sham biofeedback, usual care or fitness training found no significant difference in the same outcomes. Three RCTs examined progressive muscle relaxation (median J = 3) ranging from 24 to 45 patients. In two RCTs, no significant benefit was observed, compared to hydro-galvanic bath therapy or hypnotherapy, and one RCT demonstrated progressive muscle relaxation to be inferior to massage therapy in terms of pain, stiffness, fatigue and a number of other outcomes.

Aromatherapy, chiropractic, healing therapy, hypnotherapy, imagery and qigong were each examined in two RCTs (median J = 4.5; 2.5; 3.5; 1.5; 2.0 and 3.5 respectively). With the exception of hypnotherapy, there was generally no improvement in outcome in the intervention group, compared to various control treatments. In hypnotherapy, in one RCT patients receiving hypnotherapy reported significantly greater improvements in pain, fatigue, sleep and general health compared to those receiving in physical therapy; and in the second RCT, patients receiving hypnotherapy with analgesia suggestions reported improvements in pain intensity compared to those receiving hypnotherapy with relaxation suggestions, or relaxation alone.

Finally, one RCT each examined the effectiveness of autogenic training (J=3), craniosacral therapy (J=5), music therapy (J=3), static magnet therapy (J=4), meditation (J=5) and Tai-chi (J=4). Only in Tai-chi there was evidence of positive effect of treatment: patients in this group reported significantly greater improvements in health, disease impact, mental health and sleep compared to a control group who received wellness education and stretching exercises.

Conclusion: The major limitation in reviewing the evidence for practitioner-based CAM therapies in the treatment of FM is the paucity of RCTs. The available studies provide no consistent evidence that these treatments are effective, but the lack of RCTs means that it is hard to reach firm conclusions.

Disclosure: G. T. Jones, None; P. Paudyal, None; G. J. Macfarlane, None.


Sympathetic Nervous System Dysfunction in Fibromyalgia and in Overlapping Central Sensitivity Syndromes. A Systematic Review of Controlled Studies. Laura Aline Martinez, Tania Mora, Angelica Vargas, Mario Fuentes and Manuel Martinez-Lavin. National Institute of Cardiology, Mexico City, Mexico

Background/Purpose: Fibromyalgia often coexists and overlaps with other common painful syndromes such as chronic fatigue, irritable bowel and interstitial cystitis. Yunus proposed the label “central sensitivity syndromes” as an umbrella term for these related maladies. Sympathetic nervous system dysfunction has been reported in these central sensitivity syndromes raising the possibility that such dysautonomia could be the common underlying pathogenesis that cluster fibromyalgia with these interrelated clinical entities.

Our objective: To carry out a systematic review of all published comparative case-control studies investigating sympathetic nervous system performance in fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome and interstitial cystitis.

Methods: PubMed and Embase were accessed using the following key words: autonomic (OR) sympathetic (AND) fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome and interstitial cystitis. All entries up to April 30 2012 were reviewed by three investigators searching for case-control studies in humans. The Method for Evaluating Research and Exposure (MERGE) adapted to the Scottish Intercollegiate Guidelines Network (SIGN 50) was used to rank the level of evidence contained in the selected articles. “Sympathetic predominance” was defined as statistically significant data suggesting higher sympathetic activity, decreased parasympathetic activity or both. Reverse direction applied for “parasympathetic predominance”.

Results: See table. Heart rate variability analysis (36%) was the most often used method to assess sympathetic system performance. Other less frequently used methods were: Tilt table testing (9%), sympathetic skin response (9%) and genetic studies (5%).

Conclusion: This systematic review suggests that sympathetic nervous system predominance is very common in these overlapping central sensitivity syndromes. This concordance raises the possibility that these syndromes may share similar clinical and pathogenic mechanisms.

Disclosure: L. A. Martinez, None; T. Mora, None; A. Vargas, None; M. Fuentes, None; M. Martinez-Lavin, None.

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Presence of Small Fiber Neuropathy in a Cohort of Patients with Fibromyalgia. Todd Levine1, Victoria Lawson2, Aidan Levine3, Kevin V. Hackshaw1 and David Superstein1. 1Phoenix Neurological Associates, Phoenix, AZ, 2Ohio State University, Columbus, OH, 3Ohio State Univ/Wm Davis Res, Columbus, OH

Background/Purpose: The pain associated with fibromyalgia is classically described as deep, muscular, aching and flu-like; however, a significant percentage of patients with fibromyalgia also describe neuropathic symptoms. The pain in these patients can be categorized and burning, tingling or stabbing. These clinical descriptors may raise the concern for a coexistent neuropathy. Yet, EMG/NCS in fibromyalgia patients are typically unrevealing. The constellation of neuropathic pain with normal nerve conduction studies, raises the possibility of a neuropathy confined purely to the small unmyelinated nerve fibers: a small fiber neuropathy. These small fiber neuropathies can be diagnosed through a 3-mm punch biopsy and may offer insight into the pathogenesis of some cases of fibromyalgia.

Methods: We retrospectively examined 56 patients referred for neurological evaluation who met diagnostic criteria for fibromyalgia. The patients were seen in neuromuscular consultation at the Ohio State University or at Phoenix Neurological Associates. Patients were included if they met either the ACR criteria or the revised criteria of 2010 for fibromyalgia. Patients underwent 3 mm punch biopsies at a proximal and a distal site of one lower limb. PGP 9.5 immunolabelling was performed and the epidermal nerve fiber density was counted on 50 micron sections. The patients who were found to have reduced epidermal nerve fiber density underwent a standard serologic evaluation looking for identifiable causes for their neuropathy.

Results: 34/56 (61%) of the cases were diagnosed with small fiber neuropathy on the basis of reduced epidermal nerve fiber density. Of these 34 patients only 5 had evidence for neuropathy on EMG/Nerve conduction studies. Further, this evidence was subtle enough as to be inconclusive for diagnosis.24/34, 71%, of the patients with fibromyalgia and small fiber neuropathy had serologic evidence of an underlying etiology for their neuropathy that had not been detected prior to identification of the neuropathy: errors of glucose metabolism (n=11), vitamin D deficiency (n=5), elevated ESR (n=2), B6 deficiency (n=1), B12 deficiency (n=1), Sjogrens (n=2), elevated ANA (n=1), mutation in alpha galactosidase (Fabry’s Disease) (n=1).

Conclusion: In this retrospective series, 61% of patients with fibromyalgia and neuropathic pain were found to have small fiber neuropathy based on
Genetic Interactions Between SNP Variants in C3 Receptor Subunits in Patients with SLE. Jeffrey C. Edberg, Christine W. Duarte, Amit Patki, Elizabeth E. Brown MPH, Kenneth M. Kaufman, Jennifer A. Kelly, Mary E. Comeau, Marta E. Alarcon-Riquelme, Sang-Cheol Bae, Lindsey A. Center, Timothy J. Vyse, John B. Harley, Carl D. Langefeld, Hemant N.inder A. Kelly, Mary E. Comeau, Marta E. Alarcon-Riquelme on behalf of BIOLUPUS and GENLES. Sang-Cheol Bae, Lindsey A. Center, Cincinnati, OH, Wake Forest School of Medicine, Winston-Salem Medical Center; US Department of Veterans Affairs Medical Center, Oklahoma City, OK, Wake Forest University Health Sciences, Winston-Salem, NC, 5Wake Forest University Health Sciences, Winston-Salem, NC, 6Department of Internal Medicine, Wake Forest School of Medicine, Winston-Salem, NC, 7Department of Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA, 8Department of Medicine, Oklahoma Medical Research Foundation and Oklahoma University Health Sciences Center, Oklahoma City, OK, 9Division of Genetics and Molecular Medicine and Immunology, University of Chicago, Chicago, IL, 10Division of Genetics and Molecular Medicine and Immunology, King’s College London, London, United Kingdom, 11Cincinnati Children’s Hospital Medical Center, US Department of Veterans Affairs Medical Center, Cincinnati, OH, 12Wake Forest School of Medicine, Winston-Salem, NC

Background/Purpose: Genome-wide and candidate gene studies have supported a role for genes involved in immune complex processing as being important contributors to development of SLE. The association of ITGAM variants and SLE highlights the importance of complement and receptor interactions in the SLE diathesis. We hypothesized that there may also be statistical interactions between variants in genes that encode proteins in the complement system. We have developed a gene-based analysis strategy and present data that support a role for genetic interactions between variants in genes involved in the complement system.

Methods: A newly developed variation of the Rank Truncated Product (RTP) statistic was used to assess the combined genetic contribution of loci involved in complement component 3 (C3), C3 activation (C2, C3, C4, CFH, CRP, MBL2), and C3 recognition (CR1, CR2, CSR, ITGAM/ITGB2, CR4 (ITGAX/ITGGB2)). The significance of the RTP statistic for each gene pair was assessed using a parametric bootstrap procedure. The study population included 16,105 unrelated SLE affecteds and controls from four different ancestry backgrounds (European (EA), African (AA), Hispanic (His), Asian). All participants were of self-reported sex and race/ethnicity. Affecteds met 1997 American College of Rheumatology revised criteria for the classification of SLE. 347 SNPs in these loci were genotyped on an Illumina iSelect custom array as part of the Large Lupus Association Study 2 (LLAS2).

Results: We identify new SNP associations across multiple race/ethnicities in the C2 locus with SLE (p < 10^-11) (OR = 1.8/1.7 in EA/AA) and confirm trans-racial associations of ITGAM and SLE (OR = 10^-27/10^-11) (OR = 1.7/1.2/1 in EA/AA/Hisp respectively).

Conclusion: We demonstrate significant and replicated genetic association of genes in the C3 pathway with SLE. These associations extend beyond the ITGAM locus to include other C3 receptor genes and regulators of C3 activation. The elucidation of genetic interactions between genes in this pathway demonstrates that the contribution of variants in the C3 pathway act both independently and jointly.

Association of adam33 Polymorphisms with Systemic Lupus Erythematosus. Seung Cheol Shim, Mi Kyoung Lim, Donghyuk Sheen and Hye Park. Eulji University Hospital, Daejeon, South Korea

Background/Purpose: A Disintegrin and Metalloprotease 33 (ADAM33) is a member of a family of genes that encode membrane-associated proteins with a disintegrin and a metalloprotease domain, and is located on chromosome 20p13. Recently, the polymorphisms in ADAM33 have been found to be associated with asthma. Among the rheumatic diseases, systemic lupus erythematosus (SLE) is a prototypic Th2-mediated autoimmune disease like allergic disorders. To assess whether genetic functional variants of ADAM33 are associated with susceptibility to SLE or development of specific phenotypes in patients with SLE.

Methods: We have identified 48 SNPs, and nine SNPs were selected with regard to the LD pattern. Genotyping for g.10918G>C, g.12433T>C and g.13506C>G in the ADAM33 gene was conducted with PCR-RFLP methods, and genotyping for g.330C>T, g.517A>G, g.8227G>A, g.9511G>T, g.12462C>T, g.12988C>A polymorphisms was performed by single-base extension (SBE), using the ABI Prism® SNaPshot™ Multiplex kit (Applied Biosystems). We conducted an association study for ADAM33 polymorphisms in 190 SLE patients, 469 healthy controls, and 390 rheumatoid arthritis (RA) patients as a disease control. Haplotype analyses of related variants were performed as well.

Results: Significant associations of ADAM33 polymorphisms with susceptibility to SLE were found at g.8227G>A, g.12988C>A, and g.13506C>G (P value were all below 0.001) (Table 1). Polymorphisms at g.8227G>A was associated with the ANA titers among SLE patients (P = 0.012). In addition, we analysed the haplotype, and found a positive association of susceptibility to SLE with the major haplotype GC/GC (P = 3.5E-11) (Table 2). There was no association between ADAM33 polymorphisms and RA as expected.
Table 1. Genotype and allele analyses of the polymorphisms of Adam33 gene in SLE patients and healthy controls.

<table>
<thead>
<tr>
<th>Positiona</th>
<th>Genotype/ Allele</th>
<th>Control n (%)</th>
<th>SLE n (%)</th>
<th>Odds ratiob (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>g.330C&gt;T</td>
<td>CC</td>
<td>426 (90.8)</td>
<td>168 (88.4)</td>
<td>1.00</td>
<td>0.347</td>
</tr>
<tr>
<td></td>
<td>CT</td>
<td>43 (9.2)</td>
<td>22 (11.6)</td>
<td>1.30 (0.75–2.24)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TT</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>895 (95.4)</td>
<td>358 (94.2)</td>
<td>1.00</td>
<td>0.399</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>43 (4.6)</td>
<td>22 (5.8)</td>
<td>1.28 (0.75–2.17)</td>
<td></td>
</tr>
<tr>
<td>g.8227 A&gt;G</td>
<td>AA</td>
<td>165 (38.4)</td>
<td>262 (62.6)</td>
<td>1.30 (0.75–2.24)</td>
<td>0.392</td>
</tr>
<tr>
<td></td>
<td>AG</td>
<td>201 (46.7)</td>
<td>97 (21.5)</td>
<td>1.29 (0.88–1.88)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GG</td>
<td>29 (6.6)</td>
<td>15 (3.4)</td>
<td>1.29 (0.88–1.88)</td>
<td></td>
</tr>
<tr>
<td>g.64 (A&gt;G)</td>
<td>A</td>
<td>533 (61.7)</td>
<td>221 (58.2)</td>
<td>1.00</td>
<td>0.256</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>329 (38.3)</td>
<td>159 (41.8)</td>
<td>1.10 (0.91–1.39)</td>
<td></td>
</tr>
<tr>
<td>g.300 (C&gt;A)</td>
<td>C</td>
<td>300 (64.1)</td>
<td>162 (65.2)</td>
<td>1.00</td>
<td>&gt;0.001</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>168 (35.9)</td>
<td>97 (34.8)</td>
<td>0.86 (0.60–1.24)</td>
<td></td>
</tr>
<tr>
<td>g.-330C &gt;G</td>
<td>GA</td>
<td>168 (35.9)</td>
<td>97 (34.8)</td>
<td>1.00</td>
<td>0.692</td>
</tr>
<tr>
<td></td>
<td>GG</td>
<td>74 (15.3)</td>
<td>30 (9.0)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AA</td>
<td>16 (3.4)</td>
<td>7 (2.0)</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>g.-1016C&gt;A</td>
<td>G</td>
<td>380 (84.2)</td>
<td>156 (87.6)</td>
<td>1.00</td>
<td>0.193</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>75 (15.8)</td>
<td>20 (10.4)</td>
<td>0.86 (0.60–1.24)</td>
<td></td>
</tr>
<tr>
<td>g.12433 T&gt;C</td>
<td>T</td>
<td>275 (59.4)</td>
<td>103 (61.3)</td>
<td>1.00</td>
<td>0.271</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>127 (27.1)</td>
<td>75 (41.1)</td>
<td>1.29 (0.88–1.88)</td>
<td></td>
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<tr>
<td></td>
<td>GA</td>
<td>134 (28.8)</td>
<td>10 (5.3)</td>
<td>0.20 (0.11–0.36)</td>
<td></td>
</tr>
<tr>
<td>g.10918 C&gt;G</td>
<td>G</td>
<td>275 (59.4)</td>
<td>103 (61.3)</td>
<td>1.00</td>
<td>0.271</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>127 (27.1)</td>
<td>75 (41.1)</td>
<td>1.29 (0.88–1.88)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>134 (28.8)</td>
<td>10 (5.3)</td>
<td>0.20 (0.11–0.36)</td>
<td></td>
</tr>
<tr>
<td>g.10433 A&gt;G</td>
<td>A</td>
<td>275 (59.4)</td>
<td>103 (61.3)</td>
<td>1.00</td>
<td>0.271</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>127 (27.1)</td>
<td>75 (41.1)</td>
<td>1.29 (0.88–1.88)</td>
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</tr>
<tr>
<td></td>
<td>GA</td>
<td>134 (28.8)</td>
<td>10 (5.3)</td>
<td>0.20 (0.11–0.36)</td>
<td></td>
</tr>
<tr>
<td>g.10433 A&gt;G</td>
<td>A</td>
<td>300 (64.1)</td>
<td>162 (65.2)</td>
<td>1.00</td>
<td>&gt;0.001</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>168 (35.9)</td>
<td>97 (34.8)</td>
<td>0.86 (0.60–1.24)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>74 (15.3)</td>
<td>30 (9.0)</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

*Calculated from the translation start site.

*Logistic regression analyses were used for calculating OR (95% CI, confidence interval).

Table 2. The haplotype frequencies by Adam33 polymorphisms in both SLE patients and controls.

<table>
<thead>
<tr>
<th>Haplotype</th>
<th>g.-330 C&gt;G</th>
<th>g.8227 A&gt;G</th>
<th>g.12438 C&gt;G</th>
<th>g.13506 C&gt;G</th>
<th>Frequencya</th>
<th>Control n (%)</th>
<th>SLE n (%)</th>
<th>Odds ratiob (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ht 1</td>
<td>C</td>
<td>G</td>
<td>C</td>
<td>G</td>
<td>0.482</td>
<td>0.272</td>
<td>0.565</td>
<td>1.30 (0.75–2.24)</td>
<td></td>
</tr>
<tr>
<td>Ht 2</td>
<td>C</td>
<td>C</td>
<td>G</td>
<td>C</td>
<td>0.259</td>
<td>0.484</td>
<td>0.565</td>
<td>1.30 (0.75–2.24)</td>
<td></td>
</tr>
<tr>
<td>Ht 3</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>G</td>
<td>0.088</td>
<td>0.014</td>
<td>0.565</td>
<td>1.30 (0.75–2.24)</td>
<td></td>
</tr>
<tr>
<td>Ht 4</td>
<td>C</td>
<td>A</td>
<td>C</td>
<td>G</td>
<td>0.057</td>
<td>0.043</td>
<td>0.565</td>
<td>1.30 (0.75–2.24)</td>
<td></td>
</tr>
<tr>
<td>Ht 5</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>C</td>
<td>0.030</td>
<td>0.022</td>
<td>0.565</td>
<td>1.30 (0.75–2.24)</td>
<td></td>
</tr>
<tr>
<td>Ht 6</td>
<td>C</td>
<td>G</td>
<td>A</td>
<td>G</td>
<td>0.027</td>
<td>0.003</td>
<td>0.565</td>
<td>1.30 (0.75–2.24)</td>
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</tbody>
</table>

Conclusion: ADAM33 polymorphisms were strongly associated with susceptibility to SLE and the development of specific clinical manifestations.

Disclosure: S. C. Shim, None; M. K. Lim, None; D. Sheen, None; H. Park, None.

972

Associations of Genetic Polymorphisms of Microrna-146a and Its Target Interleukin-1-Receptor-Associated Kinase 1 with Ankylosing Spondylitis.

Chun-Huang Huang1, Jia-Yan Zhan, Kai-Jieh Yeo, James C. Wei1, Chih-Shen Chuang3, and Ruey-Shong Wong1, Chung Shan Medical University, Taichung, Taiwan, 2Chung Shan Medical University Hospital, Taichung, Taiwan, 3Chung Shan Med Univ Hospital, Taichung, Taiwan

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Background/Purpose: The severity of joint destruction is highly variable between Rheumatoid Arthritis (RA) patients, and approximately 54% of this variance is explained by genetic factors. Many of the genetic factors responsible for the severity of joint destruction are unknown. We aimed to identify new genetic risk factors by studying genetic susceptibility loci of several auto-immune diseases.

Methods: In the first phase, 646 Dutch RA-patients with yearly X-rays of hands and feet over 7 years of follow-up were studied. These patients were genotyped for 148,880 SNPs by Immunochip which contains 186 loci previously associated with autoimmune diseases. Following quality control, association of SNPs with MAF >0.01 (130,841 SNPs) with joint destruction was analyzed using a marginal regression model. Correction for multiple testing was done using the Bonferroni correction for the number of uncorrelated SNPs (threshold p<1.1 × 10^-6). In the second phase, 686 North American RA-patients with repeated hands X-rays over 15 years of follow-up, for which Immunochip genotyping data were also available, were studied. SNPs that were significantly associated in phase 1 were selected and evaluated. All X-rays were scored by the Sharp van der Heijde score (ICC 0.91 and 0.98 for phase 1 and 2, respectively).

Results: In phase 1, 109 SNPs were significantly associated with joint destruction in Dutch RA-patients (threshold p<1.1 × 10^-6). Of these, 76 were located in the HLA-region in chromosome 6; since the association of this region with joint damage is already known, these SNPs were not analyzed in phase 2. The other 33 non-HLA genetic variants, though several were in high LD, were studied in the North-American RA-patients.
After correction for the number of number of uncorrelated SNPs (threshold p<0.0036), two variants were associated with the severity of joint destruction. These were rs151066 on chromosome 8 (p=1.64x10^{-10}, MAF=0.30) and rs1109168352 on chromosome 20 (p=1.44x10^{-10}, MAF=0.21). In the presence of a risk allele of rs151066 and rs1109168352 respectively Dutch RA-patients had a 3.7% and 2.7% higher rate of joint destruction per year, which equals 29% and 20% more joint destruction over a seven years period.

**Conclusion:** Two new risk loci for progressive joint destruction in RA were identified. The region of rs151066 on chromosome 8 has previously been linked to susceptibility to type-1 diabetes. The other SNP is located at chromosome 20 and in low LD with rs4810485 (R^2 = 0.06), a variant that has previously been identified as RA risk locus. Altogether, the current data indicate that two loci that confer risk to other autoimmune disease may also affect the severity of RA.

**Disclosure:** D. P. C. de Rooy, None; S. Zhechkova, None; R. Tsonak, None; F. Kurreman, None; R. E. M. Toes, None; T. W. J. Huizinga, None; J. Houghing-Huisma, None; P. K. Gregersen, None; A. H. M. van der Helm-van Mil, None. 974

**Identification of Susceptibility Loci for Inflammatory Arthritis.**

K. J. A. Steel1, Anne Hinks1, John Bowes2, Joanna Cobb3, Edward Flynn4, Carl D. Langefeld5, Sampath Prahalad6, Johannes Peter Haas7, Johy F. Bohnsack8, Stephen Guthery9, Anne Barton1, Susan D. Thompson1 and Wendy Thomson1.

**Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester, United Kingdom, 2University of Manchester, Manchester Academy of Health Sciences, Manchester, United Kingdom, 3Wake Forest School of Medicine, Winston-Salem, NC, 4Emory Children’s Center, Atlanta, GA, 5Childrens Hospital, Erlangen, Germany, 6University of Utah, Salt Lake City, 7Cincinnati Children’s Hospital Medical Center, Cincinnati, OH**

**Background/Purpose:** One of the principal findings of genome wide association studies in autoimmune diseases has been the substantial overlap of genetic susceptibility loci identified. This has underpinned fine mapping initiatives such as the Immunochip (IC) project in which custom chips were designed to fine-map regions of associations common to a number of autoimmune diseases. Samples from patients with rheumatoid arthritis (RA), juvenile idiopathic arthritis (JIA) and psoriatic arthritis (PsA) have been genotyped using IC; given that all are types of arthritis may also affect the severity of RA.

**Methods:** As part of the IC project, genotyping, quality control and association analysis was performed for RA (11475 cases and 15870 controls), JIA (2816 polygoarticular and oligoarticular JIA cases and 8051 controls), JIA (2816 polygoarticular and oligoarticular JIA cases and 8051 controls). The statistical analysis was performed using PLINK vers1.07. A p value of p < 0.05 was considered significant.

**Results:** 49 regions showed association at p<10^{-8} with more than one type of IA, of these, in RA and JIA 4 loci (PTPN22 STAT4, ANKRD55 and TYK2) reached genome wide significance (5 x 10^{-8}), with a further 7 associated at p<10^{-5} in both diseases. Interestingly 4 of these loci are also associated with PsA at p<10^{-3} (TNFAIP3, PTPN22, RUNX1 and TYK2). 6 of these loci have been previously associated with both RA and JIA (PTPN22, STAT4, AFF3, TNFAIP3, PTPN22 and IL2RA) whilst 5 are novel overlapping regions (DNASE1L3, ANKRD55, TYK2, RUNX1 and IL2RB). For the PTPN22, STAT4, DNASE1L3, ANKRD55, TYK2 and RUNX1 regions the RA and JIA associated SNPs are either identical or highly correlated (r^2>0.8), the direction of effect is the same in both diseases and odds ratios similar. For AFF3, TNFAIP3 and PTPN22 the associated SNPs are different and weakly correlated (r^2<0.4) but the direction of effect is similar for each disease. An interesting finding is that for IL2RA and IL2RB the pattern of association in the region is completely different.

**Conclusion:** These findings add to the body of evidence that there are shared susceptibility genes for inflammatory arthritis. Further investigation is required to fully explore whether the regions contain the same or different causal effect, including functional studies to determine whether, in overlapping loci with the same causal variant, the variant predisposes to disease by the same mechanism.

**Acknowledgements:** Rheumatoid Arthritis Consortium for Immunochip (RAcI), Juvenile Arthritis Consortium for Immunochip (JAcI), UK Psoriatic Arthritis Consortium

**Disclosure:** K. J. A. Steel, None; A. Hinks, None; J. Bowes, None; J. Cobb, None; E. Flynn, None; C. D. Langefeld, None; S. Prahalad, None; J. P. Haas, None; J. F. Bohnsack, None; S. Guthery, None; A. Barton, None; S. D. Thompson, None; W. Thomson, None.

**975**

**Dense Genotyping of Risk Loci in Black South Africans with Rheumatoid Arthritis: An Association Study.**


**Division of Rheumatology, University of the Witwatersrand, Johannesburg, South Africa, 2Wits Bioinformatics Department, University of the Witwatersrand, Johannesburg, South Africa, 3Division of Human Genetics, National Health Laboratory Service, University of the Witwatersrand, Johannesburg, South Africa, 4Feinstein Institute for Medical Research, Manhasset, NY, 5Division of Clinical Immunology and Rheumatology, University of Alabama at Birmingham, Birmingham, AL**

**Background/Purpose:** Genome wide association studies (GWAS) have identified numerous rheumatoid arthritis (RA) risk loci in patients of European and Asian ancestry but the causal variants have rarely been identified. These studies have also identified susceptibility loci that are common to various autoimmune diseases. The need to identify causal variants prompted the design of the Immunochip, a custom Illumina Infinium high density genotyping array, with 196 000 single nucleotide polymorphisms (SNPs) from 186 loci previously associated with 12 autoimmune diseases. Little is known about the genetics of RA in black South Africans. We aimed to test associations with known genetic loci and to identify novel risk loci in black South Africans with RA.

**Methods:** Consenting black RA patients fulfilling the 1987 ACR criteria for RA, >18 years at disease onset, and seen at a single centre in Johannesburg, South Africa were studied and compared to ethnically and geographically matched controls. Genotyping of 716 samples was performed using the Immunochip. Only samples with ≥94% call rate and individual SNPs with ≥95% call rate, were polymorphic, in Hardy-Weinberg equilibrium (p≈5 x 10^{-5}) and with a minor allele frequency of ≥0.02 were analyzed. The cohort was further pruned for relatedness and ancestral outliers. After quality control, 117 353 SNPs were tested for association in 263 cases and 365 controls. The statistical analysis was performed using PLINK vers1.07. A p value was <5 x 10^{-8} considered significant based on previous genome wide association studies.

**Results:** The strongest associations were found in the MHC region with 64 SNPs reaching statistical significance. The most significant associations were in the intergenic region of the HLA DRB1-HLA DQA1 alleles (rs1044143, OR = 3.88, p = 5.49 x 10^{-12}; rs3129769, OR = 3.91, p = 4.60 x 10^{-11}; rs6931277, OR = 3.97, p = 1.03 x 10^{-10}). There were 2 non HLA SNPs that reached genome wide significance, rs283487 (OR = 3.25, p = 7.96 x 10^{-13}) in the PRKRA gene, and rs35198051 (OR = 0.34, p = 2.94 x 10^{-7}) in the intergenic region of C1orf76 and OGD100133106. In addition there were suggestive associations of 2 SNPs on chromosome 1, rs12739262 (OR = 0.36, p = 1.36 x 10^{-7}) in the PPP1R1B2 gene and rs12738883 (OR = 0.36, p = 1.69 x 10^{-7}) in the intergenic region of PLDS and LOC400723, both SNPs reached statistical significance in the rheumatoid factor (RF) positive subgroup (n=240/254) (rs12739262, OR = 0.33, p = 9.10 x 10^{-3} and rs12738883, OR = 0.33, p = 9.10 x 10^{-3}).

**Conclusion:** In keeping with previous studies the HLA class II region confers the strongest genetic risk for RA in black South Africans. We also found 2 novel SNPs in the overall cohort and a further 2 SNPs in the RF positive subgroup. The association of the PRKRA gene with RA is of interest.
because of its recent association with Sjögren’s Syndrome. Further studies in larger cohorts of African patients are required to validate these findings and to better understand the functional role of these novel loci in the pathogenesis of RA in black South Africans.

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Effect of Interactions Between Validated Rheumatoid Arthritis Genetic Factors and Environmental Factors On Rheumatoid Arthritis Risk, Chia-Yen Chen¹, Linda T. Hiraki², Susan Malaspes³, Jing Cui⁴, Bing Lu⁵, Robert M. Plenge⁶, Karen H. Costenbader⁷ and Elizabeth W. Karlson⁸. ¹Harvard School of Public Health, Boston, MA, ²Brigham and Women’s Hospital, Harvard School of Public Health, Boston, MA, ³Brigham and Women’s Hospital, Boston, MA, ⁴Brigham and Women’s Hospital, Harvard Medical School, Boston, MA

Background/Purpose: Studies have shown associations between environmental factors and rheumatoid arthritis (RA) risk. Also, genome-wide association studies (GWAS) have identified genetic markers associated with RA risk. We examined additive and multiplicative geneticenvironment interactions between 44 RA genetic markers and smoking, parity/breast-feeding, body mass index (BMI), and BMI at age 18 in determining RA risk.

Methods: We used a pooled nested case-control sample of 541 RA cases, including 303 seropositive (CCP+ and/or RF+) cases, and 549 matched controls from the Nurses’ Health Study and Nurses’ Health Study II. Controls were matched on age, menopausal status, and post-menopausal hormone use. All participants were Caucasian. We genotyped 36 single nucleotide polymorphisms identified in previous GWAS and meta-analysis, and 8 HLA-DBR1 shared epitope (SE) genotypes at 4 digit resolution. The information on cumulative pack-years of smoking, parity and months of breast-feeding prior and BMI variables determined prior to RA diagnosis, and BMI at age 18 was extracted from questionnaires. We examined the main effects of the genetic and environmental factors. We tested for additive interactions using the attributable proportion due to interaction and tested for multiplicative interactions separately.

Results: We found significant main effects of HLA-DBR1*0401 (OR = 1.17, 95% CI = 1.02–1.35) and HLA-DBR1*0401 smoking prior to diagnosis (OR = 0.031, 95% CI = 0.01–0.13) with smoking in all RA and seropositive RA. Also, HLA-DBR1*0401 smoking prior to diagnosis had a significant effect on RA risk (OR = 0.067, 95% CI = 0.01–0.38). We also found significant interaction effects on RA risk between smoking and BMI variables in all RA. The effect of interaction between BMI variables determined prior to RA diagnosis and BMI at age 18 was extracted from questionnaires. We examined the main effects of the genetic and environmental factors. We tested for additive interactions using the attributable proportion due to interaction and tested for multiplicative interactions separately.

Conclusion: We found significant gene-environment interaction effects on RA risk with stronger associations for the seropositive RA phenotype. We also found HLA-DBR1*0401 with different AP when interacting with different environmental factors, which suggests different mechanisms for these interactions.

Disclosure: C. Y. Chen, None; L. T. Hiraki, None; S. Malaspes, None; J. Cui, None; B. Lu, None; R. M. Plenge, None; K. H. Costenbader, None; E. W. Karlson, None.

977
14-3-3 Eta Is a Novel Citrullination Target in Rheumatoid Arthritis That Enhances Diagnostic Utility in Anti-CCP Negative Patients. Walter P. Maksymowycz, Vivian P. Bykerk, Désirée van der Heijde, R. Landewe and Anthony Marotta. ¹University of Alberta, Edmonton, AB, ²Hospital for Special Surgery, New York, NY, ³Leiden University Medical Center, Leiden, The Netherlands, ⁴Academic Medical Center/ University of Amsterdam, Amsterdam, Netherlands, ⁵Augurex Life Sciences Corp, North Vancouver, BC

Background/Purpose: 14-3-3-eta is normally an intracellular protein and in the disease state it is released into the extracellular space. We have previously presented data describing serum 14-3-3 eta’s diagnostic utility as a marker that complements RF and anti-CCP in early and established RA and is associated with joint damage in RA and PsA. Circulating autoantibodies directed to citrullinated proteins are highly specific for RA, but a significant percentage of patients are of anti-CCP negative for anti-CCP. Given that 14-3-3 eta is liberated into the synovial space where PAD enzymes are present, we investigated whether 14-3-3 eta represents a novel citrullination target that could identify anti-CCP negative RA patients.

Methods: Assays to measure the autoantibody levels to either non-citrullinated (non-cit) or citrullinated (cit) 14-3-3-eta were developed using full-length recombinant human 14-3-3-eta. Full-length cit-14-3-3-eta was generated by citrullinating the protein with purified PAD. Reactivity to non-cit and cit-14-3-3-eta was evaluated in 3 anti-CCP positive RA patients to confirm the presence of autoantibodies to cit-14-3-3-eta. To evaluate whether these novel autoantibodies are detectable in anti-CCP negative RA patients and differentially expressed compared to healthy controls, reactivity to both non-cit and cit-14-3-3-eta was measured in 30 anti-CCP negative RA patients and 30 confirmed anti-CCP negative healthy controls.

Conclusion: We found significant gene-environment interaction effects on RA risk with stronger associations for the seropositive RA phenotype. We also found HLA-DBR1*0401 with different AP when interacting with different environmental factors, which suggests different mechanisms for these interactions.

Disclosure: C. Y. Chen, None; L. T. Hiraki, None; S. Malaspes, None; J. Cui, None; B. Lu, None; R. M. Plenge, None; K. H. Costenbader, None; E. W. Karlson, None.

1cumulative pack-years of smoking (< 10 vs. ≥10 pack-years)
2≥30 vs. < 25 kg/m² defined as obese by World Health Organization
3≥25 vs. < 25 kg/m² defined as overweight by World Health Organization
4P-values were corrected for multiple comparisons. We used unconditional logistic regression model with 3 indicator variables for genetic factor, environmental factor, and interaction, adjusting for age, menopausal status, and postmenopausal hormone use. RA: rheumatoid arthritis; OR: odds ratio; CI: confidence interval; AP: attributable proportion due to interaction; SE: shared epitope; BMI: body mass index.

Table 1. Summary of significant additive interactions for 44 RA risk alleles after multiple comparison adjustment and corresponding stratified analyses
Results: Compared to non-cit 14-3-3 eta, up to 25X higher reactivity was observed to cit-14-3-3 eta in 2 of the 3 anti-CCP positive RA patients, revealing the novel expression of autoantibodies to the citrullinated form of 14-3-3 eta in RA. Within the anti-CCP negative RA group, significantly higher reactivity was observed to cit versus non-cit-14-3-3 eta at 1943U versus 395U, p=0.01. No significant differences in reactivity were observed within the healthy group. Anti-cit-14-3-3 eta expression was significantly higher in anti-CCP negative RA patients with mean max and medians (min-max) of 1943U (3045U) and 306U (68–8982U) compared to 155U (122U) and 100U (45–564U) for healthy controls, p<0.002. The corresponding ROC AUC for anti-cit-14-3-3 eta differential expression in anti-CCP negative RA patients compared to healthy controls was 0.79 (95% CI 0.68–0.91; p<0.0001). At a cut-off of 320U, the specificity and sensitivity were 90% and 50% delivering an LR positive of 5 increasing at 14A at 439U with a corresponding specificity of 97% and sensitivity of 47%.

Conclusion: Extracellular 14-3-3 eta protein has been described as an RA diagnostic biomarker with prognostic and therapy monitoring applications. 14-3-3 eta also represents a novel cirrullination target that is differentially expressed in anti-CCP negative RA patients versus healthy controls, indicating that anti-cit-14-3-3 eta may improve RA diagnosis.


978 A Genome-Wide Interaction Study with Smoking Suggests New Risk Loci for Two Different Subsets of Rheumatoid Arthritis; Results From Swedish Epidemiological Investigation of Rheumatoid Arthritis Study. Xia Jiang, Henrik Källberg, Leonid Padyukov, Lars Klæreskog, and Lars Alfredsson. 1 Karolinska Institutet, Stockholm, Sweden, 2 Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden

Background/Purpose: Rheumatoid arthritis (RA) is believed to have a multifactorial etiology, involving both genetic and environmental components, and can be divided into two major subsets according to the presence/absence of anti-citrullinated protein/peptide antibodies (ACPA). Smoking is the most established environmental risk factor. Despite progress from genome-wide association studies (GWAS), identified genetic variants only explain a small proportion of RA occurrence. Hypothetically, gene-environment interaction could add etiologic understanding of the disease. The aim of current study was to investigate gene-environment interaction between smoking and SNPs from an Immunochip, with selected SNPs of interest from an inflammatory point of view, for each of the two major RA subsets. Their association with smoking was analyzed.

Methods: Data from Swedish EIRA case-control study was analyzed by means of logistic regression models. Smoking history was collected through questionnaires. Heavy smoking was defined as more than 10 pack-years. Genetic information was obtained from an Immunochip scan. Interaction between smoking intensity and 133648 genetic markers that passed quality control were examined for the two RA subsets (1590 SNPs in LD with known susceptibility variant at HLA-DRB1 displayed high linkage disequilibrium (LD); for ACPA negative RA, 56 SNPs passed threshold for significance, most located outside the HLA region (51 out of 56, 91.07%). After adjusting for HLA-DRB1 shared epitope (SE), 37 SNPs remained significant for ACPA positive RA, with 17 (45.95%) confined to HLA region and the rest spread across 9 other chromosomes; for ACPA negative RA, 19 SNPs stood out, all of them outside the HLA region. Through functional prediction and pathway annotation, 24 candidate genes/regions were identified for ACPA positive RA, several of them (C6orf10, GRB10, HCC9, TAP2, PPT2, HLA-E, SMADJ) together with HLA-DR presented a network of antigen presentation pathways; for ACPA negative RA, 13 genes were demonstrated, 6 of them (GIPRA, AFF3, ICOSLG, NOTCH2, TGS1, LYN) constitute T-helper cell differentiation pathways. For ACPA positive RA, besides those SNPs in LD with known susceptibility variant at HLA-DRB1, none of the others have previously been identified.

Conclusion: Our study presents the most explicit picture to date, with regard to the patterns of gene-smoking interaction in ACPA positive/negative RA, suggesting fairly contrasting etiology of the two subsets. Our findings support the, by far, greatest influence from HLA-region on ACPA positive RA; while for ACPA negative RA, more genes outside HLA-region contribute to the etiology. Notably, for both RA subsets, new SNPs that are not significant in association analyses stand out in interaction analyses, indicating that genetic factors should be considered together with environmental factors in studies of RA etiology.

Disclosure: X. Jiang, None; H. Källberg, None; L. Padyukov, None; L. Klæreskog, None; L. Alfredsson, None.

979 Cell-Type Specific Type I Interferon Signatures in Systemic Lupus Erythematosus and Viral Infection: What Makes the Difference? Chioko Kyogoku, Joachim R. Grün, Tobias Alexander, Robert Biesen, Falk Hiepe, Thomas Häupl, Andreas Radbruch, and Andreas Grützkau. 1 German Rheumatism Research Centre Berlin (DZB), an institute of the Leibniz Association, Berlin, Germany, 2 Charité University Hospital Berlin, Berlin, Germany

Background/Purpose: Gene expression profiling experiments using peripheral blood mononuclear cells (PBMCs) revealed a crucial role of type I interferon (IFN) in the pathogenesis of systemic lupus erythematosus (SLE). However, it is almost unknown how particular leukocyte subsets contribute to the overall type I IFN signature described for PBMCs. Furthermore, a detailed analysis of how IFN signatures differ in autoimmune disease from that observed after viral infection is missing so far. Therefore, we compared expression levels of 2442 IFN signature genes in peripheral CD4+ T helper cells, CD16-negative inflammatory and CD16-positive resident monocytes (Mo) isolated from patients with SLE, healthy donors (ND) and ND vaccinated against yellow fever by global gene expression profiling.

Methods: Peripheral blood from 6 patients with SLE and 4 ND for CD4+ T cells, 4 patients with SLE and 4 ND for CD16-negative Mo, and 4 patients with SLE and 3 ND for CD16-positive Mo were recruited. Same ND were examined before and after immunization by yellow fever vaccine. After sorting cells, isolated RNA were applied to Affymetrix Human Genome U133 Plus 2.0 Array. Data analysis was done using BioReits database, Genesis Software and Ingenuity Pathway Analysis (IPA). A reference list of 2442 IFN-related genes was obtained from recent publications and used to estimate IFN imprints.

Results: When compared total significantly differentially expressed probe sets, 9/32 (CD4+ T cells/CD16-negative Mo/CD16-positive Mo, respectively) times more number of probes were detected in patients with SLE compared to immunized ND. The contribution of IFN signature to total gene expression signature was 20.7/23.3/23.3 % in patients with SLE, whereas 48.6/35.2/30.5 % in immunized ND. 98/165/173 probe sets (fold change >=2, <=-2) were detected as a “common” IFN signature observed both in autoimmunity and in immunized ND. 111/164/120 probe sets were detected as an “autoimmune-specific” IFN signature, whereas only 0/8/5 probe sets were detected to be specific for the “virus-induced” IFN signature. Expression pattern of these IFN signature genes clearly distinguished patients with SLE from immunized ND by hierarchical cluster analysis. Although major IFN signature genes were commonly expressed in CD4+ T cells and Mo of patients with SLE and immunized ND, expression magnitudes of them were higher in patients with SLE compared to immunized ND. In SLE, in addition to the typical “viral-induced” IFN signature, genes that are involved in apoptosis signaling, antiviral PKR signaling, Fcy receptor-mediated phagocytosis and IL-10/ IL-9/- IL-15-mediated JAK/Stat signaling pathways were identified by IPA.

Conclusion: This study demonstrated that IFN signature in autoimmunity and that in viral infection are quite different in the number of IFN-related genes activated and their expression magnitudes. Autoimmunity is characterized by a much stronger expression of IFN signature genes and is obviously modulated by a separate set of co-regulated genes defining the “autoimmune-specific” IFN signature. “Common” and “autoimmune-specific” IFN signature genes can be applied as a clinical biomarker to diagnose SLE flare discriminating from viral infection.

Disclosure: C. Kyogoku, None; J. R. Grün, None; T. Alexander, None; R. Biesen, None; F. Hiepe, None; T. Häupl, None; A. Radbruch, None; A. Grützkau, None.
Our objective was to determine the genetic heritability of joint destruction, quantified as Sharp/van der Heijde scores (SHS), and to conduct a genome wide association study (GWAS) to identify SNPs associated with quantitative joint damage in RA patients.

**Methods:** We studied 422 anti-CCP+ RA subjects in a prospective observational RA cohort at an academic hospital with baseline bilateral hand radiographs and blood samples. Using the SHS method, 4 radiologists assigned an erosion score (0–5) for 16 joints, and a joint space narrowing score (0–4) for 15 joints in each hand (total SHS range 0–280). The intra-rater reliability for the SHS in our study was 0.93. SHS measures were normalized by taking the inverse normal of the rank. Samples were genotyped on the Affymetrix 6.0 platform. We applied standard quality control procedures, followed by imputation to 2.5M SNPs using IMPUTE with HapMap2 CEU. Clinical predictors of SHS such as age, gender, disease duration were studied using general linear regression. We applied mixed linear model analysis to estimate the proportion of variance explained by genotyped SNPs from the whole genome to determine heritability.

We studied the association between each SNP and SHS using linear regression assuming a genetic additive model adjusting for the first three principal component values from Eigenvector analysis and RA disease duration.

**Results:** The 422 RA cases had mean age of 59 yrs, mean disease duration of 17 yrs, and 81% were female. The SHS range was 0–270 with median of 40. Clinical predictors including age and disease duration were significant in univariate analyses, and only disease duration was significant (P<0.0001) in multivariate analyses. Heritability analysis adjusted for disease duration and 3 principal components estimated 22% (P=0.004) of SHS variation was attributable to genetic variants using all genotyped SNP information. From the GWAS, we found 2 SNPs that exceeded the genome-wide significance threshold of 5E-8 (rs16925520 p=4.9E-8, rs2332760 p=3E-8) for association with SHS. The independent top 10 findings are shown in the table. The MHC region was not significantly associated with SHS. No known RA risk alleles (50 loci) were associated with SHS.

**Conclusion:** Our study suggests that joint damage in RA (as measured by SHS) is a heritable trait where genetic factors explain 22% of the phenotypic variance. These findings corroborate with a previous study where heritability was estimated to be higher at 45%–58%. Although several SNPs were associated with SHS at genome-wide significance, none were known RA risk alleles. These findings require confirmation in an independent sample.

**Disclosure:** J. Cui, None; N. A. Shadick, Abbott Immunology Pharmaceutical; M. C. Nevitt, Genentech and Biogen IDEC Inc.; S. R. Cummings, MedImmune, Crescendo Bioscience; M. Weinblatt, MedImmune; K. P. Liao, MedImmune; E. W. Karlson, None.

**Table**

<table>
<thead>
<tr>
<th>chr</th>
<th>rs</th>
<th>gene</th>
<th>Base pair</th>
<th>Allele A</th>
<th>Minor allele frequency</th>
<th>P value</th>
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<td>0.23</td>
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</tbody>
</table>

**Conclusion:** Our study suggests that joint damage in RA (as measured by SHS) is a heritable trait where genetic factors explain 22% of the phenotypic variance. These findings corroborate with a previous study where heritability was estimated to be higher at 45%–58%. Although several SNPs were associated with SHS at genome-wide significance, none were known RA risk alleles. These findings require confirmation in an independent sample.

**Disclosure:** J. Cui, None; N. A. Shadick, Abbott Immunology Pharmaceutical; M. C. Nevitt, Genentech and Biogen IDEC Inc.; S. R. Cummings, MedImmune, Crescendo Bioscience; M. Weinblatt, MedImmune; K. P. Liao, MedImmune; E. W. Karlson, None.

**982**

**Genetic Variants near Insulin-Like Growth Factor Binding Protein 3 (IGFBP3) Are Associated with Hip Osteoarthritis.** Daniel S. Evans1, Neeta Parm1, Ana M. Valdes2, Hanneke JM Kerkhof3, Frederic Cailotto4, Michael C. Nevitt, Steven R. Cummings5, Rik J. Lores6, Thomas D. Spector2, Nigel K. Arden7, Joyce B. van Meurs4, and Nancy E. Lane1.

1. California Pacific Medical Center Research Institute, San Francisco, CA
2. Dept of Twin Research and Genetic Epidemiology, St Thomas' Hospital, King's College London, London, United Kingdom
3. Department of Internal Medicine, Eramus Medical Center and The Netherlands Genomics Initiative
4. Sponsored Netherlands Consortium for Healthy Aging, Rotterdam, Netherlands
5. Laboratory for Skeletal Development and Joint Disorders, Department of Development and Regeneration, KU Leuven, Leuven, Belgium
6. University of California-San Francisco, San Francisco, CA
7. Oxford NIHR Musculoskeletal Biomedical Research Unit, University of Oxford, Oxford, UK
8. University of California-San Francisco, San Francisco, CA
9. UC Davis School of Medicine, Sacramento, CA

**Background/Purpose:** Hip osteoarthritis (HOA) is one of the most common joint disorders and can result in pain and disability. HOA is heritable, and...
but the particular genes contributing to the development of HOA are not well defined. To identify genetic associations with HOA, we conducted a two-stage genome-wide association study (GWAS).

Methods: All analyses were restricted to individuals of European ancestry. The discovery phase was performed using radiographically determined HOA cases and controls selected from the Osteoporotic Fractures in Men (MrOS) Study and the Study of Osteoporotic Fractures (SOF) (combined cases = 662). HOA cases were defined as Croft grade ≥ 2 or total hip replacement (THR). HOA controls were defined as Croft grade ≤ 1, maximum joint space narrowing (JSN) ≤ 1, maximum osteophytes ≤ 1, and no THR. SNPs were genotyped using the Illumina Omni1-Quad array and approximately 2.5 million SNPs were imputed using the HapMap reference panel. Logistic regression was performed, and MrOS and SOF results were combined using inverse variance weighted fixed effect meta-analysis. SNP associations with $P$-values ≤ 5 × 10⁻⁸ were examined for replication in the Rotterdam cohorts (RSI = original cohort, RSII = second replication cycle), Twins UK, and Chingford cohorts. Publicly available eQTL data from HapMap CEU lymphoblastoid cell lines were used.

Results: On average, MrOS participants (100% male) were older than SOF participants (100% female) at the clinic visits when HOA was assessed (MrOS: mean ± SD = 77.5 ± 5.4 years, range = 69–97; SOF: mean ± SD = 70.9 ± 5.0 years, range = 65–91). In the discovery meta-analysis, the rs788748 A allele and the rs879966 G allele were associated with decreased odds for OA (MrOS: mean expression = 0.49). rs879966 G allele was significantly associated with decreased odds for HOA (Table 1). The two directly genotyped SNPs were 23 kb apart and were in moderate LD (HapMap CEU $r^2$ = 0.54). Neither SNP remained nominally significant in conditional analysis, indicating independence. The SNP rs788748 replicated in the RSI cohort, but not the RSI cohort or the Chingford cohort. In the Twins UK cohort, the association between the rs788748 A allele and HOA was significant and in the opposite direction relative to the discovery samples (Table 1). The SNP rs7887966 did not replicate (Table 1).

Table 1. SNP association results in discovery and replication cohorts.

<table>
<thead>
<tr>
<th>SNP</th>
<th>Effect Size OR (95% CI)</th>
<th>MrOS/SOF (discovery)</th>
<th>RSI</th>
<th>Twins UK</th>
<th>Chingford</th>
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<td>rs788748 A</td>
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<td>4623425 (0.60–0.93)</td>
<td>140</td>
<td>1.02 (0.38)</td>
<td>73366 (1.40–2.00)</td>
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<tr>
<td>rs7887966 G</td>
<td>0.71 (0.54–0.92)</td>
<td>4623425 (0.92–2.40)</td>
<td>140</td>
<td>1.12 (0.38)</td>
<td>73366 (1.40–10.00)</td>
</tr>
</tbody>
</table>

From eQTL data, rs788748 and rs789966 were marginally associated with IGBP3 expression ($P$-value = 0.07 and 0.06, respectively), but not IGBP1 expression ($P$-value = 0.74 and 0.34, respectively). SNP associations with circulating IGBP3 levels and results from IGBP3 knockdown experiments in the ATDC5 chondrogenesis model system will be presented.

Conclusion: Our genetic association and eQTL results provide suggestive evidence for a link between IGBP3 and HOA, but further replication is required for the association results to be considered robust. IGBP3 is known to be expressed in human chondrocytes and might be an attractive candidate for follow-up studies.

Disclosure: D. S. Evans, None; N. Parimi, None; A. M. Vaides, None; H. J.M. Kerlee, None; F. Calabotto, None; M. C. Nevitt, None; S. R. Cummings, None; R. J. Lories, None; T. D. Spector, None; N. K. Arden, None; J. B. van Meurs, None; N. E. Lane, None.

983 Genome-Wide Association Study and Gene Expression Analysis Identifies CD84 as a Predictor of Response to Etanercept Therapy in Rheumatoid Arthritis. Jing Cui, University of California Los Angeles, Los Angeles, CA

Background/Purpose: There are no biomarkers that predict response to anti-TNF therapy in rheumatoid arthritis (RA). Here, we conduct a genome-wide association study (GWAS) to identify variables that influence response to anti-TNF therapy.

Methods: GWAS data were aggregated on 2,743 RA patients as part of an international collaboration. Clinical data and Disease Activity Score (DAS28) were available for RA patients treated with three anti-TNF medications: etanercept (N = 773), infliximab (N = 894) or adalimumab (N = 1,071). GWAS data were quality controlled by genotype batch, and all data were imputed to 2.5 million SNPs using IMPUTE with HapMap CEU. Change in DAS28 (delta-DAS) was used as the primary phenotype in linear regression association tests of all samples combined and subset by anti-TNF drug. We adjusted for baseline DAS28 and three ancestry-derived principal component eigenvectors. Expression quantitative trait locus (eQTL) data for the CD84 locus were available for peripheral blood mononuclear cells (PBMCs, N = 228). Sample replication from the Portuguese Reuma.pt registry (n = 405), and the Japanese IORRA and Kyoto University Hospital registries (n = 374), were genotyped using Sequenom and/or TaqMan and analyzed as in our GWAS.

Results: While no single SNP was genome-wide significant for association with delta-DAS in an analysis of all samples combined, a SNP at the CD84 locus was highly significant in the etanercept subset of patients (rs6427528, $P = 7 \times 10^{-13}$). This same SNP was not associated with delta-DAS in the infliximab or adalimumab subsets ($P > 0.05$). The allele associated with a better response, which is in the 3' UTR of an immune-related gene CD84, is also associated with higher CD84 gene expression in PBMCs ($P < 10^{-9}$). In a subset of RA patients with gene expression data, CD84 gene expression correlates with baseline DAS (r = 0.21, P = 0.02), and demonstrates a non-significant trend toward predicting response to etanercept therapy. In a small replication study, the SNP was not associated with response to etanercept therapy among European (n = 139, S4 = 0.4) or Japanese (n = 151, S4 = 0.8) RA patients.

Conclusion: GWAS in etanercept-treated RA patients revealed a highly suggestive association with the CD84 locus. Further, CD84 gene expression is under genetic control and influenced by disease activity. These findings provide support that CD84 genotypes and/or expression may serve as a useful biomarker for response to etanercept treatment in RA, although larger replication studies are required.

Disclosure: J. Cui, None;

984 Association of Elevated C5a Levels, but Not the Presence of Anti-CfH IgG Autoantibodies, with the Deletion of CFHR3 and CFHR1 in SLE. Jian Zhao, Seema Kamble, Yun Deng, Magdangal Erika, Daisuke Sakurai, Rongguan Li, Weiling Chen, Jennifer M. Grossman, Beva H. Hahn and Betty P. Tsao, Division of Rheumatology, David Geffen School of Medicine, University of California Los Angeles, Los Angeles, CA

Background/Purpose: We previously reported association of the deletion of complement regulator factor H related CFHR3 and CFHR1 genes (CFHR3-1Δ), rather than CFH exonic SNPs, with SLE in 15,864 case-control subjects of multiple ancestries (P = 2.9 × 10⁻⁹, OR = 1.17). Both CFHR3 and CFHR1 suppress C5a generation, and CFHR3-1Δ has been associated with the presence of anti-CfH IgG autoantibodies that block CFH C-terminal binding in patients with atypical hemolytic uremic syndrome. To investigate possible functional consequences of CFHR3-1Δ in SLE, we tested its association with 1) the presence of anti-CfH IgG autoantibodies, and 2) elevated C5a levels.

Methods: CFHR3-1Δ was either directly genotyped by multiplex ligation-dependent probe amplification or deduced from its tag SNP rs6677604 (r² = 1). Levels of plasma C5a and anti-CfH IgG autoantibodies were measured by ELISA. The presence of anti-CfH IgG autoantibodies (anti-CfH+) was defined as higher levels than the mean ± 3 SD of those from healthy controls carrying no deletion.

Results: Plasma anti-CfH IgG autoantibodies showed no difference between SLE cases and controls (Mean ± SEM: 5.46 ± 0.074 RU/ml in 75 cases vs. 5.47 ± 0.063 RU/ml in 45 controls, P = 0.91), no difference between men and women (P = 0.71 in cases [9 men and 66 women]; P = 0.23 in controls [22 men and 23 women]) and no correlation with age (r² = 0.00042 in cases [mean: 43 years old, range: 18–72], P = 0.91; r² = 0.0010 in controls, P = 0.79 [mean: 39, range: 20–77]). Anti-CfH+ was only identified in 4 of the 75 studied SLE cases (5%); two of them carried two copies of CFHR3-1Δ and the other two had zero copies, showing no association of anti-CfH+ with CFHR3-1Δ (P = 1.00). Although none of the 45 controls were classified as anti-CfH+, the presence of anti-CfH was not significantly associated with SLE (P = 0.30) at the current sample size.

Preliminary results of plasma C5a levels were significantly higher in 15 SLE cases carrying two copies of CFHR3-1Δ than in 34 carriers of one or zero copy (Mean ± SEM: 5.23 ± 0.13 ng/ml vs. 4.86 ± 0.06 ng/ml, P = 0.018). We observed no significant difference in plasma C5a levels between 5 controls carrying two copies of CFHR3-1Δ and 57 controls carrying one or zero copy (Mean ± SEM: 4.57 ± 0.29 ng/ml vs. 4.76 ± 0.09 ng/ml, P = 0.55), which might be due to the small sample size.

Conclusion: Our preliminary data showed that homozgyous deletion of CFHR3-1Δ, which predisposes to SLE, was associated with elevated C5a levels in SLE cases, suggesting that this deletion might confer SLE risk by uninhibited production of C5a leading to neutrophil chemotaxis and inflammatory injuries. In contrast, the deletion was not associated with IgG
antibodies to CFH. Further investigation of these associations in additional samples is ongoing.

Disclosure: J. Zhao, None; S. Kamble, None; Y. Deng, None; M. Erika, None; D. Sakurai, None; R. Li, None; W. Chen, None; J. M. Grossman, None; B. H. Hahn, None; R. B. Tsao, None.

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Inverse Relation Between the tumor Necrosis Factor Promoter Methylation and Transcript Levels in Leukocytes From Patients with Rheumatoid Arthritis. James R. Maxwell1, Lynsey H. Taylor2, Richardo A. Pacheco3, Neil Lawrence4, Gordon W. Duff5, M. Dawn. Taree6 and Anthony G. Wilson7. 1University of Sheffield, Sheffield, United Kingdom, 2University of Sheffield, United Kingdom, 3Royal Hallamshire Hospital, Sheffield, United Kingdom, 4Section of Musculoskeletal Sciences, University of Sheffield, Sheffield, United Kingdom

Background/Purpose: The importance of the epigenetic signature in RA is unclear but levels of methylation of CpG motifs in the TNF promoter have been identified to be important determinants of transcriptional activity. In view of the central importance of this cytokine in RA we hypothesised that methylation of the TNF gene in peripheral blood cells might differ between RA patients and controls. The primary objective of this study was to determine if CpG motifs in the TNF gene promoter were differentially methylated in RA compared with controls and if TNF mRNA levels correlated with DNA methylation. We also determined whether methotrexate was associated with alterations in genomewide methylation levels.

Methods: A cross-sectional RA population (n=218) and healthy controls (n=324) was used to investigate the primary objective. A second population of RA patients starting MTX were recruited (n=33) and DNA and DAS28 scores were obtained prior to treatment and at 3 months. Methylation of seven TNF CpG motifs (−349 to −78) and LINE-1, an assay of genomewide methylation, in peripheral blood leukocytes were assessed by pyrosequencing and levels of TNF mRNA were measured using quantitative PCR.

Results: Levels of methylation of 4 TNF CpGs (−170, −239, −245, −304) were higher in RA compared with controls (p=7.1 × 10−5 to 1.3 × 10−16) and TNF mRNA was 58% lower in RA cases (p=1.5 × 10−16). In both RA and controls negative correlations of TNF-245 methylation with TNF mRNA levels were detected (p=0.02 and 0.04 respectively). There was no difference in LINE-1 or TNF methylation in MTX treated patients and no correlation between change in methylation with DAS28 response after 3 months.

Conclusion: Higher levels of methylation of the TNF promoter are present in RA leukocytes compared with controls, and levels of TNF mRNA were lower in the patients. METHylation levels of TNF-245 were inversely correlated with TNF mRNA levels in both RA and controls. Treatment with MTX did not associated with changes in genomic or TNF methylation levels. These results suggest that methylation of the TNF promoter is higher in RA compared with controls and that methylation of TNF-245 is an important regulatory marker for TNF expression.

Disclosure: J. R. Maxwell, None; L. H. Taylor, None; R. A. Pacheco, None; N. Lawrence, None; G. W. Duff, None; M. D. Taree, None; A. G. Wilson, None.

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Genome Wide Association Studies of Knee Osteoarthritis in 2 Large North American Cohorts: A Meta-Analysis with 2667 Cases. Marc C. Hochberg1, Laura Yerges-Armstrong2, Changwan (Larry) Lu3, Michelle S. Yau4, Braxton D. Mitchell5, Joanne M. Jordan6, Youfang Liu7, Jordan B. Renner8, T. McSherry9, D.M. Taverna5, David Duggan1, W.J. Mysiw1 and Rebecca D. Jackson10. 1University of Maryland, Baltimore, MD, 2University of Maryland School of Medicine, Baltimore, MD, 3University of North Carolina Thurston Arthritis Research Center, Chapel Hill, NC, 4University of North Carolina, Chapel Hill, NC, 5University of North Carolina at Chapel Hill Dept of Radiology, Chapel Hill, NC, 6Gen, Phoenix, AZ, 7Ohio State University, Columbus, 8Ohio State University, Columbus, OH

Background/Purpose: A strong genetic contribution to knee osteoarthritis (OA) is widely recognized although few loci have been robustly associated with knee OA susceptibility. To identify genes associated with knee OA, we performed a meta-analysis of genome wide association (GWA) results from two large studies of knee OA: the Genetic Components of Knee OA (GeCKO) Study, an ancillary study from the Osteoarthritis Initiative (OAI), and the Johnston County (JoCo) Osteoarthritis Project. In addition, we attempted replication of 18 single nucleotide polymorphisms (SNPs) previously reported in the literature to be associated with hip or knee OA by the TREAT-OA Consortium, arcOGEN Study and others.

Methods: Cases with knee OA were Caucasians who had at least one knee with definite radiographic OA (Kellgren-Lawrence [KL] grade ≥2) at any available visit. Controls were Caucasians who were free of definite radiographic OA in both knees at all study visits. In total, data from 2014 cases and 953 controls from the OAI and 653 cases and 823 controls from the JoCo Study were included in the analysis. The OAI and JoCo DNA samples were genotyped using the Illumina 2.5M and Illumina 1M genotyping chip, respectively. In both studies imputation was performed using the 1000 genomes reference panel (June 2011 release) and statistical analysis was performed assuming an additive genetic model and adjusting for participant age and sex. Fixed-effects meta-analysis was conducted using METAL.

Results: Over 5.8 million SNP variants present in both the OAI and JoCo datasets and having both high quality 1000 genomes imputation (r2>0.3) and minor allele frequency of at least 5% were included in the meta-analysis. Ten variants had a meta-analysis P-value < 1 × 10−4 with Odds Ratios ranging from 1.27 to 1.54. The 10 variants were located in three loci: one on chromosome 11p15.4 upstream of the TRIM21 gene (encodes for tripartite motif containing protein 21, an intracellular antibody effector in the proteolysis pathway), and two in the non-genic regions of chromosome 1p15.3 and chromosome 2q35; the closest genes to the latter region being MREG and FNI1 (FNI1 encodes for fibronectin, a glycoprotein that binds to chondrocytes and is involved in cell adhesion and migration). Similar to previously reported findings (Osteoarthritis Cart 2012;20(Suppl 1):S46), only the rs143383 SNP in GDF5 (Growth and Differentiation Factor 5) was modestly associated with knee OA (P = 0.006) in the current analysis.

Conclusion: These data support the polygenic nature of the genetic contribution to knee OA. Further analyses will consist of both de novo and in silico replication in other datasets and populations.

Disclosure: M. C. Hochberg, Abbott Laboratories, Astra-Zenea, Biosiberna S.A., Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma A.G., Pfizer Inc., Stryker LLC, Xoma, 5; L. Yerges-Armstrong, None; C. Lu, None; M. S. Yau, None; B. D. Mitchell, None; J. M. Jordan, Alzymes, Inc., 1, Johnson and Johnson, 5; Johnon and Jonson, 5; Interleukin Genetics, Inc, 5, Eli Lilly and Company, 5, Mutual Pharmaceutical Company, 5; Y. Liu, None; J. B. Renner, None; T. McSherry, TGen, 3; D. M. Taverna, TGen, 3; D. Duggan, TGen, 3; W. J. Mysiw, None; R. D. Jackson, None.

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Autoimmune Susceptibility Genes Are Regulators of Gene Expression Response to ER Stress. William E. Bernal1, Michael P. Morley2 and Vivian G. Cheung1. 1The Children’s Hospital of Philadelphia, Philadelphia, PA, 2University of Pennsylvania, Philadelphia, PA, 3Howard Hughes Medical Institute, Chevy Chase, MD, University of Pennsylvania, Philadelphia, PA

Background/Purpose: Endoplasmic reticulum (ER) stress is caused by excessive demands on the protein-processing capacity of the ER; inefficiencies in response to ER stress lead to human diseases such as ankylosing spondylitis (AS). ER stress has been linked to inflammatory pathways. To study the role of ER stress in disease susceptibility, we identified the genes and pathways involved in ER stress response in human cells, assessed individual variation in these pathways, and mapped DNA sequence variants that influence ER stress response.

Methods: To study ER stress response in B-cells, we exposed the cells from 131 normal unrelated individuals to tunicamycin, a chemical inducer of ER stress, and measured changes in gene expression before and following ER stress. Then, to determine the genetic basis of variation in gene expression response to ER stress, we carried out genetic mapping using B-cells from members of 15 extended families.

Results: We identified 1,523 ER stress-responsive genes which showed at least 1.5 fold changes in gene expression following ER stress. The results showed extensive individual variation in gene expression response to ER stress. For instance, TNSF13B (BAFF/Blys), a potent activator of B cells, has a mean induction of 1.6-fold but there is a 2.4-fold difference in its level between the individuals with the lowest and highest induction of this gene. XBP1 and DDIT3 (CHOP), which encode key ER stress transcription factors, vary by 5-fold and 9-fold. From our linkage and association studies, we focused our analysis on 778 ER stress-responsive genes and identified 10 variants that are associated with the response of 497 of the genes, including TNSF13B. Regulators of gene expression response to ER stress include susceptibility genes for autoimmune diseases: BLK (systemic lupus erythematosus, rheumatoid arthritis, Kawasaki disease); SVIL (multiple
Zone-Specific Protein Profiles in Human Cartilage Unraveled by a Quantitative Proteomic Approach. Patricia Fernandez-Puente, Lucia Lourido, Valentina Calamia, Jesus Mateos, Cristina Ruiz-Romero, Martin K. Lotz and Francisco J. Blanco, 1Osteoarticular and Aging Research Group, Rheumatology Division, Biomedical Research Center (INIBIC). Hospital Universitario A Coruña, As Xubias de Arriba 84, 15006, A Coruña, Spain, 2Rheumatology Division, Proteomics Group/ProteoRed-ISCIII, INIBIC-C. Hospitalario, A Coruña, Spain, 3Department of Molecular and Experimental Medicine, The Scripps Research Institute, La Jolla, CA

Background/ Purpose: Articular cartilage consists of a single type of cells called chondrocytes, which comprise 2–5% of total tissue mass and an extracellular matrix (ECM) mainly composed of water, proteoglycans and collagens. The tissue function is dependent on the molecular composition of this ECM. Articular cartilage is characterized by a zonal architecture with unique cell phenotypes and ECM properties in the superficial, middle and deep zone. In osteoarthritis (OA), cartilage is thinned, eventually completely degraded, resulting in joint dysfunction and pain. OA is also associated with hypertrophic bone changes with osteophyte formation, subchondral bone degraded, resulting in joint dysfunction and pain. OA is also associated with unique cell phenotypes and ECM properties in the superficial, middle and deep zone.

Methods: Cartilage samples were obtained from OA patients undergoing joint replacement and normal donors without history of joint disease (n=3). For the localization studies, independent normal cartilage samples (n=3) were sectioned into three layers (superficial, middle and deep). Cartilage proteins were extracted, quantified, digested with trypsin and differentially labelled with iTRAQ isobaric tags. The peptide mixture was separated by two-dimensional LC coupled to MALDI-TOF/TOF mass spectrometry. Identification and relative quantification of the proteins were performed using ProteinPilot 3.0 software.

Results: We identified 220 different proteins in normal articular cartilage. An increased abundance of type VI collagen and small proteoglycans (mimicen, lumican or PRG4) was detected in the superficial layer of cartilage. Several proteins involved in cell adhesion processes were also increased in this layer (gelosin, vitronectin, tenascins). The middle layer was characterized by a high presence of type I, V, IX and XXVIII collagen, cartilage intermediate layer proteins (CILPs), COMP, vitronectin and decorin. Finally, the deep layer exhibited an increased abundance of type I and XI collagen, aggrecan and bone-related proteins (bone sialoprotein 2, osteomodulin, and bone morphogenetic protein 3). Comparison of this normal cartilage proteome with that from OA tissue led to the identification of 281 proteins: 23 were increased in the pathologic tissue (including aggrecan, COMP, complement factors or thrombospondin 1), whereas 36 were decreased in OA cartilage, such as type I, II and VI collagens, proteoglycans (biglycan, PRG4), tenascins or vitronectin.

Conclusion: In summary, more than 300 different human articular cartilage proteins have been mapped according to their presence in the three different tissue layers. 59 of them were altered in OA cartilage when compared to normal tissue. This information would be of high relevance in the search of tissue-specific OA biomarkers.

Disclosure: W. E. Bernal, None; M. P. Morley, None; Y. G. Cheung, None.

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Genome-Wide Analysis Reveals a Recessive Association of ERAP1 Variants with Behcet’s Disease and Epistasis Between ERAP1 and HLA-B*51. Elaine F. Remmers, Yohseki Kirino, George Bertias, Yoshiaki Ishigatsubo, Yoonhee Kim, Michael J. Ombrello, Ilkka Tugul-Tutkan, Emir Seyahi, Yilmaz Ozyazgan, F. Sevgi Saci, Burak Erer, Zelilha Emrence, Atilla Cakar, Nislihan Abaci, Duran Ustek, Colleen Satorium, Mitsuhiro Takeno, Ahmet Gül and Daniel L. Kastner. National Human Genome Research Institute, National Institutes of Health, Bethesda, MD, Yokohama City University Graduate School of Medicine, Yokohama, Japan, 2National Human Genome Research Institute, National Institutes of Health, Baltimore, MD, 3Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey, 4Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey, 5Institute of Experimental Medicine, Istanbul University, Istanbul, Turkey

Background/ Purpose: We recently performed a genome-wide association study in 1215 patients with Behcet’s disease (BD) and 1278 controls from Turkey and found disease-associated variants within the class I region of the MHC, and in the IL10 and IL23R loci. However, the combined effects of these loci account for less than 10% of the estimated disease heritability, suggesting other loci are yet to be identified.

Methods: To limit disease heterogeneity, we performed an analysis of the subset of patients with uveitis (n=463) in this subset we expanded the association analysis to include 3 genetic models, additive, dominant, and recessive, correcting the threshold for genome-wide significance for the 3 models examined. Confirmatory studies were conducted in our combined GWAS and replication sets of 2017 BD cases and 1875 controls, and in this sample an interaction between two loci was evaluated with a logistic likelihood ratio test comparing a full model (including a multiplicative interaction term) with a reduced model (without the interaction term).

Results: A genome-wide analysis, applying a recessive model, in 420 BD patients with uveitis and 1278 controls revealed one variant located 5’ of ERAP1, with near genome-wide significance (rs2927615, p = 1.02 x 10^-6). This effect was not observed with an additive or dominant model. ERAP1 encodes an endoplasmic reticulum expressed aminopeptidase that plays an important role in trimming and loading intracellular peptides for class I MHC presentation. Fine-mapping with the same samples and replication in an independent collection of 370 Turkish BD cases with uveitis and 630 controls identified two disease-associated non-synonymous variants in ERAP1, with the most significant combined p value for rs17482078 (ERAP1, p = 4.46 x 10^-5). Furthermore, we identified a genetic interaction between the BD-associated MHC class I allele, HLA-B*51, and ERAP1 (p = 0.0009) in the combined Turkish GWAS and replication samples. ERAP1 R725Q homozygosity compared with non-homozygosity was associated with an OR for BD of 3.78 (95% CI = 1.94–7.35) in HLA-B*51 positive individuals versus an OR of 1.48 (95% CI = 0.78–2.80) in HLA-B*51 negative individuals.

Conclusion: A coding variant of ERAP1, encoding endoplasmic reticulum expressed aminopeptidase 1, recessively confers risk for BD preferentially to individuals carrying the disease-associated HLA-B*51 allele. Genetic similarity with two other MHC class I associated diseases, ankylosing spondylitis and psoriasis (shared loci include MHC class I, IL23R, ERAP1 and the MHC-ERAP1 interaction), suggest shared pathogenic pathways among these diseases.

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Proteomic Shotgun Analysis of Mesenchymal Stem Cells Reveals an Altered Regulation of Proteosomal Proteins in Osteoarthritics Patients. Jose Ramon Lamas. Hospital clinico San Carlos, Madrid, Spain

Background/ Purpose: To describe proteins with a potential role in OA pathogenesis, in this study we have followed a proteomic approach based on a shotgun comparative analysis of Mesenchymal Stem Cells (MSCs) isolated from OA patients and healthy donors.

Disclosure: P. Fernandez-Puente, None; L. Lourido, None; V. Calamia, None; J. Mateos, None; C. Ruiz-Romero, None; M. K. Lotz, None; F. J. Blanco, None.
Methods: MSCs were obtained from bone marrow aspirates at the time of joint replacement surgery of three OA patients (mean age 76.7 years) and three hip fracture subjects without OA (mean age 73.3). Cells were cultured and expanded. Confluent cells at the third passage (approximately 2 × 10^6) were used for the experiments. After Protein extraction, solubilization and digestion, samples were subjected to a LC-MS shotgun analysis. For protein identification the MS/MS spectra were extracted using the Proteome Discoverer 1.0 software and searched against the MSPI human database (version 091510) using the Mascot 2.1 program. GeneCodis 2.0 software was used for functional classification of different proteins.

Results: A total of 1748 proteins were identified. The statistical analysis revealed 123 differentially expressed proteins between OA-MSCs and control MSCs with foldchange values > 2 times at the p < 0.05 level of significance, of which 76 (62%) were upregulated and 47 (38%) were downregulated in OA-MSCs as compared with control cells. Interestingly, five proteosomal proteins, pertaining to the regulation of ubiquitin-protein ligase activity biological function: PSMD2 (2.52), PSMA1 (3.36), PSMB3 (4.56), PSMA3 (7.08) and PSMA4 (13.26) were clearly upregulated.

Conclusion: Given that proteosomal-dependent degradation has a critical role in regulating activities of key osteoblastogenic transcription factors (e.g., RUNX2, ATF4) and signaling pathways (e.g., Hedgehog, BMP, Wnt/β-catenin), upregulation of proteasome subunits and increased activity in MSCs from OA patients might be related to reduced bone mass and/or poor bone tissue quality in OA patients.

Disclosure: J. R. Lamas, None;

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MTHFR Polymorphisms in Systemic Lupus Erythematosus and Rheumatoid Arthritis: Associations with Intima Media Thickness Scores, Clio P. Mavragani, Maira Giannelou, Ioanna Papadaki, Eleni Antypa, Dimitrios Ioakeimidis, Haralampos M. Moutsopoulos and Michael Koutsilieris. 1School of Medicine, University of Athens, Athens, Greece, 2School of Medicine, University of Athens, Athens, Greece, 3General Hospital of Athens “G. Gennimatas”, Athens, Greece, 4General Hospital of Athens, Greece, 5General Hospital Athens, Greece

Background/ Purpose: Previous studies identified polymorphisms in the gene coding for the Methylenetetrahydrofolate reductase (MTHFR) enzyme as genetic contributors for cardiovascular disease in the general population. The purpose of the present study was to determine the prevalence of the MTHFR polymorphisms for either 677 or 1298 allele in patients with systemic lupus erythematosus (SLE) and rheumatoid arthritis (RA) and to investigate whether they associate with carotid and femoral intima media thickness scores and plaque formation.

Methods: 77 consecutive SLE patients, according to the American/European classification criteria, 101 RA patients and 137 healthy controls were enrolled. All study groups were assessed for MTHFR 677CT or 1298AC genotype. Furthermore, all patients underwent ultrasound determination of intima-media thickness score (IMT) and plaque formation in the carotid and femoral arteries. Data regarding clinical, hematological, serological, immunological information and therapeutic regimens were recorded in all patients. Classical risk factors for cardiovascular disease were also assessed.

Results: The prevalence of MTHFR TT and CC genotypes in the SLE group was 25% (19 of 77 patients) for the 677 allele and 10.5% (8 of 77 patients) for the 1298 allele, respectively. The corresponding figures for the RA group were 77.9% (133 of 177 patients) and 9.8% (13 of 133) and the healthy controls 13.1% (18 of 137) and 9.48% (13 of 137), respectively. A significantly higher prevalence for the MTHFR homozygous 677TT mutation was observed in patients with SLE compared to both RA patients and healthy controls (p-values 0.004 and 0.038, respectively). No differences were detected in the prevalence of the different MTHFR genotypes between RA and healthy controls.

Conclusion: A significant number of SLE patients evaluated for subclinical atherosclerosis, 25 (32.46%) had increased IMT scores (defined as ≥0.90mm) and 44 (57.14%) had plaque. IMT score was found positively associated with the presence of either the MTHFR 677 or 1298 homozygous mutation (p=0.026). A trend of increased IMT scores was detected in RA patients sharing the heterozygous MTHFR 1298 AC genotype compared to the other groups. No correlation was found between the development of plaque and the presence of any MTHFR mutation in SLE and RA populations.

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Functional Genomics of the Human ITGAM Locus, Yebin Zhou1, Dan C. Bullard1, Alexander Szalai3, Jianming Wu1 and Jeffrey C. Edberg1, 1University of Alabama at Birmingham, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL, 3University of Minnesota, St. Paul, MN, 4Department of Medicine, University of Alabama at Birmingham, Birmingham, AL.

Background/ Purpose: ITGAM encodes CD11b, the αM subunit of the Mac-1/αMβ2 integrin. Mac-1 has many functions on leukocytes including its role as an adhesion molecule and complement receptor. Genome-wide association studies (GWAS) have demonstrated that a non-synonymous SNP in the ITGAM locus, rs1143679 encoding an Arg/His in the extracellular domain, is associated with SLE susceptibility. This variant is in strong linkage disequilibrium with another common non-synonymous SNP (rs1143678 encoding a Ser/Lys in the cytoplasmic domain). We have explored possible functional changes due to these ITGAM variants through analysis of expression level, activation and cell function using ex vivo approach with neutrophils from genotype healthy donors.

Methods: Neutrophils from healthy control donors genotyped at both rs1143678 and rs1143678 were isolated for ex vivo functional studies. The phagocytic potential of CD11b variants was probed with complement coated erythrocytes (EAC) and serum treated zymosan (STZ). The adhesion potential of ITGAM variants was assessed in a flow chamber analyzing neutrophil adhesion to both ligand (ICAM-1) and endothelial cells. Total neutrophil CD11b expression and expression of the activation dependent I-domain was assessed by flow cytometry.

Results: In 2424 healthy control donors, we confirmed strong LD between SNP rs1143678 and rs1143678 (D'=0.97, r=0.82). We assessed the functional potential of neutrophils from donors heterozygous for each SNP alone using STZ to determine complement dependent binding and phagocytosis. Variation at either SNP results in a quantitative decrease in STZ phagocytosis and that donors homozygous for both variants had even lower phagocytosis (repeated measures ANOVA, p<0.04, n=3). Quantitative complement dependent phagocytosis was also significantly decreased in donors homozygous for the variant alleles (39% decrease for STZ, n=3 pairs, p<0.02/38% decrease for EAC, n=3 pairs, p<0.001). In a flow chamber based assay of neutrophil adherence, cells from donors homozygous for the variant alleles of rs1143678 and rs1143678 adhered significantly less than neutrophils for donors homozygous for the common alleles (adherence to ICAM-1/endothelial cells:42% decrease for either MTHFR 677TT or 1298CC, suggesting the effect of genetic risk factors in the accelerated atherosclerotic disease characterizing SLE patients.

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A Genome-Wide DNA Methylation Analysis Reveals Different Methylation Patterns in the OA Disease. Ignacio Rego-Pérez1, Juan Fernandez-Tajes1. Mercedes Fernandez-Moreno1, Maria Tamayo Novas1, Alejandro Mosquera Rey1, Natividad Oreiro1, Carlos Fernandez-Lopez1, Jose Luis Fernandez Garcia1 and Francisco J. Blanco1, 2INIBIC-Hospital Universitario A Coruña. Rheumatology Division. Genomic Group, A Coruña, Spain, 2INIBIC-Hospital Universitario A Coruña. Genetic Department, A Coruña, Spain

Background/Purpose: DNA methylation is a basic mechanism involved in epigenetic regulation that affects gene transcription by the addition of a methyl group to the cytosine residue within a CpG dinucleotide to form methylated cytosine. The objective of this work is to identify and analyze the genome-wide DNA methylation profiles of human articular chondrocytes from a population-based case-control study of OA.

Methods: DNA methylation profiling was performed using the Infinium HumanMethylation27 beadchip (Illumina Inc.), which allows interrogation of 27,578 highly informative CpG loci. Previously, cartilage isolated DNA from 23 OA patients and 19 healthy controls was bisulfite-modified, using the EZ DNA methylation kit (Zymo Research) and hybridized according to the manufacturer's instructions. DNA methylation b-values were normalized using GenomeStudio v3.0 (Illumina Inc.). Appropriate bioinformatics analyses were carried out using both R bioconductor software packages and Babelomics suite v4.2 (babelomics.bioinfo.cipf.es).

Results: A first approach based on an unsupervised clustering method for the most variable CpG loci (n=508) showed three distinct groups of samples called cluster 1, cluster 2 and cluster 3. Specifically, cluster 2 formed a particularly tight cluster with a characteristic DNA methylation profile (Figure 1). The analyses of the biological relevance of the differentially methylated genes in cluster 2 compared with non-cluster 2 by means of a gene set enrichment approach, showed that some of the biological processes significantly altered were those related to cellular adhesion, morphogenesis/angiogenesis and regulation of cell proliferation, all of them hypermethylated in cluster 2; on the contrary, those genes related to cytokine secretion/production as well as immune response and inflammation appeared significantly hypomethylated in cluster 2.

Conclusion: The genome-wide methylation analysis shows a clearly distinct epigenetic profile for OA patients. The DNA methylation profile could be one of the reasons of the existence of different forms OA and could also be related to both the prevalence and progression of this disease.

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Background/Purpose: Many genes, many of them still unknown, are involved in the etiology and development of OA. Today, different tools are available to try to identify some of the key genes related to the OA process. Therefore, the objective of this work is to perform a genome-wide expression assay in order to identify different expression profiles in the OA disease

Methods: Total RNA from OA cartilage samples was isolated with RNeasy Kit (Qiagen, Madrin, Spain) following manufacturer's instructions. RNA was checked for integrity and purity with the Agilent Bioanalyzer (Agilent Technologies) and NanoDrop spectrophotometer (Thermo Scientific). 150 nanograms of total RNA were used for cDNA synthesis using the Ambion WT Expression kit (Ambion). The fragmented cDNA was hybridized against the Human Gene 1.1 ST array strip (Affymetrix) and scanned using the GeneTitan system (Affymetrix). Quality controls, normalization, pre-processing, differential gene expression and functional analyses were carried out with Bioconductor packages using R software.

Results: Human Gene 1.1 ST Array, which interrogates more than 28,000 well-annotated genes of 33,297 probes, was used for studying the genome wide expression profile of 23 OA-patients cartilage samples. A non-specific filtering was previously applied for removing those probes with non-annotation information and with low intra-array variation. An unsupervised machine learning approach revealed a group of samples highly different (Figure 1). The differential expression analysis between this cluster, comprising a total of six OA-patients, and the rest of the samples allowed for the identification of 176 differentially expressed probes with an adjusted p value below 0.0001. The analysis of the biological processes related to these differentially expressed genes showed that inflammation and immune processes were the main pathways found to be altered when a gene set enrichment analysis was applied.

Conclusion: The genome-wide expression analysis shows a clearly distinct profile for a group of OA patients. Both inflammation and immune response processes appeared to be significantly altered and revealed as key factors in the development of the OA disease.

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Genetic Effects of HLA-DRB1, IL-4R, and FcγRIIb on Long-Term Treatment Responses in Patients with Early Rheumatoid Arthritis: 78-Week Results of a 4 Phase Study. Alla Skapenko1, Josef S. Smolen1, Arthur Kavanagh2, Vijin Arora3, Hartmut Kupper4 and Hendrik Schulze-Koops1.

Background/Purpose: Previous analyses suggested that the HLA-DRB1 shared epitope (SE), and the IL-4R V50I and the FcγRIIb I232T single nucleotide polymorphisms (SNPs) affected response to adalimumab (ADA) plus methotrexate (MTX) at 26 weeks.1 Their effect on long-term responses is unclear. To examine 78-wk clinical responses according to 3 candidate loci: HLA-DRB1 SE, IL-4R I50V and FcγRIIb I232T SNPs.

Methods: MTX-naïve patients (pts) ≥18 yrs with RA <1 yr, active disease [DAS28(CRP)>3.2, ESR=28 mm/hr or CRP=1.5 mg/dL], and >1 erosion, RF+, or anti-CCP+ were randomized to ADA+MTX or placebo (PBO)=MTX for 26 wks (Period 1, P1). Pts who achieved a stable LDA target (DAS28<3.2 at wks 22 & 26) with ADA+MTX were re-randomized to continue ADA+MTX (ADA Continuation arm) or have ADA blindly withdrawn (ADA Withdrawal arm) for 52 wks (P2). Pts who achieved the stable LDA target with PBO+MTX continued blinded therapy (MTX Continuation arm). Pts who did not achieve the stable LDA target with initial combination therapy or MTX monotherapy were offered open-label (OL) ADA+MTX (OL ADA Carry On and Rescue ADA arms, respectively).

Results: Baseline demographics were similar across all arms. The Table shows the percentage of pts achieving DAS28<3.2 at wk 78. There were no consistent patterns for the IL-4R alleles in any group. While limited by small sample sizes, pts with FcγRIIb-CC appeared to have higher responses at wk 78 among groups initially exposed to ADA+MTX during P1. The positive influence of SE was apparent at wk 78 in groups originally exposed to MTX, particularly in pts who did not achieve the stable LDA target at wks 22 & 26 but continued ADA+MTX. However, this pattern was not observed in pts who failed to achieve the target with MTX and were subsequently treated with ADA+MTX.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>HL-DRB1 SE</th>
<th>IL-4R</th>
<th>FcγRIIb</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA Withdrawal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(75.0)</td>
<td>(69.4)</td>
<td>(77.3)</td>
<td></td>
</tr>
<tr>
<td>ADA Continuation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(62.2)</td>
<td>(56.0)</td>
<td>(67.4)</td>
<td></td>
</tr>
<tr>
<td>OL ADA Carry On</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(94.9)</td>
<td>(86.3)</td>
<td>(87.5)</td>
<td></td>
</tr>
<tr>
<td>Rescue ADA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(59.8)</td>
<td>(50.0)</td>
<td>(41.2)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Regardless of genetic background, wk 78 responses were generally higher for pts who achieved the stable LDA target at wks 22 & 26. The positive effects of HLA-DRB1 SE and FcγRIIb-CC in response to ADA+MTX previously noted at wk 26 were not apparent at wk 78, but noticeable in pts who failed to achieve the target. Further, while SE predicted clinical response to ADA+MTX, particularly when combined with IL-4R alleles, it had no influence on the ability to withdraw ADA in pts who achieved LDA. These findings may indicate that genetic factors have a stronger influence on initial treatment response than on sustained disease control.

Reference

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Genetic Predictors of Methotrexate Efficacy and Toxicity in Early Rheumatoid Arthritis: Results From the Treatment of Early Aggressive Rheumatoid Arthritis Trial. Stella Aslibekyan1, Elizabeth Brown2, Richard J. Reynolds1, David T. Redden1, Sarah L. Morgan1, Joseph Baggott3, Jin Shai4, Larry W. Moreland5, James R. O’Dell6, Jeffrey R. Curtis7, S. Louis Bridges Jr8, and Donna K. Arnett1.

Background/Purpose: Methotrexate (MTX) has emerged as first-line therapy for early moderate to severe rheumatoid arthritis (RA), but individual variation in treatment efficacy and toxicity remains unexplained. We test the hypothesis that genetic markers in genes involved in drug metabolism, excretion, and transport are associated with MTX response in early RA.

Methods: Treatment of Early Aggressive Rheumatoid Arthritis Trial participants (n=471) were analyzed for 863 markers spanning 224 genes from key pharmacogenetic pathways. Multiple regression models were fit with efficacy (Disease Activity Score on 28 joints at 24 weeks) and toxicity (self-report of any side effects or infections) as outcomes, adjusted for age, sex, race, and single markers as predictors. Penalized regression models were used to test joint associations of markers and/or covariates with the outcomes.

Results: The strongest genetic associations with efficacy were in the CHST11 gene (five markers with P <0.0024), encoding carbohydrate (chondroitin 4) sulfotransferase 11. Top markers associated with MTX toxicity were in the cytochrome p50 superfamily genes CYP20A1 and CYP39A1, solute carrier genes SLCA22A1 and SLCA7A1, and the mitochondrial alternative dehydrogenase ALDH12 (P <0.0004). Results from the penalized regression models included only genetic markers for the toxicity outcome, while clinical covariates were stronger predictors of MTX efficacy. The selected markers explained more variance in toxicity (9%) than efficacy (4%).

Conclusion: We identified several novel and biologically relevant genetic markers associated with MTX response in early RA. These preliminary findings could inform future development of personalized therapeutic approaches.

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Methods: Data from a combined population of three MTX trials (Treatment of Early Aggressive RA Trial; Immunex Early RA Trial; UAB Folic Acid Supplementation Trial, total subjects = 633) were analyzed for 3,127 genetic markers previously linked to RA risk or MTX metabolism pathways, with MTX efficacy (defined as the change joint count scores over 24 weeks of MTX therapy) and toxicity (defined as self-report of any adverse events) as outcomes. Gene-based tests were conducted to complement single marker analyses. All statistical models were adjusted for age, sex, race, and treatment as fixed effects, and for study as a random effect; the efficacy models were additionally adjusted for baseline disease activity.

Results: In the MTX efficacy models, the strongest signals were observed with variation in genes encoding efflux transporters (ABCC1; gene-based P = 1.4 × 10−4), B cell surface antigen (CD40, gene-based P = 3.8 × 10−4), and immunoglobulin receptors (FCGR2A, FCGR3A; gene-based P = 1.5 × 10−5 and P = 1.6 × 10−5 respectively). Although no genetic variants reached statistical significance in the models of adverse effects associated with MTX therapy, the top hits included markers near GFRα2 (rs12549890, P = 2.8 × 10−3), the ABCA12 transporter (rs4673907, P = 4.6 × 10−3), and multiple SNPs in ADK included in the adenosine pathway.

Conclusion: This study provides preliminary identification of several novel targets relevant to MTX metabolism in RA. These findings will inform future studies aimed at developing pharmacogenetic tools to predict response to MTX therapy.

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998 Association Study of Genetic Risk Variants for Psoriasis in a Large Cohort of Psoriatic Arthritis, Psoriasis and Controls of the Spanish Population and Association with Relevant Clinical Subphenotypes. J. D. Cañete, Jose Luis Fernandez-Suero, Raimon Sammarti, Jesus Rodriguez, Jordi Gratacós, Rubén Quero, Juan Carlos Torre-Alonso, Jose Perez Venegas, Santiago Muñoz-Fernandez, Carlos M. Gonzalez, Daniel Roig, Alba Erra, Isabel Acosta, Antonio Fernández-Nebro, Pedro Zarco, Aralda Alonso, Maria Americá Lópe...
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Epistatic Interaction Between \textit{BANK1} and \textit{BLK} in Rheumatoid Arthritis: Results From a Large Trans-Ethnic Meta-Analysis. Emmanuelle Genin\textsuperscript{1}, Baptiste Couster\textsuperscript{2}, Yannick Allanore\textsuperscript{3}, Maria Teruel\textsuperscript{4}, Amaud L. Constantin\textsuperscript{5}, Shigeto Toba\textsuperscript{6}, O. Vittecoq\textsuperscript{7}, Hiroshi Furukawa\textsuperscript{8}, Alejandro Balsa\textsuperscript{9}, Thierry Schaeverbeke\textsuperscript{10}, Miguel Angel Gonzalez-Gay\textsuperscript{11}, Gilles Chiochicia\textsuperscript{12}, Naoyuki Tsuchiya\textsuperscript{13}, Javier Martin\textsuperscript{14} and Philippe Dieude\textsuperscript{15}, \textsuperscript{1}INSERM UMR-S946, Paris, France, \textsuperscript{2}Université Paris Descartes, Hôpital Cochin, Paris, France, \textsuperscript{3}Paris Descartes University, Rheumatology A department, Cochin Hospital, Paris, France, \textsuperscript{4}Instituto de Parasitoloxía y Biomedicina Lopez-Neyra, CSIC, Granada, Spain, \textsuperscript{5}Purpan University Hospital, Toulouse Cedes 9, France, \textsuperscript{6}Sagamihara National Hospital, Sagamihara City, Japan, \textsuperscript{7}University Hospital, Rouen, France, \textsuperscript{8}Clinical Research Center for Allergy and Rheumatology, Sagamihara National Hospital, National Hospital Organization, Sagamihara, Japan, \textsuperscript{9}La Paz Hospital, IdiPaz, Madrid, Spain, \textsuperscript{10}Groupe Hospitalier Pellegrin, Bordeaux, France, \textsuperscript{11}Hospital Universitario Marqués de Valdecilla. IFIMAV, Santander, Spain, \textsuperscript{12}Institut Cochin - INSERM U1016 - CNRS (UMR 8104), Paris, France, \textsuperscript{13}Molecular and Genetic Epidemiology Laboratory, University of Tsukuba, Tsukuba, Japan, \textsuperscript{14}Instituto de Parasitoloxía y Biomedicina Lopez-Neyra (CSIC), Granada, Spain, \textsuperscript{15}APHIP, Hôpital Bichat, Paris, France

Background/Purpose: \textit{BANK1} and \textit{BLK} belong to pleiotropic genes and receive a genetic and physical interaction between \textit{BANK1} and \textit{BLK} has been detected in systemic lupus erythematosus. Although \textit{BLK} has been reproduced identically as a RA risk factor, conflicting results have been reported regarding the contribution of \textit{BANK1} in RA susceptibility. To ascertain the real impact of \textit{BANK1} on RA genetic susceptibility we performed a large meta-analysis. In addition, we tested for an epistatic interaction between \textit{BLK} and \textit{BANK1} in RA susceptibility.

Methods: We performed a large trans-ethnic meta-analysis including data from 8,898 RA patients and 15,479 controls genotyped for \textit{BANK1} rs3733197 and \textit{BLK} rs13277113 GG genotype: OR = 1.21, 95% CI [1.04–1.41], P = 0.015. The epistatic interaction between \textit{BANK1} rs3733197 G risk allele and RA was restricted to individuals carrying the \textit{BLK} rs13277113 GG genotype: OR = 1.21, 95% CI [1.04–1.41], P = 0.015.

Conclusion: This study confirms \textit{BANK1} as a RA susceptibility gene and provides for the first time, evidence for epistasis between \textit{BLK} and \textit{BANK1}. Our results illustrate the concept of pleiotropic epistatic interaction suggesting that \textit{BLK} and \textit{BANK1} might play a role in RA pathogenesis.

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\textbf{CNstream2: Improved SNP and CNV Genotyping Reveals New Loci Associated with Rheumatic Diseases.} Arnoldo Alonso, Antonio Julià, Raúl Tortosa and Sara Marsal. Vall d’Hebron Research Institute, Barcelona, Spain

Background/Purpose: In Genome-Wide Association Studies (GWAS), the performance of the genotyping algorithm is crucial to identify new SNPs associated with disease risk. Recently, a novel method was developed to exploit SNP-oriented microarrays in order to genotype Copy Number Variations (CNVs), albeit with a reduced performance compared to SNPs. In this study we present CNstream2, a method for both SNP and CNV genotyping that achieves a superior accuracy compared to other established methods. In addition, we have identified several new CNV loci that are in high linkage disequilibrium (LD) with SNPs previously associated to rheumatic diseases.

Methods: CNstream2 is a substantially improved version of our previous CNstream software which achieves a superior accuracy in both SNP and CNV genotyping compared to other well-established methods (i.e. GenoSNP/GenCall for SNP genotyping and PennCNV/QuantisNP for CNV genotyping). All these improvements have been assessed in different Illumina platforms using public microarray data from HapMap samples. SNP genotypes from the 1000 Genomes Project (1KGP) and CNV genotypes from recent studies using CNV-oriented technologies have been used as golden standards for performance comparisons. In order to show the power of CNstream2, we performed a correlation analysis between SNPs associated with rheumatic diseases reported by the GWAS catalog and the CNVs identified by CNstream2 over the same HapMap samples using Humomni1 data. All the CNV loci that obtained an r2 > 0.7 (N = 16) were reported in this study.

Results: CNstream2 obtained a high performance both on SNP and CNV genotyping. When assessing SNP genotyping accuracy, CNstream2 obtained an average gain of 0.20% with respect to GenoSNP and GenCall (representing a gain of 1,000–2,000 genotyped SNPs per GWAS). On the other hand, when comparing CNV calls obtained by CNstream2, PennCNV and QuantisNP within previously characterized CNV loci, CNstream2 exceeded by an average of 20% the number of correctly captured loci compared to its competitors. The LD analysis between SNPs associated to rheumatic diseases with CNVs detected by CNstream2 revealed 16 highly correlated SNP-CNVP pairs. From these, 11 pairs were located in the HLA region and were associated to several rheumatic diseases. Given the strong correlation of the CNV with the disease risk SNP, additional functional studies exploring its relevance are warranted. Outside the HLA region, 5 new CNVs from loci associated with rheumatological diseases were identified. From these, a previously unidentified deletion in Rheumatoid Arthritis risk gene PADI4, showed a strong association.

Conclusion: After an exhaustive evaluation of CNstream2 performance we can conclude that this new software tool provides an unprecedented accuracy both in SNP and CNV genotyping. Using CNStream2 on publicly available data, we have identified new CNVs on loci previously associated to rheumatological diseases which could likely explain the observed disease risk association.

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\textbf{MicroRNA Expression Profiles in Peripheral Blood Mononuclear Cells of Early Onset Psoriatic Arthritis.} G. Ciancio\textsuperscript{1}, Manuela Ferracin\textsuperscript{2}, Barbara Zagatti\textsuperscript{2}, Elena Sacceneti\textsuperscript{2}, Valentina Bagnati\textsuperscript{2}, Ilaria Farina\textsuperscript{2}, Matteo Colina\textsuperscript{3}, Marco Seri\textsuperscript{4}, Francesco Trotta\textsuperscript{1}, Massimo Negrini\textsuperscript{2} and Marcello Govoni\textsuperscript{1}.

\textsuperscript{1}Rheumatology Unit-Azienda Ospedaliera-Universitaria Sant’Anna, Ferrara, Italy, \textsuperscript{2}Laboratory for Technologies of Advanced Therapies (LTTA), University of Ferrara, Ferrara, Italy, \textsuperscript{3}Section of Internal Medicine A.Ospedale Maggiore, Bologna, Italy, \textsuperscript{4}Medical Genetics Unit, Bologna, Italy

Background/Preocus: Micro-RNAs (miRNAs) are small non-coding RNAs that negatively regulate gene expression. It is known that an altered miRNA expression plays an important role in cancer. A new emerging role for miRNAs has been evidenced in the pathogenesis of autoimmune diseases such as rheumatoid arthritis (RA), in which miR-146a has gained increasing relevance, psoriasis and systemic lupus erythematosus. No data about the miRNA expression profile in psoriatic arthritis (PsA) are available to date. In a preliminary study, we identified 16 miRNAs (9 up- and 7 down-regulated) differentially expressed in a sample of 13 early PsA vs 7 healthy controls (submitted data). Now, our main purpose is to validate the identified miRNA signature in a larger series of patients and controls.

Methods: Blood samples from 21 consecutive patients with early, active and naive from treatment PsA (disease duration < 6 months; M:9; W:12; mean age:39.3±8.1; DAS 44: 4.12 ± 0.29; SPARCC Enthesitis Index score: 2 ± 0.5) were collected. As controls, 12 random healthy volunteers (M:4; W:8; mean age 34 ± 11) were recruited. The expression levels of 723 mature miRNAs in peripheral blood mononuclear cells (PBMC) were investigated in all patients and recently by an Agilent miRNA microarray. Differentially expressed genes were identified by applying a two-tailed unpaiared t-test (Graph-Pad).

Results: We identified 3 microRNAs (miR-21,miR-34a and miR-21*),
previously described as upregulated in PsA as significantly upregulated also in this new cohort of patients (p = 0.01-0.001) compared to controls.  

**Conclusion:** A 3-miRNA signature was identified in patients with early active PsA. The upregulated miR-21, miR-34a and miR-21* appear of great interest to understand the underlying pathogenic processes of PsA. Moreover, their expression in patients with active disease makes them attractive as potential biomarkers.

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**1003**

**Role of Particular Class I MHC Haplotypes in Determining Different Traits within the Psoriatic Arthritis Phenotypes.** Muhammad Haroon1, Jon T. Giles2, Robert Winchester3 and Oliver M. FitzGerald1. 1Dublin Academic Medical Center, St. Vincent’s University Hospital, Dublin, Ireland, 2Columbia University Medical Center, New York, NY, 3Columbia University, New York, NY

**Background/Purpose:** A rigorously ascertained psoriatic arthritis (PsA) cohort demonstrated considerable genetic heterogeneity and provided preliminary evidence that MHC genes determine quantitative traits within the PsA phenotype with different patterns of MHC effect.

**Methods:** We now extend these findings by performing detailed clinical phenotyping of PsA cases to better characterize the clinical features associated with particular HLA class I alleles and their haplotypes.

**Results:** A total of 150 PsA patients [mean age 52 ± 12 years; 46% male; mean PsA duration 25 ± 12 years; 45% with axial involvement, 25% with sacroiliitis; 41% with radiographic erosions; median PASI = 1.2] were studied. In univariate analysis, the inheritance of B*27:05 was apparently associated with a more severe joint disease phenotype including: joint erosions, the requirement for TNF therapy and axial disease manifestations such as spine involvement and sacroiliitis that were temporally preceded by or coincident with skin disease. In striking contrast, the presence of HLA-C*06, whether on a B*57-C*06 or B*37-C*06 haplotype, was associated with a considerable delay in the development of arthritis, and conferred a reciprocal phenotype of significant negative associations with arthritis severity, including the presence of erosions, the requirement for TNF inhibitor therapy, and axial disease. B*08 and B*08-C*07 (EH8.1) were correlated with joint deformities, erosions, TNF inhibitor requirement, osteolysis, and dactylitis, developing after the appearance of psoriasis, suggesting this haplotype denotes a more severe but delayed arthritic phenotype.

Surprisingly, in contrast to the uniform association of disease susceptibility with B*27, the association with phenotypic features was not uniform across all B*27 alleles, and was mainly accounted for by the B*27-C*01 (EH27.1) haplotype and not B*27-C*02 (EH27.2), suggesting the influence of additional genetic effects on EH27.1. The predictive value of these haplotypes was confirmed by logistic regression, which after adjustment for confounders showed, for example, the probability of developing sacroiliitis was almost completely determined by the inheritance of EH27.1, EH1.0 or C*05, figure A. Similarly, the probability of developing peripheral joint erosions was strongly associated with the presence of EH27.1, EH8.1 or C*03, figure B.

**Conclusion:** Certain HLA alleles, and, most strikingly particular haplotypes, contribute importantly to the magnitude of traits comprising the diverse phenotypes of PsA, but this contribution does not completely parallel the role of these alleles or haplotypes in determining susceptibility.

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**1004**

**A Unique Single Nucleotide Polymorphism in the 3’ UTR of the MED29 Gene On Chromosome 19 Is Associated with the Clinical Outcome of Different Biologic Response Modifiers.** Susanne Drynda, David Leesch, Marietta Gloetznzer and Joern Kekow. Univ of Magdeburg, Vogelsang-Gommern, Germany

**Background/Purpose:** Due to the wide range of highly specific and effective biologic response modifiers that are available today for the treatment of RA it has become of great importance to identify biomarkers for the prediction of therapy outcome, supporting an individualized therapy. Most studies in this field analysed potential markers for a single biological or substance group, respectively. In this study we analysed the association of genotypes of the single nucleotide polymorphism (SNP) rs10414216 in the 3’ UTR of the MED29 gene with the outcome of two biologic response modifiers, targeting different pathways.

**Methods:** We studied 275 RA patients treated first with the TNF-blocker etanercept (ETN) and a subgroup of 62 patients treated later in the course of the disease with a B-cell directed therapy, with rituximab (RTX). The frequency of the SNP rs10414216 MED29 C/T was analysed using a validated TaqMan™ genotyping assay containing sequence-specific primers and fluorescence-labelled allele-specific probes. Disease activity and therapy response were assessed according to the EULAR improvement criteria (http://www.eular.org/activities-score.nl). The TNF-ETN therapy was assessed 3–4 months after initiation of therapy, the outcome of rituximab after 4–6 months after the first infusion of RTX.

**Results:** The genotype distribution of the SNP rs10414216 MED29 C/T in 275 RA patients was comparable with a cohort of non-affected controls. There were no differences in the genotype frequencies in subgroups of ACPA-positive and -negative RA patients. There was no association of genotypes with disease activity observed. The DAS28 at baseline before start of ETN or RTX treatment was comparable for all genotypes. After 3–4 months of ETN treatment the DAS28 decreased by 1.670 ± 1.377, 2.083 ± 1.348 and 2.382 ± 1.286 (mean ±SD) for the C/C, C/T and T/T genotypes, respectively. The improvement of the DAS28 was significantly better for the T/T genotype compared to C/C (p = 0.003), 58% of T/T carriers but only 27.2 % of the C/C carriers were identified as good responders to ETN. However, in RTX treated patients the carriers of the C/C genotype were identified as better responders, after 4–6 months the DAS28 decreased by 2.277 ± 1.588 for the C/C genotype compared to 1.310 ± 1.347 for the C/T genotype (p = 0.025). 46.2% of C/C and only 27.3% of C/T carriers were good responders to RTX. The T/T carriers were underrepresented in the RTX subgroup, probably as a result of a better outcome of the TNF-blocker therapy in these patients.

**Conclusion:** Our data clearly indicate that a single SNP has the potential to predict the outcome to different therapeutic approaches. The functional importance of this genetic variation has not yet been characterized. However, this SNP is located in the gene region of MED29, a subunit of the mediator complex which plays a substantial role in the regulation of gene expression. Further analysis of this SNP and the respective gene locus could provide further insight into the mechanisms which determine the outcome of different targeted therapies.

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**The Identification of Pathway Markers in Behcet’s Disease Using Genomewide Association Data From Two Different Populations.** Burcu Bakir-Gungor1, Elaine Remmers2, Daniel L. Kastner3, Akira Meguro4, Nobuhisa Mizuki4, Ahmet Gul5 and Osman Ugur Sezerman5. 1Bahcesehir University, Istanbul, Turkey, 2National Institutes of Health, National Human Genome Research Institute, Bethesda, MD, 3National Human Genome Research Institute, National Institutes of Health, Bethesda, MD, 4Yokohama City University Graduate School of Medicine, Yokohama, Japan, 5Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey, 6Sabanci University, Istanbul, Turkey.

**Background/Purpose:** Behçet’s disease (BD) is a multi-system inflammatory disease, characterized by recurrent exacerbations affecting several organs including orogenital mucosa, eyes and skin. Two recent genomewide association study (GWAS) of BD in Turkish and Japanese populations both confirmed the strong association of MHC Class I region and identified two non-HLA common genetic variations with a mild effect on BD. In complex
diseases such as BD, multiple factors [e.g. single nucleotide polymorphisms (SNPs), miRNAs, metabolic and epigenetic factors] may target different sets of genes in the same pathway crippling its function and thus causing the disease development. In this regard, we hypothesized that the pathways critical to the mechanisms underlying BD will be conserved within and across populations.

**Methods:** To identify these disease-associated pathways, we previously developed a novel methodology that combines nominally significant evidence of genetic association with current knowledge of biochemical pathways, protein-protein interaction networks, and functional information of selected SNPs. Using this methodology, we herein searched for the disease related pathways on two BD GWAS in Turkish and Japanese case-control cohorts by using the list of SNPs providing a p value <0.05.

**Results:** Even though there were a few significantly conserved SNPs/genes within and between populations, five of the top ten affected pathways were found to be significant in both populations. The probability of random occurrence of such an event is 5.13E-36. These shared pathways were Notch signaling pathway, focal adhesion, Jak-STAT signaling pathway, long-term potentiation and pathways in cancer. Considering some differences in the clinical manifestations such as more frequent involvement of major vessels in Turkish patients, we observed some correlating rankings in the pathways. The complement and coagulation cascade pathway was identified in 5th and 33rd rankings with P=2.47E-20, P=2.6E-12 in Turkish and Japanese populations, respectively.

**Conclusion:** By applying our method on two BD GWAS dataset, here we have shown that while the total number of genome-wide significant genetic associations is limited, identification of the shared pathways between the Turkish and the Japanese populations may help further explaining the general mechanisms of BD pathogenesis. Even though each individual has a unique combination of factors involved in disease development mechanism, most of the targeted pathways that need to be altered by these factors are expected to be conserved. The pathways that are identified by population specific GWAS need to be examined to gain a more comprehensive understanding of BD pathogenesis and their potential to be used as biomarkers and/or drug targets.

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**1006 Dynamic Gene Expression of Wnt Signaling Pathway During Osteogenic Stimulation In Vitro of Osteoarthritis Mesenchymal Stem Cells.** A. Peralta-Sastre1, M. Hernandez-Moliner2, P. Tornero-Esteban3, E. Villafuertes4, B. Fernandez-Gutierrez5 and Jose Ramon Lamar6. 11UGC de Reumatologia, Hospital Clínico San Carlos, Instituto de Investigación Sanitaria del Hospital Clínico San Carlos (IdISSC), Madrid, Spain.; 2Hospital Clínico San Carlos, Madrid, Spain.; 3Hospital de Rheumatology, Hospital Clínico San Carlos, Madrid, Spain.; 4Hospital clinico San Carlos, Madrid, Spain.

**Background/Purpose:** The role of Wnt signalling in Mesenchymal Stem Cell (MSC) fate is still unclear. Both, canonical and non-canonical pathways have been implicated in differentiation and proliferation resulting from specific Wnt ligands, receptors, inhibitors and downstream molecules responsible for the signalling and/or the developmental commitment. Although osteogenesis is a well-studied process, molecular details remain unknown. The aim of the study was to delineate the changes in gene expression of Wnt related occurring during osteogenesis of MSCs by developing a novel methodology.

**Methods:** MSCs were obtained from bone marrow aspirates at the time of joint replacement surgery of five OA patients (mean 76 years) and three control subjects without OA signs (mean 80 years). Cells were cultured and expanded under osteogenic stimuli. Confluent cells in passage 6 were collected at days 1, 10 and 21. RNA was purified and retrotranscribed prior quantitative PCR analysis. Simultaneous gene expression of 84 Wnt related genes was analysed using the Human Wnt PCR Array PAHS-043A, from SABiosciences according. The resulting expression raw data was analyzed using the SABiosciences web-based PCR Array Data Analysis tool. ΔΔCt values relative to the RPL13A housekeeping gene were used to calculate the fold change changes. Two-fold changes with p<0.05 were considered significant.

**Results:** MSCs from OA patients undergoing osteogenesis progressively increases the number of downregulated genes related to the Wnt signaling. While at basal conditions only two genes were downregulated, at days 10 and 21, twelve and sixteen genes were downregulated respectively. Among downregulated genes, some encode for essential proteins participating both in canonical and non-canonical Wnt pathway and including several ligands, co-receptors, inhibitors, kinases and transcription factors.

**Conclusion:** Our data demonstrate a clear alteration during osteogenesis of MSCs biology from OA patients. We hypothesized that a possible cause of OA may lie in these intrinsic alterations of MSCs preventing proper differentiation into fully functional adult tissues.

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**ACR/ARHP Poster Session B Imaging of Rheumatic Diseases:**

**High Resolution Peripheral Quantitative CT Detects Marked Differences in Metacarpal Head and Shaft and Ultra-Ultra-Distal Radius Bone Volumetric Density and Microstructure in Early Rheumatoid Arthritis.** Lynne M. Feehan, Helen R. Buie, Linda C. Li, Kamran Shojania, Cheryl Barnabe and Heather A. McKay. 1Arthritis Research Centre of Canada and University of British Columbia, Vancouver, BC; 2University of Calgary, Calgary, AB; 3University of British Columbia, Vancouver, BC.

**Background/Purpose:** Despite improvements in clinical management of rheumatoid arthritis (RA), many with early disease are still at high risk for developing periarticular erosions and osteopenia, as well as, generalized systemic bone loss. It is essential to develop new approaches to assess changes in bone microstructure in people with early RA before permanent macro structural bone damage occurs. High Resolution Peripheral Quantitative CT (HR-pQCT) [XtremeCT, Scanco Medical AG] provides a solution; it is a novel imaging system that images bone microstructure at the thickness of a human hair. The purpose of this study was to determine if HR-pQCT could identify and characterize early volumetric density or microstructural differences in people with early RA relative to controls.

**Methods:** Thirty individuals with early RA and 30 age and gender matched controls consented to participate. Five regions of interest (ROI) of the dominant side were imaged with HR-pQCT (82 μm, 60 kVp, 900 μA, 10 ms): ultra-ultra-distal radius (UUDr) [9 mm, starting 2 mm distal to the radial styloid proximal to the medial tip distal radius]; metacarpal heads (MH) of the 2nd and 3rd digits [18 mm, starting 2 mm distal to tip of most distal 2nd or 3rd MH]; and metacarpal shafts (MS) of the 2nd and 3rd digits [9 mm, starting 4.5 mm distal to 3rd MS mid-shaft].

Standard manufacturer protocols were used for segmentation of the bone from the soft tissue. Cortical and trabecular regions were extracted using direct transformation methods with modified boundary conditions for the MH. Primary outcome variables included: 1) whole, trabecular and cortical region apparent volumetric bone density (vBMD) and bone volume fraction (BV/TV), 2) trabecular region structural model index (SMI), 3) cortical region thickness (CTh) and material vBMD, and 4) MS marrow space diameter (MSd). Paired Student T-test statistical analyses were used to compare all variables.

**Results:** Participants: Both groups = Sex (Females 24, Males 6); age (mean 53 years, range 21 to 73). RA group = 73% Rheumatoid Factor &/or anti-CCP positive; mean 8 (SD 5) months since diagnosis and 13 (SD8) months since symptom onset and a Health Assessment Questionnaire - Disability Index mean of 0.6 (SD 0.6). Imaging: HR-pQCT identified marked differences in whole, trabecular and cortical bone volumetric density and microstructure in the periarticular UUDr and MH regions, as well as, the extra-articular MS regions between RA subjects and controls. All density and microstructural outcome variables were lower in early RA participants with the exception of UUDr and MH trabecular bone SMI and MSd, which were higher (Table 1).
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slices distally and 242 slices proximally to the surface of the third metacarpal to accurately quantify volume, shape and surface of erosions and to increase the joint space width have not yet been developed for research or clinical applications. Methodology to provide longitudinal and sensitive 3D measurements of joint progressive joint damage and functional impairment in rheumatoid arthritis (RA).

Conclusion: HR-pQCT is a promising new imaging technology that can identify and quantify very early changes in hand and distal forearm bone volumetric density and microstructure in people with early RA. Participants in this study will be evaluated again at 1 year.

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Segmentation and Quantification of Bone Erosions in the Hands of Patients with Rheumatoid Arthritis Using High Resolution Computed Tomography. Dominique Toepfer, Stephanie Finzel, Oleg Maseyko, Klaus Engelke and Georg A. Schett. 1University of Erlangen-Nuremberg, Erlangen, Germany, 2Department of Internal Medicine III and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

Background/Purpose: Bone erosions are important for diagnosis and monitoring of disease activity in RA. However, semi-quantitative scoring schemes may be inadequate for a true 3D quantification of size and shape. Recently high-resolution peripheral quantitative CT (HR-pQCT) with an isotropic spatial resolution of about 120µm has been used for a semiquantitative assessment of erosion volume in the metacarpophalangeal (MCP) joints. Here we developed a highly automated 3D analysis technique to more accurately quantify volume, shape and surface of erosions and to increase precision.

Methods: In the MCP joints of the second to forth digit of 18 patients 80 slices distally and 242 slices proximally to the surface of the third metacarpal head were scanned (XtremeCT, Scanco Switzerland; isotropic voxel size 82µm). Erosions were quantified as follows: After segmenting the periosteal surface the user identified each erosion by manually placing a seed point. The erosions were then automatically segmented by a 3D level-set algorithm (Fig. 1a) with the option of operator corrections. Erosion volume (Vol), surface area (SA), and sphericity (SP), a parameter describing the shape deviation from a perfect sphere, were determined. In addition manual measurements were carried out. Here the erosion volume was approximated by a half-ellipsoid constructed from the surface area of the cortical break and the maximum erosion depth perpendicular to it (Fig. 1b). In order to compare both methods the length measurements obtained from the manual technique were also determined during the automated 3D analysis.

Table 1. Comparison of Volumetric Density and Microstructural Outcomes for UUD, MH3 and MS2 ROIs

<table>
<thead>
<tr>
<th>Region Type</th>
<th>ROI Name</th>
<th>RA [Mean (SD)]</th>
<th>Non-RA [Mean (SD)]</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Bone</td>
<td>Apparent vBMD (mgHA/cm³)</td>
<td>262.26 (51.27)</td>
<td>283.52 (44.41)</td>
<td>-7%</td>
</tr>
<tr>
<td>Trabecular Region</td>
<td>Apparent vBMD (mgHA/cm³)</td>
<td>167.30 (47.74)</td>
<td>187.70 (53.26)</td>
<td>-12%</td>
</tr>
<tr>
<td>Cortical Region</td>
<td>Apparent vBMD (mgHA/cm³)</td>
<td>760.29 (301.2)</td>
<td>783.52 (34.29)</td>
<td>-3%</td>
</tr>
<tr>
<td>Whole Bone</td>
<td>Bone Volume Fraction - BV/TV (%)</td>
<td>30.70 (4.99)</td>
<td>33.33 (4.35)</td>
<td>-6%</td>
</tr>
<tr>
<td>Trabecular Region</td>
<td>Bone Volume Fraction - BV/TV (%)</td>
<td>28.88 (0.99)</td>
<td>29.39 (0.99)</td>
<td>-5%</td>
</tr>
<tr>
<td>Cortical Region</td>
<td>Bone Volume Fraction - BV/TV (%)</td>
<td>70.42 (5.08)</td>
<td>71.60 (5.07)</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Figure 1. a) Metacarpal bone with periosteal segmentation and segmented erosion. b) Manual measurement of cortical break and maximum depth.

Results: 32 erosions were assessed in the 18 datasets with a mean/min/max Vol of 9.66mm³/0.37mm³/54.7mm³ (automated 3D analysis). Inter-operator precision errors (3 operators, root mean squares coefficients of variation (RMSCV)/RMS standard deviation (RMSSD)) were 7.8%/0.8 mm² and 4.9%/0.02 for Vol, SA and SP, respectively. Excluding 18 erosions, in which operator interactions were performed, decreased the errors by about a factor of 3. Correlation between the manual analysis and the length measurements obtained from the automated 3D analysis was r = 0.87, however, correlation with the Vol obtained from the full 3D analysis was r = 0.39, indicating that a simplistic approximation of erosion volume may not capture the full shape information.

Conclusion: We developed a new precise full 3D characterization of bone erosions that may help improving the assessment of disease activity and treatment efficacy. Precision errors depend on the degree of user interaction that may be necessary to correct the automated segmentation, which is more frequent in erosions with large cortical breaks. Manual measurements are less impacted by image quality, such as motion artifacts; however, the approximation of erosion volume by a half-ellipsoid underestimates the true erosion volume. The clinical evaluation of this method is currently being performed.

Disclosure: D. Toepfer, None; S. Finzel, None; O. Maseyko, None; K. Engelke, None; G. A. Schett, None.

1009


Background/Purpose: Joint space narrowing is an important feature of progressive joint damage and functional impairment in rheumatoid arthritis (RA). Methodology to provide longitudinal and sensitive 3D measurements of joint space width have not yet been developed for research or clinical applications.

High-resolution peripheral quantitative computed tomography (HR-pQCT) (Scanco Medical AG, Switzerland) has recently become available to accurately and reproducibly measure bone microstructure at a nominal isotropic voxel dimension of 82 µm. Given the ability of HR-pQCT to detect bone margins with high precision, we developed a methodology to measure the 3D metacarpophalangeal (MCP) joint space width. This work determines the reproducibility of the scan protocol with hand repositioning for application for early detection and longitudinal monitoring of RA.

Methods: Two repeated HR-pQCT scans of the 2nd and 3rd MCP joints of ten subjects with early RA (70% female, mean age 45 years) with repositioning between scans were obtained. The periosteal edges of the metacarpal head were scanned (XtremeCT, Scanco Switzerland; isotropic voxel size 82µm). Erosions were quantified as follows: After segmenting the periosteal surface the user identified each erosion by manually placing a seed point. The erosions were then automatically segmented by a 3D level-set algorithm (Fig. 1a) with the option of operator corrections. Erosion volume (Vol), surface area (SA), and sphericity (SP), a parameter describing the shape deviation from a perfect sphere, were determined. In addition manual measurements were carried out. Here the erosion volume was approximated by a half-ellipsoid constructed from the surface area of the cortical break and the maximum erosion depth perpendicular to it (Fig. 1b). In order to compare both methods the length measurements obtained from the manual technique were also determined during the automated 3D analysis.

Conclusions: HR-pQCT is a promising new imaging technology that can identify and quantify very early changes in hand and distal forearm bone volumetric density and microstructure in people with early RA. Participants in this study will be evaluated again at 1 year.

Disclosure: L. M. Feehan, None; H. R. Buie, None; L. C. Li, None; K. Shojania, None; C. Barnabe, None; H. A. McKay, None.
and proximal phalanx base were detected and segmented, and from these images the joint space width and distribution of joint space thickens were measured using a custom analysis implemented for the HR-pQCT based on direct measurements from the high resolution image data.

**Results:** In this population, the mean joint space width of the 2nd MCP was 1.82 mm (SD 0.20) and of the 3rd MCP 1.84 mm (SD 0.23). Reproducibility with repositioning was excellent, with overlapping filtered histograms and a root square mean coefficient of variance of 4.8%.

**Conclusion:** We have established a highly reproducible methodology for evaluating the joint space width, applied here to the MCP joints. Currently, we combine this assessment with measures of joint erosions and periarticular bone density. Together, these measures from HR-pQCT show great promise for a new approach for early RA detection, and monitoring of disease activity and/or treatment.

**Disclosure:** C. Barnabe, None; H. R. Buie, None; M. Kan, None; S. G. Barr, None; L. Martin, None; S. K. Boyd, None.

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**Background/Purpose:** Anti-citrullinated protein antibodies (ACPA) are a major risk factor for rapid disease progression in rheumatoid arthritis (RA). We have recently shown that ACPA directly induce bone loss by stimulating osteoclast differentiation (Harre et al, J Clin Invest 2012;122:1791). As ACPA have recently shown that ACPA directly induce bone loss by stimulating osteoclast differentiation, we hypothesized that ACPA positive healthy individuals may show altered joint space distribution.

**Methods:** performed a comparative micro computed tomography analysis of the bone microstructure in the metacophalangeal joints (MCP) of ACPA positive and -negative healthy individuals without signs of arthritis.

**Results:** ACPA positive (N=10) and -negative (N=10) healthy individuals were not different in age (48.2 ± 4.1 vs. 51.4 ± 3.8 years, p = 0.57) and gender (each 8 females and 2 males). Bone mineral density was significantly reduced in ACPA-positive individuals (mean ± SEM: 280 ± 11 mg/ccm) compared to controls (327 ± 6 mg/ccm). Bone loss was based on cortical bone changes with significant (p = 0.044) reduction in cortical thickness in the ACPA-positive group (mean ± SEM: 3.22 ± 0.03 mm) as compared to controls (3.02 ± 0.03 mm).

**Conclusion:** Structural bone damage starts before the clinical onset of arthritis in subjects with ACPA. These findings revise the concept of bone damage as an exclusive consequence of synovitis in ACPA positive individuals.

**Disclosure:** S. Finzel, None; V. Lang, None; A. Kleyer, None; J. Rech, None; B. Manger, None; E. Araujo, None; A. J. Hieber, None; U. Harre, None; G. Schott, None.

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**Table 1. Descriptive Statistics for mTSS by Week 36 Clinical Disease Response Category**

<table>
<thead>
<tr>
<th>Week 36 Response</th>
<th>n</th>
<th>Baseline, Units</th>
<th>Mean (Median)</th>
<th>Final Time, Units</th>
<th>Mean (Median)</th>
<th>Progression Rate, Units/Yr</th>
<th>Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAID Remission</td>
<td>195</td>
<td>36.5 (41.4)</td>
<td>38.4 (45.4)</td>
<td>0.1 (0.1, 0.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAID LDA (&gt;2.8)</td>
<td>2</td>
<td>39.3 (17.5)</td>
<td>39.7 (19.5)</td>
<td>0.4 (0.2, 0.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAID NR (&gt;10)</td>
<td>94</td>
<td>44.4 (22.5)</td>
<td>45.0 (23.2)</td>
<td>0.6 (0.3, 1.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAS28 Remission</td>
<td>487</td>
<td>37.9 (16.5)</td>
<td>38.2 (18.0)</td>
<td>0.3 (0.2, 0.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAS28 LDA (&gt;2.6)</td>
<td>135</td>
<td>41.9 (19.4)</td>
<td>42.1 (19.5)</td>
<td>0.2 (0.1, 0.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAS28 NR (&gt;3.2)</td>
<td>82</td>
<td>42.6 (16.0)</td>
<td>43.3 (17.0)</td>
<td>0.7 (0.2, 1.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05, Kruskal Wallis test for differences in distributions. †Final time point defined as the sum of baseline and progression rate. DAS28 = 28-joint Disease Activity Score; CAID = Clinical Disease Activity Index; LDA = low disease activity; NR = no response.

**Conclusion:** Inhibition of radiographic progression was more robust with ETN + MTX therapy compared with MTX, regardless of week 24 disease activity. Overall, patients who achieved remission at week 24 had less radiographic progression at year 2 than those with LDA or NR, and less progression with remission defined by CAID than DAS28. These results may be the first to indicate that achievement of clinical remission within 6 months may predict longer term inhibition of structural damage.

**Reference**

**Disclosure:** P. Emery, Abbott, Merck, Pfizer, UCB, Roche, and BMS; V. Strand, Pfizer Inc; A. S. Koening, Pfizer Inc; 3, Pfizer Inc Inc; 1; R. Pedersen, Pfizer Inc; 3, Pfizer Inc Inc; 1; E. Bananis, Pfizer Inc; 1, Pfizer Inc, 3.

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**1012**

**Radiographic Deformation of the Foot Is Starting From the Early Stage of Rheumatoid Arthritis.** Kenji Mamoto, Tatsuya Koike, Tadashi Okano, Atsuko Kamiyama, Yuki Sugioka, Masahiro Tada and Hiroaki Nakamura. Osaka City University Graduate School of Medicine, Osaka, Japan

**Background/Purpose:** Foot deformities frequently arise in patients with rheumatoid arthritis (RA). It might cause gait dysfunction and lead to disability. However, the precise mechanism of progression of foot deformity is still unclear.

**Disclosure:** No.
The aim of this study is to clarify the relationship between disease progression and the deformity of feet in patients with RA.

Methods: The prospective cohort TOMORROW (TOTAL Management Of Risk factors in Rheumatoid arthritis patients to IOウェ morbidity and mortality; clinical trial registration number, UMIN000003876) study was started in 2010. We examined antero-posterior and lateral radiographs obtained from 416 weightbearing feet of 208 patients with RA from this cohort. The stage of articular destruction was classified from the hand radiographs based on Steinbrocker classification. We measured the hallux valgus angle (HVA), the intermetatarsal angle between the first and second metatarsals (M1M2) and the first and fifth metatarsals (M1M5) on antero-posterior radiographs, and calcaneal pitch (CP) on lateral radiographs. Each deformity was defined as hallux valgus: HVA>15 degree, spread foot: M1M5>30 degree and flat foot:CP>20 degree.

Results: We finally analyzed 387 feet of 196 patients excluding those that had been surgically treated. The mean age and mean disease duration were 58.2 years old and 12.7 years, respectively. Steinbrocker’s stages 1, 2, 3 and 4 were identified 39, 48, 44 and 65 patients, respectively (Table 1). We identified any of hallux valgus, spread foot and flat foot in Steinbrocker’s stage 1. Moreover HVA and CP had progressed according to the progression of stage and disease duration. However, M1M2 and M1M5 has been progressed from the early stage. These findings indicate that foot deformities started from the early stage of RA and progressed with advancing stages.

Table 1. Development of foot deformities in patients with rheumatoid arthritis according to Steinbrocker’s stage.

<table>
<thead>
<tr>
<th>Steinbrocker’s stage</th>
<th>1 (n = 39)</th>
<th>2 (n = 48)</th>
<th>3 (n = 44)</th>
<th>4 (n = 65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease duration (y)</td>
<td>6.9</td>
<td>7.6</td>
<td>14.5</td>
<td>21.8</td>
</tr>
<tr>
<td>DAS28-ESR</td>
<td>2.8</td>
<td>3.2</td>
<td>3.8</td>
<td>3.9</td>
</tr>
<tr>
<td>HVA (°)</td>
<td>15.6</td>
<td>18.9</td>
<td>17.4</td>
<td>24.9</td>
</tr>
<tr>
<td>M1M2 angle (°)</td>
<td>9.5</td>
<td>10.5</td>
<td>9.7</td>
<td>9.4</td>
</tr>
<tr>
<td>M1M5 angle (°)</td>
<td>29.5</td>
<td>29.4</td>
<td>30.3</td>
<td>29.2</td>
</tr>
<tr>
<td>Calcaneal pitch (°)</td>
<td>19.3</td>
<td>18.2</td>
<td>16.9</td>
<td>15.5</td>
</tr>
<tr>
<td>Hallux valgus (°)</td>
<td>47.4</td>
<td>59.4</td>
<td>50.6</td>
<td>63.5</td>
</tr>
<tr>
<td>Spread foot (%)</td>
<td>41.6</td>
<td>40.6</td>
<td>44.8</td>
<td>42.1</td>
</tr>
<tr>
<td>Flat foot (%)</td>
<td>52.6</td>
<td>58.3</td>
<td>67.8</td>
<td>73.8</td>
</tr>
</tbody>
</table>

Conclusion: Foot deformities started from an early stage of RA, and correlated with disease stage and duration in patients with RA. This result suggests that the disease activity may be underestimated without the assessment of feet in routine clinical care. It is necessary to consider joint destruction and deformity of the foot from the early stage of RA.

Disclosure: K. Mamoto, None; T. Koike, Chugai Pharmaceutical, 2; Eli Lilly Japan, 8; Novartis Pharmaceutical Corporation, 2; Teijin Pharma, 8; Bristol-Myers Squibb, 2; Ono Pharmaceutical, 2; Sanofi, 2; UCB Pharma, 2; Astellas Pharma Corporation, 2; Pfizer Japan Inc., 8; Janssen Pharmaceutical, 2; Asahi Kasei Pharma Corporation, 2; Takeda Pharmaceutical, 8; Astellas Pharma Inc., 8; Pfizer Japan Inc., 8; Janssen Pharmaceutical, 2; Asahi Kasei Pharma Corporation, 2; Takeda Pharmaceutical, 8; Astellas Pharma Inc., 8; Pfizer Japan Inc., 8; Janssen Pharmaceutical, 2; Asahi Kasei Pharma Corporation, 2; Takeda Pharmaceutical, 8; Astellas Pharma Inc., 8; Pfizer Japan Inc., 8; Janssen Pharmaceutical, 2; Asahi Kasei Pharma Corporation, 2; Takeda Pharmaceutical, 8; Astellas Pharma Inc., 8; Pfizer Japan Inc., 8; Janssen Pharmaceutical, 2; Asahi Kasei Pharma Corporation, 2; Takeda Pharmaceutical, 8; Astellas Pharma Inc., 8; Pfizer Japan Inc., 8; Janssen Pharmaceutical, 2; Asahi Kasei Pharma Corporation, 2; Takeda Pharmaceutical, 8; 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relative to ANCOVA, but analyses of ranks do not yield intuitively interpretable values representing the magnitude of damage inhibition. A conceptual bridge between rank analyses and ANCOVA is the trimmed-analysis approach, where extreme values are systematically removed from the data set.

Methods: In this analysis, mTSS data were trimmed in 1% increments up to 10%, eg 2% trimming deletes observations <1st percentile and >99th percentile. In the ORAL Scan study this resulted in approximately 2–3 observations symmetrically removed per group per 1% trimming. ANCOVA was then applied to each resulting trimmed set (0% was the primary analysis).

Results: At 1% trimming, nominal statistical significance was achieved for both tofacitinib doses (CI less than 0) and was maintained with further trimming (Figure). As expected, the mean difference from PBO diminished slightly with trimming, but was more than compensated for by reductions in variability.

Conclusion: In ORAL Scan, significance of inhibition of structural damage was demonstrated for both tofacitinib doses after just 1% trimming, indicating that significance in the primary analysis was not dependent on extreme data. Trimmed analyses give improved insight into the influence of extreme values and should be considered as one of the sensitivity analyses of choice for structural data.

References
4. De’sire’e van der Heijde, Abbott, Amgen, AstraZeneca, BMS, Centocor, Chugia, Eli-Lilly, GSK, Merck, Novartis, Otsuka, Pfizer, Roche, Sanofi-Aventis, Schering-Plough, UCB, Wyeth, 5.


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Analysis of Integrated Radiographic Data for Two Long-Term, Open-Label Extension Studies of Adalimumab. Désirée van der Heijde1, Robert Landewe2, Edward C. Keystone1, Ferdinand C. Breedveld1, Shufang Liu1 and Neelufar Mozaffarian4.1Leiden University Medical Center, Leiden, Netherlands, 2 Academic Medical Center, Amsterdam, Netherlands, 3University of Toronto, Toronto, ON, 4Abbott, Abbott Park, IL.

Background/Purpose: The assessment of radiographic data from long-term studies in patients (pts) with rheumatoid arthritis (RA) poses a significant challenge, given the potential involvement of multiple readers who typically evaluate films from only a subset of the available time points, often re-scoring previously read images. This analysis describes an integration approach to evaluate the complete set of radiographic scores assessed over several years (yrs) from long-term studies of adalimumab (ADA).

Methods: Data from 2 large, multicenter, phase 3, randomized, placebo (PBO)-controlled trials of ADA were analyzed: PREMIER (MTX-naïve pts, early RA), had a 2-yr double-blind (DB) period followed by an ongoing 8-yr open-label extension (OLE); DE019 (MTX-inadequate responders, long-standing RA), had a 1-yr DB period followed by a completed 9-yr OLE. Pts received OL ADA±MTX in both OLEs. This post hoc analysis evaluated radiographic data based on randomization to the original PBO+MTX and standard dose ADA+MTX arms through 8 yrs of treatment in PREMIER and 10 yrs in DE019. Radiographic progression was assessed using the change in modified total Sharp score (ΔmTSS) from baseline (BL). Radiographs were assessed at Yrs 2, 3, 5, and 8 (PREMIER) and Yrs 1, 2, 3, 5, 5, 6, 8, 10 (DE019). At each assessment yr, radiographs from BL and selected prior yrs were re-read. A mixed effect model was used to evaluate the repeated measurements at different time points within different assessment yrs in the integrated analysis. ΔmTSS at each time point was estimated by least square mean and summarized alongside the most recent assessment yr of PREMIER (Yr 8, which included repeat reads for BL, and Yrs 2 and 6) and DE019 (Yr 10, which included repeat reads for BL, and Yrs 1 and 8).

Results: Radiographic data from 452 pts in PREMIER (215, PBO+MTX; 237, ADA+MTX) and 327 pts in DE019 (162, PBO+MTX; 165, ADA+MTX) with BL and ≥1 post-BL radiograph were identified. Radiographic progression was most pronounced in pts receiving PBO+MTX during the DB periods, but progression slowed dramatically upon switch to OL ADA+MTX therapy in both trials (Figure). Following up to 8 yrs of treatment, pts in PREMIER experienced ΔmTSS estimates of 11.1 (PBO+MTX) and 3.9 (ADA+MTX) units; pts in DE019 experienced estimates of 6.6 (PBO+MTX) and 0.9 (ADA+MTX) units through up to 10 yrs of treatment. The estimated curves in each of the studies revealed subtle changes in progression rates not seen in their respective most recent assessment yr.

Conclusion: Longitudinal, data integration analyses factoring in mTSS from all available assessments enabled a robust estimate of total radiographic progression in 2 long-term studies of ADA±MTX. Moreover, the present analysis confirmed the radiographic efficacy of long-term therapy with ADA±MTX.
Bye Bye Biopsy: Diffusion Tensor and Dynamic Contrast Enhance Magnetic Resonance Imaging Parameters Reflect Molecular Events of Inflammation in the Synovium.

Vikas Agarwal1, Rishi Awasthi1, Deepak Tripathi2, Vinita Agrawal1, Ram Kishore Singh Rathore2, Kusum Sharma2, CM Pandey1 and Rakesh K. Gupta1. 1Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, Lucknow, India, 2Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India, Lucknow, India, 3Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Lucknow, India, 4Indian Institute of Technology, Kanpur, India, 5Postgraduate Institute of Medical Education and Research, Chandigarh, India

Background/Purpose: Chronic synovial inflammation is characterized by accumulation of inflammatory cells and increased vascularity. Synovial histology remains the most definitive way to delineate the severity of inflammation. Herein we hypothesize that Diffusion tensor imaging (DTI) derived metrics may delineate the aggregation of the inflammatory cells. Dynamic contrast enhanced (DCE) imaging may provide information regarding vascularity in the inflamed synovium. Combination of these may provide information about the ongoing inflammation.

Methods: Patients with chronic knee arthritis underwent conventional, DTI and DCE MRI (3T) followed by arthroscopic synovial biopsy. Masks of synovial regions that enhanced on post contrast T1-weighted imaging were created using an automated segmentation algorithm. Created masks were used to segment the inflamed synovium to extract various DTI and DCE metrics. Synovium was subjected to histopathology, immunohistochemistry (IHC), culture and PCR.

Results: There were 65 patients (45 male) with mean age 39 years [range 18–76] and mean disease duration 29 months [range 4–192]. Fifteen patients had tuberculosis and rest had; undifferentiated spondyloarthropathy (n = 14), chronic monoarthritis (n = 11), chronic undifferentiated monoarthritis (n = 10), rheumatoid arthritis (n = 6), osteoarthritis (n = 3), ankylosing spondylitis (n = 2), reactive arthritis (n = 2) and juvenile idiopathic arthritis and leprosy one each.

The mean values of various DTI and DCE and IHC parameters are presented in (Table-1). Amongst the DTI parameters, FA significantly correlated with all the inflammatory cells infiltrating into the synovium (Table-2) and various proinflammatory cytokines. FA was the best predictor of infiltrating T cells, B cells, plasma cells, macrophages, adhesion molecule and proinflammatory cytokines. DCE parameters significantly correlated with CD34 and blood volume was the best predictor of CD34.

Table 1. Mean values of DTI, DCE, IHC markers

<table>
<thead>
<tr>
<th>DTI indices</th>
<th>Mean ±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA</td>
<td>0.22 ± 0.031</td>
</tr>
<tr>
<td>MD (×10^{-3} mm^2 sec^{-1})</td>
<td>1.63 ± 0.51</td>
</tr>
<tr>
<td>CL</td>
<td>0.06 ± 0.027</td>
</tr>
<tr>
<td>CP</td>
<td>0.15 ± 0.054</td>
</tr>
<tr>
<td>CS</td>
<td>0.75 ± 0.023</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DCE indices</th>
<th>Mean ±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BF (ml/100gm/min)</td>
<td>109 ± 42.8</td>
</tr>
<tr>
<td>BV (ml/100gm)</td>
<td>9.5 ± 4.2</td>
</tr>
<tr>
<td>k on/min^-1</td>
<td>2.5 ± 1.0</td>
</tr>
<tr>
<td>PCI</td>
<td>1820.4 ± 211.6</td>
</tr>
</tbody>
</table>

**Immune cells in synovium**

| CD3 | 154.94 ± 48.65 |
| CD4 | 63.42 ± 32.85 |
| CD8 | 53.58 ± 17.63 |
| CD20 | 39.34 ± 13.96 |
| CD34 | 52.94 ± 17.28 |
| CD35 | 36.35 ± 13.14 |
| CD68 | 163.2 ± 34.62 |
| CD34 | 36.06 ± 14.49 |

**TOTAL CELLS**

489.66 ± 106.39

**IL-1β**

31.09 ± 18.15

**TNF-α**

24.71 ± 11.52

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Conclusion: DTI and DCE metrics capture cellular and molecular events and correlate with the degree of synovial infiltration. They may replace synovial histology in future.

Disclosure: V. Agarwal, None; R. Awasthi, None; D. Tripathi, None; V. Agarwal, None; R. K. S. Rathore, None; K. Sharma, None; C. Pandey, None; R. K. Gupta, None.

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Reliability of the Early Erosions in Rheumatoid Arthritis Software When Quantifying Bone Loss.

Background/Purpose: To determine the intra and inter-rater reliability when applying EERA software to the quantification of erosions in the metacarpal phalanges (MCPs) of RA patients.

Methods: Two readers, R1 and R2, trained to use EERA software, but otherwise inexperienced with conventional quantification techniques, evaluated erosions captured by MRI in the second through fifth MCPs of 50 patients diagnosed with RA under the American College of Rheumatology 1987 revised definition. A 1T magnet, 100mm diameter cylindrical transmit and receive coil, and a 3D spoiled gradient echo sequence were used in acquiring the images. Images were evaluated by each reader twice with a 72 hour wait period between runs. Intra and inter-rater reliabilities for the total volume measures between the two readers and two runs were assessed via intra-class correlations, ICC(2,1), with 95% confidence intervals. For each run, volume differences between readers were graphed against R2's volume measures in Bland-Altman difference plots so as to visually capture the degree to which scores varied.

Results: Of the 50 participants recruited for the study, 16 were male and 34 were female. Study subjects had a mean age of 57 (SD = 11.5) yr, a mean weight of 78 (SD = 15.6) kg, and a mean height of 169 (SD = 13.9) cm. Readers identified 64 ± 1 erosions in the patients: 15 of these occurred in second MCP, 33 ± 1 in the third MCP, 12 ± 1 in the fourth MCP, and 4 in the fifth MCP. Mean erosion size, as determined by R1 during the first and second runs, were 87.1 (SD = 118.9) mm3 and 88.1 (SD = 121.2) mm3 respectively. R2's measures had a mean erosion volume of 90.7 (SD = 130.1) mm3 for the first run and 103.2 (SD = 151.0) mm3 for the second run. For both runs, agreement between readers was better for smaller sized erosions decreasing appreciably beyond 100 mm3 (See Figure 1). Run 2 results are not shown but are available upon request. The intra-rater reliability had an ICC value of 0.956 with the 95% confidence interval ranging from 0.935 to 0.970. Between R1 and R2, the inter-rater reliability had an ICC value of 0.921 with a 95% confidence interval from 0.886 to 0.946.

Conclusion: Results obtained suggest that EERA software can be applied to acquire MCP erosion volume measures in a reliable manner.

Disclosure: M. X. Koh, None; J. W. Barbosa, None; R. Tavares, None; S. Tytus, None; E. Pomed, None; C. Gordon, None; G. Ioamidis, None; K. A. Beattie, None; W. G. Bensen, None; R. S. Bobba, None; A. A. Cividino, None; L. E. Hart, None; M. Larche, None; A. N. Lau, None; J. D. Adachi, Abbott, Angen, Bristol Myers Squibb, and Roche Pharmaceuticals, 2.

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Visualization of Cartilage in High-Resolution Magnetic Resonance Imaging Is a New Imaging Biomarker for the Quantification of Joint Damage in Rheumatoid Arthritis.

Background/Purpose: Recent achievements in Magnetic Resonance Imaging (MRI) have been the gradient-echo-based T1-delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) focussing on the detection of proteoglycan content in cartilage; moreover, the multi-echo and spin-echo T2-mapping has been developed for the assessment of cartilage hydration and collagen microstructure. Current MRI-studies suggest a link between dGEMRIC and T2-mapping and early changes of cartilage in inflammatory diseases. However, their diagnostic value in inflammatory diseases has not yet been fully clarified. To investigate the relation between morphological and biochemical alterations in the cartilage of patients with Rheumatoid Arthritis (RA) by high-resolution 3Tesla-MRI.

Methods: 29 RA-patients received a 3Teslis-MRI scan of the 2nd and 3rd metacarpophalangeal (MCP) joint of the dominant hand. T2-mapping and dGEMRIC were performed with 2 small-diameter surface coils designed for high-resolution imaging of cartilage (0.26×0.26×105mm voxel size; Verio Siemens Healthcare, Erlangen, Germany). T2 and T1 relaxation times were obtained via a region-of-interest (ROI) evaluation. MCP heads and bases were scored semiquantitatively for synovitis, bone marrow edema (BME) and bone erosion (BE) using the RA MRI scoring (RAMRIS) system; joint space and cartilage thickness were measured perpendicular to the joint plane in all 3 joint regions (fig. 1a).

Results: Inter- and intraobserver agreement was good (details see fig. 1b). For correlation analysis mean values of real and total joint spaces (RJS, TJS), RAMRIS-subscores, and ROIs of dGEMRIC and T2-evaluations were used; image 1a shows details of source data acquisition, image 1c data of correlation analysis. Interestingly, early changes of cartilage such as BME and synovitis in RAMRIS as compared to dGEMRIC were correlated negative (p = 0.029; p = 0.003); likewise, BME and synovitis showed positive correlation (p = 0.013; p = 0.015) in T2. In contrast, periaricular changes occurring later in the course of the disease such as BE did not correlate with dGEMRIC (p = 0.704) and weakly with T2 (p = 0.26). All joint space subanalyses of MCP3 despite RJS correlated with dGEMRIC and T2 mainly in medial region (TJS p = 0.017; TCT p = 0.020; CT p = 0.018). Additionally, in dGEMRIC MCP2 and RJS correlated in ulnar side (p = 0.001).
Conclusion: High-resolution MRI using dGEMRIC and T2-mapping enables meticulous detection of very early inflammatory changes in cartilage which are known to precede RA-typical periarticular bone damage. This is important both for early discovery of those damages, adequate therapy decisions and therapy monitoring; moreover, it may also have an impact on the development of anti-inflammatory drugs in the future. Additional studies on mechanical influences on cartilage are needed to further evaluate the mechanisms of joint space alterations.

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1020 Location of Erosions At the Metatarsophalangeal Joints in Patients with Rheumatoid Arthritis. Heidi J. Siddle1, Richard J. Hodgson2, Andrew J. Grainger2, Anthony C. Redmond2, Richard J. Wakefield2 and Philip S. Helliwell3, 1NIHR Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 2Leeds Teaching Hospitals NHS Trust and NIHR Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 3University of Leeds and NIHR Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 4University of Leeds and NIHR Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 5NIHR Leeds Biomedical Research Unit, Leeds, United Kingdom, 6NIHR Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 7Emma Children’s Hospital/Academic Medical Center (AMC), Amsterdam, Netherlands, 8Academic Medical Center (AMC), Amsterdam, Netherlands

Background/Purpose: The forefoot is described as the most common site of symptoms in the foot and ankle of patients with rheumatoid arthritis (RA). Pressure under the forefoot area is significantly increased in patients with RA compared to normal subjects and forefoot peak pressures have been reported to correlate with pain, damage and higher erosion scores at the MTP joints. Damage to plantar structures such as the capsule and plantar plate of the MTP joints in patients with RA is associated with bone erosion, suggesting altered biomechanics or mechanical effects due to capsule or plantar plate abnormalities may cause bone changes. While a tendency towards a lateral distribution has been noted in the hands, the location of erosions at the MTP joints has not been previously reported in patients with RA. Furthermore, these study findings highlight the need for further imaging of the MTP joint when using ultrasound alone to detect erosions in RA.

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1021 Magnetic Resonance Imaging in Follow-up of Clinical Remission in Juvenile Idiopathic Arthritis. Mirja van Veenendaal1, Robert Hemke2, Marjolijn I. Bos3, Mario Maas4, Marion A. J. Van Rossum5 and Taco W. Kuippers1, 1Emma Children’s Hospital/Academic Medical Center (AMC), Amsterdam, Netherlands, 2Academic Medical Center (AMC), Amsterdam, Netherlands

Background/Purpose: Despite clinical remission, a substantial proportion of Juvenile Idiopathic Arthritis (JIA) patients will flare after a period of inactive disease. MRI has proven to depict subclinical inflammation as reflected by synovial hypertrophy, and may therefore be useful to identify patients at risk for flaring during follow-up.

The purpose of this study, focussing on the main target joint, was to use MRI in JIA patients in clinical remission, and to identify inflammatory changes as compared to clinical status over time.

Methods: In this prospective study, 16 patients with JIA (median age 11.8 years [IQR, 10.5–14.5], median disease duration 3.2 years [IQR, 1.8–5.6]) in clinical remission (fulfilling the Pediatric Rheumatology International Trials Organization (PRINTO) preliminary criteria for clinical remission) were studied with MRI at 2 consecutive time points (median interval 16.1 months [IQR 11.0–23.7]) and assessed for clinical relapse. Initial clinical remission was achieved in 14 patients on medication (CRM) (median duration inactive disease 11.0 months [IQR 7.2–13.7]) and in 2 patients off medication (CR) (median duration inactive disease 28.7 months [IQR 15.7–28.7]). Contrast-enhanced MRI of the formerly most involved knee was performed to evaluate the degree of synovial hypertrophy, using the validated Juvenile Arthritis MRI Scoring (JAMRIS) (synovial hypertrophy score; <2 mm=0, 2–4 mm=1 and >4 mm=2, at 8 knee regions).

Results: The first MRI showed signs of subclinical synovitis in 8 patients (50 %) and no synovitis in 8 patients. The second MRI in follow-up demonstrated an increased score of synovial hypertrophy as compared to the first MRI in the 6 patients with relapse of arthritis. In contrast, all patients with sustained clinical remission showed either stable (6 patients) or improved (4 patients) scores of synovial hypertrophy. CRP and erythrocyte sedimentation rate were not increased at both MRI time points.

Conclusion: A large degree of JIA patients who satisfy the PRINTO remission criteria with normal findings on clinical and laboratory assessment had MRI based synovitis in this study, suggestive of ongoing disease activity. Increase of synovial hypertrophy over time was related to disease flaring, whereas stable or further reduction of synovial hypertrophy was associated with sustained clinical remission. Serial MRI allows for adequate follow-up of underlying disease even when clinically silent.

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1022

Imaging of Ankle Joints by MRI in Murine Models of Inflammatory Arthritis. Shawn M. Rose1, Harris R. Perlman1, Emily Alex Waters2 and Thomas Meade2. 1Northwestern University, Chicago, IL, 2Northwestern University, Evanston, IL

Background/ Purpose: One of the fundamental shortcomings in the field of experimental rheumatology is the inability to non-invasively monitor the development of inflammatory arthritis longitudinally. Magnetic resonance imaging (MRI) overcomes this limitation, by allowing for detailed examination of anatomical structures as well as the assessment of joint and soft tissue inflammation. Here, we have utilized cutting-edge MRI technologies to image ankle joints in control (C57BL/6) and arthritic (K/BxN serum transfer-induced arthritis (STIA) and K/BxA9 mice) over time. Further, the MRI data was validated against both clinical, histological, and in vivo imaging system (IVIS) assessments of inflammatory arthritis.

Methods: C57BL/6 mice were injected with PBS (controls) or 100 mL of K/BxN serum at day 0. Mice were scored clinically and imaged via IVIS and MRI at days 0, 3, 7, 15, and 21 after arthritis induction. MRI imaging was also performed on ankle joints from 10- and 21-week-old K/BxA9 mice. Arthritis severity was assessed by measurement of ankle width and clinical score. Decalcified ankle joint specimens were sectioned and stained with hematoxylin and eosin for histological analysis. Luminescence acquisition was performed using an IVIS Spectrum System 10 minutes after intraperitoneal injection of 100 mL (200 mg/kg) of Xenogen Redlight Inflammation Probe. Radiance signal intensity from normalized gated analyses of forepaw and hindpaw joints was quantified utilizing Living Image software. Ankle joint MRI was performed on a 9.4T Bruker Biospec MRI system. Two high-resolution 3D images were acquired; a gradient echo pulse sequence (FLASH) to evaluate bone and a spin echo sequence (MSME) to evaluate inflammation (long T2 signal volume). Amira software was used to perform MRI long T2 signal analyses and bone reconstructions. Graphpad Prism software was used for ANOVA and linear regression analyses with statistical significance established at p < 0.05.

Results: Arthritic STIA animals demonstrated increased clinical, histological, IVIS, and MRI measures of disease severity compared to controls. Peak arthritis intensity occurred at day 7 and complete resolution of inflammation was observed by day 21. Following induction of arthritis, the majority of increased long T2 signal and volume expansion of ankle joints occurred in a juxtarticular rather than intrarticular fashion. Ankle joint bone destruction in K/BxA9 mice was readily detectible via MRI as early as age 10 weeks. Linear regression analyses demonstrated a strong correlation between clinical score and paw joint radiance intensity by IVIS (R2 = 0.54, p <0.0001). There was also a statistically significant relationship between ankle joint width and volume of long T2 signal by MRI (R2 = 0.57, p <0.001).

Conclusion: MRI is an optimal technology for anatomic localization of articular and soft tissue changes during the development and resolution of inflammatory arthritis. Future studies may combine MRI imaging with various in vivo labeling agents to investigate joint disease in a cell-type specific fashion.

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Scoring Radiographic Progression in Axial SpA: Should We Use the Modified Stoke in Ankylosing Spondylitis Spine Score or the Radiographic Ankylosing Spondylitis Spinal Score? Sofia Ramiro1, A.M. Van Tubergen2, Carmen Stolwijk2, Robert Landewe3 and Desiree van der Heijde4. 1Academic Medical Center, University of Amsterdam, The Netherlands and Hospital Garcia de Orta, Almada, Portugal, 2Maastricht University Medical Center, Maastricht, Netherlands, 3Academic Medical Center, University of Amsterdam and Atrium Medical Center, Heerlen, Netherlands, 4Leiden University Medical Center, Leiden, Netherlands

Background/ Purpose: Radiographic damage is one of the core outcomes in axial SpA and it is usually assessed with the modified Stoke Ankylosing Spondylitis (AS) Spine Score (mSASSS). The recently proposed Radiographic Status and 2-year progression scores of both scoring methods were compared, first in terms of their availability. To assess the potential of the thoracic segment to progression (Table), whilst progression was more frequently than expected observed in the cervical spine, and less frequently in the lumbar spine.

Conclusion: The determination of a RASSS for status or progression of radiographic abnormalities in the spine is frequently impossible or strongly influenced by non-contributory imputation. In comparison to the conventional mSASSS method, the contribution of thoracic VC's in the RASSS-method is negligible, and does not justify the additional scoring efforts.

Reference
A&R:61,764-71

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What Constitutes the Characteristic Fat Lesion On MRI of the Sacroiliac Joints in Early Spondyloarthritis? Ulrich Weber1, Susanne Juhi Pedersen2, Veronika Zuber3, Kaspar Rütibach1, Stanley Chan1, Robert G. Lambert4, Mikkel Ostergaard1 and Walter P. Maksymowych5. 1Balgrist University Hospital, Zurich, Switzerland, 2Copenhagen University Hospital Glostrup, Copenhagen, Denmark, 3University of Zurich, Zurich, Switzerland, 4University of Alberta, Edmonton, AB, 5Copenhagen University Hospital at Glostrup, Glostrup, Denmark

Background/ Purpose: It is well known that fat infiltration (FI) of bone marrow may be observed on T1-weighted MRI in the sacroiliac joints (SIJ) of healthy individuals and patients with mechanical back pain and with spondyloarthritis (SpA). But it is unclear whether the MRI features of FI allow characterization of FI as pathological rather than physiological. Moreover, it is unclear if this might have diagnostic utility in early SpA. We aimed to assess which MRI features of fat contribute to diagnostic utility of SIJ MRI in 2 inception cohorts of early SpA.
Methods: Cohort A comprised 69 consecutive patients ≥50 years referred from rheumatology and primary care practices for assessment of clinically suspected SpA, cohort B comprised 88 consecutive patients ≥50 years with acute ankylosing spondylitis and back pain. They were classified according to clinical examination and pelvic X-ray as having non-radiographic axial SpA (nr-axSpA) (n=20 and 31 for cohorts A and B, respectively), ankylosing spondylitis (AS) (n=10 and 24), or mechanical back pain (MBP) (n=39 and 33). Cohort A also comprised 20 healthy volunteers (HV). SJJ MRI were assessed independently in random order by 4 blinded readers for the following morphological features of FI: distinct border around the region of FI, homogeneity of the T1-weighted signal, proximity to subchondral bone, and association with other SJJs lesions (bone marrow edema (BME), erosion (ER)).

Results: In cohort A and B, FI in ≥2 SJJs quadrants was recorded by any 2 readers in AS in 90% and 100%, in nr-axSpA in 45% and 48%, in MBP in 36% and 24%, respectively, and in HV in 10%. Inter-reader agreement for FI expressed as intraclass correlation coefficient over all 4 readers was 0.59 and 0.75 for cohort A and B.

Diagnostic utility (mean of 4 readers for cohort A/B) of SJJ FI in nr-axSpA vs MBP patients

<table>
<thead>
<tr>
<th>Feature</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive LR</th>
<th>Negative LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>FI per se</td>
<td>0.44/0.42</td>
<td>0.73/0.78</td>
<td>1.62/2.18</td>
<td>0.77/0.74</td>
</tr>
<tr>
<td>FI with distinct border</td>
<td>0.20/0.25</td>
<td>0.97/0.90</td>
<td>1.29/2.13</td>
<td>0.80/0.90</td>
</tr>
<tr>
<td>Homogeneous FI</td>
<td>0.30/0.25</td>
<td>0.97/0.93</td>
<td>2.63/2.04</td>
<td>0.75/0.78</td>
</tr>
<tr>
<td>Subchondral FI</td>
<td>0.25/0.30</td>
<td>0.85/0.83</td>
<td>2.36/2.04</td>
<td>0.75/0.78</td>
</tr>
<tr>
<td>FI with any 2 features</td>
<td>0.20/0.25</td>
<td>0.90/0.90</td>
<td>1.29/2.13</td>
<td>0.77/0.74</td>
</tr>
</tbody>
</table>
| BME or ER also showed high diagnostic utility.

Conclusion: SJJ FI characterized by a distinct border or homogeneity on MRI had substantial diagnostic utility in early SpA. FI in combination with BME or ER also showed high diagnostic utility.

Disclosure: U. Weber, None; S. J. Pedersen, None; V. Zulicher, None; K. Ruffbach, None; S. Chan, None; R. G. Lambert, None; M. Ostergaard, None; W. P. Maksymowych, None.

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Spinal Inflammation in the Absence of SJ Joint Inflammation On MRI in Patients with Active Non-Radiographic Axial Spondyloarthritis.

Désirée van der Heijde1, Joachim Sieper2, Walter P. Maksymowych3, Matthew A. Brown4, Suchitrit S. Rathmann5 and Aileen L. Pangan1. 1Leiden University Medical Center, Leiden, Netherlands, 2Charité Universitätsmedizin Berlin, Berlin, Germany, 3University of Alberta, Edmonton, AB, 4University of Queensland Diamantina Institute, Brisbane, Australia, 5Abbott Laboratories, Abbott Park, IL

Background/Purpose: The imaging arm of the ASAS axial spondyloarthritis (SpA) criteria requires the presence of sacroiliitis on MRI or radiographs. In patients (pts) with non-radiographic axial SpA (nr-axSpA), there may be inflammation along the spine in the absence of sacroiliac joint (SIJ) inflammation on MRI. This analysis evaluated the existence of spinal inflammation on MRI at baseline (BL) in nr-axSpA pts with and without inflammation in the SIJs on MRI.

Methods: ABILITY-1 is an ongoing multicenter, randomized, controlled trial of adalimumab vs. placebo in pts with nr-axSpA classified using the ASAS axial SpA criteria, who had an inadequate response, intolerance to, or contraindication for NSAIDs. MRI of the SIJ and spine performed at BL were centrally scored using the SPARCC method (density-based scores) by 2 independent readers blinded to the treatment codes. Mean scores of the readers were used. SPARCC score ≥2 for either the SIJ or spine was used as the operational definition of positive MRI evidence of inflammation. For these analyses, all pts were combined, independent of randomization.

Results: Mean symptom duration of the study population (N=185) was 10 yrs. At BL, 48% of pts were reported by the local investigator to have past or present MRI evidence of sacroiliitis as required by the ASAS axial SpA criteria. Of pts with available BL SPARCC scores, 40% had a BL SIJ score ≥2 and 52% had a BL spine score ≥2. Of the pts with BL SPARCC SIJ score ≥2, 49% had evidence of spinal inflammation (BL SPARCC spine score ≥2). Comparison of BL disease characteristics based on BL spine and SIJ scores <2 vs. ≥2 were generally comparable except for a greater proportion of males among those with spine and SIJ scores ≥2, and younger age and shorter symptom duration among those with spine and SIJ scores <2. The cumulative probability plot (figure) shows a similar distribution of SPARCC spine scores regardless of presence or absence of SIJ inflammation on MRI. The most frequently involved DUVs with bone marrow edema were in the lower thoracic and lumbar spine.

Conclusion: Assessment by experienced readers shows that spinal inflammation on MRI may be observed in half of nr-axSpA pts without SIJ inflammation on MRI. MRI of both sites might be of value when evaluating pts with nr-axSpA. These data in pts with long-standing disease need to be confirmed in pts with shorter disease duration.

Disclosure: D. van der Heijde, Abbott Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth, 5, Abbott Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth, 2, Imaging Rheumatology, 4, J. Sieper, Abbott, Merck, Pfizer, and UCB, 2, Abbott, Merck, Pfizer, and UCB, 5, Abbott, Merck, Pfizer, and UCB, 8, W. P. Maksymowych, Abbott, Amgen, BMS, Eli-Lilly, Janssen, Merck, and Pfizer, 2, Abbott, Amgen, BMS, Eli-Lilly, Janssen, Merck, and Pfizer, 5, M. A. Brown, Abbott Laboratories, 5, S. S. Rathmann, Abbott Laboratories, 3, Abbott Laboratories, 1, A. L. Pangan, Abbott Laboratories, 3, Abbott Laboratories, 1.

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Psoriatic Arthritis and Spondyloarthritis: Inflammation Assessed by “Head to Toe” Wholebody Magnetic Resonance Imaging—A Comparison with Clinical Joint Examination.

Rene Panduro Poggensen1, Susanne Juul Pedersen2, Iris Eshed3, Inge Juul Sorensen4, Ole Rintek Madsen5, J.M. Möller6 and Mikkel Østergaard6. 1Copenhagen University Hospital in Glostrup, Copenhagen, Denmark, 2Glostrup Hospital, Copenhagen, Denmark, 3Sheba Medical Center, Tel Hashomer, Israel, 4Copenhagen University Hospital in Gentofte, Copenhagen, Denmark, 5Copenhagen University Hospital in Herlev, Copenhagen, Denmark, 6Copenhagen University Hospital Glostrup, Glostrup, Denmark

Background/Purpose: Psoriatic arthritis (PsA) and spondyloarthritis (SpA) is associated with a varied pattern of axial and peripheral inflammation. Wholebody magnetic resonance imaging (WBMRI) is a new imaging modality where patients are scanned from head to toe in one single examination. The purpose was to explore the potential of WBMRI for detecting peripheral and axial inflammation.

Methods: Patients with clinically active peripheral PsA (Moll and Wright, n=19) or axial SpA (ESSG, n=19) and healthy subjects (HS, n=12) were included. T1-weighted pre/post-contrast and STIR sequences were performed on a 3 tesla MRI unit. Synovitis and bone marrow oedema (BME) were evaluated at sites included in the 78-tender joint count (TJC). Axially, BME was evaluated dichotomously in each discovertebral unit (DUV) of the spine, and in each quadrant of the sacroiliac joints (SIJ).

Results: Characteristics median (range): PsA/SpA/HS age 49(23–79)/42(26–61)/32(20–61) yrs. PsA/SpA disease duration: 4 (0–34)/17 (5–48) yrs; 78-TJC: 11(3–65)/3(0–17), 76-swollen joint count (SJC): 5 (0–20)/1(0–5), and BASDAI score 45(9–85)/55(2–93) mm. WBMRI assessment was done in 3800 joints included in the TJC, and...
synovitis/BME were detected in 593 (16%)/207 (5%) joints, synovitis/BME was absent in 1929 (51%)/1860 (49%) joints, and 1278 (34%)/1733 (54%) joints were not possible to evaluate. Evaluation was most frequently possible in the hip joints (188 joints (94%)), knees (186 (93%)), and the spine (in overall 94% of DVUs). In contrast, no temporomandibular joints, and only 17 (8%) of elbows could be evaluated.

In PsA, synovitis was found most frequently in carpectemarcal (CM), metacarpal 1 and 2 (77% and 27%), and shoulder (15 (53%) joints). In SpA, synovitis was found most frequently in 1st metatarsophalangeal joints (21 (67%)), and shoulders (17 (50%)).

In patients, the best agreement between WBMRI synovitis and clinical swelling was found at the right hand proximal interphalangeal (PIP) joint (kappa: 0.65), left hand 3rd distal interphalangeal joint (0.63), and the right hand 3rd PIP joints (0.62). The best agreement between WBMRI synovitis and tenderness was found at left foot 2nd and 3rd PIP (0.78), and right hand 2nd PIP (0.70) joints.

In PsA, we found a significant correlation between SJC-28 and BME assessed in 28 and 78 joints (Spearman’s rho: 0.54, P<0.05; 0.69, P<0.005). WBMRI synovitis did not correlate significantly with clinical joint examination. Scores of BME assessed in 78 joints were significantly higher in PsA/SpA compared to HS (Mann-Whitney, P<0.05).

BME in the spine was detected in PsA/SpA in median 2 (0–6)/1 (0–11) DVU, respectively, and BME in the SJJ was detected in 0 (0–2)/0 (0–5) quadrants, respectively. Sum scores of BME detected in spine and SJJ were for PsA: 2 (0–7) and SpA: 4 (0–11), which were significantly higher than in HS (1 (0–4)) (P<0.05).

The best agreement between WBMRI synovitis and tenderness was found at left foot 2nd and 3rd PIP (0.78), and right hand 2nd PIP (0.70) joints.

In PsA, we found a significant correlation between number of joints with BME and SJC, whereas TJC did not correlate. WBMRI is a promising imaging modality, as it allows simultaneous visualisation of inflammation in peripheral and axial joints.

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Frequency of MRI-Detected Hip Osteoarthritis Features in Persons with Chronic Hip Pain and the Diagnostic Performance of Radiography Using MRI As the Reference. Li Xu1, Daichi Hayashi1, Ali Guermazi2, David J. Hunter4, Anton Winterstein3, Ling Li4, Klaus Bohndorf3 and Frank Janssen, Merck, Mundipharma, Novartis, Novo, Pfizer, Roche, Schering-Plough, UCB, Wyeth, 2.

**Background/Purpose:** Conventional radiography has been the standard imaging tool to diagnose and grade the severity of hip OA. However, radiography cannot visualize the bone marrow, cartilage and articular soft tissues that are relevant for clinical manifestation and structural progression of disease. The Hip Osteoarthritis MRI Scoring System (HOAMS) was recently developed to enable MRI-based whole-organ-quantitative assessment of the hip. Frequency distribution of OA-associated features in the various anatomical subregions of the hip has not been described before. Further, the diagnostic performance of radiography to detect these abnormalities is unknown. Our aim was to describe the frequency of MRI-detected features of hip OA (cartilage damage, subchondral cysts, osteophytes and attrition) in various subregions of the hip joint and to evaluate the diagnostic performance of radiography for detection of these features using MRI as the reference.

**Methods:** 52 consecutive patients with chronic hip pain (mean age ±SD 63.5±9.5 years; 54% women) without inflammatory arthritis or recent trauma were imaged by 1.5T MRI. Of these, 44 subjects (85%) underwent weight-bearing antero-posterior pelvic radiography. For MRI assessment, the hip joint was subdivided into the following subregions (modified HOAMS system): latero-superior, centro-medial, anterior and posterior. According to HOAMS, cartilage was graded 0 to 4 based on extent (depth and area) of surface damage. Subchondral cysts and osteophytes were graded 0–3 and 0–4, respectively (based on size). Bone attrition was noted as absent or present in the latero-superior subregion only. Presence of radiographic joint space narrowing (JSN) was compared to MRI-assessed cartilage damage. Sensitivity and specificity of radiography for diagnosing each feature (presence or absence) were calculated using MRI as the reference standard, and the AUC was calculated from the ROC curve for each feature.

**Results:** 21 of 44 subjects had radiographic OA. Frequency of diffuse cartilage damage (for n=44) (HOAMS grade 3–4) in the latero-superior, centro-medial, anterior and posterior subregions was 58%, 58%, 35% and 33%, respectively. Frequency of subchondral cysts (grade≥1) and osteophytes (grade≥1) was 31% and 64% in the latero-superior, 12% and 77% in the centro-medial, and 15% and 15% in the anterior, 8% and 35% in the posterior subregions, respectively. Frequency of bone attrition in the latero-superior subregion was 17%. Sensitivity, specificity and AUC of radiography to detect MRI assessed cartilage damage were 64%, 88% and 0.76 for JSN, 84%, 71% and 0.78 for osteophytes, 44%, 89% and 0.67 for subchondral cyst, and 78%, 86% and 0.82 for attrition.

**Conclusion:** In this cohort of subjects with hip pain diffuse cartilage damage and osteophytes were more frequent in the latero-superior and centro-medial subregions, while subchondral cysts were more frequent in the latero-superior and anterior subregions. Radiography offers acceptable diagnostic performance for attrition, diffuse cartilage damage (in the form of joint space narrowing) and osteophytes, but shows low sensitivity in detecting acetabular subchondral cysts a finding explaining the projectional drawbacks of radiography.

**Disclosure:** L. Xu, None; D. Hayashi, None; A. Guermazi, Boston Imaging Core Lab, 1, Stryker, 5, Merck Serono, 5, Genzyme Corporation, 5, AstraZeneca, 5, Novartis Pharmaceuticals Corporation, 5, D. J. Hunter, None, A. Winterstein, None; L. Li, None; K. Bohndorf, Boston Imaging Core Lab, 1; F. Roemer, Boston Imaging Core Lab, 1, National Institute of Health, 5, Merck Serono, 5.

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**Background/Purpose:** Current MRI scoring methods for assessment of bone marrow lesions (BML) in the knee of patients with osteoarthritis rely on a complex subdivision of the knee into 15 subregions and then a further estimation of the proportion of subregion with BML1. Scoring of synovitis-erosion (S-E) is based on a restricted grading scheme assessing the whole joint (0= none, 3= large) which limits responsiveness. We aimed to develop and conduct preliminary validation of an MRI method for direct semi-quantitative assessment of BML and S-E, that focuses on detection of change (Knee Inflammation MRI Scoring System (KIMRISS)).

**Methods:** Assessment of BML is based on assessment of coronal and sagittal images for patella-femoral compartment and axial/sagittal images for patella-femoral compartment using a fluid-sensitive MRI sequence (STIR, T2 FatSat). Size of a BML lesion is defined according to the largest continuous increase in signal assessed in all dimensions and number of slices in which the increased signal can be detected (small = <1cm in all dimensions on 2 slices; moderate = >1cm but NOT >2 cm in ≥2 dimensions; large = >2 cm in ≥2 dimensions). A weighting is applied in change in BML size (1.5× and 2× for moderate and large lesions, respectively). Size of S-E is assessed in each of 4 compartments (medial and lateral patellar recess, suprapatellar, semimembranous bursa) according to a 0–4 grading scheme and a weighting is applied for change in S-E size (1.5× and 2× for grade 3 and 4 lesions, respectively). MRI scans were performed on the knee joints of 15 enrolled patients after initial screening for anti-TNF agent in subjects with persistent pain due to knee osteoarthritis and clinical evidence of effusion who had failed conventional therapy. Scans were performed at baseline and 12 weeks and independently reviewed by 3 readers blinded to timepoint. Reliability of change scores was assessed by intraclass correlation coefficient (ICC) and responsiveness by standardized response mean (SRM). We assessed correlations with WOMAC pain, patient global, and target joint clinical effusion score.

**Results:** Reliability of detection of change in KIMRISS BML (ICC for 3 reader pairs = 0.71, 0.73, 0.75), KIMRISS S-E (ICC for 3 reader pairs = 0.78, 0.82, 0.86), and Total KIMRISS (ICC for 3 reader pairs = 0.77, 0.81, 0.89) was very good with substantial responsiveness after 12 weeks of treatment (Table). Improvement in Total KIMRISS score was observed in 12 patients although change in either the Total KIMRISS or KIMRISS BML did not significantly correlate with change in WOMAC pain or patient global. KIMRISS S-E did not correlate with target joint effusion score.
Background/Purpose: Osteoarthritis (OA) commonly occurs in the patellofemoral joint (PFJ) and knee pain in subjects with knee OA often emanates from the PFJ rather than the tibiofemoral joint (TFJ). Despite this, research into risk factors and mechanisms for PFJ OA is limited compared to those for the TFJ. Medial patellopatellar plica (MPP) is often seen in conjunction with patello-femoral structural damage and plica syndrome is a common cause of knee pain. However, it is unclear if MPP is an independent risk factor for structural PFJ damage or if MPP is an incidental finding of questionable relevance. Our aim was to describe the frequency of different types of MPP in a cohort of subjects with knee pain and to assess the cross-sectional association of MPP with cartilage damage and bone marrow lesions (BMLs) in the PFJ.

Methods: 177 subjects aged 35–65 with chronic, frequent knee pain were included. 3T MRI of both knees was performed and a total of 342 knees were included. MPP was scored as Types A, B, and C according to a grading system modified from the Sakakibara arthroscopic classification, which takes into account the relative size of the plica in relation to the osteochondral junction of the anterior medial trochlea. The Whole Organ Magnetic Resonance Imaging Score (WORMS) system, cartilage (graded 0 to 6) and BMLs (graded 0 to 3) were semi-quantitatively assessed for the medial patella, medial trochlea, lateral patella, and lateral trochlea. In addition Hoffa-synovitis and effusion-synovitis were scored from 0 to 3. Anatomical measurements of the PFJ that are potential risk factors for cartilage loss included the patellar length ratio (PLR), lateral patellar tilt angle (LPTA), bisect offset (BO), and sulcus angle (SA) on MR images. The frequencies of each type of MPP were recorded. Further, presence of MPP (any type) and its cross-sectional association with cartilage damage (defined as WORMS score ≥2) and BMLs (defined as WORMS score ≥1) in the PFJ was assessed using logistic regression. Adjustment was made for age, gender, body mass index (BMI), PLR, LPTA, BO, SA, and Hoffa- and effusion-synovitis.

Results: The mean age of subjects was 52 (SD±2.4) years, BMI of 29.2±5.4 were men, 160 (90.4%) were white and 144 (81.4%) had a BMI ≥25. Altogether 163 (47.7%) knees exhibited MPP (76 knees (22.2%) were Type A, 69 knees (20.2%) were Type B, and 18 knees (5.3%) were Type C). Significant cross-sectional associations between MPP and cartilage damage were observed for the medial patella (adjusted odds ratio (aOR) 2.12, 95% CI 1.23–3.64), but not for the medial trochlea or the lateral PFJ. No associations were found for MPP and presence of BMLs in the medial and lateral patellofemoral compartments.

Conclusions: Type A and B plicae were common while type C plicae were less common. The presence of MPP is cross-sectionally associated with medial patellar cartilage damage. No increased risk was observed for presence of MPP in the cartilage damage at the medial trochlea or the lateral compartment. No associations were found between MPP and BMLs in any of the PFJ subregions. The latter finding might be explained by different loading conditions in the PFJ in comparison to the TFJ.

Disclosure: W. P. Makowsky, None; U. Weber, None; M. Pianta, None; R. G. Lambert, None.

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Frequency of Mediolateral Plica in Persons with Chronic Knee Pain and Its Cross-Sectional Association with Patellofemoral Cartilage Damage and Bone Marrow Lesions: Data From the Joints On Glucosamine and Its Cross-Sectional Association with Patellofemoral Cartilage Damage and Bone Marrow Lesions (Jarraya)

Daichi Hayashi1, Mohamed Jarraya1, Ali Guermazi1, C. Kent Kwoh2, Michael J. Hannon2, Carolyn E. Moore3, John M. Jakicic2, Stephanie M. Green2 and Frank Roemer4. Boston University School of Medicine, Boston, MA; 2University of Pittsburgh School of Medicine, Pittsburgh, PA; 3Texas Women’s University, Houston, TX; 4University of Pittsburgh, Pittsburgh, PA; 5University of Pittsburgh School of Medicine, Pittsburgh, PA; 6Texas Women’s University, Houston, TX; 7University of Pittsburgh, Pittsburgh, PA, 8Klinikum Augsburg, Augsburg, Germany

Background/Purpose: Knee pain is a common symptom of osteoarthritis (OA). Type A and B plicae were common while type C plicae were less common. The presence of MPP is cross-sectionally associated with medial patellar cartilage damage. No increased risk was observed for presence of MPP in cartilage damage at the medial trochlea or the lateral compartment. No associations were found between MPP and BMLs in any of the PFJ subregions. The latter finding might be explained by different loading conditions in the PFJ in comparison to the TFJ.

Discussion: L. Xu, None; D. Hayashi, None; A. Guermazi, Boston Imaging Core Lab, 1, Stryker, 5, Merck Serono, 5, Genzyme Corporation, 5, AstraZeneca, 5, Novartis Pharmaceutical Corporation, 5; C. K. Kwoh, AstraZeneca, 2, Bevise, 2, Novartis Pharmaceutical Corporation, 5, Pfizer Inc, 5; M. J. Hannon, None; M. Jarraya, None; C. E. Moore, None; M. Jakicic, Novartis Pharmaceutical Corporation, 5, Pfizer Inc, 5, Merck Serono, 5; F. Roemer, Boston Imaging Core Lab, 1, National Institute of Health, 5, Merck Serono, 5.
High Degree of Symmetry of MRI-Detected Articular Tissue Damage in Subjects with Knee Pain: A within-Person Analysis From the JOG Study. Frank Roemer1, C. Kent Kwoh2, Michael J. Hannan3, Robert M. Boudreau4, Stephanie M. Green4, John M. Jakicic5, Carolyn E. Moore6 and Ali Guermazi7. 1Klinikum Augsburg, Augsburg, Germany, 2University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 3University of Pittsburgh School of Medicine, Pittsburgh, PA, 4University of Pittsburgh, Pittsburgh, PA, 5University of Pittsburgh, Pittsburgh, PA, 6University of California, San Francisco, Houston, TX, 7Boston University School of Medicine, Boston, MA

Background/Purpose: Several risk factors for osteoarthritis (OA) have been described to be associated with an increased risk for incident radiographic OA, on a local (joint) or systemic (person) level. While radiography depicts articular changes only late in the disease process, magnetic resonance imaging (MRI) is capable of visualizing tissue pathology at a much earlier stage. Most MRI-based studies have used a one knee per person approach and thus data on bilaterality of OA features are sparse. Study aim was to describe symmetry of MRI-detected OA features in a cohort with knee pain.

Methods: 169 subjects aged 35–65 with chronic, frequent knee pain were included in the Joint in Glucosamine (JOG) study. 3T MRI of both knees was performed using the same pulse sequence protocol as in the Osteoarthritis Initiative (OAI). Knees were semi-quantitatively assessed according to the WORMS system by one expert MSK radiologist. Cartilage damage and bone marrow lesions (BMLs) were read in five plates (medial/lateral femur, medial lateral tibia, patella, femoral trochlea) while meniscal damage was read in three medial and three lateral subregions. Chi² tests were used to compare the proportion of people with unilateral tissue pathology to the proportion what would be expected if the two knees were independent. For this analysis, all MRI features were divided into present (score >1) and absent (score =0). We further used linear weighted (w) kappa statistics to describe agreement between knees for cartilage damage and BMLs in the same articular plates using the full WORMS scores (0–4 for cartilage and 0–3 for BML).

Results: 52.1% of participants were men, mean age was 51.2 (+2.6) years old, mean BMI was 29.0 (+4.1). The worst Kellgren/Lawrence (KL) grades in either knee were: K/L 0: 37 (21.9%), knees, K/L 1: 14 (8.3%) knees, K/L 2: 26 (15.4%) knees, K/L 3: 78 (46.2%) knees K/L 4: 14 (8.3%). All plates showed a significant lower degree of unilaterality for any cartilage damage (ranging between 15.5% and 32.0%) than expected (ranging between 27.1% and 50.2%). For any BMLs the degree of unilaterality was lower for the patella, trochlea, medial tibia, and medial femur; for any meniscal damage the degree of unilaterality was lower for all medial meniscal subregions but not lateral. All plates showed higher overall % agreement (range 82.6–94.7%) than expected (range 73.0–93.1%) for cartilage damage and BMLs. Moderate agreement (defined as w-kappa 0.4–0.6) was observed for patellar and trochlear cartilage damage (0.59 and 0.54) and patellar (0.41) BMLs.

Table 1. Expected and exact overall % agreement and w kappa for different articular plates

<table>
<thead>
<tr>
<th>Plate (Worst grade in plate)</th>
<th>Exact % agreement</th>
<th>Expected % agreement</th>
<th>Weighted kappa</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartilage Patella</td>
<td>88.99%</td>
<td>73.00%</td>
<td>0.59</td>
<td>0.054</td>
</tr>
<tr>
<td>Femoral Trochlea</td>
<td>91.12%</td>
<td>80.73%</td>
<td>0.54</td>
<td>0.058</td>
</tr>
<tr>
<td>Medial Femur</td>
<td>86.09%</td>
<td>79.55%</td>
<td>0.32</td>
<td>0.055</td>
</tr>
<tr>
<td>Lateral Femur</td>
<td>89.94%</td>
<td>85.28%</td>
<td>0.32</td>
<td>0.069</td>
</tr>
<tr>
<td>Medial tibia</td>
<td>86.39%</td>
<td>79.27%</td>
<td>0.34</td>
<td>0.057</td>
</tr>
<tr>
<td>Lateral Tibia</td>
<td>90.53%</td>
<td>85.25%</td>
<td>0.36</td>
<td>0.059</td>
</tr>
<tr>
<td>BMLs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patella</td>
<td>82.64%</td>
<td>70.64%</td>
<td>0.41</td>
<td>0.058</td>
</tr>
<tr>
<td>Femoral Trochlea</td>
<td>83.65%</td>
<td>75.11%</td>
<td>0.34</td>
<td>0.059</td>
</tr>
<tr>
<td>Medial Femur</td>
<td>86.39%</td>
<td>81.54%</td>
<td>0.27</td>
<td>0.060</td>
</tr>
<tr>
<td>Lateral Femur</td>
<td>94.67%</td>
<td>93.08%</td>
<td>0.23</td>
<td>0.060</td>
</tr>
<tr>
<td>Medial tibia</td>
<td>87.50%</td>
<td>83.55%</td>
<td>0.24</td>
<td>0.061</td>
</tr>
<tr>
<td>Lateral Tibia</td>
<td>90.53%</td>
<td>89.80%</td>
<td>0.07</td>
<td>0.061</td>
</tr>
</tbody>
</table>

Conclusion: A higher degree of symmetry of articular tissue damage than expected by chance was observed in this cohort of subjects with knee pain. These findings support the hypothesis that OA is a multifactorial disease triggered by risk factors on an individual joint level but also by person-based risk factors that predispose joints not only to radiographic OA but also to articular tissue damage commonly associated with OA.

Disclosure: F. Roemer, Boston Imaging Core Lab, 1, National Institute of Health, 5. Merck Serono, 2. C. K. Kwoh, None; 3. M. J. Hannon, None; 4. R. M. Boudreau, None; 5. S. M. Green, None; 6. J. M. Jakicie, None; 7. C. E. Lewis, None; 8. A. Guermazi, Boston Imaging Core Lab, 1, Stryker, 5; Merck Serono, 5; Genzyme Corporation, 5. AstraZeneca, 5; Novartis Pharmaceutical Corporation, 5.

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Medial Meniscal Root Tears and the Association with Meniscal Extrusion, Prevalent Cartilage Damage and Longitudinal Cartilage Loss: The MOST Study. Mohamed Jarraja1, David T. Feslon1, Daichi Hayashii, Frank Roemer1, Yuqing Zhang1, Jingbo Niu1, Michel Crema1, Martin Englund2, John A. Lynch3, Michael C. Nevitt4, James Tomer5, C.E. Lewis6 and Ali Guermazi7. 1Boston University, Boston, MA, 2Klinikum Augsburg, Augsburg, Germany, 3Lund University, Lund, Sweden, 4University of California at San Francisco, San Francisco, CA, 5University of California-San Francisco, San Francisco, CA, 6University of Iowa, Iowa City, IA, 7University of Alabama at Birmingham, Birmingham City, AL.

Background/Purpose: The meniscal root is a ligamentous structure that anchors the posterior horn of the meniscus to the tibial plateau. The association of isolated meniscal root tears with progression of osteoarthritis or cartilage loss has not been examined. Aim of the study was to assess the cross-sectional association of medial meniscal root tears with prevalent medial tibiofemoral cartilage damage and medial meniscal extrusion in subjects with radiographic osteoarthritis. We further wished to assess if isolated medial meniscal root tears increase the risk of incident and progressive cartilage damage in the medial tibiofemoral compartment at 30-month follow up.

Methods: The Multicenter Osteoarthritis (MOST) Study is a longitudinal observational study of subjects with or at risk for knee osteoarthritis. Knees were randomly selected from subjects with radiographic OA at baseline and read for presence of absence of root tear (k=1 for intra-reader agreement). Cartilage damage was graded from 0 to 6 in each of the 5 medial tibiofemoral subregions according to WORMS scoring system. Prevalent cartilage damage was defined as any score ≥2 in at least one subregion. Longitudinal progression of cartilage damage was studied for 548 patients who had follow up MRIs read, and was defined as at least within grade or more increase in at least one subregion including incident cartilage damage. Meniscal extrusion was recorded as present or absent. Isolated meniscal root tear was defined as the presence of a root tear without any additional meniscal damage (WORMS1–4). Knees were divided into 3 groups: knees with an isolated medial meniscal root tear (i.e., referent group A), and knees with a root tear or meniscal damage (i.e., referent group B). In the longitudinal analysis, we calculated relative risk (RR) of cartilage worsening comparing the exposed group and the group A with the group B.

Results: Of 594 knees included in the cross-sectional analysis (64.1% with mean age 62.8 ± 7.9, mean BMI 30.9 ± 5.2), 37 knees were in the exposed group, 293 in referent group A and 264 in referent group B. Exposed knees showed higher prevalence of meniscal extrusion than referent group B (91.9% vs. 60.7%, p<0.0001). Prevalence of cartilage damage was...
also higher in the exposed group than in group B (97.3% vs 63.7%, p<0.0001) but not group A (97.3% vs 95.2%, p=0.057). Of 548 knees included in the longitudinal analysis, 33 knees were in the exposed group, 270 in group A, and 245 in group B. The adjusted RR's for cartilage loss in the exposed group and the group A were 2.04 (95%CI 1.19 - 3.49) and 1.84 (95% CI 1.32 - 2.58), respectively, when compared to group B.

Conclusion: Knees with isolated meniscal root tears exhibit a higher prevalence of ipsocompartamental extension when compared to knees without meniscal damage. Isolated meniscal root tears increase the risk of ipsocompartmental cartilage loss longitudinally.

Disclosure: M. Jarraya, None; D. T. Feston, None; D. Hayashi, None; F. Roemer, Boston Imaging Core Lab, 1, National Institute of Health, 5, Merck Serono, 5, Genzyme Corporation, 5, Astra-Loeuille4, Veronika Zubler3, Frank Roemer5, Eric C. Sayre6 and Robert GWsteroid injection therapy.

MRI lesions and associations with clinical changes in patients receiving reliability and responsiveness of both methods for detecting change in these region affected on both coronal and sagittal scans. We aimed to determine the using consecutive images in the coronal plane and a dichotomous (yes/no) which assess synovitis-effusion but score BML using different approaches:

OA and can be detected on MRI. Two scoring methods have been developed

Lambert1. 1University of Alberta, Edmonton, AB,2Arthritis Research Ctr of Germany,6Arthritis Research Centre of Canada, Vancouver, BC

Moderate to high for synovitis-effusion. Significant associations were noted radiologists and rheumatologists. Responsiveness and discrimination was assessed using intra-class correlation coefficient (ICC), subregion readings. In HOAMS, BML (0–3) and synovitis (0–2), were (0–30) and total score was calculated based on femoral and acetabular score.

Methods: Six readers (3 radiologists, 3 rheumatologists) assessed MRI scans of hip joints from 18 patients enrolled into a randomized double-blinded placebo-controlled trial1. Both synovitis and bone marrow lesions (BML) have been associated with pain in Lambert et al. Arthritis Rheum 2007; 56: 2278

Changing Osteoarthritis Treatment Assessment Paradigms: Subchondral Bone Is a More Responsive Measure of Progression Than the Current Radiographic Standard: Michael A. Bové1, Christopher B. Wolstenholme1, Devan Hopkinson1, Graham R. Vincent1 and Philip G. Conaghan2, 1Imorphics Ltd, Manchester, United Kingdom, 2University of Leeds, Leeds, United Kingdom

Background/Purpose: Radiographic joint space width (JSW) assessment, a surrogate for cartilage assessment, is the standard for structure modification trials of osteoarthritis (OA). However the subchondral bone is integral to OA progression and modern image analysis techniques allow accurate, automated identification of bone in MR images. The objective of this study was a comparison of the sensitivity of 3D bone area measures in MR images with minimum medial JSW in radiographs in all subjects in the Osteoarthritis Initiative dataset with definite medial OA over a 2 year period, representative of a typical OA clinical trial.

Methods: 828 subjects with medial OA and MR images at baseline, 12 and 24 months, and available radiograph scoring were selected from the Osteoarthritis Initiative dataset; medial OA was defined as KL≥2 and presence of medial osteophytes. Femur, tibia and patella bones were automatically segmented from MRIs using active appearance models1. Anatomical areas were automatically identified within the model2 and were measured at each time-point. All regions of the articulating surface of the femur, tibia and patella were included in the analysis. Minimum medial joint space width (minJSW) was provided by the OAI, using a semi-automated software method. Sensitivity of both methods to change was assessed using the standardised response mean (mean/SD of change).

Results: Mean age (SD) of the case group was 62 years (8.8); BMI 29.7(4.8); KL 2.55(0.65); 35% females. MinJSW showed significant change at 12 and 24 months with SRM values of −0.16 and −0.33. Change in bone area was significant in all regions for all time-points, except the lateral femur at 12 months (see Figure 1). Medial femur compartments provided the greatest sensitivity to change, with SRM values typically twice those of miniJSW. Tibial compartments and the notch of the femur also showed higher SRM figures than miniJSW, while patellar compartments had comparable SRMs to the radiographic measure. Only the lateral femoral compartments had lower SRMs than the miniJSW method.

Mean Change

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum median JSW</td>
<td>−0.1 (0.04)</td>
<td>−0.23 (0.05)</td>
<td>−0.16</td>
<td>−0.33</td>
</tr>
<tr>
<td>MF</td>
<td>0.52 (0.09)</td>
<td>1 (0.12)</td>
<td>0.39</td>
<td>0.57</td>
</tr>
<tr>
<td>TrFLMed</td>
<td>0.55 (0.1)</td>
<td>1.1 (0.12)</td>
<td>0.39</td>
<td>0.63</td>
</tr>
<tr>
<td>LF</td>
<td>0 (0.12)*</td>
<td>0.17 (0.16)</td>
<td>0.05</td>
<td>0.07</td>
</tr>
<tr>
<td>TrFlat</td>
<td>0.1 (0.09)</td>
<td>0.35 (0.1)</td>
<td>0.07</td>
<td>0.23</td>
</tr>
<tr>
<td>Notch</td>
<td>0.44 (0.1)</td>
<td>0.73 (0.11)</td>
<td>0.31</td>
<td>0.45</td>
</tr>
<tr>
<td>MT</td>
<td>0.45 (0.1)</td>
<td>0.87 (0.12)</td>
<td>0.31</td>
<td>0.48</td>
</tr>
<tr>
<td>LT</td>
<td>0.34 (0.1)</td>
<td>0.69 (0.12)</td>
<td>0.23</td>
<td>0.38</td>
</tr>
<tr>
<td>MP</td>
<td>0.34 (0.16)</td>
<td>0.91 (0.2)</td>
<td>0.15</td>
<td>0.31</td>
</tr>
<tr>
<td>LP</td>
<td>0.33 (0.16)</td>
<td>0.95 (0.19)</td>
<td>0.14</td>
<td>0.34</td>
</tr>
</tbody>
</table>

JSWs are in mm, bone area change in % change in bone area from baseline (95% confidence limits). All changes were highly significant except* which was not significant

Conclusion: Change in bone area was more sensitive than the miniJSW method in a number of knee compartments, particularly in the medial femur

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and tibia. Measurement of bone change provided a more responsive tool for monitoring OA progression in a cohort selected for typical OA trial characteristics.

References

Disclosure: M. A. Bowes, Imorphics Ltd, 1, Imorphics Ltd, 3; C. B. Wolstenholme, Imorphics Ltd, 3, Imorphics Ltd, 1; D. Hopkinson, None; G. R. Vincent, Imorphics Ltd, 3, Imorphics Ltd, 1; P. G. Conaghan, None.

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Characterisation of New Bone Formation in Gout: A Quantitative Site-by-Site Analysis Using Plain Radiography and Computed Tomography, Nicola Dalbeth1, Aaron Milligan2, Barnaby Clark2, Fiona M. McQueen1 and Anthony Doyle1, 1University of Auckland, Auckland, New Zealand, 2Department of Radiology, Auckland District Health Board, Auckland, New Zealand

Background/Purpose: Radiographic descriptions of gout have noted the tendency to hypertrophic bone changes. The aim of this study was to characterise the features of new bone formation (NBF) in gout, and to determine the relationship between NBF and other radiographic features of disease, particularly erosion and tophus.

Methods: Paired plain radiographs (XR) and computed tomography (CT) scans of 798 individual hand and wrist joints from 20 patients with gout were analysed. Following a structured review of a separate set of images, films were scored for the presence of the following features of NBF: spur, osteophyte, periosteal NBF, ankylosis and sclerosis (Figure). Sites for NBF scoring were those included in the gout-modified Sharp-van der Heijde method for erosion scoring. The relationship between NBF and other imaging features of gout (erosion and tophus) was analysed.

Figure. Examples of the features of new bone formation (NBF) observed by plain radiography and computed tomography in patients with gout. A. Spur. B. Osteophyte. C. Periosteal NBF. D. Ankylosis. E. Sclerosis. Top panel shows plain radiographic images and lower panel shows CT images.

Results: The most frequent forms of NBF were bone sclerosis (28.6% of all assessed joints using CT) and osteophyte (30.5%). Spur and periosteal NBF were less common (17.8% and 6.0% respectively), and ankylosis was rare (0.6%). On both XR and CT, joints with bone erosion were more likely to have NBF: for XR, odds ratios (OR) 64.9 for spur, 64.9 for osteophyte, 119.8 for periosteal NBF, 30.1 for ankylosis and 101.1 for sclerosis (p for all <0.0001); and for CT, OR 45.1 for spur, 3.3 for osteophyte, 16.6 for periosteal NBF, 26.6 for ankylosis and 32.3 for sclerosis (p for all <0.01). Similarly, on CT, joints with intraosseous tophus were more likely to have NBF; OR 48.4 for spur, 3.3 for osteophyte, 14.5 for periosteal NBF, 35.1 for ankylosis and 39.1 for sclerosis (p for all <0.01).

Conclusion: This detailed quantitative analysis has demonstrated that NBF occurs more frequently in joints affected by other features of gout. This work suggests a connection between bone loss, tophus, and formation of new bone during the process of joint remodelling in gout.

Disclosure: N. Dalbeth, None; A. Milligan, None; B. Clark, None; F. M. McQueen, None; A. Doyle, None.

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Background/Purpose: Digital imaging combined with picture archiving and communication system (PACS) access allows detailed image retrieval and magnification. Calcium pyrophosphate dihydrate (CPPD) crystals preferentially deposit in fibrocartilages, the cartilage of the acromioclavicular (AC) joint being one such structure. We sought to determine if careful examination of the AC joints on magnified PACS imaging of routine chest films would be useful in identifying chondrocalcinosis (CC).

Methods: Retrospective radiographic readings and chart reviews involving all 20 patients aged 50 or more who had routine outpatient chest radiographs over a 4 month period were performed. CC was identified as linear or punctate cartilage calcifications. Knee radiographs were available for comparison in 489 patients. Medical records were reviewed to abstract demographics, chest film reports, and diagnoses.

Results: AC joint CC was identified in 1.1% (21/1920) of consecutive chest films. Patients with AC joint CC were 75 (± 11.6 S.D.) years of age versus 65 (± 10.5 S.D.) in those without CC (p=0.0002, Wilcoxon rank sum). There was no significant gender difference in the prevalence of AC joint CC (49.0% patients had knee films. 6 of these patients had AC joint CC and of these 5 also had knee CC (83%). Of the 483 without AC joint CC 62 (12%) had knee CC (p=0.002 Fisher’s exact). The patients with AC joint CC only 14% had a diagnosis of CPPD recorded on the chart and none had AC joint calcification noted on the official radiology report. Patients with AC joint CC were more likely to have a recorded history of CPPD crystal disease than those without AC joint CC (14% versus 1%, p=0.0017 Fisher’s exact).

Conclusion: By using digital imaging and PACS software magnification, AC joint CC is discernible on routine chest films. The prevalence of AC joint CC increases with age and is usually an indicator of associated knee CC. AC joint CC is most often overlooked by radiologists reading routine chest images. Rheumatologists (and radiologists) should consider scrutiny of available chest films for AC joint CC. A finding of AC joint CC should heighten suspicion of pseudogout or secondary osteoarthritis in appropriate clinical settings. And AC joint CC in a young patient should alert the clinician to the possibility of an associated metabolic condition. Moreover, such scrutiny is without cost other than less than a minute of time.

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Magnetic Resonance Imaging (MRI) Assessment of Inflammatory Myopathy: Quantitative Fat-Corrected Muscle T2 and Conventional T2 Measurement Versus Standard MRI and Clinical Metrics. Lawrence Yao1, Adrienne L. Yip2, Sepehr Mesdaghinia1, Ashkan Shademan1, Joseph A. Shrader1, Anna V. Jansen2, Frederick W. Miller2 and Lisa G. Rider3, 1Clinical Center, NIH, Bethesda, MD, 2NIEHS, NIH, Bethesda, MD, 3NIEHS, NIH, Bethesda

Background/Purpose: Active muscle disease in patients with idiopathic inflammatory myopathies (IIM) is characterized by prolonged muscle T2 relaxation on MRI. We examined the utility of MR T2 maps, and a method of correcting these maps for varying fat content, as quantitative, semi-automated alternatives to conventional MRI in the evaluation of IIM. MRI measures were also validated against other myositis metrics.

Methods: Forty-four IIM patients (8 dermatomyositis [DM], 13 polymyositis [PM], 22 juvenile DM, 1 juvenile PM) underwent MRI of the thighs at 1.5 Tesla and extensive clinical testing, including assessment of Physician Global Activity (PGA), muscle strength by isometric dynamometry (QNT), functional assessment by Childhood Myositis Assessment Scale (CMAS), functional assessment by Childhood Myositis Activity Questionnaire (CHAQ), and the Myositis Damage Index (MDI). Follow-up imaging was also performed 11 months later in 20 patients after therapy. MRI included a Carr-Purcell-Meiboom-Gill sequence and a Dixon-based

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fat water separation sequence, for generation of T2, fat fraction (FF), and fat-corrected T2 (fc-T2) maps, and Short Tau Inversion Recovery (STIR) and T1 spin echo (SE) sequences for standard visual assessment. Muscle edema and damage were visually scored on STIR and T1 SE images, respectively, using a semi-quantitative rating system that incorporates anatomic extent and severity of findings. T2, fc-T2, and fat fraction (FF) values were tabulated for the thigh muscles of each patient with an automated segmentation algorithm.

**Results:** STIR scores correlated significantly with mean T2 and mean fc-T2 values (Spearman’s r = 0.65 and 0.61, p < 0.001), while T1 damage scores correlated with mean FF (r = 0.67, p < 0.001). Baseline mean T2, mean fc-T2, and visual STIR scores correlated significantly with the CMAS (r = −0.50, −0.36, −0.55, respectively, p < 0.05) and CHAQ (r = 0.46, 0.33, 0.43 respectively, p < 0.05), and with QMT (r = −0.49, −0.52, −0.48, respectively, p < 0.05). MDI muscle damage scores correlated significantly with visual T1 damage scores (r = 0.72, p < 0.001) and mean FF measurements (r = 0.67, p < 0.001). For 20 patients evaluated after a change in therapy, standardized response means for visual STIR, mean fc-T2, and mean T2 scores were −0.52, −0.31, −0.12, respectively. The change in PGA assessment correlated with changes in STIR (r = 0.74, p < 0.01) and mean fc-T2 scores (r = 0.46, p < 0.05). However, changes in STIR scores and mean fc-T2 values were discordant with outcomes, based on 20% improvement in PGA, in 5 and 6 of 20 patients, respectively.

**Conclusion:** Semi-automated survey of quantitative thigh muscle T2, FF, and fc-T2 MRI maps have good content validity with visual scoring of clinical MRI. These quantitative MRI measures have good construct validity with other measures of myositis disease activity and damage, particularly muscle measures. While fc-T2 appears to be more responsive than conventional T2, fc-T2 and T2 are less responsive than visual STIR scores. Additionally, both visual and quantitative MR analysis of thigh muscles exhibited limited agreement with global disease improvement after therapy, as reflected by the PGA assessment.

**Disclosure:** L. Yao, None; A. L. Yip, None; S. Mesdaghlina, None; A. Shademan, None; J. A. Shadrer, None; A. V. Jansen, None; F. W. Miller, None; L. G. Rider, None.

### 1039 Cardiac Involvement in Systemic Sclerosis: The Added Value of Magnetic Resonance Imaging

**Background/Purpose:** Cardiac involvement in systemic sclerosis (SSc) affects the prognosis of the disease. Myocardial fibrosis is the pathological hallmark of this complication and has been reported in 50-80% of cases in necropsy. Echocardiography is the routine imaging tool to easily detect cardiac involvement, but it is not accurate to detect myocardial fibrosis. Delayed gadolinium enhancement (DE) cardiovascular magnetic resonance (CMR) is the gold-standard for myocardial fibrosis assessment. The aim of the present study was to evaluate the added value of DE-CMR to echocardiography and Doppler in SSc patients.

**Methods:** After a thorough clinical characterization, 171 SSc patients (age = 52 ± 14, 91% females, 22% diffuse form) underwent, on the same day, a comprehensive echocardiogram, including tissue Doppler imaging (TDI), and a DE-CMR.

**Results:** Echocardiography showed normal systolic function (ejection fraction > 50%) and wall motion score index (1) in 100% of patients, whereas DE-CMR showed a pattern of non-ischaeamic myocardial fibrosis in 12/53 (23%) patients. In 2/53 patients (4%), T2-weighted CMR showed myocardial oedema, that resolved after steroid therapy. No clinical parameter (age, duration of disease, limited or cutaneous form, Scl-70 positivity, Rodman skin score, activity score) was an independent predictor of the presence of myocardial fibrosis.

**Conclusion:** Subclinical cardiac involvement is relatively frequent in SSc and is not necessarily related to duration of disease or other clinical characteristics. CMR can detect different patterns of reversible (by T2-weighted) and irreversible (by DE) cardiac involvement (see figure), not detectable by echocardiography.

1Heinrich-Heine-University, Düsseldorf, Germany, 2Hospital Essen Süed, Essen, Germany, 3Heinrich-Heine-University, Duesseldorf, Germany

Background/Purpose: To evaluate whether combined multi-pinhole single photon emission computed tomography (MPH-SPECT) with technetium-99m-labelled disphosphonates (Tc99m-DPD) and magnetic resonance imaging (MRI) detect changes in inflammation in early rheumatoid arthritis (ERA) patients under methotrexat (MTX) therapy and to investigate the relation between Tc99m-DPD uptake and the development of erosion.

Methods: MPH-SPECT and MRI of metacarpophalangeal joints (MCP) have been prospectively performed in 10 consecutive ERA patients (8 female, 2 male; 49 ± 13 years [mean ± SD], range: 24–68) prior to and 6 months after initiation of MTX. The Tc99m-DPD uptake was measured using a region of analysis. The course of synovitis, bone marrow edema (BME) and erosions were scored according to the Rheumatoid Arthritis MRI Score (RAMRIS) criteria.

Results: The frequency of increased Tc99m-DPD uptake, synovitis and BME decreased under MTX therapy; but the number of bone erosions increased. Joints with progressive and newly developed erosions on follow-up had a higher baseline Tc99m-DPD uptake (2.64 ± 1.23 vs. 1.43 ± 0.91) (p < 0.001). Joints with persistent synovitis did not show higher Tc99m-DPD uptake values (1.56 ± 1.27 vs. 1.47 ± 0.75) (p = 0.74). There was no correlation between persistence of synovitis and the development of erosions (F = 0.3, p = 0.12).

Conclusion: Persistence of synovitis seems to be independent from Tc99m-DPD uptake and the development of erosions, while early increased bone metabolism is found in MCP joints which show erosive progression under MTX therapy. Hybrid MPH-SPECT and MRI might thus provide valuable additional information for individual risk-stratified therapeutic decisions.

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Psoriatic Arthritis Patients Assessed by Dynamic Contrast-Enhanced MRI in High Disease Versus Minimal Disease Activity State - a Cross-Sectional Study Correlating Conventional MRI and Clinical Composite Measures. René Panduro Poggenborg1, Pernille Boyesen2, Charlotte Wiell3, Susanne Juhl Pedersen4, Inge Juul Sørensen5, Ole Rintek Madsen6, Ole Slot7, Jakob M. Møller8, Mikael Boesen9, Henning Bliddal6, Olga Kubassova10 and Mikkel Østergaard11.

1Copenhagen University Hospital in Glostrup, Copenhagen, Denmark, 2Diakonhjemmet Hospital, Oslo, Norway, 3Copenhagen University Hospital in Gentofte, Copenhagen, Denmark, 4Copenhagen University Hospital in Herlev, Copenhagen, Denmark, 5Copenhagen University Hospital at Frederiksberg, Copenhagen, Denmark, 6Aalborg University Hospital in Aalborg, Aalborg, Denmark, 7Copenhagen University Hospital at Frederiksberg, Copenhagen, Denmark, 8Copenhagen University Hospital in Glostrup, Copenhagen, Denmark, 9Glostrup Hospital, Copenhagen, Denmark, 10DANBIO, On behalf of Depts of Rheumatology, North, South, Central, Zealand and Capital Region, Copenhagen, Denmark, 11Copenhagen University Hospital in Gentofte, Copenhagen, Denmark.

Image Analysis Ltd., Leeds, United Kingdom, 11Glostrup Hospital, Glostrup, Denmark

Background/Purpose: Dynamic contrast-enhanced (DCE) magnetic resonance imaging (MRI) has been validated in rheumatoid arthritis for measuring inflammation, but has rarely been studied in psoriatic arthritis (PsA).

The purpose was to investigate whether DCE-MRI can discriminate PsA patients with high disease activity from minimal disease activity (MDA), and to correlate DCE-MRI findings with conventional MRI and clinical measures.

Methods: PsA patients fulfilling CAPSAR criteria were eligible in this investigator-initiated study of patients with either high disease activity (group 1) or MDA (group 2). Inclusion criteria were for group 1: swollen joint count (SJC) ≥ 6, tender joints count (TJC) ≥ 6, hand involvement and clinical indication for initiation of anti-TNF therapy, and for group 2: hand involvement within 1 year, long-term treatment with adalimumab 40 mg ev, and fulfilling criteria for MDA (at least 5 out of 7: TJC ≥ 5; SJC ≥ 5; CRP ≥ 5; ESR ≥ 5; HAQ ≥ 0.5; 13-enthesitis ≥ 1). DAS28 and the new Disease Activity Index for Psoriatic Arthritis (DAPSA) score (sum of SCI, TJC, PtGA, pain and CRP) was calculated. The validated PsAMRIS scoring system (3) was used for assessing conventional MRI (0.6 tests). PsAMRIS total inflammation was calculated by adding synovitis, flexor tenosynovitis, periarticular inflammation and bone marrow oedema scores. DCE-MRI were analysed by Dynaminika software (Image Analysis Ltd., Leeds, UK). Regions of interest (ROIs) were drawn around 2–5 metacarpophalangeal joints, excluding large blood vessels. The ROIs were used for automatic computing of the number of pixels with plateau and washout pattern (Np, w*), the initial rate of enhancement (IRE), and maximum enhancement (ME).

Results: Patient characteristics were: 9 males/8 females, median age 45 (25–63) years, joint/skin disease duration 8 (2–59) (15–52) years (no difference between groups). Clinical and imaging data are shown in the table.

<table>
<thead>
<tr>
<th>Group 1: High disease activity (n=9)</th>
<th>Group 2: Minimal disease activity (n=8)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Np, w*</td>
<td>712 (13–1587)</td>
<td>362 (25–1316)</td>
</tr>
<tr>
<td>IRE × 10^3</td>
<td>8 (5–33)</td>
<td>10 (6–14)</td>
</tr>
<tr>
<td>ME</td>
<td>1.20 (1.17–1.33)</td>
<td>1.21 (1.16–1.33)</td>
</tr>
<tr>
<td>Np, w* × ME</td>
<td>5.4 (0.4–15.9)</td>
<td>2.8 (0.2–13.2)</td>
</tr>
<tr>
<td>PsAMRIS synovitis</td>
<td>946 (16–1903)</td>
<td>434 (29–1608)</td>
</tr>
<tr>
<td>PsAMRIS total inflammation</td>
<td>3 (0–5)</td>
<td>2 (0–5)</td>
</tr>
<tr>
<td>DAPSA score</td>
<td>16 (1–24)</td>
<td>7.5 (3–18)</td>
</tr>
<tr>
<td>DAS28 score</td>
<td>5.5 (3–6.4)</td>
<td>7.5 (3–18)</td>
</tr>
<tr>
<td>DAPSA score</td>
<td>64.9 (30.9–103.3)</td>
<td>2.4 (0.1–5.6)</td>
</tr>
</tbody>
</table>

Median (range). Groups compared using Kruskal-Wallis test.
We found a significant correlation between the DCE-MRI parameters ($N_{p}^{\text{IRE}}, N_{p}^{\text{ME}}$, and $N_{p}^{\text{w}}$) and PsAMRIS total inflammation (Spearmann’s rho: 0.53, 0.51, and 0.51; all $P<0.05$). DCE-MRI parameters were not statistically significant correlated with clinical measures, but $N_{p}^{\text{IRE}}, N_{p}^{\text{ME}}$, and $N_{p}^{\text{w}}$ were numerically lower in the MDA group.

**Conclusion:** DCE-MRI parameters correlated significantly with PsAMRIS total inflammation score, and showed a trend toward higher values in the high disease activity versus the MDA group. DCE-MRI is a promising method for assessing joint inflammation in PsA. However, a larger longitudinal study is needed to clarify, if DCE-MRI is superior to conventional MRI for discriminating between disease activity levels.

**Ref**
1. Coates, ARD 2009; 12
2. FitzGerald, ARD 2011; 12
3. Østergaard, J Rheum 2009

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**Assessment of Rheumatoid Arthritis Disease Activity by Power Doppler Ultrasonography: Association with Routine Clinical Indices and Its Usefulness in Detecting Remission.** Hiroaki Taguchi, Kazuo Nishi, Takeo Kudo and Yuuka Okano. Kawasaki Municipal Kawasaki Hospital, Kawasaki, Japan

**Background/Purpose:** Power Doppler ultrasonography (PDUS) is sensitive for detecting synovitis in patients with rheumatoid arthritis (RA). We aimed to clarify the association of PDUS findings with routine clinical indices and its usefulness in detecting disease remission.

**Methods:** We studied 72 RA patients with mean age 62.5 years, mean disease duration 5.6 years, and 61% women. We examined 22 joints including bilateral wrists, metacarpophalangeal, and proximal interphalangeal joints using PDUS to evaluate the presence of inflammation with scoring from 0 to 3 according to the signal intensity of each joint, and the sum score (ranging from 0 to 66) was defined as “PDUS score”. Clinical disease activity score/indices including DAS28CRP, SDAI, and CDAI were also recorded. Clinical remission was defined according to the following criteria: DAS28CRP < 2.3, SDAI ≤ 3.3, CDAI ≤ 2.8, and Boolean-based definition. Sonographic remission was defined by absence of PDUS signals.

**Results:** Mean values ± SD of DAS28CRP, SDAI, and CDAI were 3.3 ± 3.8, 18.8 ± 15.0, and 17.3 ± 13.5, respectively. Mean values ± SD of PDUS score was 6.2 ± 6.3 and significantly correlated with all three clinical disease activity score/indices; among them the correlation with SDAI was strongest ($r=0.77$, $p<0.001$). PDUS score was more significantly correlated with swollen joint counts ($r=0.73$, patient global assessment ($GA$) ($r=0.77$), or evaluator GA ($r=0.85$), than with tender joint counts ($r=0.50$) or serum CRP ($r=0.61$). Remission was observed in 17 (24%) patients by DAS28CRP, in 11 (15%) by SDAI, in 12 (17%) by CDAI, and in 14 (19%) by Boolean-based definition, respectively. Sonographic remission was observed in 9 (13%) patients. In 36-59% of the patients satisfying clinical remission criteria, the PDUS signals were detected indicating the presence of synovitis (Table 1). Values of DAS28CRP, SDAI, and CDAI of patients with sonographic remission were 1.3, 1.7, and 1.9, respectively.

**Table 1.** Distribution of patients with absence and presence of PDUS signals for patients with clinical disease remission defined by DAS28CRP, SDAI, and CDAI, and Boolean-based criteria.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>sonographic signals</th>
<th>presence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DAS28CRP &lt; 2.3</strong></td>
<td>17</td>
<td>7 (41%)</td>
<td>10 (59%)</td>
</tr>
<tr>
<td><strong>SDAI ≤ 3.3</strong></td>
<td>11</td>
<td>7 (64%)</td>
<td>4 (36%)</td>
</tr>
<tr>
<td><strong>CDAI ≤ 2.8</strong></td>
<td>12</td>
<td>7 (58%)</td>
<td>5 (42%)</td>
</tr>
<tr>
<td><strong>Boolean-based criteria</strong></td>
<td>14</td>
<td>8 (57%)</td>
<td>6 (43%)</td>
</tr>
</tbody>
</table>

**Conclusion:** PDUS is useful for evaluating RA disease activity, is exceedingly sensitive, and is a useful method for detecting "pure" RA disease remission.

**Disclosure:** H. Taguchi, None; K. Nishi, None; T. Kudo, None; Y. Okano, None.

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**Ultrasound Scores of Enthesitis and Dactylitis Do Not Correlate with Corresponding Clinical Findings in Psoriasis Arthritis.** Rusrum Husie1, Josef Herrmann1, Judith Greter2, Winfried B. Graninger1 and Christian Deja-co1.
1Medical University Graz, Graz, Austria, 2Auenbruggerplatz 15, Graz, Austria

**Background/Purpose:** To compare sonography verified inflammation of entheses, tendons and joints with corresponding clinical findings in psoriasis arthritis (PsA) patients.

**Methods:** Prospective study of 70 consecutive PsA patients [mean age 51.1 (±11.6) years, 30% female, median disease duration 7.0 (range 0–44.7) years]. Clinical and ultrasound examination was performed at 68 joints and 14 entheses (lateral epicondyle, triceps insertion, quadrizides insertion, proximal and distal insertion of patellar ligament, Achilles tendon, plantar fascia), and clinical scores including the Disease Activity index for Psoriatic Arthritis (DAPSA), composite psoriatic disease activity index (CPDAI), dactylitis score, Leeds enthesitis index (LEI), HAQ and PASI were calculated. Sonography was performed by two rheumatologists blinded to clinical data using an Esaote Twice ultrasound device. Synovial hypervascularity and/or joint effusion (SH/E) as well as Power Doppler (PD) were graded at each joint from 0 to 3 in accordance with prior publications. At hands and feet we also recorded the presence of perisynovitis and tenosynovitis. For grading of entheses by ultrasound the MASEI and GUESS scores were used. Ultrasound signs of dactylitis were defined by the presence of synovitis plus tenosynovitis at MCP, MTP, PIP and DIP joints.

**Results:** The median DAPSA was 12.1 (0.1–70.2), mean CPDAI 4.8 (±2.5), median clinical Dactylitis score 0 (0–10), median LEI 0 (0–4), mean HAQ 0.73 (±0.81) and mean PASI 1.0 (0–23.2). Using sonography, we found SH/E and/or PD at 12 (range 3–35) (median [SD] score 16.0 (range 3.0–50.6)) and/or PD score 3.0 (0–31.0)) joints, respectively. Eighteen patients (25%) had evidence of perisynovitis in at least one MCP joint and 20 (28.6%) patients demonstrated flexor tenosynovitis affecting at least one whole finger or toe. Median MASEI and GUESS scores were 32.5 (7.0–73.0) and 13.0 (4.0–27.0), respectively. Ultrasound signs of dactylitis were found in 5 (7.1%) patients.

DAPSA showed a moderate correlation with total SH/E (correcc $0.35$, $p=0.006$) and PD-scores $0.36$, $p=0.002$), as well as with the number of joints affected by SH/E (correct $0.24$, $p=0.045$) and/or PD (correcc $0.32$, $p=0.006$). Total CPDAI did not correlate with SH/E, PD, enthesitis or dactylitis scores; however, within the CPDAI-joint domain we found differences concerning SH/E- and PD-scores between patients with no [$n=17$, median SH/E 12.0 (3.0–32.0); PD-score 1.0 (0–11.0)] and moderate [$n=17$, SHE 25.0 (6.0–43.0), $p=0.009$; PD 5.0 (0–31.0), $p=0.005$] or high clinical activity ($n=26$, SHE 18.5 (6.0–56.0), $p=0.025$; PD 5.5 (0–30.0), $p=0.005$). In the CPDAI enthesitis and dactylitis domains no differences were found, comparing the MASEI/GUESS and ultrasound defined dactylitis, respectively between the groups. No correlation was found between clinical and sonographic dactylitis scores; or LEI (clinical) and MASEI/GUESS (sonography).

**Conclusion:** No association was found between sonographic and clinical assessment of enthesitis and dactylitis in PsA patients. Ultrasound verified joint inflammation moderately correlated with DAPSA and CPAI joint components.

**Disclosure:** R. Husie, None; J. Herrmann, None; J. Greter, None; W. B. Graninger, None; C. Deja-co, None.

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**Dynamic Contrast-Enhanced Magnetic Resonance Imaging of the Wrist in Rheumatoid Arthritis Patients Treated with Methotrexate, Intravenous Glucocorticoid and Adalimumab/Placebo.** Mette Bjørndal Axelsen1, Merete L. Højland2, Kim Hørnebye-Petersen1, Kristian Steengaard-Pedersen1, Peter Junker3, Jan Pedersen4, Jakob M. Møller, Henning Bliddal5, Olga Kubassova6, Mikael Boesen7 and Mikkel Østergaard1.
1Copenhagen University Hospital at Glostrup, Copenhagen, Denmark, 2Copenhagen University Hospital at Gentofte, Hellerup, Denmark, 3Copenhagen University Hospital in Herlev, Copenhagen, Denmark, 4University of Southern Denmark, Odense, Denmark, 5Aarhus University Hospital, Aarhus, Denmark, 6Odense University Hospital, Odense C, Denmark, 7Copenhagen University Hospital in Gentofte, Hellerup, Denmark, 8The Parker Institute, University of Southern Denmark, Odense, Denmark

**Background/Purpose:** To validate parameters of dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) in an early rheumatoid arthritis (RA)
clinical trial by comparison with clinical parameters of disease activity, and by investigating the sensitivity to change during a 2-year-follow-up.

Methods: 14 early RA patients diagnosed according to the ACR1987 criteria within 6 months of inclusion and with a DAS28 ≥3.2 (9/5 women/ men, median aged 37 [range 27-69] years, disease duration 82 [42-129] days) were randomized 1:1 to treatment with methotrexate (MTX) and adalimumab or MTX and placebo. Any swollen joints were injected with triamcinolone (max 4 joints/4 ml per visit) in a 2-year-follow-up. If continuous disease activity was present, treatment was intensified. Conventional MRI and DCE-MRI of the right wrist were performed at baseline, and after 6, 12 and 24 months using a 0.6 Tesla MRI-unit. A 3-slice dynamic sequence was obtained at the time of injection of the contrast agent (Gadoteric acid 0.2 mL/kg). DCE-MRI parameters: TR 33ms, TE 4.2ms, flip angle 25°, FOV 200 mm², matrix 108×192, slice thickness 3 mm.

On DCE-MRI images, the wrist was manually delineated using the image software DynaVersa version 4.6.0 (Image analysis Ltd., Leeds, UK, www.imageanalysis.org) and for these regions of interest (ROI) the number of enhancing voxels (Nvoxel), the initial rate of enhancement (IRE), the maximum enhancement (ME) and 60% enhancement (60%E) were extracted by the software and compared to clinical parameters of disease activity.

Results:

Table 1. Clinical and MRI data at baseline and at follow-up visits.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>6 months</th>
<th>12 months</th>
<th>24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP (mg/dL)</td>
<td>146 (28-328)</td>
<td>48 (12-82)</td>
<td>55 (15-76)</td>
<td>150 (72-235)</td>
</tr>
<tr>
<td>Patient’s VAS pain</td>
<td>3 (0-6)</td>
<td>5 (0-10)</td>
<td>7 (0-12)</td>
<td>7 (0-12)</td>
</tr>
<tr>
<td>Patient’s global pain</td>
<td>1 (0-3)</td>
<td>2 (0-4)</td>
<td>3 (0-5)</td>
<td>3 (0-5)</td>
</tr>
<tr>
<td>Patient’s VAS fatigue</td>
<td>3 (0-9)</td>
<td>5 (0-12)</td>
<td>7 (0-15)</td>
<td>7 (0-15)</td>
</tr>
<tr>
<td>Health Assessment Questionnaire</td>
<td>1.0 (0.0-3.5)</td>
<td>1.5 (0.0-3.5)</td>
<td>1.0 (0.0-3.5)</td>
<td>1.0 (0.0-3.5)</td>
</tr>
<tr>
<td>Swollen Joint Count</td>
<td>3 (1-7)</td>
<td>5 (0-15)</td>
<td>7 (0-25)</td>
<td>7 (0-25)</td>
</tr>
<tr>
<td>Tendon Joint Count</td>
<td>1 (0-3)</td>
<td>2 (0-5)</td>
<td>3 (0-5)</td>
<td>3 (0-5)</td>
</tr>
<tr>
<td>Number of Enhancing Voxels (Nvoxel)</td>
<td>48 (0-378)</td>
<td>53 (0-387)</td>
<td>55 (0-387)</td>
<td>55 (0-387)</td>
</tr>
<tr>
<td>Maximum Enhancement (ME)</td>
<td>1.2 (0.1-3.1)</td>
<td>1.5 (0.1-3.1)</td>
<td>1.5 (0.1-3.1)</td>
<td>1.5 (0.1-3.1)</td>
</tr>
<tr>
<td>Initial Rate of Enhancement (IRE) (%a)</td>
<td>0.45 (0.0-1.0)</td>
<td>0.50 (0.0-1.0)</td>
<td>0.50 (0.0-1.0)</td>
<td>0.50 (0.0-1.0)</td>
</tr>
<tr>
<td>ME/Nvoxel (%a)</td>
<td>246 (0.45-246)</td>
<td>300 (0.45-246)</td>
<td>300 (0.45-246)</td>
<td>300 (0.45-246)</td>
</tr>
</tbody>
</table>

Values are presented as medians (minimum–maximum). VAS: visual analog scale. Change from baseline: Wilcoxon Signed Ranks Test. **p<0.01, ***p<0.001; NS: p not significant.

All clinical parameters decreased during follow-up, while there were no statistically significant changes for the DCE-MRI parameters, which may reflect lack of power. Furthermore, it should be emphasized that only 3 of the 10 RA patients suffering from acute sarcoidosis were clinically affected at baseline.

Conclusion: DCE-MRI is a promising outcome measure in clinical trials, but MRI at baseline must include clinically involved joints.

Disclosure: S. Y. Kawashiri, None; T. Suzuki, None; Y. Nakashima, None; A. Okada, None; N. Iwamoto, None; K. Ichinose, None; K. Tamai, None; K. Arima, None; H. Nakamura, None; T. Origuchi, None; M. Uetani, None; K. Aoyagi, None; A. Kawakami, None.

1047

Evaluation of Ankle Swelling Due to Löfgren’s Syndrome: A Pilot Study Using B-mode and Power Doppler Ultrasonography. Emmmanuelle LeBras1, Sandra Balser2, Valentin S. Schäfer3, Boris P. Ehrenstein4, Patrick Hoffstetter1, Martina Müller1, Martin Fleck1 and Wolfgang Hartung1.

Background/Purpose: Automated Breast Volume Scanner (ABVS) is an ultrasonic device to be developed for the automated scanning for mammary glands. We have tried to explore the clinical application of ABVS toward the synovial lesion in patients with rheumatoid arthritis (RA).

Methods: Ten active RA patients of mean 54 y.o., whose mean disease duration 15 months and DAS28-ESR 5.69, were recruited. Patients gave their informed consent to be subjected to the protocol that was approved by the Institutional Review Board of Nagasaki University. We have examined in total 100 (112 swollen, 20 non-swell) ankle joints as well as 20 wrist joints at dorsal sites by both ABVS (ACUSON S2000) and conventional ultrasonography (US) at the same day consecutively. ABVS was scanned in a water tank. Presence of synovial hypertrophy and bone erosion by gray-scale were examined by both methods, and the association of both methods was calculated by kappa coefficient.

Results: The scanning time of ABVS was 2 min per patient and that of conventional US was 15 min per patient, respectively. ABVS detected synovial hypertrophy in 10 MCP joints and 13 wrist joints whereas conventional US detected synovial hypertrophy in 11 MCP joints and 13 wrist joints. Kappa coefficient of synovial hypertrophy was 0.84 in MCP joints and 0.78 in wrist joints, respectively. ABVS detected bone erosion in 2 MCP joints and 5 wrist joints whereas conventional US detected bone erosion in 5 MCP joints and 6 wrist joints. Kappa coefficient of bone erosion was 0.56 in MCP joints and 0.90 in wrist joints, respectively.

Conclusion: Present data have shown a substantial agreement of ABVS with conventional US to find the synovial hypertrophy and bone erosion of wrist and finger joints in patients with RA. Since ABVS can be used to scan the wrist and finger joints automatically in a short time, ABVS is a helpful new ultrasonic method to examine joint injury in patients with RA.

Disclosure: S. Y. Kawashiri, None; T. Suzuki, None; Y. Nakashima, None; A. Okada, None; N. Iwamoto, None; K. Ichinose, None; K. Tamai, None; K. Arima, None; H. Nakamura, None; T. Origuchi, None; M. Uetani, None; K. Aoyagi, None; A. Kawakami, None.

1046

Automated Breast Volume Scanner (ABVS), a New Automated Ultrasonic Device, Is Useful to Examine Joint Injury in Patients with Rheumatoid Arthritis. Shin-ya Kawashiri1, Takahisa Suzuki2, Yohshikazu Nakashima1, Akito Okada3, Naoki Iwamoto4, Kenhiro Ichinose1, Mami Tanaka1, Kazuhiko Arima2, Hideki Nakamura1, Tomoki Origiuchi1, Masatada Uetani1, Kiyoshi Aoyagi1 and Atsushi Kasamukai1.

Background/Purpose: Automated Breast Volume Scanner (ABVS) is an ultrasonic device to be developed for the automated scanning for mammary glands. We have tried to explore the clinical application of ABVS toward the synovial lesion in patients with rheumatoid arthritis (RA).

Methods: Ten active RA patients of mean 54 y.o., whose mean disease duration 15 months and DAS28-ESR 5.69, were recruited. Patients gave their informed consent to be subjected to the protocol that was approved by the Institutional Review Board of Nagasaki University. We have examined in total 100 (112 swollen, 20 non-swell) ankle joints as well as 20 wrist joints at dorsal sites by both ABVS (ACUSON S2000) and conventional ultrasonography (US) at the same day consecutively. ABVS was scanned in a water tank. Presence of synovial hypertrophy and bone erosion by gray-scale were examined by both methods, and the association of both methods was calculated by kappa coefficient.

Results: The scanning time of ABVS was 2 min per patient and that of conventional US was 15 min per patient, respectively. ABVS detected synovial hypertrophy in 10 MCP joints and 13 wrist joints whereas conventional US detected synovial hypertrophy in 11 MCP joints and 13 wrist joints. Kappa coefficient of synovial hypertrophy was 0.84 in MCP joints and 0.78 in wrist joints, respectively. ABVS detected bone erosion in 2 MCP joints and 5 wrist joints whereas conventional US detected bone erosion in 5 MCP joints and 6 wrist joints. Kappa coefficient of bone erosion was 0.56 in MCP joints and 0.90 in wrist joints, respectively.

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Disclosure: S. Y. Kawashiri, None; T. Suzuki, None; Y. Nakashima, None; A. Okada, None; N. Iwamoto, None; K. Ichinose, None; K. Tamai, None; K. Arima, None; H. Nakamura, None; T. Origuchi, None; M. Uetani, None; K. Aoyagi, None; A. Kawakami, None.
**Background/Purpose:** Carpal tunnel syndrome (CTS) is a common neuropathy affecting the median nerve. CTS occurs more frequently in inflammatory arthropathies, such as rheumatoid arthritis (RA). This may relate to the presence of tenosynovitis in the wrist. Patients with tenosynovitis might be better treated conservatively with a diagnostic rheumatological consultation and other non-surgical methods, such as a glucocorticoid injection. However, flexor tenosynovitis at carpal tunnel level is not always easy to detect at clinical examination, but may be detected reliably by ultrasonography (US). Our aim was to determine the presence of tenosynovitis detected at US in idiopathic CTS patients referred for surgery and to compare this with the peroperative evaluation and histological findings.

**Methods:** The wrists of 34 consecutive idiopathic CTS patients, with an indication for carpal tunnel release, were assessed before surgery with grey-scale US (GSUS) and power Doppler US (PDUS) at the volar aspect of the wrist. Flexor tenosynovitis was scored according to OMERACT US definitions. During surgery, tenosynovitis was evaluated by the surgeon according to a three-grade tenosynovitis classification system. Biopsy specimens were obtained in 28 patients; tenosynovitis was scored histologically by a pathologist according to a three-grade scoring system.

**Results:** US Tenosynovitis was detected in 59% of the patients. Operative, surgical tenosynovitis was detected in 88% of the patients. The pathologist found minor tenosynovitis in 17% of the patients, while 79% showed reactive changes (Table 1). The agreement between the respective modalities is presented in tables 2 and 3.

**Table 1. Prevalence of tenosynovitis**

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Surgery</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS +</td>
<td>59%</td>
<td>46%</td>
<td>17%</td>
</tr>
<tr>
<td>TS +/-</td>
<td>N.A.</td>
<td>42%</td>
<td>79%</td>
</tr>
<tr>
<td>TS -</td>
<td>41%</td>
<td>12%</td>
<td>4%</td>
</tr>
<tr>
<td>- TS: Tenosynovitis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- For surgery and histology TS +/- is grade 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Comparison US-Surgery**

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Surgery</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS+</td>
<td>17</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>TS -</td>
<td>13</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Surgical TS: Grade 1 + grade 2. Histological TS: Grade 2 (expert opinion)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3. Comparison US-Histology**

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Surgery</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS+</td>
<td>4</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>TS -</td>
<td>1</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Surgical TS: Grade 1 + grade 2. Histological TS: Grade 2 (expert opinion)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** In idiopathic CTS patients undergoing surgery, frequently tenosynovial changes are found at US and surgical evaluation, but histology did not confirm this entirely. Tenosynovitis was seen, histologically, in only a minority of all cases. However, reactive changes can be observed in a large number of cases and this could also be the basis of the surgical and ultrasonographic findings. The exact definition of tenosynovitis in these three modalities needs further investigation.

**Disclosure:** D. F. Ten Cate; None; N. Glaser; None; J. J. Luime; None; K. H. Lam; None; J. W. G. Jacobs; None; R. W. Selles; None; J. Hazes; None; M. Bertleff; None.

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**1049 The Prevalence of the Ultrasonographic Positive Power Doppler Synovitis Is High and Predicts the Risk of Relapse and Structural Progression in Rheumatoid Arthritis in Clinical Remission: A Systematic Literature Review and Meta Analysis.**

Huong Nguyen¹, Adeline Ruyssen-Witrand², Arnaud L. Constantin³, Violaine Foltz⁴, Frédérique Gandjbakhch⁵ and Alain G. Cantagrel⁶.

¹Purpan University Hospital, Toulouse, France, ²Pitié Salpêtrière Hospital, Paris, France

**Background/Purpose:** Ultrasonography (US) can detect synovitis in patients with rheumatoid arthritis (RA) more sensitively than clinical examination either in active disease or in remission.¹,² There are many definitions of clinical remission, no consensus on US assessment of RA activity and the clinical implication of residual US synovitis is hotly debated.¹,³ This study is to assess the prevalence of residual US synovial hypertrophy (USGS+) and US power Doppler (PD) activity in patients in clinical remission and evaluate the predictive value of this residual synovitis in terms of relapse and structural progression.

**Methods:** A systematic literature search was performed in the Medline, Embase and Rheumatology meeting databases up to 28 May 2012. The prevalence of USGS+, cold synovitis (USGS+/PD-) and active synovitis (USGS+/PD+) and complete remission (USGS-/PD-) were collected taking into account the definition of clinical remission, the stage of RA (early or established disease) and the US examination method. A meta-analysis assessing the risk of relapse or structural progression in patients with USGS+/PD+ compared to other patients was performed calculating the odds ratio (OR[95%CI] and 95% confidence interval [95%CI]) with the Mantel-Haenszel method.

**Results:** 18 studies including 1528 patients were included in this systematic literature review. All of the studies used the OMERACT method for US scoring. The prevalence of US GS+, USGS+/PD-, USGS+/PD+ and USGS-/PD- were 81.8%, 40%, 43% and 15.7%, respectively. USGS+ or USGS+/PD+ prevalence was comparable between the different definitions of clinical remission (DAS44, DAS28, SDAI, ACR 1981 or ACR/EULAR 2011) and between the different US examination methods (from 5 to 44 joints assessed). The prevalence of USGS+ and USGS+/PD+ was higher in the patients with established RA in comparison to patients with early RA (respectively 87% of USGS+ compared to 64%, p<0.001 and 45% of USGS+/PD+ compared to 34%, p<0.001). According to the results of the meta-analysis performed on 4 studies³ -¹⁰ (including 178 patients) and 3 studies³,⁹,¹⁰ (including 173 patients), the presence of USGS+/PD+ was associated with an increased risk of relapse (OR[MRI][95%CI]=2.9, [1.5,5.9], p=0.002) and an increased risk of structural progression (OR[95%CI]= 12.8, [1.3, 126.8], p=0.03), respectively, over 1 to 2 years.

**Conclusion:** The prevalence of residual US synovitis is high in patients in clinical remission. Residual USGS+/PD+ increase the risk of relapse and structural progression in these patients.

**Disclosure:** H. Nguyen; None; A. Ruyssen-Witrand; None; A. L. Constantin; None; V. Foltz; None; F. Gandjbakhch; None; A. G. Cantagrel; None.

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**1050 Assessment of Validity of Magnetic Resonance Imaging Measures of Joint Inflammation and Damage in Rheumatoid Arthritis Wrist/Hand - A Systematic Literature Review.**

TQ Woodward¹, O. Morgachëva², OM Troum³, OL Pimienta³, P. Maranian³, V.K. Ranganath² and D.E. Furst².

¹Visiting Clinical Researcher, David Geffen School of Medicine, UCLA, Los Angeles, CA, ²David Geffen School of Medicine, UCLA, Los Angeles, CA, ³USC Keck School of Medicine, Santa Monica, CA

**Background/Purpose:** Limitation of x-ray joint damage is a key indicator of therapeutic efficacy in rheumatoid arthritis (RA). Although magnetic resonance imaging (MRI) is increasingly used due to its greater sensitivity vs radiographs, summary evidence validating MRI features of RA joint inflammation and damage is lacking. By systematic literature review (SLR), we examined the validity of MRI for assessment of RA wrist/hand features according to Outcome Measures in Rheumatology Clinical Trials (OMER- ACT) criteria.

**Methods:** An SLR in PubMed with Cochrane hedge was conducted using search terms: RA, AND MRI, AND specific terms i.e., synovitis, joint space narrowing (JSN), erosions or bone marrow edema (BME), AND humans AND randomized controlled trials [RCTs], clinical studies; 1970 to Aug 2011; English. Pairs of authors evaluated titles/abstracts, selecting articles for extraction according to these criteria: adults with RA, MRI of hands and/or
wrist arthralgia in at least one of the following: synovitis, BME/osteitis, tenosynovitis, erosions, JSN; RCT, observational study, or case series ≥10 patients. To achieve ≥ 95% consistent data extraction, authors evaluated the same 5 articles, ensuring consensus on data extraction methods. Each author then extracted a proportion of the articles. Data extracted included MRI, field measurements, and validity criteria: criterion, content, construct, reliability, responsiveness, and discrimination. Level of evidence was assessed using Cochrane Handbook criteria, adapted for imaging research.

**Results:** Of 575 MRI titles/abstracts, 180 met criteria with 81 having at least 1 type of validation. Although MRI measurement methods were developed using several approaches, OMERACT RA MRI scoring (RAMRIS) was determined to be the dominant method. As 43 articles utilized 1.5T and 7 used other field strengths; only 1.5T articles were analyzed. (Table 19) articles including 6 RCTs using 1.5T and RAMRIS were excluded seeking validation of MRI measures. The table summarizes the number of articles with data for validation. Histologic or radiographic evidence for criterion validity was extracted from 5 other articles.

**Table.** Validation status for measurement with 1.5T MRI images of synovitis, tenosynovitis, osteitis, erosions, joint space narrowing (JSN)—number of articles providing data

<table>
<thead>
<tr>
<th>Type of validity</th>
<th>Critical validation</th>
<th>Content validation</th>
<th>Construct validity</th>
<th>Construct relatedness</th>
<th>Responsiveness to change</th>
<th>Intermethod reliability or validity</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>STMR (1.5T)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>STMR (1.5T)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STMR (1.5T)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Synovitis</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Tenosynovitis</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Osteitis/BME</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Erosions</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>JSN</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1) =statistically significant validation; 0 =no significant data; ICC = intraclass correlation coefficient

**Conclusion:** Using a rigorous PRISMA-compliant method for quality assurance and uniform article extraction in a SLR, we found that synovitis, osteitis/BME, and erosions are the best-validated features of joint inflammation and damage for RA wrist and hand. Assessment of other measurement methods, field strengths and joints requires further work.


**Disclosure:** T. Woodworth, None; O. Morigacheva, None; O. Troum, Genetech, 2; Genetech, 5; O. Pimenta, None; P. Maranian, None; V. K. Ranganath, UCB, BMS, Celgene, 2; UCB, 5; D. E. Furst, BMS, Centocor, UCB, Genetech, Amgen, 2, BMS, Centocor, UCB, Aragen, Abbott, 5.

1051

**Magnetic Resonance Imaging in Inflammatory Bowel Disease Patients with Arthralgia.** W. Stomp, 1; L.K.P.M. Brakenhoff, 2; F.A. van Gaalen, 3; D. van der Heijde 1, H.H. Fidder 1, D.W. Hommes 3, M. Reijnierse 1 and J.L. Adachi 6. 1McMaster University, Hamilton, ON, 2;Northern Ontario School of Medicine, Sudbury, Qatar, 3;Hamilton Health Sciences, Hamilton, 4;Hamilton Health Sciences, Hamilton, ON, 5;St. Joseph’s Health Care, Hamilton, ON, 6;Charlton Medical Centre, Hamilton, ON.

**Background/Purpose:** In rheumatoid arthritis (RA), disparities between erosive bone lesion detection on magnetic resonance imaging (MRI) and X-ray require reconciliation. It is hypothesized that early erosions detectable on MRI increase in size with disease progression to become detectable on radiography (X-ray). The study’s objectives were 1) to compare the relative diagnostic test accuracy of X-ray for MRI-detected erosions and 2) to determine if MRI erosions develop into X-ray erosions over time.

**Methods:** A systematic review was conducted. Medline (Jan 1996-Apr 2011) and EMBASE (Jan 1988-Apr 2011) citation indexes were searched to determine if MRI erosions develop into X-ray erosions over time.

**References**

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**Systematic Review of the Association Between Magnetic Resonance Imaging and Radiographic Detection of Erosions in Rheumatoid Arthritis.** Ruben Tavares 1, Stephen R. Tytus 2, Karen A. Beattie 1, Maggie Larche 1, Naveen Parasa 1, Colin E. Webber 4, Lawrence E. Hart 3 and Jonathan D. Adachi 1. 1;McMaster University, Hamilton, ON, 2;Northern Ontario School of Medicine, Sudbury, Qatar, 3; Hamilton Health Sciences, Hamilton, 4;Hamilton Health Sciences, Hamilton, ON, 5;St. Joseph’s Health Care, Hamilton, ON, 6;Charlton Medical Centre, Hamilton, ON.

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**Methods:** A systematic review was conducted. Medline (Jan 1996-Apr 2011) and EMBASE (Jan 1988-Apr 2011) citation indexes were searched to determine if MRI erosions develop into X-ray erosions over time.

**Results:** Sixteen eligible studies reporting 34 unique datasets comprising 10,953 paired observations were included. The relative diagnostic test accuracy results were heterogeneous across studies. Sensitivity results ranged from 0.00 (95% CI: 0.00–0.04) to 0.87 (95% CI: 0.60–0.98). Average sensitivity weighted by study sample size was 0.28 (95% CI: 0.28–0.29). Specificity ranged from 0.38 (95% CI: 0.14–0.68) to 1.00 (95% CI: 0.99–1.00). The weighted mean specificity was 0.97 (95% CI: 0.97–0.97). The sensitivity of X-ray for MRI erosions appeared to increase with increasing symptom duration. Specificity ranged from 0.07 (95% CI: 0.00–0.24) for patients with a mean symptom duration of 0.25 years, to 0.34 (95% CI: 0.20–0.51) for patients with 14 years symptom duration. Specificity decreased slightly with increasing symptom duration. Specificity ranged from approximately 0.99 (95% CI: 0.97–1.00) to 0.92 (95% CI: 0.88–0.95) for gadolinium sequences. MRI images were evaluated by two musculoskeletal radiologists in consensus for the presence of synovitis, tenosynovitis, bone marrow edema and erosions. The readers were blinded for all patient information.

**Results:** MR imaging of the MCP,PIP and/or DIP 2–5 joints of the hand was performed in 10 patients and 10 matched controls, MRI of the knee in 4 patients and 4 matched controls. A total amount of 62 painful joints were evaluated and 62 corresponding joints in the control group. Minimal synovitis was seen in one of the MCP joints in two of the arthralgia patients (3.2% of all painful joints) and in none of the control group (p = 0.50). Bone marrow edema was not appreciated in the arthralgia patients, but a small amount of bone-marrow edema was seen in a MCP joint of a control (1.6% of total joints, p = 1.00). Tenosynovitis and erosions were absent in both groups.

**Conclusion:** Subclinical inflammation on MRI was not seen more often in painful joints in arthralgia patients than in joints of controls. No anatomical substrate was found for arthralgia in IBD patients.
symptom durations ranging from 0.25 to 9.5 years, respectively. Studies varied by sample symptom duration, anatomy investigated, MRI magnetic strength, definition of erosion, number of X-ray projections, use of prescriptive scoring systems, number of raters, unit of analysis, and QUADAS parameters.

**Conclusion:** X-ray has low sensitivity and high specificity for MRI erosions. The relationship between X-ray and MRI erosion detection is dependent on symptom duration and the time interval between tobiymaging interventions. As the time between initial MRI and follow-up X-ray increases, there is decreasing specificity of X-ray for MRI erosions. This suggests that erosive progression is not limited to joints initially detected on MRI. Sources of study heterogeneity and potential bias warrant attention in future comparative investigations.

**Disclosure:** R. Tavares, None; S. R. Tytus, None; K. A. Beattle, None; M. Larche, None; N. Parasu, None; C. E. Webber, None; L. E. Hart, None; J. D. Adachi, None.

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**1053**

**Severe Joint Injury Assessed by Musculoskeletal Ultrasonography (MSKUS) Predicts the Presence of MRI-Proven Osteitis in Patients with Rheumatoid Arthritis.**

Shin-ya Kawashiri, Y. Nakashima, Mami Tamai, Hideki Nakamura, Kiyoshi Aoyagi, Atsushi Kawakami, Nakagaki University Graduate School of Biomedical Sciences, Nagasaki, Japan; Nakagaki University, Nagasaki, Japan

**Background/Purpose:** MRI-proven osteitis is known as the prognostic factor toward radiographic progression in patients with rheumatoid arthritis (RA). Musculoskeletal ultrasonography (MSKUS) is another high sensitive imaging modality to find joint injury of RA patients. We have tried to explore whether MSKUS assessment of synovial joint injury predict the presence of MRI-proven osteitis in patients with RA.

**Methods:** Thirty RA patients, who fulfilled 2010 RA classification criteria and are naïve to disease-modifying antirheumatic drugs (DMARDs) were evaluated by MSKUS including biologics or glucocorticoids, are consecutively enrolled in this study from May 2010 through December 2011. Twenty-two joints from each patient including bilateral wrists and finger joints of the 1st-, 5th-metacarpophalangeal (MCP) joints, the 1st interphalangeal (IP) joint and the 2nd-5th proximal interphalangeal (PIP) joints were examined by both MSKUS and plain MRI. Therefore, a total of 660 joints were investigated by both methods in the present study. Power Doppler (PD) and gray scale (GS) assessment of articular synovitis by a semi-quantitative manner as well as the presence of bone erosion were examined by MSKUS. Plain MRI-proven osteitis was evaluated by RAMRI scoring (RAMRIS) technique. The Cochran-Armitage test was used to investigate a correlation of each MSKUS finding with MRI-proven osteitis.

**Results:** The mean disease duration, age, DAS28-ESR, prevalence of RF and anti-cyclic citrullinated peptide antibodies (ACPA) at examination were 4 months, 62 years-old, 5.06, 83.3% and 73.3%, respectively. MSKUS-proven bone erosion was found in 40 sites and MRI-proven osteitis 64 sites, respectively. A remarkable correlation of the PD grade (p < 0.0001), GS grade (p < 0.0001) and the presence of MSKUS-proven bone erosion (p < 0.0001) with the presence of osteitis was demonstrated by the Cochran-Armitage test.

**Conclusion:** Our present data suggest that severe joint injury assessed by MSKUS predicts the presence of MRI-proven osteitis in patients with rheumatoid arthritis.

**Disclosure:** S. Y. Kawashiri, None; T. Suzuki, None; Y. Nakashima, None; Y. Horai, None; N. Iwamoto, None; K. Ichinose, None; K. Arima, None; M. Tama, None; H. Nakamura, None; T. Orighu, None; K. Aoyagi, None; A. Kawakami, None.

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**1054**

**Diffusion Tensor and Dynamic Contrast Enhanced Perfusion Imaging Metrics Discriminate Chronic Tubercular Synovitis From Chronic Inflammation of the Knee.**


**Background/Purpose:** The study was performed to quantify dynamic contrast enhanced (DCE) and diffusion tensor imaging (DTI) metrics in synovium of patients with tubercular synovitis (TS) and chronic inflammatory synovitis (CIS) with an aim to discriminate between TS and CIS.

**Methods:** Seventy-three patients with knee synovitis (18–75 years, 51 Male) underwent conventional, DTI and DCE-MRI. DTI and DCE data were quantified from the segmented contrast enhanced synovium. Descriptive statistics, Box-plot with Tukey’s hinges were produced for all DTI (fractional anisotropy, FA and mean diffusivity, MD) and perfusion metrics (blood volume, BV; blood flow, BF and volume transfer constant, ktrans). The mean difference between the two groups was compared using Student’s t-test for independent samples. To classify subjects into TS and CIS, two-group discriminant function analysis with stepwise inclusion of variables was performed.

**Results:** Out of 73 patients, 15 were detected to have TS, while rests were found to have CIS. DCE (BV, BF) and DTI metrics (FA, MD) were significantly (p<0.001) different between the two groups (TS: BV=14.35±4.21 ml/100g, CIS BV=4.57±2.77 ml/100g, TS BF=153.7±29.5 ml/100g/mm, CIS BF=94.9±34.5 ml/100g/mm, TS FA=0.26±0.02, MD=1.22±0.39×10−3 mm²/sec −1; CIS FA=0.20±0.02, MD=1.75±0.5×10−3 mm²/sec −1). Discriminant analysis revealed BV and FA as discriminators of TS and CIS. It classified 93.3% of TS and 100% of CIS correctly. The overall model classified 98.6% cases correctly.

**Conclusion:** DTI and DCE-MRI metrics are able to discriminate TS from CIS. FA and BF may be used as non-invasive image biomarkers for its differentiation.

**Disclosure:** V. Agarwal, None; R. K. Gupta, None; R. Awasthi, None; D. Tripathi, None; P. Sahoo, None; V. A. Sahoo, None; K. Sharma, None; R. Marak, None; R. K. S. Rathore, None; C. Pandey, None.

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**ACR/ARHP Poster Session B**

**Innate Immunity and Rheumatic Disease**

Monday, November 12, 2012, 9:00 AM-6:00 PM

**1055**

**Sec61 Is Indispensable for Antigen Cross-Presentation and the Development of Lupus Nephritis: A Novel ‘Self-Organized Criticality Theory’ Explaining the Cause of Systemic Lupus Erythematosus (SLE).**

Ken Tsumiyama and Shunichi Shiozawa. Kyushu University Beppu Hospital, Beppu, Japan

**Background/Purpose:** We found that systemic lupus erythematosus (SLE) was induced experimentally by repeatedly immunizing the mice normally not prone to autoimmune diseases by any exogenous antigen so far examined (Tsumiyama K et al. PLoS One 4(12):e8382, 2009). We have then proposed a novel ‘self-organized criticality theory’ that explains the cause of SLE. Systemic autoimmunity, or SLE, necessarily takes place when host’s immune system is overstimulated by repeated exposure to antigen to levels that surpass the immune system’s stability limit, i.e., self-organized criticality. The autoreactive lymphocyte clones, which we name autoantibody-inducing CD4⁺ T cells (aCD4⁺ T cells) are newly generated via de novo T cell receptor (TCR) revision from thymus-passed non-autoreactive clones at peripheral lymphoid organs. They not only stimulated B cells to generate varieties of autoantibodies but also helped final differentiation of CD8⁺ T cell into cytotoxic T lymphocyte (CTL) via antigen cross-presentation to induce tissue injuries identical to SLE. Here we show the essential role of a translocon Sec61 for antigen cross-presentation and lupus tissue injuries with regard to self-organized criticality theory.

**Methods:** Bone marrow-derived dendritic cell (BMDC) of BALB/c mice was cultured with fluorescent-labeled ovalbumin (OVA). Early endosome antigen 1 (EAA1) and calnexin were detected by using immunofluorescent staining to identify endosome and endoplasmic reticulum (ER), respectively. A translocon Sec61 was also detected to examine whether or not engulfed antigen is exported from endosome to cytoplasm through Sec61. For in vivo study, BALB/c mice were repeatedly immunized with OVA to induce SLE. The CD11c⁺ DC isolated form spleen (spDC) of the mice immunized 12× with OVA was cultured with fluorescent-labeled OVA to examine localization of engulfed antigen. Localization of OVA, EAA1, calnexin and Sec61 in BMDC and spDC was examined using confocal laser microscopy. Further our study showed that Sec61 was co-immunized with OVA to inhibit Sec61 in vivo in BALB/c mice. Renal lesion and the generation of CTL were assessed by proteinuria and the number of IFN-γ producing CD8⁺ T cell.

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Results: In BMDC, OVA was co-localized with an endosomal marker EEA1 until 15 min of culture, and subsequently separated from EEA1. OVA did not co-localize with an ER marker calnexin. Instead, OVA was co-localized with a translocon Sec61. The same result was obtained using sPDC, suggesting that OVA could be exported from endosome directly to cytoplasm via Sec61. After repeated immunization with OVA, we found that the amount of Sec61 localized in endosome was gradually and significantly increased compared with control. While we showed previously that antigen cross-presentation is a pre-requisite for lupus tissue injury inducing nepritus, we did find that treatment of BALB/c mice with a Sec61 inhibitor exotoxin A inhibited both the generation of CTL and lupus nepritus.

Conclusion: Direct export of antigen from endosome to cytoplasm via Sec61 is essential not only for antigen cross-presentation but also development of lupus nepritus.

Disclosure: K. Tsumiyama, None; S. Shiozawa, None.

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Fc Receptor Gamma-Dependent Autoimmune Endocarditis in K/BxN Mice. Patricia M. Hobday1, Jennifer L. Auger2, J. Sjef Verbeek3, Jeffrey V. Ravetch3 and Bryce A. Binstadt4. 1University of Minnesota, Minneapolis, MN; 2Leiden University Medical Center, Leiden, Netherlands; 3The Rockefeller University, New York, NY

Background/Purpose: Arthritis and endocarditis co-exist in several human rheumatic diseases, including systemic lupus erythematosus, rheumatic fever, and rheumatoid arthritis. K/BxN TCR transgenic mice, well known for their inflammatory arthritis, also develop spontaneous endocarditis. FeRγ, the cytoplasmic signaling molecule shared by the three activating Fcγ receptors in the mouse (FcγRI, II, and III), is key to the presence of antibodies bound to the inflamed cardiac valves.

Results: Although IgG1 is the predominant autoantibody isotype in K/BxN mice, we found that IgG1, IgG2b, and IgG2c were all bound to their inflamed cardiac valves. We also detected expression of each of the activating Fcγ receptors in the cardiac valves of K/BxN mice lacking expression of FcγRII, FcγRIII, or FcγRIV developed endocarditis with equivalent severity to control mice. The bone marrow transplant experiments revealed that recipient mice lacking FcγRI were protected from endocarditis. Surprisingly, the presence or absence of FcγRI on bone marrow-derived donor cells did not influence the severity of endocarditis.

Conclusion: Our results indicate that no single activating Fcγ receptor is solely required for the development of endocarditis in K/BxN mice. The simplest explanation for these findings is that there is redundancy among the activating Fcγ receptors in driving endocarditis. This interpretation is consistent with our data showing that multiple immunoglobulin isotypes are bound to the inflamed valves and that each of the activating Fcγ receptors can be detected in the valves. A less likely explanation is that an Fcγ-R utilizing receptor type other than the activating Fcγ receptors is at play. We also conclude that FcγRII chain expression by radio-resistant host cells rather than by radio-sensitive, bone-marrow derived cells is required for the development of endocarditis. Candidate cell types include cardiac stromal cells and/or radio-resistant dendritic cells. Our findings provide new insight into the pathogenesis of cardiovascular inflammation in the setting of autoantibody-associated diseases.

Disclosure: P. M. Hobday, None; J. L. Auger, None; J. S. Verbeek, None; J. V. Ravetch, None; B. A. Binstadt, None.

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A Specific Inhibitor of Spleen Tyrosine Kinase, PRT062607, Is a Potent Modulator of Innate Immune Cell Function. Lynn A. Kamen, Jillian Stephens, Anjali Pandey and Uma Sinha. Portola Pharmaceuticals, South San Francisco, CA

Background/Purpose: Tumor Necrosis Factor-α (TNF-α) is an essential component of the inflammatory stimuli leading to rheumatoid arthritis (RA). Therapeutics targeting TNF-α are the standard of care but are not always capable of inhibiting disease progression. Thus, there is an unmet need for novel targets for treatment of RA. Spleen tyrosine kinase (Syk) is a non-receptor tyrosine kinase that plays an important role in phagocyte (macrophage and neutrophil) activation. Phagocytes are known to be important in the pathology of RA; the purpose of this study was to evaluate the impact of Syk inhibition in modulating phagocyte activation.

Methods: Macrophages were generated by culturing peripheral blood monocytes from healthy human volunteers with M-CSF (5ng/mL) for five days. Neutrophils were isolated from human peripheral blood on a Ficoll gradient and separated from erythrocytes via dextran sedimentation. As a surrogate for pathogenic autoantibodies in the arthritic synovial joint, immune complex was used for activation of macrophages and neutrophils. Immune complex was prepared by preincubating chicken egg ovalbumin with goat anti-chicken egg ovalbumin IgG at 37°C. To mimic integrin-mediated activation, plate-bound poly-RGD (20 µg/mL) was used as a stimulus. TNF-α release from macrophages was measured via ELISA (R and D Systems). The SOD-inhibitable oxidative burst response in neutrophils was measured through cytochrome c reduction in a plate-based absorbance assay. Specific Syk inhibitor, PRT062607 (PS05-15) was added in vitro to the experimental system containing human macrophages or neutrophils.

Results: Syk inhibition by PRT062607 suppressed inflammatory cytokine release. Cytokine levels, as measured by TNF-α release from macrophages stimulated with immune complex, was potently inhibited by PRT062607 (IC50=0.070µM). Furthermore, PRT062607 treatment was a potent inhibitor of neutrophil-mediated superoxide production in response to various physiologically relevant stimuli (integrin ligation IC50=0.037µM and immune complex stimulation IC50=0.195µM). Interestingly TNF-α alone was able to facilitate neutrophil-mediated superoxide production, and this activity was potently suppressed by PRT062607 (IC50=0.065µM).

Conclusion: Together these data indicate a novel role for Syk inhibition in controlling TNF-α-mediated inflammation. These results suggest that in addition to decreasing immune cell activation and inflammation in the joint, Syk inhibition could also partly mimic the effects of an anti-TNF-α therapy. Thus, Syk inhibition by a small molecule kinase inhibitor has the potential to be a novel mode of therapy in RA.

Disclosure: L. A. Kamen, Portola Pharmaceuticals Inc, 1; G. Stephens, Portola Pharmaceuticals, 3; A. Pandey, Portola Pharmaceuticals, 1; U. Sinha, Portola Pharmaceuticals, 1.

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Background/Purpose: Macrophage Activation Syndrome (MAS) is a potentially lethal cytokine storm syndrome that complicates various rheumatic diseases. We have previously shown that Toll-like Receptor (TLR9) mediated MAS is Interferon gamma (IFNg) dependent, and others have demonstrated IFNg-dependence in models of Hemophagocytic Lymphohistiocytosis. We have also shown the critical role of IL-10 in regulating TLR9-induced MAS, and mice co-treated with TLR9-agonism and IL-10 receptor blockade (IL10RB) develop “fulminant MAS.” This study seeks to determine the role of IFNg in the fulminant MAS model.

Methods: We gave CpG1826 repeatedly to WT and transgenic mice as described. Antibodies inhibiting the action of the IL-10 receptor (IL10RB, 1B1.3A) and IL-12p40 (C17.8) were given as described. All injections were intraarterioenal. We then evaluated for signs of MAS.

Results: Fulminant MAS resulted in greatly enhanced serum IL-10, IL-12, and IFNg. While dendritic cell populations were dominant producers of IFNg in the IL-10 sufficient scenario, other proinflammatory forces were at work. Administration of CpG and IL10RB to IFNg−/− mice resulted in fulminant MAS nearly comparable to that seen in WT mice. Notably,
IFN-γ−/− mice were spared from severe anemia and severe hepatitis but developed all other aspects of fulminant MAS including HPCs. Thus, while certain aspects of disease (anemia and hepatitis) are IFNγ-dependent, fulminant MAS, including hemophagocytosis, occurs independent of IFNγ. Interestingly, blockade of type I interferon signaling (using IFNAR−/− mice) did not prevent disease in the IL-10‐deficient situation, but partially abrogated fulminant MAS. HPCs also persisted despite Type I IFN receptor blockade.

Conclusion: In the TLR9‐meditated model, IL‐12 functions to induce IFNγ. However, fulminant MAS is largely IFNγ‐independent. This suggests that therapeutic targeting of IFNγ may not be sufficient in all cases of hemophagocytic syndrome. Furthermore, our results dissociate the development of IFNγ‐induced “consumptive” anemia and hepatitis, and the presence of HPCs. Thus, the goal of chemotherapeutic elimination of HPCs may not be of benefit for many aspects of the disease, since their presence does not correlate with either anemia or hepatitis.

Disclosure: S. W. Canna, None; J. Wrobel, None; P. A. Kreiger, None; M. E. Paessler, None; E. M. Behrens, None.

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Endogenous Complement Factor H Plays an Important Role in Controlling Immune Complex‐Induced Inflammatory Arthritis. Nirnalk K. Banda1, Gaurav Mehta1, Vивiana P. Ferreira2, Claudio Cortes2, Michael K. Pangburn3, William P. Arend4 and V. Michael Holers5. 1University of Colorado School of Medicine, Aurora, CO, 2University of Toledo Health Science Campus, Toledo, OH, 3University of Texas Health Sciences Center, Tyler, TX

Background/Purpose: The complement system, a major component of innate immunity, likely plays an important role in the pathogenesis of rheumatoid arthritis (RA). Factor H (FH) is an endogenous regulator of the alternative pathway (AP) that binds surface polyanions in combination with the C3‐derived fragments C3b and C3d initially through its carboxy‐terminal domain containing short consensus repeats (SCR) 19–20, thereby inhibiting both AP activation and engagement of the AP amplification loop. We have shown that the AP is uniquely both necessary and sufficient for the development of collagen antibody‐induced arthritis (CAIA) in mice. However, the mechanisms whereby normal control of the AP is overcome and injury develops are unknown. The hypothesis pursued in the current studies is that FH plays a critical role in regulating the AP in immune complex‐initiated injury in CAIA. We have examined the role of FH in CAIA by inhibiting its binding to tissues through administration of a recombinant dominant negative inhibitor containing murine SCR19–20 (rfH19–20), which impair FH surface AP regulation, and the use of gene‐targeted FH deficient mice.

Methods: CAIA was induced in C57BL/6 WT, FH−/− and FH+/+ mice by injecting four anti‐type II collagen (CII) mAbs i.p. on day 0 and lipopoly‐saccharide (LPS) i.p. on day 3. Intrapertitoneal injections of 100 and 300 μg/mouse of rhFH19–20 were carried out 15 min after the injection of mAb to CII on day 0 and again 15 min after LPS on day 3. Blood was drawn intraorbital from all mice at day 0 prior to injection of mAb to CII, at day 3 prior to LPS injection, and at day 10 prior to sacrifice. All mice were sacrificed on day 10 for histopathologic scoring of injury and immunohistochemical analysis of C3 deposition. Control experiments were performed using rhFH1–5 which does not inhibit FH binding to tissues. The absolute levels of C3, FH and C5a in serum of mice were measured by ELISA.

Results: Both doses of rhFH19–20 significantly increased the clinical disease activity score (DAS) using a sub‐maximal dose (0.5 mg/mouse) of anti‐CII mAbs. Scores for histopathologic injury and C3 deposition on the surface of the cartilage and in the synovium increased with treatment in an identical fashion. No significant differences in the DAS were observed when WT mice were treated with 300 μg/mouse of control rhFH3–5, FH−/− mice, compared with WT mice, were resistant to CAIA due to the significantly reduced serum levels of C3, WT and FH−/− mice have identical serum levels of C3, but FH−/− mice have 30% reduced levels of FH. WT and FH−/− mice developed indistinguishable DAS using a sub‐maximal dose as well as a maximum dose (8 mg) of anti‐CII mAb. In addition, though, the DAS at day 10 in FH−/− mice treated with 300 μg/mouse of rhFH19–20 increased to 5.5 ± 0.65 compared with untreated FH−/− mice which was 1.75 ± 0.25 (p < 0.05).

Conclusion: We show for the first time that endogenous FH makes a significant contribution to regulating immune complex‐induced injury in CAIA through binding to target surfaces via SCR19–20 and blocking AP activation and amplification.

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Protein Kinase C Inhibitor Generates Human Tolerogenic Dendritic Cells That Induce Tr1 and Foxp3+ Regulatory T Cells. Takuya Matsu‐moto, Hitoshi Hasegawa, Jun Ishizaki, Koichiro Suemori, Sachiko Onishi and Masaki Yasukawa. Ehime University Graduate School of Medicine, Toon, Japan

Background/Purpose: Tolerogenic dendritic cells (tDCs) play a critical role in immune tolerance and are involved in the pathogenesis of autoimmune diseases such as rheumatoid arthritis. Suppression by tDCs is primarily mediated via the induction of regulatory T cells (Treg). tDCs are induced in the presence of specific biological agents. Therefore, we screened the molecules that enhanced induction of tDCs from the libraries of lipids, neutral receptor ligands, and kinase inhibitors. Of these, protein kinase C inhibitors (PKCIs) such as bisindolylmaleimide I, Go6983, and Ro32–0243, suppressed the expression of CD80, CD83, and CD86 on DCs and suppressed allogeneic T cell responses. In this study, we showed the characterization of PKCI‐treated human tDCs and application to the therapy for autoimmune diseases.

Methods: Mature DCs (mDCs) were prepared from human monocytes by treating with GM‐CSF and IL‐4 for 5 days, and then induced maturation with TNF‐alpha for 48h. PKCI‐treated tDCs were generated by adding bisindolylmaleimide I, Go6983, or Ro32–0243 during this process. We analyzed the cell surface expression on DCs, cytokine production, and phagocytic ability. Furthermore, we examined the effects of these molecules on stability and plasticity of DCs, antigen presenting, allogenic T cell responses, and induction of Tr1 and Treg cells.

Results: DCs treated with PKC inhibitors such as bisindolylmaleimide I, Go6983, and Ro32–0243 decreased the expression levels of CD40, CD80, CD83, CD86, and HLA class I significantly but not those of CD11a, CD11c, and HLA class II compared with mDCs. Moreover, PKCI‐treated tDCs produced 15–20‐fold and 2–4‐fold higher concentration of IL‐10 and TGF‐beta than mDCs, respectively, resulting in a strong reduction of allogeneic T cell responses. From the co‐culture of DCs and naïve T cells, PKCI‐treated tDCs induced IL‐10‐producing Tr1 cells and Foxp3+ regulatory T cells. PKCI‐treated tDCs retained phagocytic ability as well as immature DCs (iDCs). PKC I‐treated iDCs kept the low expression levels of CD80, CD83, and CD86 and suppressive properties at least one week after stimulated with proinflammatory cytokines or LPS, whereas iDCs recovered the similar expression levels to mDCs and did not have suppressive properties.

Conclusion: We showed that PKCI‐treated human DCs acted as a strong and stable tDCs. PKCI‐treated iDCs may be useful to the therapy for autoimmune diseases.

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1061
Generation of Myeloid‐Derived Suppressor Cells in Vitro From Murine Bone Marrow Precursors. Julia Kurko, Beata Tryniszewska, Tibor A. Rauch, Colt Egelston, Tibor T. Glant and Katalin Mikecz. Rush University Medical Center, Chicago, IL

Background/Purpose: Myeloid‐derived suppressor cells (MDSCs) are innate immune cells that expand under pathological conditions (such as cancer and autoimmune diseases) in response to local growth factors or cytokines. MDSCs are a heterogeneous population of immature myeloid lineage (monocyte‐like and granulocyte‐like) cells with immunosuppressive ability. These cells have the potential to down‐regulate autoreactive T cell responses in autoimmune diseases such as rheumatoid arthritis (RA). Using proteoglycan (PG)‐induced arthritis (P gia), a mouse model of RA, we previously reported that MDSCs are present in synovial fluid (SF) of the arthritic joints of mice and suppress antigen‐specific T cell proliferation. As the number of cells that can be collected from murine SF is limited and SF MDSCs do not expand in culture, we sought an alternative source for generating greater quantities of MDSCs for potential therapeutic intervention (via cell transfer) in P gia.

Methods: Bone marrow (BM) cells were isolated from naïve BALB/c mice and cultured in the presence of recombinant murine granulocyte macrophage‐colonystimulating factor (GM‐CSF), granulocyte colony‐stimulating factor (G‐CSF) and interleukin‐6 (IL‐6) for up to 7 days. After
harvest, the phenotype of cells was evaluated by flow cytometry. Their suppressive function towards PG-specific T cells was tested by co-culture with PG-loaded BM-derived dendritic cells (DCs) and T cells from naïve PG-specific T cell receptor transgenic (PG-TCR-Tg) mice. The mechanisms of MDSC-mediated suppression were investigated using inhibitors of MDSC-produced effector molecules including arginase-1, inducible nitric oxide (NO) synthase (iNOS), and reactive oxygen species. Expression of MDSC effector molecules was analyzed by RT–PCR and Western blot.

**Results:** Similar to SF MDSCs, BM-derived MDSCs expressed the common myeloid marker CD11b. However, unlike SF MDSCs, BM MDSCs contained a smaller population of Ly6G positive (granulocyte-like) cells, and the majority of them expressed both Ly6G and the monocytic cell surface marker Ly6C. Upon co-culture with PG-TCR-Tg T cells in the presence of PG-loaded DCs, BM MDSCs profoundly inhibited the proliferation of T cells, thereby confirming their suppressor activity. BM cells grown with GM-CSF, G-CSF, and IL-6 for only 3 days already showed potent suppressive effect on T cell proliferation. Despite expression of Ly6C by most BM MDSCs, these cells retained their suppressor activity after depletion of the Ly6C positive population. Experiments with inhibitors of MDSC effector molecules revealed that the primary mechanism of suppression of T cell proliferation was via NO release. Indeed, iNOS expression in BM MDSCs was found elevated at both mRNA and protein levels.

**Conclusions:** Utilizing unique and innovative structure-based drug design, we have rapidly discovered potent and selective IRAK4 inhibitors as potential drug candidates for the treatment of chronic rheumatic diseases.

**Disclosure:** D. Chaudhary, None; S. Robinson, None; C. E. Masse, None; M. D. Westen, None; W. Watts, None; R. Greenwood, None; M. Shelley, None; M. Brewer, None; G. Harriman, None; L. L. Frye, None; R. T. Wester, None; R. Kapeller, None; D. Romero, None.

1063 Dysfunction of Natural Killer and Natural Killer T Cells in Patients with Adult Onset Still’s Disease. Young-Nan Cho1, Sung-Ji Lee1, Jae-Jong Kim2, Hye-Mi Jin1, Dong-Jin Park1, Seung-Jung Kee1 and Yong-Wook Park1. 1Chonnam National University Medical School and Hospital, Gwangju, South Korea, 2Chonnam National University Medical School, Gwangju, South Korea

**Background/Purpose:** Adult onset Still’s disease (AOSD) is an uncommon systemic inflammatory disorder of unknown etiology. Natural killer (NK) cell dysfunction is frequently observed in some human autoimmune disease, such as systemic lupus erythematosus and rheumatoid arthritis. However, NK cell function has not previously been investigated in AOSD. Furthermore, the relation between NK and NKT cells has not been determined. Purpose of this study is to examine the levels and functions of NK and NKT cells, to investigate relationships between NK and NKT cells, and to determine the clinical relevance of NKT cell levels in patients with AOSD.

**Methods:** Patients with active untreated AOSD (n = 25) and age- and sex-matched healthy controls (n = 25) were enrolled in the study. NK and NKT cell levels were measured by flow cytometry. Peripheral blood mononuclear cells were cultured in vitro with α-galactosylceramide (α-GalCer). NK cytotoxicities against K562 cells and proliferation indices of NKT cells were estimated by flow cytometry.

**Results:** Percentages and absolute numbers of NK cells were significantly lower in the peripheral blood of patients than in healthy controls. Proliferative responses of NKT cells to α-GalCer were also lower in patients, and this was found to be due to proinflammatory cytokines and NK cell apoptosis. In addition, NK cytotoxicities were found to be significantly lower in patients than in healthy controls, but NK cell levels were comparable in the two groups. Notably, this NKT cell deficiency was found to be correlated with NK cell dysfunction and to reflect an active disease status. Furthermore, α-GalCer-mediated NK cytotoxicity, showing the interaction between NK and NKT cells, was significantly lower in patients than in healthy controls.

**Conclusions:** Our findings show that NKT cells are numerically and functionally deficient in AOSD. In addition, we report a novel observation that NK cell dysfunction is related to NKT cell deficiency. These findings provide important information concerning the pathogenesis of AOSD.

**Disclosure:** Y. N. Cho, None; S. J. Lee, None; T. J. Kim, None; H. M. Jin, None; D. J. Park, None; S. J. Kee, None; Y. W. Park, None.

1064 CD1c-Expressing Myeloid Dendritic Cells From Joints of Rheumatoid Arthritis Patients Produce Increased Levels of T Cell-Attracting Chemokines and Strongly Activate Autologous T Cells. F.M. Moret, C.E. Hack, F.P.G. Lefebre, R.D.J. Radstake and J.A.G. van Roon. University Medical Center Utrecht, Utrecht, Netherlands

**Background/Purpose:** Myeloid dendritic cells (mDCs) are potent T cell-activating antigen-presenting cells that have been implicated to play a crucial role in the regulation of tolerance and pro-inflammatory immune responses in many disease states, including rheumatoid arthritis (RA). Despite this, studies that have reported on the role of naturally occurring circulating mDCs in RA are scarce. Recently, CD1c mDCs from RA patients were suggested to migrate from the circulation to the joint where they exhibit a synovial phenotype. However, data on the capacity of these CD1c mDCs to regulate T cell activation in RA are lacking. The present study investigated the expression profiles of co-stimulatory molecules and pro-inflammatory mediators secreted by CD1c mDCs from synovial fluid (SF) versus peripheral blood (PB) of RA patients and studied their capacity to stimulate autologous CD4 T cell proliferation and cytokine production.

**Methods:** CD1c mDC numbers and their expression of surface molecules involved in T cell activation were assessed by FACS analysis in SF and PB from RA patients (n=9). Production of inflammatory mediators by CD1c mDCs from SF and PB of RA patients (n=6) was determined after 20h of
culture by multiplex immunoassay (measuring 51 cytokines). The capacity of CD1c mDCs from SF (n=5) and PB (n=11) to activate autologous CD4 T cell proliferation in the absence of additional stimuli was measured after 6 days of culture by 3H-thymidine incorporation assay. Additionally, T-cell cytokine production was measured upon ionomycin/PMA restimulation.

**Results:** The number of CD1c mDCs was significantly increased in SF versus PB of RA patients (mean 5.0% vs. 0.6%, resp., p<0.01). mDCs from SF showed increased expression of CD80 and CD86 (CD80: MFI 131 vs. 68, p=0.04; CD86: 157 vs. 89, p<0.02, resp.). Furthermore, the number of positive mDCs for HLA-II, CD80 and CD86 was significantly increased in SF versus PB (all p<0.05). Numerous cytokines were abundantly and equally produced by mDCs both from PB and SF (incl. IL-12, IL-23, IL-13, IL-21). mDCs from SF produced higher IP10, MIG, TARC, and OPG concentrations as compared to mDCs from PB (IP10: 247 vs. 54, p<0.05; MIG: 90 vs. 24, p<0.01; TARC: 26 vs. 1, p<0.01; OPG: 354 vs. 156, p<0.05, resp., all pg/ml). By contrast, MDC secretion by mDCs from SF was significantly lower than mDCs from PB (2456 vs. 4397 pg/ml, p<0.05, resp.). Moreover, mDCs from SF had a strongly increased capacity to induce proliferation of CD4 T cells as compared to mDCs from PB (ratio DC:T cell 1:5, 29635 vs. 17 pg/ml, resp.).

**Conclusion:** The present study indicates that increased numbers of CD1c mDCs in SF play an essential role in the inflammation cascade by the secretion of specific T cell-attracting chemokines and the activation of secretory T cells to induce Th1, Th17, and Th2 targeting. Overexpression of CD1c mDCs or the specific triggers of these cells could represent a novel therapeutic approach to prevent immunopathology of RA.

**Disclosure:** F. M. Moret, None; C. E. Hack, None; F. P. J. G. Lafeber, None; T. R. D. J. Radstake, None; J. A. G. van Roon, None.

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**Hypoxia-Inducible Factor-1α: Trigger of Toll-Like Receptor Signalling-Engaged Inflammation in Rheumatoid Arthritis.** Fanlei Hu1, Rong Mu2, Jiaxin Zhu1, Wenwei Shao3, Lianjie Shi1, Philip L. Cohen3, Xiaoyan Qiu2

**Background/Purpose:** Hyperplasia of synovial fibroblasts, infiltration with lymphocytes, and tissue hypoxia are the major characteristics of rheumatoid arthritis (RA). Data has confirmed the central role of toll-like receptors (TLRs) in RA. However, much remains unknown regarding the impact of hypoxia on TLR signalling-induced inflammatory response in RA.

The aim of this study was to reveal the effect of hypoxia and its regulator hypoxia-inducible factor-1α (HIF-1α) on the inflammatory response in rheumatoid arthritis synovial fibroblast (RASF) stimulated by different TLR ligands, especially LPS.

**Methods:** Hypoxia was induced in RASF by incubation with Na2S2O5. TLR3 ligand polyIC, TLR2 ligand PGN, TLR4 ligand LPS, and TLR9 ligand CpG were used to stimulate the cells. Effects of hypoxia on these ligands-induced inflammatory cytokines and matrix metalloproteinases (MMPs) were determined by RT-PCR, realtime PCR, and ELISA. Overexpressing HIF-1α as well as knocking-down its expression by siRNA were used to reveal its fundamental role. RASF-induced inflammatory T cell expansion was determined by flow cytometry, realtime PCR, and ELISA analyses after RASF/T cell coculture.

**Results:** Hypoxia potentiated the expression of inflammatory cytokines, MMPs, and VEGF in RASF stimulated by different TLR ligands, especially polyIC; a synthetic mimic of dsRNA from virus or apoptotic cells. HIF-1α played a fundamental role in this synergy. Moreover, overexpression of HIF-1α enhanced RASF-mediated inflammatory T cell expansion, inducing more proinflammatory IFN-γ and IL-17 production.

**Conclusion:** Our findings suggest that hypoxia and HIF-1α may function collaboratively with TLR-engaged inflammatory response to exacerbate the pathogenesis of RA, and HIF-1α might serve as a therapeutic target for this disease.

**Disclosure:** F. Hu, None; R. Mu, None; J. Zhu, None; W. Shao, None; L. Shi, None; P. L. Cohen, None; X. Qiu, None; Z. Li, None.

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**Extrathymic Autoimmune Regulator (AIRE) Expression in Rheumatoid Arthritis.** A.R. Noort1, K.P.M. van Zoest2, M.C. Lebre3, P. P. Tak4 and S.W. Tas1

1. Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands; 2. Academic Medical Center/University of Amsterdam and GlaxoSmithKline, Amsterdam, Netherlands.

**Background/ Purpose:** The Autoimmune Regulator (AIRE) is a transcription factor that is involved in the negative selection of self-reactive thymocytes in the thymus and therefore is pivotal in the establishment of central tolerance. It has been suggested that non-canonical NF-kappaB signaling is required for thymic AIRE expression. Recently, AIRE protein has also been detected in peripheral lymphoid organs, predominantly in dendritic cells (DC). In these peripheral sites, AIRE was found to regulate the expression of a group of tissue-specific antigens that is distinct from those expressed in the thymus, suggesting that peripheral AIRE may play a complementary role in tolerance induction. It is currently unknown whether AIRE may play a role in inflamed tissues associated with ectopic lymphoid neogenesis, such as rheumatoid arthritis (RA) synovial tissue (ST).

**Objective:** To document and further characterize extrathymic AIRE expressing cells in ST and paired peripheral blood (PB) mononuclear cells (MCs) as well synovial fluid (SF) MCs of RA patients.

**Methods:** ST was obtained via mini-arthroscopy from inflamed joints of RA and undifferentiated arthritis (UA) patients. Expression of AIRE was evaluated using immunohistochemistry and immunofluorescence (IF) microscopy. AIRE expression was also investigated in PB and SF DC using flow cytometry.

**Results:** AIRE expressing cells were detected in 80% of analyzed RA ST and in contrast only in 25% of UA ST. Further characterization using double-immunofluorescence microscopy revealed that these cells were predominantly CD1c (BDCA1)+ myeloid (mDC). Interestingly, a significantly higher percentage of CD1c+ mDC in RA SF expressed AIRE (55 ± 5 %; n=12) compared to RA PB (20 ± 3 %; n=12; p=0.05) and healthy PB (19.7 ± 2 %; n=3; p=0.05).

**Conclusion:** Extrathymic AIRE expressing cells are present in RA ST and RA SF, suggesting a role in synovial inflammation. These AIRE expressing cells appear to be mainly CD1c+ mDCs. Extrathymic AIRE expression in RA synovial inflammation may be an attempt to control inflammation through the induction of peripheral tolerance to antigens involved in the perpetuation of the chronic inflammatory response. This mechanism may be exploited to develop new treatments for RA patients.

**Disclosure:** A. R. Noort, None; K. P. M. van Zoest, None; M. C. Lebre, None; P. P. Tak, None; S. W. Tas, None.

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**1067**

**Spontaneous Aggregation of the Anti-Viral Mavs Protein in Certain Systemic Lupus Erythematosus Patients May Explain Excessive Type I Interferon Production.** Philip L. Cohen1 and Wen-Hai Shao2

1. Temple University, Philadelphia, PA; 2. Temple University School of Medicine, Philadelphia, PA.

**Background/Purpose:** Patients with systemic lupus (SLE) often have increased type I interferon levels (IFN-I) and activation of IFN-inducible genes (IFN signature). The mitochondrial adaptor protein MAVS (also known as IPS1, VISA or CARDIF) is a key intermediary in the RIG-I pathway, where viral RNA triggers a conformational change in RIG-I, leading to MAVS activation and then downstream activation of IKK and TBK1, with subsequent IFN production driven by IRF-3/7 (IRF3 for IFN-beta; IRF7 for IFN-alpha) and NFkB activation and translocation. Using in vitro methods, it has been observed that MAVS may form large prion-like aggregates that might stimulate IFN-I activation in a potent and prolonged fashion (Hou et al., Cell 146:448, 2011). We wondered if such aggregates might play a role in the sustained increased production of IFN-I.

**Methods:** Peripheral blood mononuclear cells (PBMCs) were isolated from 17 patients fulfilling ACR criteria for SLE, and from 9 controls. Thirty million PBMCs were lysed and supernatants loaded onto semi-denaturing 1.5% vertical agarose gels. After electrophoresis, the proteins were transferred with essentially all of their MAVS protein in a high molecular weight aggregated form. None of 9 controls had abnormal MAVS. Three of the four...
aggregation-positive SLE patients had nephritis and the fourth had lung involvement. SLEDAI scores of MAVS-aggregate positive SLE patients did not differ from patients with normal molecular weight MAVS. Patient 4 (P-4) shows the aggregated MAVS phenotype in the western blot below (Panel B, P-4). Denatured MAVS immunoblotting is shown in panel A and actin immunoblotting in panel C. N-1 and N-2 are normal controls. P-1 has less protein loaded and no MAVS band is discernible.

Conclusion: This is the first report of aggregated MAVS in human cells. The significance of this abnormality needs further investigation, it is possible that prolonged and increased IFN-I production could result from such MAVS aggregation, and that the poorly degradable prion-like protein could signal IFN-I production for prolonged periods.

Disclosure: W. Jiang, None.

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A Selective Inhibitor of Endosomal Toll-Like Receptors, IMO-8400, Suppresses Activation of Multiple Cytokines, Th17 Response and Inflammasome Activation. Witwen Jiang, Fugang Zhu, Dong Yu, Ekambar R. Kandimalla, Nicola La Monica and Sudhir Agrawal, Idera Pharmaceuticals, Cambridge, MA

Background/Purpose: In autoimmune diseases, activation of Th1 and Th17 pathways has been associated with disease maintenance and progression. Engagement of endosomal Toll-like receptors (TLRs) 7, 8 and 9 through interaction with immune complexes containing nucleic acids induces production of proinflammatory cytokines leading to the activation of Th1 and Th17 responses. Blocking the engagement of these receptors through an antagonist may inhibit this pathway, thus providing a novel approach to the treatment of autoimmune diseases.

Methods: In C57BL/6 mice, psoriasis-like skin lesions were induced by intradermal injection of IL-23. Skin lesions were examined histopathologically and gene expression was monitored. IL-23 injection stimulated upregulation in the skin of genes of multiple cytokines (including IL-12, IL-21, IL-23 and IL-17) keratinocyte peptides (including LL-37) and inflammasome protein NLRP3. Treatment of mice with IMO-8400 was carried out by subcutaneous administration.

Results: IMO-8400 was well tolerated at the dose level used in this study. IMO-8400 treatment showed reduction in epidermal hyperplasia and infiltration of leukocytes. In addition, mice treated with IMO-8400 showed suppression of multiple cytokines including IL-12, IL-21, IL-23 and IL-17 compared to untreated mice. Expression of inflammasome protein NLRP3 and of keratinocyte genes Defensin B4, S100a4 and LL-37 was also suppressed in IMO-8400 treated mice compared to untreated mice.

Conclusion: Treatment with IMO-8400 exerts a therapeutic effect on the IL-23 mediated induction of psoriatic lesions by blocking Th1 and Th17 pathways and NLRP3. IMO-8400 is in development for the treatment of lupus and other autoimmune diseases.

Disclosure: W. Jiang, Idera Pharmaceuticals, 3; F. Zhu, Idera Pharmaceuticals, 3; D. Yu, Idera Pharmaceuticals, 3; E. R. Kandimalla, Idera Pharmaceuticals, 3; N. La Monica, Idera Pharmaceuticals, 3; S. Agrawal, Idera Pharmaceuticals, 3.

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The Effects of TNF Stimulation On Control of Apoptosis in Neutrophils. Direkrin Chiewchengu, Connie Lam, Kate Roberts, Helen Wright, Huw Thomas, Robert Moots and Steven Edwards. University of Liverpool, Liverpool, United Kingdom

Background/Purpose: TNF is a key regulator of immune function and plays a pivotal role in inflammatory conditions such as rheumatoid arthritis. Human neutrophils express and release TNF, and are activated by it. Neutrophil responses to TNF are bimodal: low concentrations of TNF (10 ng/mL) delay apoptosis but higher concentrations (>20 ng/mL) accelerate apoptosis. When neutrophils are activated to express TNF, complex regulatory mechanisms must control their response to both autocrine and paracrine signalling. This study investigated the mechanisms by which neutrophils respond to anti-apoptotic concentrations of TNF and control apoptosis delay.

Methods: Human neutrophils were exposed to 10 ng/mL of TNF: apoptosis was determined by flow cytometry (annexin V/PI binding); gene expression was determined by analysis of mRNA levels, flow cytometry and western blotting.

Results: Transcriptome analysis revealed that TNF signalling significantly increased mRNA levels for TNF, ICAM1, TNFAIP3, CD40, BFL1 plus several genes associated with NF-kB signalling. In contrast, mRNA levels of TNF receptor 1, TNF receptor 2, FADD, Bax and Caspase 8 were all significantly down-regulated. Many of these changes in mRNA levels were paralleled by changes in protein levels. These data indicate that neutrophils contribute to TNF-mediated signalling pathways via activated secretion of this cytokine. In parallel, they up-regulate genes that delay apoptosis (e.g. BFL1) but down-regulate expression of pro-apoptotic genes such as Bax and FADD.

Conclusion: These data shed important new insights into understanding the function of neutrophils in inflammatory and autoimmune diseases; neutrophils contribute to TNF-mediated inflammation and in doing so become more resistant to apoptosis.

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CD11c+ Dendritic Cells Play an Important Proinflammatory Role in Inflammatory Arthritis. Antonia Puchner1, Stephan Blümle2, Harald Leiss2, Victoria Saferding2 and Kurt Redlich2.1 Medical University Vienna, Vienna, Austria, 2 Medical University of Vienna, Vienna, Austria

Background/Purpose: Dendritic cells (DCs) play an important role in bridging innate and adaptive immune responses by serving as antigen presenting cells. Therefore DCs are implicated in the initiation of chronic autoimmune diseases, including rheumatoid arthritis. Using the KBxN serum transfer arthritis, a model of human rheumatoid arthritis, which depends only on the innate immune system, allowed us to investigate the innate role of dendritic cells in inflammatory arthritis.

Methods: KBxN serum transfer arthritis was induced in CD11c-dipheria toxin receptor (DTR) transgenic mice, which express the human diphtheria-toxin receptor under the CD11c promoter. This allows for specific depletion of CD11c+ cells by administration of diphtheria toxin (DT). DT or PBS was given on day −1, 3, 6 and 9 and the severity of arthritis was determined clinically and histologically. In addition, serum transfer arthritis was induced in wild type animals who also received DT.

Results: Efficient depletion of DCs after injection of DT was confirmed by flow cytometry and histological analysis of spleens of CD11c-DTR transgenic mice. Clinical scores of arthritis showed that CD11c-DTR transgenic mice had significantly reduced paw swelling and loss of grip strength after administration of DT when compared to PBS treated animals. Moreover, histological analysis showed decreased synovial inflammation and a trend towards reduced local bone destruction in these animals. In contrast, in wild type mice receiving DT we detected identical clinical signs of arthritis as in PBS treated animals, indicating that DT has no unspecific effects on the development of arthritis.

Conclusion: These data show that DCs are involved in innate reactions leading to inflammatory arthritis and therefore could be an important target for treating rheumatoid arthritis.

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TLR3 As a Therapeutic Target for OA? Ashwini Maratha and Sinead M. Miggin. Immune Signalling Laboratory, Maynooth, Ireland

Background/Purpose: Osteoarthritis (OA) is a multifactorial and most disabling disease that affects millions of people globally, with a largely unknown aetiology. OA is now considered a whole-joint inflammatory disease, associated with synovitis of the fibroblast-like synoviocytes (FLS). FLS are sentinel cells that contribute to OA pathogenesis, possibly through activation of the innate immune Toll-Like Receptors (TLRs) aiding in induction of inflammatory mediators and cellular infiltration, however, the exact role of TLRs in OA is poorly understood. The aim of the research work was to characterise the role and functionality of TLRs in OA and to identify the key TLRs that modulate OA pathology.

Methods: TLR3 neutralisation assays, ELISA, Proteomics, Confocal analysis, Immunoblot analysis, Luciferase reporter gene assays.

Results: Interestingly, we found that TLR3, activated by Poly(IC)/ dsRNA, RNA from necrotic cells or OA synovial fluid, plays a key role in OA and this was confirmed by neutralisation of TLR3 expression which shifted the balance from pro-inflammatory to an anti-inflammatory cytokine milieu. Next, using a proteomic approach, we found that prohibitin 1 (PHB1), an anti-proliferative and anti-inflammatory molecule, was drastically down-regulated in FLS upon poly(I:C) stimulation and in whole synovial tissue biopsy from early and late stage OA. Interestingly, neutralisation of surface-bound TLR3 in FLS restored the PHB1 levels and showed an immunomodulatory/signal transduction modulatory role by employing anti-TLR3 antibody. These findings were supported by confocal and immunoblot analysis in FLS and through luciferase reporter gene assays in HEK293.

Conclusion: Together, these data indicate a potential regulatory role of enzymatic lipid oxidation by 12/15-LO during the initiation of an adaptive immune response by both orchestrating a cell- and context-specific clearance of antigens by different phagocyte subsets and regulating the maturation and activation status of the respective APC.

Disclosure: S. Uderhardt, None; T. Rothe, None; E. Zinser, None; O. Oskolkova, None; M. Herrmann, None; A. Steinkasserer, None; V. Bochkov, None; G. Schett, None; G. Kronke, None.

Increased Oxidative Burst in Neutrophils but Not Monocytes in Systemic Lupus Erythematosus. Sandro F. Perazzoli1, Reinaldo Salomao1, Neusa P. Soares1, Eduardo C. Bradeski2, Federal University of Sao Paulo, Brazil, 1Escuela Paulista de Medicina - Universidade Federal de Sao Paulo, Sao Paulo, Brazil, 3University Federal de Sao Paulo, Sao Paulo, Brazil

Background/Purpose: The role of innate immunity in the pathogenesis of Systemic Lupus Erythematosus (SLE) has acquired increasing importance lately. Chronic Granulomatous Disease (CGD), a hereditary inability of phagocytes in producing Reactive Oxygen Species (ROS), has been associated with increased frequency of discoid lupus erythematosus (2.7%) and with SLE (0.5%). This study aimed to evaluate the oxidative response in monocytes and neutrophils from SLE patients and healthy controls (HC) at basal state and after bacterial stimulus.

Methods: 300 SLE patients and 301 age- and gender-paired HC (blood donors) were clinically examined and evaluated for quantification of the oxidative burst in phagocytes by flow cytometry based on the oxidation of 2,7-dichlorofluorescein-diacetate before and after stimuli with Staphylococcus aureus and Pseudomonas aeruginosa. There was a 7-day wash-out period for immunosuppressant drugs before sample collection.

Results: No patient or HC presented oxidative burst profile compatible with CGD, however one patient was classified as carrier of defective gene (0.33%) and 5% of the SLE patients had higher basal oxidative activity than HC [mean fluorescence intensity (MFI) = 53.77 ± 11.38 versus 15.08 ± 2.63, respectively; p < 0.001]. ROS production was also significantly higher in SLE as compared with HC after stimulation with S. aureus (MFI = 355.46 ± 58.55 versus 151.92 ± 28.25, respectively; p < 0.001) or P. aeruginosa (MFI = 82.53 ± 10.1 versus 48.99 ± 6.74, respectively, p < 0.001). Furthermore, the neutrophilic response after bacterial stimuli (DMFI = post-stimulus MFI minus basal MFI) was more intense in SLE than in HC for S. aureus (301.69 ± 54.42 versus 118.38 ± 26.03, respectively; p < 0.001), P. aeruginosa (28.76 ± 12.3 versus 15.45 ± 5.15, respectively; p < 0.001). Oxidative burst profile was not associated with disease activity (SLEDAI=6) or severity (SLICC-DI=2). Neutrophil basal ROS production was higher in patients with lupus nephritis (median DMFI = 39.43; ranging from 1.0 to 167.4) than in patients without nephritis (median DMFI = 27.29; ranging from 1.2 to 143.9; p = 0.014). In addition neutrophils from patients with lupus nephritis (n = 166) presented higher increment in ROS production after stimulus with S. aureus (median DMFI = 320.1; ranging from 194.9 to 826.1) than neutrophils from patients without nephritis (n = 133; median ΔMFI = 278.5; ranging from 149.9 to 649.9; p = 0.03). These differences in ROS production were not observed in monocytes from patients with lupus nephritis. There was no association of PMN oxidative burst profile and the therapeutic regimen.

Conclusion: Neutrophils from SLE patients presented increased basal ROS production and increased oxidative response to bacterial stimuli. These findings were particularly evident in patients with kidney involvement. The present findings corroborate the important role of innate immune response ranging from specific immunity to tolerance. However, the uptake of particles and subsequent resolution of inflammation and limitation of inflammation-associated tissue damage. In this study, we investigated the potential role of enzymatic lipid oxidation by 12/15-LO during the initiation of an adaptive immune response by both orchestrating a cell- and context-specific clearance of antigens by different phagocyte subsets and regulating the maturation and activation status of the respective APC.

Disclosure: S. Uderhardt, None; T. Rothe, None; E. Zinser, None; O. Oskolkova, None; M. Herrmann, None; A. Steinkasserer, None; V. Bochkov, None; G. Schett, None; G. Kronke, None.

Enzymatic Lipid Oxidation Contributes to the Maintenance of Self-Tolerance by Regulating Antigen Clearance and Dendritic Cell Function. Stefan Uderhardt1, Tobias Rothe 1, Elisabeth Zinser 1, Olga Oskolkova 2, Martin Herrmann3, Alexander Steinkasserer4, Valery Bochkov2, Georg Schett1 and Gerhard Kronke1.1University of Erlangen, Erlangen, Germany, 2Department of Vascular Biology and Thrombosis Research, Center for Physiology and Pharmacology, Medical University of Vienna, Vienna, Austria, Vienna, Austria, 3Phil. Erlangen, Germany, 4Department of Immune Modulation at the Department of Dermatology, University Hospital Erlangen, Erlangen, Germany. 5Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany.

Background/Purpose: During inflammation and tissue damage, pathogen as well as dying cells are ingested by different phagocytes such as macrophages and dendritic cells. The uptake of particles and subsequent presentation of derived antigens by antigen presenting cells (APC) are key events in the initiation of an adaptive immune response. Thus, both the nature and the activation state of the respective phagocyte determine the resulting immune response ranging from specific immunity to tolerance. However, defects and alterations of these processes are associated with chronic inflammation and autoimmunity. Specific lipid oxidation products, generated by the enzyme 12/15-lipoxygenase (12/15-LO) were implicated in the active resolution of inflammation and limitation of inflammation-associated tissue damage. In this study, we investigated the potential role of enzymatic lipid oxidation by 12/15-LO during initiation of an adaptive immune response and the maintenance of self-tolerance.

Methods: We studied both the clearance of AC and pathogens, as well as the maturation and function of monocyte-derived, antigen-presenting phagocytes in vitro and in vivo.

Results: We observed a pivotal role of 12/15-LO in the maintenance of self-tolerance as aged 12/15-LO-deficient mice spontaneously developed autoimmune encephalomyelitis (EAE), which resembles clinical and autoimmune features indicating a break of self-tolerance. Moreover, a loss of 12/15-LO resulted in an exacerbation of a murine disease model of experimental autoimmune encephalomyelitis (EAE), which resembles clinical and pathological hallmarks of human multiple sclerosis.

Consistently, 12/15-LO −/− mice showed a disturbed clearance of AC under inflammatory conditions, with a clear shift of phagocytosis towards pro-inflammatory antigen-presenting cells. In addition, we could detect a marked expression of 12/15-LO in vitro-generated bone marrow-derived dendritic cells (BMDC). Interestingly, BMDC isolated from 12/15-LO −/− mice presented an increased expression of co-stimulatory molecules on their surface, accompanied by an altered pro-inflammatory cytokine profile. Under in vivo conditions, the uptake of AC-derived model-antigens by APC from 12/15-LO −/− mice resulted in an increased antigen presentation and subsequent T cell activation, both in vitro and in vivo. By adding 12/15-LO-generated phospholipid oxidation products, we were, in turn, able to restore an anti-inflammatory clearance of AC in vitro and in vivo, down-regulate co-stimulatory markers expressed by APC and, thereby, limit T cell activation in vitro.

Conclusion: Together, these data indicate a potential regulatory role of enzymatic lipid oxidation by 12/15-LO during the initiation of an adaptive immune response by both orchestrating a cell- and context-specific clearance of antigens by different phagocyte subsets and regulating the maturation and activation status of the respective APC.

Disclosure: S. Uderhardt, None; T. Rothe, None; E. Zinser, None; O. Oskolkova, None; M. Herrmann, None; A. Steinkasserer, None; V. Bochkov, None; G. Schett, None; G. Kronke, None.
immunity in SLE and implicate neutrophils in the pathophysiology of the disease.

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TLR2 Deletion Promotes Arthritis and Joint Destruction Through Reduction of IL-10. Qi Quan Huang1, Renee E. Koessler2, Robert Birkett3, Harris R. Perlman4, Lampping Xing5 and Richard M. Pope6. 1Northwestern University, Chicago, IL, 2Northwestern University Feinberg School of Medicine, Chicago, IL, 3University of Rochester, Rochester, NY, 4Northwestern Univ Med School, Chicago, IL

Background/Purpose: TLR2 signaling pathway has been suggested as a potential therapeutic target in RA. However, studies with mice deficient in TLR2 (TLR2−/−) and IL-1Ra suggest that TLR2 may suppress arthritis mediated through increased interferon-γ, and reduced TGFB and T regulatory cell function. In order to determine the role of TLR2 deletion on the effector phase of arthritis, studies were performed with the K/BxN serum transfer model of RA, mediated by antibodies to glucose-6-phosphate isomerase (GPI) which results in an immune-complex-mediated arthritis.

Methods: Wild type and homozygous Tlr2−/− mice on the C57BL/6 background were injected intraperitoneally with 100 ml anti-GPI serum and evaluated between days 0 to 9 post-induction by ankle swelling and clinical score. Ankles were harvested and sections analyzed by hematoxylin and eosin, and TRAP activity staining for osteoclasts. IL-1b, IL-10, RANKL and OPG in ankle homogenates were quantified by ELISA. Bone marrow-derived macrophages (BMM) were generated from wild type and Tlr2−/− mice by in vitro differentiation in GM-CSF for 7 days. BMAM activation was induced by incubation with model immune complexes employing mouse IgG coated on plastic plates for 4 hours. Supernatants were assessed for TNFa and IL-10 expression by ELISA. The macrophage Fc receptor mediated macrophage signaling was assessed by immunoblots analysis employing phospho-antibodies to Akt, p38, and ERK. Fc receptor expression on cell membranes was determined employing antibodies to CD16/CD32, analyzed by flow cytometry. Macrophage Fc receptor isoform expression at mRNA level was determined by quantitative real-time RT-PCR.

Results: The transfer of anti-GPI serum resulted in significantly worse arthritis in TLR2−/− mice compared to wild type controls. Histological exam demonstrated more inflammation and joint destruction. Examination of the joints homogenates collected at the peak of inflammation (day 7 post-induction) revealed increased Il-1b and decreased IL-10 in TLR2−/− mice. TLR2 deficiency also resulted in increased osteoclasts, identified by TRAP staining. There was a trend toward reduction of OPG (p = 0.036) in the ankles of TLR2−/− mice, and a strong negative correlation (p < 0.001) between OPG and joint swelling. There was no difference in the expression of inhibitory or activating Fc receptors in TLR2−/− mice. However, activation of TLR2−/− macrophages with immune complexes resulted in significantly reduced IL-10, while there was no difference in the expression of inhibitory or activating Fc receptors in TLR2−/− mice.

Conclusion: These observations demonstrate that deletion of TLR2 exacerbates serum transfer-induced arthritis. In the absence of TLR2, there was a reduction of IL-10 in the joints, and this may be due to the reduced activation of Akt by immune complexes. These observations demonstrate cross-talk between TLR2 and Fc receptor signaling modulates the effector phase of inflammatory arthritis.

Disclosure: Q. Q. Huang, None; R. E. Koessler, None; R. Birkett, None; R. H. Perlman, None; L. Xing, None; R. M. Pope, None.
Conclusion: The survival of CD11c⁺ dendritic cells in the spleen requires FLIP. The deletion of FLIP in CD11c dendritic cells also results in increased circulating neutrophils and a multigranular neutrophil infiltration. A substantial proportion of these mice develop an arthropathy but proteinuria was not observed. FLIP expression in CD11c⁺ dendritic cells is necessary for survival in the spleen and for neutrophil homeostasis.

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p21 Promotes Inflammatory Arthritis Resolution by Facilitating Alternative Activation of Macrophages. Angelica K. Gierut¹, Carla M. Cuda², Alexander V. Misharin³, Rana Saber³ and Harris R. Perlman³ ¹Northwestern Med Faculty Found, Chicago, IL, ²Northwestern University Feinberg School of Medicine, Chicago, IL, ³Northwestern University, Chicago, IL

Background/Purpose: Current understanding of pathogenesis suggests that RA is mainly a Th1 mediated process that promotes robust inflammatory cytokine production by "classically" activated macrophages. This is in contrast to Th2 diseases such as parasitic infection or allergy that balance potential catastrophic tissue destruction from large worm invasion, or chronic inflammatory response to ubiquitous proteins, by skewing macrophages to an alternatively activated state. Alternatively activated cells appear to be generated from local macrophage proliferation in pure Th2 environments. However, in conditions with concomitant Th1 stimuli, recruited monocytes can be skewed toward alternative activation as well. It is unknown what role alternative macrophages may play in RA. It seems reasonable to assume that their presence would be favorable given their "anti-inflammatory" properties. However, they theoretically have the potential to hinder response to, and clearance of, a yet unknown foreign antigen. Given that alternative macrophages display distinct proliferating capabilities, it seems reasonable to suspect that proteins controlling the cell cycle may be involved in their regulation. One such protein, a cytokine dependent kinase inhibitor, p21, is decreased in RA patient synovium, and is associated with worse serum transfer-induced arthritis (STIA) compared to wild type (WT) controls.

Methods: In vitro studies were done with bone marrow derived macrophages (BMDMs) and thioglycollate induced peritoneal macrophages (PMs). Cells were treated with stimuli for classical, alternative, and regulatory macrophage differentiation. Supernatants were analyzed for production of cytokines by ELISA, and for nitric oxide (NO) by colorimetry. Quantigene assays were performed for various genetic markers of macrophage phenotype. Mice were also injected IV with p21 and KBxN serum and observed for arthritis. In vivo analysis of skewed BMDMs and PMs revealed increased production of nitric oxide in p21⁻/⁻ cells stimulated with interferon gamma + lipopolysaccharide compared to B6 control cells. Conversely, p21⁺//+ BMDMs and PMs stimulated by IL-4 had less relm alpha mRNA, a marker of alternative activation. In vivo studies were concordant in that p21⁻/⁻ mice treated with thioglycollate + IL-4 had less relm alpha protein expression by flow cytometry. Intriguingly, there was increased local proliferation of p21⁻/⁻ PMs as measured by 3 hr BRDU incorporation. However, recently recruited p21⁻/⁻/⁻ monocytes showed significantly less proliferation compared to B6. Finally, IV IL-4 significantly dampened STIA in B6 mice whereas arthritis in p21⁻/⁻ mice was not attenuated.

Conclusion: p21 may promote homeostasis during inflammatory conditions by potentiating recruited monocytes and possibly local macrophage differentiation into alternatively activated states. This appears to be independent of its role as a cell-cycle inhibitor because monocytes recruited to inflammatory sites have less proliferation in the absence of p21.

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Prolactin Is Increased in Responders to Anti-TNFα Treatment and the Role of the Prolactin Receptor in Rheumatoid Arthritis. Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵, Man Wai Tang¹, Danielle M. Gerlag², Veronica Codullo³, Elsa Vieira-Sousa⁴, Anne Q. Reuwer⁵.

Background/Purpose: Rheumatoid arthritis (RA) is the most common rheumatic disease which mainly affects women. In the last decade, it is known that prolactin (PRL) is a sex hormone with immunomodulatory properties. It has been shown that high prolactin levels are associated with an increase of the disease activity postpartum and that the PRL inhibitor, bromocriptine, improves disease activity of patients with RA. Furthermore, the serum PRL levels correlated positively with the Larsen score.

Recently, the prolactin receptor (PRLR), belonging to the family of cytokine receptors, has been described in atherosclerotic plaques, mainly on macrophages.

The objective of the study is to determine 1) the level of PRL in RA patients related to rheumatoid factor (RF), anti-cyclic citrullinated peptide antibodies (ACPA), erosive disease and response to anti-TNF treatment 2) PRLR expression in synovial tissue of RA, psoriatic arthritis (PsA) and osteoarthritis (OA) patients 3) the phenotype of the PRLR expressing cell.

Methods: Serum prolactin levels were measured using immunofluorescent metric assay in patients with RA before TNF-α blockade (n=101). The expression of PRLR was determined in synovial tissue (ST) of RA (n=91), PsA (n=15) and OA (n=9) patients using digital image analysis. Immunofluorescence (IF) was used to detect the PRLR expressing cell type.

Results: A trend towards higher PRL levels were found in patients who are rheumatoid factor positive compared to rheumatoid factor negative RA patients (5.0 (2–24) and 7.3 (2.5–36) μg/L; P=0.06). When the PRL levels were divided into 3 categories, the percentage of the RF positive patients had significantly higher PRL levels (P=0.021). A trend towards higher PRL levels were also seen in patients who are ACPA positive (P=0.063) and similar results with erosive disease (P=0.057). Baseline PRL levels were significantly lower in non-responders (median (range): 5.3 (2.0–22) μg/L than in moderate (7.0 (2.5–36)) and responders (8.5 (4.0–19)) on anti-TNF treatment (P=0.025). Overall, the prolactin levels were similar between females and males.

PRLR expression was higher in RA (median (range): 0.055 (0.000–5.673) μg/mL; P=0.06). When the PRL levels were divided into 3 categories, the percentage of the RF positive patients had significantly higher PRL levels (P=0.021). A trend towards higher PRL levels were also seen in patients who are ACPA positive (P=0.063) and similar results with erosive disease (P=0.057). Baseline PRL levels were significantly lower in non-responders (median (range): 5.3 (2.0–22) μg/L than in moderate (7.0 (2.5–36)) and responders (8.5 (4.0–19)) on anti-TNF treatment (P=0.025). Overall, the prolactin levels were similar between females and males. The expression of the PRLR was also confirmed by RT-PCR in macrophages.

Conclusion: Higher levels of PRL are found in patients who respond to anti-TNF treatment. The expression of the PRLR in synovial tissue, mainly by macrophages, is higher in the inflammatory diseases (RA and PsA) than in OA. Our combined data suggest an important role of prolactin and its receptor in RA.

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Polyclonal CD4+ Foxp3+ Treg Cells Induce TGFβ-Dependent Tolerogenic Dendritic Cells That Suppress Murine Lupus-Like Syndrome. Qin Lan1 and Song G. Zheng2. 1University of Southern California, Los Angeles, CA, 2Keck School of Medicine of USC, Los Angeles, CA

Background/Purpose: Interplay between Foxp3+ regulatory T cells (Treg) and dendritic cells (DCs) maintains immunologic tolerance, but the effects of each cell on the other are not well understood.

Methods: Naive CD4+Foxp3- cells isolated from DBA/2 mice were stimulated with anti-CD3/CD28 antibodies with IL-2 and TGF-β to develop polyclonal CD4+ iTregs. These cells were adoptively transferred to DB2F1 mice that also received D2 spleen cells. Anti-IL-10R, Anti-TGFβ and ALK5 (TGFβRII) inhibitor was administered in some groups of mice. To determine molecular mechanism, TGFβRII DC conditional KO mice were developed and colitis model was used. DC numbers and phenotypes were determined in chronic lupus mice before and after Treg or Tcon treated groups and were adoptively transferred to another lupus mice to determine the therapeutic role of DC subsets.

Results: We report that polyclonal CD4+ Foxp3+ Treg cells induced ex-vivo with TGFβ (iTreg) suppress a lupus-like chronic graft-versus-host disease by preventing the expansion of immunogenic DCs and inducing protective DCs that generate additional recipient CD4+Foxp3+ cells. The protective effects of the transferred iTreg cells required both IL-10 and TGFβ, but the tolerogenic effects of the iTreg on DCs, and the immunosuppressive effects of these DCs, was exclusively TGFβ-dependent. The iTreg were unable to tolerate Tgfr2-deficient DCs.

Conclusion: These results support the essential role of DCs in “infectious tolerance” and emphasize the central role of TGFβ in protective iTreg/DCs interactions in vivo.

Disclosure: Q. Lan, None; S. G. Zheng, None.

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Background/Purpose: This study explored the effect of in vitro blockade of the NK cell receptor NKG2A on normal and rheumatoid arthritis (RA) peripheral blood mononuclear cell (PBMC) populations

Methods: A whole blood culture system that allows for up to 48 hours of whole blood culturing was utilized for all experiments. This technique allowed for exploring the effect of NKG2A blockade in the context of the complex interactions that exist in the periphery with minimal manipulation.

Results: The addition of the anti-NKG2A mAb to the whole blood cultures led to alteration of the surface phenotype of NK cells from rheumatoid arthritis patients. These alterations included the up-regulation of chemokine receptors as well as the modulation of CD27. This appeared to be a specific pattern of up-regulation as a wide panel of NK related receptors were explored and were not found to be altered. This up-regulation was also found to be rapid occurring within 24 hours of culture. Finally the effect was specific to RA patients as similar changes were not seen in normal donors.

Conclusion: These results indicate that treatment with an anti-NKG2A mAb may alter the homing potential of an NK cell to the site of inflammation. Once at the site of inflammation the presence of the anti-NKG2A mAb may skew the inhibitory balance and thus enable the elimination of stressed and/or inflamed cells. These two activities provide a novel mechanism of action, via the anti-NKG2A mAb, for the treatment of RA.

Disclosure: J. Wahle, Novo Nordisk; J. Bui, Novo Nordisk; K. Bontadelli, Novo Nordisk. 3.

1081

Toll-Like Receptor 7, 8 and 9 Activation of Primary Human Cells by Lupus Immune Complexes Is dependent On Interleukin 1 Receptor Associated Kinase 4 Activity. Aaron Winkler, Weiyong Sun, Ken Dower, Elizabeth A. Murphy, Julia Shin, Michael Luong, Michael J. Primiano, Varenka A. Rodriguez, Tatyana Souza, Lih-Ling Lin, J. Perry Hall, Katherine Lee, Vikram R. Rao and Margaret Fleming. Pfizer, Cambridge, MA

Background/Purpose: Genetic, in vitro and in vivo evidence strongly implicate the activation of nucleic acid sensing toll like receptors (TLR) 7, 8 and 9 in the pathophysiology of systemic lupus erythematosus (SLE). IRAK4 is a serine/threonine kinase activated by TLRs that utilizes the MyD88 adaptor protein for signaling. The relative importance of IRAK4 scaffolding and kinase functions in signaling is not clear. Indeed, at least one recent report indicates profound differences between species, stimuli, and cell types with regard to the requirement of IRAK4 kinase activity for cell activation[1]. Utilizing a potent, selective and cell-permeable small molecule inhibitor of IRAK4, we queried the importance of IRAK4 kinase activity in primary human cell based assays utilizing SLE disease relevant stimuli.

Methods: Sera from SLE patients was screened for the ability to induce interferon-alpha (IFN-α) protein release from primary human plasmacytoid dendritic cells (pDC). Immunoglobulin-G (IgG) was purified from SLE sera that could induce IFN from pDCs, and then combined with antibodies to apoptotic U937 cells as a source of TLR 7, 8 and 9 ligands, to form SLE immune complexes (SLE-IC). Human peripheral blood mononuclear cells (PBMC) were stimulated with SLE-IC, and type I interferon (i.e., IFN-α) release in cell culture supernatant was assayed by ELISA. Type I IFN exposure can be monitored in whole blood from SLE patients using an IFN-responsive gene signature, so the expression of IFN-induced genes was assayed in RNA from SLE-IC stimulated PBMC using quantitative real-time polymerase chain reaction (qRT-PCR). As auto-antibody production by B cells is also a key component of pathophysiology in SLE, B cell activation and differentiation induced by TLR ligands was measured by flow cytometry, and cytokine release by B cells was measured by ELISA.

Results: The IRAK4 inhibitor potently blocked SLE-IC induced type I IFN release and IFN gene signature in PBMC. This compound also blocked B cell activation- B cell surface activation marker expression in response to R848 in whole blood, 7 day plasma cell differentiation in PBMC, and cytokine expression by purified B cells exposed to IFN-α and R848.

Conclusion: Using a potent and selective inhibitor of IRAK4 kinase activity in primary human cells, we can demonstrate that IRAK4 kinase activity is essential to inflammatory cytokine release, type I IFN production, and B cell activation, all of which are components of SLE pathophysiology in vivo.

References

Disclosure: A. Winkler, Pfizer Inc, 3; W. Sun, Pfizer Inc, 3; K. Dower, Pfizer Inc, 3; E. A. Murphy, Pfizer Inc, 3; J. Shin, Pfizer Inc, 3; M. Luong, Pfizer Inc, 3; M. J. Primiano, Pfizer Inc, 3; V. A. Rodriguez, Pfizer Inc, 3; T. Souza, Pfizer Inc, 3; L. L. Lin, Pfizer Inc, 3; J. P. Hall, Pfizer Inc, 3; K. Lee, None; V. R. Rao, Pfizer Inc, 3; M. Fleming, Pfizer Inc, 3.

ACR/ARHP Poster Session B
Orthopedics, Low Back Pain, and Rehabilitation Poster Monday, November 12, 2012, 9:00 am–6:00 pm

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Predictors of Persistence in People with Subacute Low Back Pain. Souraya Torbey, Ali Mansour, Kristina Herrmann, Marwan Baliki, Thomas J. Schnitzer and A. Vania Apkarian. Northwestern University, Chicago, IL

Background/Purpose: Acute pain is a vital adaptive and protective mechanism. Conversely, chronic pain is a persistent, maladaptive response that outlasts the normal healing period of an injury or insult, and may result in drastic deterioration of quality of life, sometimes for the rest of life. In a
longitudinal brain imaging study of people with subacute back pain, we recently identified brain markers by fMRI that predict transition to chronic pain. Here we investigate, in the same study, behavioral biomarkers that may be predictive of pain chronicization.

Methods: 62 patients with new onset subacute back pain (less than 3 mo duration, no back pain for at least a year prior to symptom onset) were seen 6 times over one year. At each visit, pain intensity was determined using a 100 mm visual analog scale, behavioral questionnaires completed and fMRI brain scans obtained. For this analysis, the subacute group was divided into persisting (SBPr) and recovering (SBPp) groups using a greater than 20% change criterion, from the baseline visit to the one year visit. Multivariate logistic regression was utilized to evaluate individual behavioral parameters and their association with pain persistence.

Results: There were 32 males and 30 females, with mean age at study onset of 43±11 yrs, mean pain duration 10 weeks, and mean initial VAS pain intensity was 64±16. By the end of one year, there were 36 SBPp and 26 SBPr. No significant group differences in VAS pain intensity were evident at baseline. However, when evaluated over time, SBPp and SBPr segregated as early as their second visit (within 2 weeks) and the divergence persisted until the final visit at one year. The Neuropathic Pain Scale (NPS), the McGill Pain Questionnaire affective (MPQa), Pain detect (pDetect) and smoking status were significantly different between SBPp and SBPr groups at baseline (t-test). Smoking status at time of entry into the study was the strongest predictor of SBPp and SBPr groups at one year from symptom onset, odds ratio = 5, CI 1.6–16, p=0.007, accuracy = 0.67. NPS, MPQA and pDetect were correlated with each other, and their logistic multiple regression was not significant. Thus, all three parameters reflect interrelated properties of back pain. In a multiple regression logistic model when we include all four parameters, only smoking status remains significant with a stronger odds ratio = 13.5, CI = 2.5–75, p=0.003, accuracy = 0.84; thus after correcting for pain characteristics the effects of smoking on pain chronication are even stronger.

Conclusion: There is a strong association between smoking at the time of the onset of back pain symptoms and longer term pain chronication. As this observation was not a presupposed hypothesis of the study, we label the observed result as an association that needs to be validated in a systematic study.

Disclosure: S. Torbey, None; A. Mansour, None; K. Herrmann, None; M. Baliki, None; T. J. Schnitzer, None; A. V. Apkarian, None.

1083

Physicians’ Recommendations for Total Knee Arthroplasty in Younger Persons with Moderate Osteoarthritis. Lizana Fraenkel1, Lawrence Weis2, and Lisa G. Suter3, Yale University, New Haven, CT, 2Yale University School of Medicine, Veterans Affairs Connecticut Healthcare System, New Haven, CT

Background/Purpose: Rates of total knee arthroplasty (TKA) are increasing in all age groups. The most rapidly growing population of patients undergoing TKA are those under the age of 65. This reason for this increasing prevalence is unclear. While physicians’ recommendations regarding use of TKA are likely to be fairly uniform for patients with severe OA, little is known regarding physicians’ decision-making for younger patients with less severe arthritis. The objective of this study was to gain insight into the factors influencing physicians’ recommendations for younger persons with OA using an experimental 2x2 design.

Methods: A convenience sample of rheumatologists and orthopedic surgeons, recruited at their respective national meetings, completed a survey including a standardized scenario of a 62 year old person with knee OA who has moderate knee pain limiting strenuous activity despite medical management. The scenarios varied on patient gender, employment status (business manager vs retired), and x-ray (mild vs moderate OA). Each subject rated their recommendation for a single scenario (distributed randomly) on a 7-point scale. Recommendation was treated as a dichotomous variable: For vs Against TKA.

Results: 406 surgeons [mean age (SD) = 49 (10), 18% female] and 494 rheumatologists; [mean age (SD) = 48 (10), 44% female] participated. Overall, 51% of both surgeons and rheumatologists recommended TKA. As expected, both groups recommended TKA more frequently for scenarios including less severe radiographic OA (Table 1). However, this feature had a greater influence on rheumatologists than orthopedic surgeons. Orthopedic surgeons were more likely to recommend TKA for male vs female patients. Whereas, rheumatologists were less likely to recommend referral for TKA for business managers compared to housewives or retired men. The influence of physicians’ demographic characteristics on TKA recommendations is presented in Table 2. Younger physicians, regardless of specialty, were more likely to recommend TKA (p <0.05). Rheumatologist’s recommendations for TKA did not vary by geographic location; however, American and Asian surgeons were more likely to recommend TKA compared to their European counterparts.

Table 1. Influence of Patient Characteristics on Physicians’ Recommendations for TKA

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>% of Rheumatologists Recommending TKA</th>
<th>% of Orthopedic Surgeons Recommending TKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate vs Mild radiographic changes</td>
<td>60 vs 41, p&lt;0.0001</td>
<td>56 vs 47, p=0.05</td>
</tr>
<tr>
<td>Male vs Female</td>
<td>49 vs 52, p=0.5</td>
<td>59 vs 44, p=0.002</td>
</tr>
<tr>
<td>Working outside of the home vs Retired Housewife</td>
<td>42 vs 56, p=0.002</td>
<td>49 vs 53, p=0.4</td>
</tr>
</tbody>
</table>

Table 2. Influence of Physician Characteristics on their Recommendations for TKA

<table>
<thead>
<tr>
<th>Physician Characteristics</th>
<th>% of Rheumatologists Recommending TKA</th>
<th>% of Orthopedic Surgeons Recommending TKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (&lt;50 vs ≥ 50)</td>
<td>55 vs 46, p=0.03</td>
<td>57 vs 47, p=0.04</td>
</tr>
<tr>
<td>Male vs Female</td>
<td>50 vs 53, p=0.5</td>
<td>51 vs 56, p=0.7</td>
</tr>
<tr>
<td>Location (Asia vs Europe vs US)</td>
<td>54 vs 49 vs 52, p=0.8</td>
<td>67 vs 34 vs 52, p=0.006</td>
</tr>
</tbody>
</table>

Conclusion: Physicians recommendations for TKA vary significantly for younger patients with moderate OA. Recommendations are influenced by both physician and patient characteristics.

Disclosure: L. Fraenkel, None; L. Weis, None; L. G. Suter, None.

1084

In Vivo Kinematics of Three-Component Mobile-Bearing Total Ankle Replacement for Rheumatoid Arthritis. Keiji Iwamoto1, Tetsuya Tomota2, Takaharu Yamazaki3, Kenrin Shi1, Norinasa Shimizu1, Masahiro Kurbta, Kazuma Futai1, Yasuo Kunugiza1, Hideki Yoshikawa1 and Kazuomi Sugimoto1, 1Osaka University Graduate School of Medicine, Osaka, Japan, 2Osaka University, Osaka, Japan

Background/Purpose: The standard treatment for end-stage arthritis of the ankle joint due to rheumatoid arthritis (RA) has been an ankle arthrodesis. Patients with RA who require surgery usually already have degeneration of the subtalar and midtarsal joints. Fusion of the ankle and hindfoot will result in functional problems with gait. Thus, total ankle replacement (TAR) that can relieve pain while retaining ankle movement is important for patients with RA. However, high complication rates and low survivorship are still problematic in TAR, as compared to total knee and hip replacements. This could primarily be due to implant loosening and subsidence induced by excessive articular contact stress during ankle motion. A better understanding of ankle kinematics after TAR may be important to explain the failures in TAR, especially those attributed to loosening and subsidence. The purpose of this paper was to study in vivo kinematics of a three-component mobile-bearing TAR by 3D-evaluation of fluoroscopic imaging of ankle motion.

Methods: We investigated ten ankles in 7 patients with RA implanted with a three-component mobile-bearing TAR (FINE Total Ankle System, Nakashima Medical, Okayama, Japan), which allows not only internal/external rotation but also anteroposterior translation. Fluoroscopic images were obtained while each patient was asked to perform normal gait with full weight-bearing on the implanted ankle. Thereafter tibio-talar motion was analyzed by 2D/3D registration technique; a reproduction method of the spatial position of each component in TAR, from single-view fluoroscopic images by use of computer-assisted design models. We evaluated the dorsiflexion/plantarflexion angle, internal/external rotation angle and anteroposterior translation between the components.

Results: The average range of tibio-talar motion during the stance phase of gait with full weight-bearing on the implanted ankle was 11.2±2.7°. The average range of internal/external rotation was 3.9±1.4°. However, large intersubject variability resulted in the lack of a uniform pattern of rotational movement. The average absolute amount of anteroposterior translation was 1.6±0.7mm.

Conclusion: The range of motion, with regard to plantar/dorsi flexion, was not so wide as expected, and was almost the same with other non-mobile
Results: There were minimal differences between the two cohorts in terms of age (2011-12: 66.5 years, vs. 2000/4: 67.6 years; p=0.05). The more recent patient cohort consisted of fewer females (57%) compared to the earlier group (66%). Pre-operative physical function scores (SF36/PCS) were 3 points higher in 2011-12 than 2000-04 (33.6 ± 0.3 vs. 30.3 ± 0.1; p<0.0000). The 2000–2004 cohort (n=7686) had a mean BMI of 32 vs 31.7 for the 2011-12 cohort (n=1362). When compared to the national PCS norm of 50 (SD=10), TKR patients from both periods reported pre-operative function levels almost 2 standard deviations below the national norm.

Conclusion: The profile of primary TKR patients changed between 2000-04, and 2011-12. Today, patients are younger and have a higher pre-operative physical function scores. They continue to report significant levels of disability with mean pre-TKR PCS significantly lower than average OA patients.

Disclosure: P. D. Franklin, Zimmer, Inc., 2; W. Li, None; B. Snyder, None; C. Lewis, None; P. Noble, Zimmer;Stryker,Omnisn, SN, 7; D. Ayers, None.

1087
Do Younger TKR Patients Have Similar Disability At Time of Surgery As Older Adults? Patricia D. Franklin1, Wenjun Li1, Leslie R. Harrold1, Benjamin Snyder1, Courtland Lewis2, Philip Noble3 and David Ayers1. 1University of Massachusetts Medical School, Worcester, MA, 2UMass Medical School, Worcester, MA, 3CT Joint Replacement Institute, St. Francis Hospital, Hartford, CT, 4Baylor College of Medicine, Houston, TX

Background/ Purpose: The trend toward greater numbers of working-aged patients choosing TKR has raised concerns that younger patients may receive surgery prematurely. We compared the severity of operative knee pain and functional status in younger versus older TKR patients.

Methods: Patients undergoing primary TKR from 7/1/11 through 3/30/12 were identified from a national research consortium which enrolls patients from 89 surgeons in 27 US states. Patients, surgeons and hospitals submit data including the SF 36 Physical Component Score (PCS), the Knee injury and Osteoarthritis Outcome Score (KOOS), and the Oswestry Low Back Pain Disability Questionnaire. The KOOS data were used to estimate the Western Ontario and McMaster Universities Arthritis Index (WOMAC). We compared those <65 to those who were ≥65 years of age using descriptive statistics.

Results: Primary TKR was performed in 570 younger (<65) and 769 older (≥65) patients. Younger patients were less likely to be white (89% vs. 92%, p=0.02), and had a greater body mass index (mean BMI 33.0 vs. 30.7, p<0.0001). Younger patients reported greater pain (48.9 vs. 53.8, p<0.001) and stiffness (38.5 vs. 46.7, p<0.001) in the operative knee joint. Overall function as measured by the WOMAC and SF36 PCS were similar in the two age groups (WOMAC 51.9 vs. 53.8; PCS 32.8 vs. 33.8). Function levels in both groups reflect significant impairment at time of surgery.

Conclusion: At the time of TKR, younger and older patients have similar levels of functional impairment suggesting surgeons use comparable standards for selecting TKR in younger and older adults.

Disclosure: P. D. Franklin, Zimmer, Inc., 2; W. Li, None; L. R. Harrold, None; B. Snyder, None; C. Lewis, None; P. Noble, Zimmer;Stryker,Omnisn,SN, 7; D. Ayers, None.

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Factors Influencing Long-Term Recovery of Total Knee Arthroplasty. C. Allsny Jones1, Gian S. Jiangri2 and Maria E. Suarez-Almazor1. 1Department of Physical Therapy and School of Public Health, University of Alberta, Edmonton, AB, 2School of Public Health, University of Alberta, Edmonton, AB, 3University of Texas MD Anderson Cancer Center, Houston, TX

Background/ Purpose: Although a number of studies have examined short term outcomes after total knee arthroplasty (TKA), few have prospectively examined the long term trajectory of recovery of health-related quality of life. The aim of this study was to identify patient-related outcomes that explained the pattern of pain and functional recovery over 10 years for TKA.

Methods: This is a prospective observational study that followed a community-based cohort of patients receiving elective primary TKA within a 6-month time period. In 2006, 6 months after surgery, data were collected from patient interviews, chart reviews and regional administrative databases. Joint pain and function were measured using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Health status

Disclosure: None;
was evaluated over time using the SF-36. Effect sizes were calculated to measure change over time. Pre-operative and operative factors were inspected as possible variables that predicted the pattern of recovery. Linear mixed models for pain and functional recovery were used to evaluate changes over time while adjusting for covariates.

**Results:** Of the 289 patients followed, the mean age was 69.4 (SD 9.2) yrs; 170 (59%) were female. At 10 years 145 patients responded. The mean number of comorbid conditions was 3.5 (SD 2.0) at baseline and 4.7 (SD 2.3) at 10 years. WOMAC pain score mean difference from baseline to 6 months was 33.0 (95% 30.5, 35.5) with the largest effect size (ES) of 1.89. Long-term change was much smaller from 6 months to 3 years (ES 0.18) and from 3 to 10 years (ES 0.03). Smaller changes were seen with function; baseline to 6 months (ES 1.65), 6 months to 3 years (ES 0.07) and 3 to 10 years (ES ~0.13). The ES of the SF-36 physical summary score at 6 months was 1.17 and over the 10 years was 1.87. After adjusting for age and gender, the 10 year trajectory for pain was explained by baseline health status (SF-36 summary scores), and baseline WOMAC pain (< 0.05). The 10 year trajectory for function had similar covariates which explained the trajectory, in that baseline WOMAC function and health status were significant factors. In-hospital complications, prosthesis-type, and obesity did not impact long-term recovery patterns for TKA.

**Conclusion:** Pain and functional recovery after TKA occurs primarily within 6 months after surgery with negligible change from 3 to 10 years. Greater pain, dysfunction and lower overall health at baseline explained slower long-term recovery patterns for TKA.

Disclosure: C. A. Jones, None; G. S. Jiangri, None; M. E. Suarez-Almazor, None. 1089

**The Number of Ruptured Tendons As a Prognostic Factor for Reconstructing Extensor Tendon Rupture in Patients with Rheumatoid Arthritis.** Yu Sakuma, Kensuke Ochi, Takaji Iwamoto, Shinji Yoshida, Asami Saitou, Katsunori Ikari and Shigeaki Momohara. Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan

**Background/Purpose:** Extensor tendon rupture seen in patients with rheumatoid arthritis (RA) is usually surgically treated in combination with extensor tendon reconstruction and wrist arthroplasty. However, limited data exist in literature concerning factors significantly correlating with poor prognosis of the extensor tendon reconstruction. The purpose of this study is to investigate factors significantly correlating with poor prognosis of the extensor tendon reconstruction.

**Methods:** Total of 68 RA patients (mean age of 52 years old; 57 females) who underwent combined surgical procedures of tendon reconstruction and wrist arthroplasty because of spontaneous extensor tendon ruptures were investigated. The result of extensor tendon reconstruction was evaluated as “good”, “fair” and “poor”. This evaluation was defined based on active flexion and extension lag of metacarpophalangeal (MP) joint of the affected fingers 3 months after the surgery. The cases in which active flexion arc was greater than 45 degrees and extension lag was less than 15 degrees were defined as “good”. The cases, in which active flexion arc was greater than 45 degrees and extension lag ranged from 15 to 45 degrees, or active flexion arc was less than 45 degrees and extension lag was less than 15 degrees, were defined as “fair”. All other cases were defined as “poor”. We investigated the relation among clinical factors such as age at surgery, the number of ruptured extensor tendons, duration between onset of rupture and surgery, methods for reconstructing ruptured tendons, surgical procedures for wrist arthroplasty, the time interval between surgery and beginning of postoperative rehabilitation, and the frequency of ambulatory visit for rehabilitation, and the postoperative results by using multiple regression analysis. The correlation between factors relating to the postoperative result and duration between onset of rupture and surgery, methods for reconstructing ruptured tendons, surgical procedures for wrist arthroplasty, the time interval between surgery and beginning of postoperative rehabilitation, and the frequency of ambulatory visit for rehabilitation, and the postoperative results by using multiple regression analysis. The correlation between onset of rupture and surgery had significant correlation between increased number of ruptured tendons (p=0.003). The longer duration between onset of rupture and surgery had significant correlation between increased number of ruptured tendons (p=0.002). The number of ruptured tendons was the only independent variable which significantly related to poor postoperative results (p=0.0002). The number of ruptured tendons was the only independent variable which significantly related to poor postoperative results (p=0.0002). The longer duration between onset of rupture and surgery had significant correlation between increased number of ruptured tendons (p=0.003).

**Conclusion:** Number of ruptured extensor tendons significantly correlated with poor postoperative result of extensor tendon reconstruction in patients with RA. The number of increased ruptured extensor tendons also significantly correlated with duration between onset of rupture and surgery. The importance of surgical intervention is crucial at early stage of extensor tendon rupture, in which only few tendons are suspected to be involved, to result in better prognosis.

Disclosure: Y. Sakuma, None; K. Ochi, None; T. Iwamoto, None; S. Yoshida, None; A. Saitou, None; K. Ikari, None; S. Momohara, None.

1090

**A Comparison of Patient-Reported and Measured Range of Motion in a Cohort of Total Knee Replacement Patients.** Jamie E. Collins, Benjamin N. Rome, Vladislav Lerner, Jeffrey N. Katz and Elena Losina. Brigham and Women’s Hospital, Boston, MA

**Background/Purpose:** Range of motion (ROM) is an important component of the assessment of total knee replacement (TKR) outcome. Traditionally, ROM is measured by a clinician or trained researcher, making ROM less practical than self-report measures that can be obtained by phone or mail. Recently, Gioe et al. developed a method that presents patients a set of lateral knee photographs depicting varying levels of flexion and extension and asks the patients to select the photographs that most closely resemble their motion. We aimed to compare this self-reported method of assessing flexion and extension with clinical measurement before and after TKR.

**Methods:** As part of a prospective cohort study of consecutive patients undergoing TKR, patients were asked to self report flexion and extension on their operated knee using the method of Gioe et al. In addition, flexion and extension were measured using a goniometer by a trained research assistant. These measures were obtained preoperatively and at three and six months postoperatively. We compared self-reported ROM category with measured ROM for both flexion and extension using ANOVA. We dichotomized flexion at 90 degrees and determined the sensitivity and specificity of the self-report flexion categories for identifying patients with poor ROM.

**Results:** One hundred and one patients provided both self-report and RA-measured ROM at baseline. There was a significant association between self-report ROM category and ROM measurement for both flexion and extension (P<0.001). The Spearman correlation coefficient was 0.51 for extension and 0.45 for flexion, indicating moderate correlation. We combined all 3 visits to assess sensitivity and specificity of self-report flexion categories. Overall 15 of 25 patients with poor measured flexion (≤90°) also self-reported poor flexion (to 90° or lower) for a sensitivity of 60% and 17 of 190 patients without poor flexion (>90°) did not self-report poor flexion (to 100° or higher) for a specificity of 93%. The negative predictive value for self-report was 95%, indicating that the vast majority of patients self-reporting adequate flexion do not have poor flexion.

**Table 1. Performance of self-report flexion categories for identifying patients with poor ROM**

<table>
<thead>
<tr>
<th>Measured Flexion</th>
<th>≤90°</th>
<th>&gt;90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Report – How well can you bend your knee?</td>
<td>To 90° or lower</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>To 100° or higher</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>190</td>
</tr>
</tbody>
</table>

**Conclusion:** Patient self-reported ROM may be a useful outcome measurement for TKR when clinical ROM measurement is not possible. These findings are based on a small sample in one center and should be confirmed. Self-report is particularly effective (>90% specificity) in confirming adequate ROM.

Disclosure: J. E. Collins, None; B. N. Rome, None; V. Lerner, None; J. N. Katz, None; E. Losina, None.

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**Trends in Patient Physical Activity Before and After Primary Total Hip Arthroplasty.** Anne Lübbeke, Dorthiz Zimmermann, Constantinou Roussos, Alexis Bonvin, Robin Peter and Pierre Hoffmeyer. Geneva University Hospitals, Geneva, Switzerland

**Background/Purpose:** Total hip arthroplasties (THA) are performed to reduce pain and enhance patients’ function and physical activity (PA) level. PA is also recognized as the most important patient-related factor determining
implant survival. Furthermore, unrealistic patient expectations regarding PA after surgery have been identified as one of the reasons for increased dissatisfaction. Detailed assessment of PA before and after THA is lacking. Our objective was to evaluate (1) how patient’s PA level evolves: prior to disease onset, prior to THA, and at 5 and 10 years postoperative, and (2) whether PA level before and after THA has changed over the last decade across birth cohorts of identical age.

Methods: Patients included are part of a prospective hospital-based cohort of all THAs of a University hospital and followed longitudinally since 1996. We included all primary THAs between 1/2000 and 4/2012. PA was assessed by the physician and self-reported, preoperatively and at 5 and 10 years postoperative. Moreover, PA was evaluated with the UCLA activity scale. To determine PA evolution over the course of OA and THA, cross-sectional analyses were performed to assess mean UCLA scores over four periods: prior to disease, prior to surgery, 5- and 10-years postoperative independently of the year of surgery. Separate analyses were performed for men and women and by age categories (<55, 55–64, 65–74, ≥75 yrs. at operation). To analyze secular trends in PA, cross-sectional analyses were performed at three time periods within identical ages categories (2000–2003, 2004–2007, 2008–2011).

Results: Overall, lifestyle was assessed preoperatively for 2916 THAs and postoperatively for 1565 THAs. The UCLA score was assessed at follow-up for 1345 THAs. Mean age at operation was 68.4 years, 56% were women.

Prior to surgery 61% of patients reported a sedentary lifestyle compared to 45% at 5 years postoperative (RD 16%, 95% CI 12; 20). The proportion of patients with a sedentary lifestyle prior to surgery decreased from 68% in 2000–2003 to 54% in 2007–2011 (RD 14%, 95% CI 9; 18) despite a similar mean age (p=0.1). Sedentary lifestyle 5 years after surgery was reported by 53% of those operated 2000–2003 compared to 39% of those operated 2004–2007 (RD 14%, 95% CI 9; 20).

Mean UCLA scores prior to OA onset, prior to THA and 5 and 10 years postoperative were respectively in men 8.4, 3.7, 6.2 and 6.2 and in women 6.1, 3.4, 5.1 and 4.8.

Prior to surgery UCLA scores were similar across age categories ranging from 3.7 in the youngest to 3.2 in the eldest group (p=0.8). Five years postoperative UCLA scores declined as age increased. Across the four age categories the mean UCLA scores were respectively 6.7, 6.4, 5.6 and 4.2 (p<0.0001). Ten years postoperative mean UCLA scores were 6.4, 6.4, 5.2 and 3.8, respectively (p<0.0001).

Conclusion: Primary THA substantially and durably improved PA levels in men and women and in all age categories. Activity levels were lower in women than in men at all times. In the last decade the proportion of patients with an active lifestyle before and after THA increased by 14%.

Disclosure: A. Lübcke, None; D. Zimmermann, None; C. Roussos, None; A. Bovin, None; R. Peter, None; P. Hoffmeyer, None.

Effect of FULL Contact FOOT Orthosis On Plantar Fasciitis. Hilda A. Oliveira1, AnaMaria Jones1, Emilia Moreira1, Fabio Jennings1 and Jamil Natour1, 2. Universidade Federal de Sao Paulo, Sao Paulo, Brazil, 2Universidade Federal de Sao Paulo, Sao Paulo, Brazil

Background/Purpose: Plantar fasciitis (PF) is an inflammation of the foot plantar fascia, characterized by stiffness in the medial arch and ankle, especially during first steps, and can have a significant effect on activities of daily living. Insoles are one of the most often employed methods for the treatment of PF. The full contact foot orthosis is the most recommended, as it redistributes the load uniformly throughout the sole of the foot. However, few studies have demonstrated the effectiveness of this device and there is no consensus on which type of insole is the most adequate. The aim of the present study was to assess the effectiveness of a full contact foot orthosis regarding pain, foot function and quality of life in patients with PF.

Methods: Seventy-four patients were randomly allocated to an experimental group (n=37) using a full contact foot orthosis or a control group (n=37) using a sham insole. Evaluations were performed of pain (VAS), quality of life (SF-36), foot function (FFI and FSHQ), six-minute walk test and static/dynamic baropodometry (AM Cube FootWalk Pro program). The groups were evaluated at baseline and after 45, 90 and 180 days after randomization by a blinded evaluator.

Results: The groups were homogeneous at baseline regarding clinical and demographic characteristics. In the comparisons over time, we found better results for the experimental group for pain during walking on the right feet (p=0.008 - Figure 1). In the intragroup analysis we found in both groups improvement regarding pain during walking on the left feet, the six-minute walk test, foot function and some quality of life parameters, with no statistically significant differences between groups. No changes in foot pressure were found with the use of the insole.

Conclusion: The benefit of the use of full contact foot orthosis for the treatment of PF was restricted to the improvement in pain during walking in right feet.

Disclosure: H. A. Oliveira, None; A. Jones, None; E. Moreira, None; F. Jennings, None; J. Natour, None.

Obesity Is Not a Risk Factor for Poor Pain and Function Two Years After Total Knee Replacement. Lisa A. Mandl. Mark P. Figgie, Alejandro Gonzalez Della Valle, Michael Alexiades and Susan M. Goodman, Hospital for Special Surgery, New York, NY

Background/Purpose: Almost 90% of referring physicians think obesity increases the likelihood of poor outcomes after total knee replacement (TKR). However, current data are conflicting. The purpose of this study is to assess the association of body mass index (BMI) with pain, function and satisfaction 2 years after primary TKR.

Methods: Institutional TKR Registry patients who had a primary TKR between July 2007 and June 2009 and BMI >18.5 were enrolled. Poor pain and function were defined as WOMAC score <= 60. Data were collected prior to surgery and 2 years post-op. Multivariate regressions were performed to evaluate the association between BMI at baseline and poor pain and function at 2 years, controlling for gender, age, race, Deyo Comorbidity score and educational attainment. Expectations were measured with a validated TKR Expectations Survey.

Results: 2524 patients were included in the analysis. BMI > 40 were more likely to be non-Caucasian, female, have less education and more co-morbidities. Pre-operatively, both pain and function were least severe in <25 BMI category, increasing as BMI increased. At 2 years, change in WOMAC pain and function showed a step wise, dose dependant improvement across BMI categories, with BMI > 40 showing the most improvement. At 2 years, there was a statistically significant trend towards lower BMI categories having the least pain (p-value=0.0003) and best function (p-value<0.0001), but the differences between groups were not clinically significant. In the multivariate regressions, there were no statistically significant associations between any BMI category or number of co-morbidities and poor pain or function at 2 years. Being female significantly increased the risk of having poor pain (OR 1.6; 95% CI 1.2–2.2) or poor function (OR 1.5; 95% CI 1.1–2.1) at 2 years. Being Caucasian decreased the risk of poor pain (OR 0.6; 95% CI 0.4–0.9) or poor function (OR 0.5; 95% CI 0.3–0.7). Having only high school education also increased the risk of poor pain (OR 1.5; 95% CI 1.1–2.1) and poor function (OR 1.9; 95% CI 1.4–2.6) at 2 years. Age group 61–70 showed a decreased risk of poor pain compared to age <=60, (OR 0.5; 95% CI 0.4–0.8). At 2 years, 20.4% of patients lost weight, (mean weight loss 0.6 lbs +/- 2.7), with the greatest loss in BMI >40 (2.7 lbs; +/- 5). There were no significant differences in expectations or satisfaction between BMI categories.

Conclusion: Although obese patients have worse pain and function at the time they elect TKR, their outcomes at 2 years are not clinically significantly different than other patients. However, race and educational
attainment were significantly associated with poor outcomes. Obese patients have similar expectations and are as satisfied as patients with lower BMI. More research should be done on the effect of race and education on TKR outcomes. Obesity should not be regarded as a risk factor for poor outcomes after primary TKR.

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Average BMI (18.5 ≤ BMI &lt; 25)</th>
<th>Overweight (25 ≤ BMI ≤ 30)</th>
<th>Obese class I (BMI ≥ 35)</th>
<th>Obese class II (BMI ≥ 40)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>N=523</td>
<td>N=902</td>
<td>N=203</td>
<td>N=189</td>
<td>N=297</td>
</tr>
<tr>
<td>Age</td>
<td>71.0 (±10)</td>
<td>69.1 (±9.7)</td>
<td>66.7 (±9.2)</td>
<td>64.8 (±9.9)</td>
<td>64.3 (±9.7)</td>
</tr>
<tr>
<td>Male</td>
<td>476 (70.5%)</td>
<td>476 (53.5%)</td>
<td>559 (52.7%)</td>
<td>200 (69.4%)</td>
<td>152 (75.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>214 (24.6%)</td>
<td>214 (24.3%)</td>
<td>203 (28.9%)</td>
<td>86 (30.3%)</td>
<td>67 (39.5%)</td>
</tr>
<tr>
<td>Some college or college major</td>
<td>140 (29.4%)</td>
<td>140 (28.9%)</td>
<td>121 (29.4%)</td>
<td>72 (29.4%)</td>
<td>51 (30.3%)</td>
</tr>
<tr>
<td>College professional</td>
<td>51 (30.3%)</td>
<td>51 (30.3%)</td>
<td>51 (30.3%)</td>
<td>51 (30.3%)</td>
<td>51 (30.3%)</td>
</tr>
<tr>
<td>Pre-operative comorbidities</td>
<td>103 (20.0%)</td>
<td>214 (24.3%)</td>
<td>178 (28.9%)</td>
<td>86 (30.3%)</td>
<td>67 (39.5%)</td>
</tr>
<tr>
<td>1-2 Deyo comorbidities</td>
<td>400 (76.4%)</td>
<td>644 (75.5%)</td>
<td>420 (63.0%)</td>
<td>195 (65.8%)</td>
<td>100 (90.9%)</td>
</tr>
<tr>
<td>&gt; 3 Deyo comorbidities</td>
<td>105 (20.6%)</td>
<td>214 (24.3%)</td>
<td>178 (28.9%)</td>
<td>86 (30.3%)</td>
<td>67 (39.5%)</td>
</tr>
<tr>
<td>Overall Sat./H11549</td>
<td>89.1 (±10.5)</td>
<td>11.9 (±16.9)</td>
<td>13.3 (±20.3)</td>
<td>21.6 (±21.9)</td>
<td>37.9 (±15.9)</td>
</tr>
<tr>
<td>WOMAC Function</td>
<td>209 (20.0%)</td>
<td>209 (20.0%)</td>
<td>209 (20.0%)</td>
<td>209 (20.0%)</td>
<td>209 (20.0%)</td>
</tr>
<tr>
<td>Pain</td>
<td>445 (88.3%)</td>
<td>786 (91.5%)</td>
<td>537 (89.2%)</td>
<td>252 (89.7%)</td>
<td>148 (91.4%)</td>
</tr>
<tr>
<td>Somewhat/Very</td>
<td>445 (88.3%)</td>
<td>786 (91.5%)</td>
<td>537 (89.2%)</td>
<td>252 (89.7%)</td>
<td>148 (91.4%)</td>
</tr>
<tr>
<td>Satisfied with TKR</td>
<td>445 (88.3%)</td>
<td>786 (91.5%)</td>
<td>537 (89.2%)</td>
<td>252 (89.7%)</td>
<td>148 (91.4%)</td>
</tr>
</tbody>
</table>

**Disclosure:** L. A. Mandl, None; M. P. Figgie, None; A. Gonzalez Delia Valle, None; M. Alexides, None; S. M. Goodman, None.

1094

The Relationship Between Lumbar Spine Individual Radiographic Features and Low Back Symptoms with and without Associated Leg Symptoms: The Johnston County Osteoarthritis Project. Adam P. Goode1, Janet K. Freburger2, Timothy S. Carey2, Chad E. Cook4, Jordan Renner5, Sean D. Rundell6 and Joanne M. Jordan7. 1Duke University, Durham, NC, 2University of North Carolina, Chapel Hill, NC, 3Center for Health Services Research University of North Carolina, Chapel Hill, NC, 4Thurston Arthritis Research Center, Chapel Hill, NC, 5University of Rochester Medical Center, Rochester, NY, 6Fimlab Laboratories, Tampere, Finland, 7Immunoregulation, Institute of Biomedical Technology, University of Tampere, Tampere, Finland.

**Background/Purpose:** Little is known of the relationships between low back symptoms (LBS) and associated leg symptoms and lumbar spine individual radiographic features (IRF). We examined the associations between LBS, with and without associated leg symptoms, and lumbar spine IRF of disc space narrowing (DSN), vertebral osteophytes (OST) and facet joint osteoarthritis (FOA) and determined if these associations differed by race or gender.

**Methods:** 840 newly enrolled participants in the Johnston County Osteoarthritis Project from 2003-04 having data on lumbar spine IRF (DSN, OST and FOA) were the subjects (mean age 60.1 (SD 10.3), 62.3% female, 37.6% African American, mean body mass index (BMI) 31.3 (SD 7.4)). Lateral lumbar spine films were graded for each lumbar level in a semi-quantitative fashion (0–3) for DSN and OST according to the Burnett Atlas, while FOA was graded present or absent. Low back symptoms with and without associated leg symptoms were determined with the following questions: “On most days have you had symptoms of pain, aching or stiffness in your low back?” and “On most days do you have pain (sciatica) radiating down your right or left leg?” Two outcome groups were created: LBS and LBS with associated leg symptoms. Each group was compared separately to those with no symptoms. Logistic regression models were used for all analyses while adjusting for BMI, race, gender and age. Interactions between lumbar spine IRF and race or gender were tested with likelihood ratios tests (p<0.10 for significance).

**Results:** Low back symptoms and LBS with associated leg symptoms were present in 51.8% and 24.9% of participants, respectively. Disc space narrowing was present in 57.6%, OST present in 88.1% and FOA present in 57.9% of participants. Those with LBS were 32% as likely than those without LBS to have DSN (adjusted odds ratio [aOR] 1.32 (95% CI 1.09, 1.52)). No association was found with FOA and either LBS or LBS with associated leg symptoms. No significant association was found between OST and LBS with associated leg symptoms.

A significant interaction (p<0.001) was observed between race and OST with LBS. African Americans (AAs) with OST were more likely (aOR 1.78 (95% CI 1.25, 2.55)) to report LBS than AAs without OST. There was no effect among Caucasians.

**Conclusion:** Modest associations were found between DSN and LBS but no significant associations were found with LBS and associated leg symptoms. LBS with associated leg symptoms may have an etiology other than disc degeneration; suggesting that plain film radiographs may have limited clinical utility for this subgroup.

**Disclosure:** A. P. Goode, None; J. K. Freburger, None; T. S. Carey, None; C. E. Cook, None; J. Renner, None; S. D. Rundell, None; J. M. Jordan, Algynomics, Inc., 1, Johnson and Johnson, 5, Johnson & Johnson, 2, Interleukin Genetics, Inc., 5, Eli Lilly and Company, 5, Mutual Pharmaceutical Company, 5.

1095

Metal Concentrations in Patients with Failed Metal-On-Metal Hip Prostheses Determine the Inflammation Phenotype in Peri-Implant Tissue. Eija-Leena Paukkeri1, Riku Korhon1, Antti Eskelinen1, Marko Pesu1, Katja Vasama1, Teemu Moilanen1 and Eeva Moilanen1. 1The Immunopharmacology Research Group, University of Tampere School of Medicine, 2Tampere University Hospital, Tampere, Finland, 3Joint Replacement, Tampere, Finland, 4Immunoregulation, Institute of Biomedical Technology, University of Tampere, Tampere, Finland, 5Fimlab Laboratories, Tampere, Finland.

**Background/Purpose:** Hip arthroplasty is the standard treatment of a painful hip destruction in rheumatoid arthritis and osteoarthritis. The use of metal-on-metal (MoM) bearing surfaces in total hip arthroplasty gained popularity especially in young and active patients during the last decade. Recently, worriesome failures due to inflammatory soft tissue reactions related to wear particles have been widely reported. The pathogenesis of this reaction is unknown. The aim of the present study was to clarify the inflammatory responses in peri-implant tissue in patients with a failure of MoM articulation.

**Methods:** Sixteen patients with a failed Articular Surface Replacement (ASR) implant were included in the study. Blood metal ion levels were analysed with coupled plasma mass spectrometry before revision surgery. Samples of peri-implant tissues collected during revision surgery were degraded by enzyme digestion and the distributions of cell populations were analysed by flow cytometry.

**Results:** In macroscopic observation, peri-implant reactions had variable amounts of necrotic and granulomatous tissue and cystic pseudotumour formation. All patients expressed elevated levels of blood chromium and cobalt, but the patient-to-patient variation was significant. In histological examination, intensive inflammatory cell infiltration was a characteristic feature, but only few metal containing cells were observed. An analysis by flow cytometry showed that the distributions of the inflammatory cells were mainly polarized either to macrophage-rich (CD45+/CD14+) or T-lymphocyte-rich (CD45+/CD3+) phenotypes with the average portions being 54 % (macrophages) and 20 % (T-lymphocytes) in macrophage-dominated inflammation and 25 % (macrophages) and 54 % (T-lymphocytes) in T-lymphocyte-dominated conditions. The proportions of B-lymphocytes (CD45+/CD19+ or) and granulocytes (CD45+/CD15+) were small. Interestingly, the levels of blood chromium and cobalt were significantly higher in patients with macrophage-dominated inflammation than in patients with T-lymphocyte-dominated inflammation.

**Conclusion:** The results suggest that the adverse reactions induced by MoM wear particles contain heterogeneous pathogeneses and the metal levels seem to be an important factor in the determination of inflammatory phenotype. The present results support the hypothesis that higher levels of metal particles cause tissue necrosis and macrophages are recruited to clear the necrotic debris. The lymphocyte-dominated inflammation may, on the other hand, reflect a delayed hypersensitivity reaction induced by lower metal concentrations.

**Disclosure:** E. L. Paukkeri, None; R. Korhon1, None; A. Eskelinen1, None; M. Pesu1, None; K. Vasama1, None; T. Moilanen1, None; E. Moilanen1, None.
Lower Income Paradoxically Associated with Better Patient-Reported Outcomes After Knee Arthroplasty in the U.S. Javinder A. Singh1 and David Lewallen2. 1University of Alabama at Birmingham, Birmingham, AL, 2Mayo Clinic College of Medicine, Rochester

Background/Purpose: To assess whether income is associated with patient-reported outcomes (PROs) after primary total knee arthroplasty (TKA).

Methods: We used the prospectively collected data from the Mayo Clinic Total Joint Registry to assess the association of income with index knee functional improvement, and moderate-severe pain at 2- and 5-year follow-up after primary TKA using multivariable-adjusted logistic regression analyses. Analyses were adjusted for various characteristics previously shown to be associated with PROs after TKA, namely demographics (age, gender, body mass index (BMI)), comorbidity as measured by Deyo-Charlson index, American Society of Anesthesiologist (ASA) score as a measure of perioperative mortality, implant fixation (cemented/hybrid versus not cemented), underlying diagnosis (osteoarthritis, rheumatoid/inflammatory arthritis or other) and distance from medical center (categorized <100, 100–500 and >500 miles/overseas). ASA score was not collinear with Deyo-Charlson index (correlation coefficient <0.40).

Results: There were 7,139 primary TKAs at 2-years and 4,234 at 5-years. In multivariable-adjusted analyses, at 2-year follow-up, both lower income groups (<=35K and >35K–45K) were significantly associated with lower odds ratio (OR) (95% confidence interval (CI) of moderate-severe pain, OR 0.6 [95% CI 0.4, 0.9] (p=0.02) and 0.7 [95% CI 0.5, 0.9] (p=0.02). The overall improvement in knee function was rated as ‘better’ more often at 2-years for patients with income in the < =35K compared to patients with income >$45K, with OR of 1.9 [95% CI 1.0, 3.6] (p=0.06), respectively. At 5-years, numerically similar but non-significant odds were noted.

Conclusion: We found that lower income was associated with better pain outcome and more improvement in knee function postoperatively. Insights into mediators of these relationships need to be investigated to understand how income influences outcomes after TKA.

Disclosure: J. A. Singh, Research and travel grants from Takeda, Savient, Wyeth and Anjen, 2; Honaria from Abbott, Consultant fees from URL Pharma, Savient, Takeda, ArdeBioScience, Allergan and Novartis, 5; D. Lewallen, Zimmer, 5; Zimmer, 7; DePuy, Stryker and Zimmer, 2.
increasing x-ray severity and with number of knees involved with OA (Table).

Table 1. Cross-sectional Association of Knee OA with Prevalent Frailty

<table>
<thead>
<tr>
<th>Knee OA Status</th>
<th>Presence of Frailty</th>
<th>Crude PR</th>
<th>Adjusted * PR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiographic Knee OA (yes vs. no)</td>
<td>KL=0 (reference)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>KL=1</td>
<td>1.42</td>
<td>1.27 (0.75, 2.15)</td>
</tr>
<tr>
<td></td>
<td>KL=2</td>
<td>1.49</td>
<td>1.49 (0.96, 2.31)</td>
</tr>
<tr>
<td></td>
<td>KL=3</td>
<td>1.42</td>
<td>1.42 (0.90, 2.26)</td>
</tr>
<tr>
<td></td>
<td>KL=4</td>
<td>2.52</td>
<td>1.78 (1.12, 2.83)</td>
</tr>
</tbody>
</table>

*Adjusted for age, sex, BMI, physical activity, smoking, education, knee injury, co-morbidities, study site

Conclusion: Frailty is present more frequently in persons with knee OA than those without. Further research is needed to explore whether knee OA predisposes to frailty, and whether early management of knee OA might prevent frailty and its related adverse outcomes.

Disclosure: D. Misra, None; M. C. Nevitt, None; C. E. Lewis, None; J. Torner, None; D. T. Felson, None; T. Neogi, None.

1099

Whole Blood Lead Is Associated with Symptoms, but Not Radiographic Osteoarthritis, in Multiple Joint Sites: The Johnston County Osteoarthritis Project, Amanda E. Nelson, Xiaoyan A. Shi, Todd A. Schwartz, Jordan B. Renner, Kathleen L. Caldwell, Charles G. Helmik, and Joanne M. Jordan, 1University of North Carolina Thurston Arthritis Research Center, Chapel Hill, NC, 2SAS Institute, Inc, Cary, NC, 3University of North Carolina Gillings School of Global Public Health, Dept of Biostatistics, Chapel Hill, NC, 4University of North Carolina School of Medicine, Dept of Radiology, Chapel Hill, NC, 5Centers for Disease Control and Prevention, Atlanta, GA

Background/Purpose: We have previously identified associations between whole blood lead (Pb) and knee osteoarthritis (OA) and with biomarkers of joint metabolism. We hypothesized that Pb may be associated with burden of OA as assessed by multiple joint radiographs and symptoms.

Methods: Whole blood Pb concentrations, representing recent exposure and Pb mobilized from bone, were determined at the Centers for Disease Control and Prevention using inductively coupled plasma-mass spectrometry cell mass spectrometer analysis; levels were categorized into quartiles for analysis. We used composite scores obtained from previously described factor analysis (1) of radiographic OA (ROA) scores from the hands, knees, and spine, and symptoms scores of the low back, hands, knees, and hips, to reflect body burden of OA as outcome measures. Generalized logit and proportional odds models were used for these multi-level outcomes, and pairwise r2 (categorized due to non-normal distributions). Generalized logit and proportional odds models were used for these multi-level outcomes, and then additionally for the other joint site scores.

Results: This cross-sectional analysis includes data (collected at a single visit during 2003-8) for 1659 individuals, 33% male and 35% African American with a mean age of 65 years and BMI 30 kg/m2. At individual sites, ROA with symptoms was present in 13% for hand, 12% for hip, 24% for knee, and 28% for spine. Whole blood Pb was associated with spine RoA scores (30% increased odds of having higher spine ROA scores in the highest Pb quartile compared to the lowest, adjusted OR 1.34 [95% CI 1.01–1.77]), although this was no longer significant after adjustment for the composite scores of other joint sites (Table). The composite score of symptoms, however, was associated with Pb in models adjusted for covariates (OR 1.84 [95% CI 1.41, 2.40]) and after adjustment for ROA scores (Table), such that those in the highest quartile of Pb had 70–85% higher odds of reporting more symptoms compared to those in the lowest Pb quartile.

Conclusion: There was a statistically significant positive association between blood Pb levels and the composite symptoms score, reflecting symptoms at multiple joint sites. No associations were seen for multiple joint ROA in this cross-sectional study.

Disclosure: A. E. Nelson, None; X. A. Shi, None; T. A. Schwartz, None; J. B. Renner, None; K. L. Caldwell, None; C. G. Helmik, None; J. M. Jordan, Algynomics, Inc., 1, Johnson and Johnson, 5, Johnson & Johnson, 2, Interleukin Genetics, Inc., 5, Eli Lilly and Company, 5, Mutual Pharmaceutical Company, 5.

1100

A Functional Growth Hormone Receptor Polymorphism, Exon 3 Deleted Ghr, Is Associated with Radiographic Knee Osteoarthritis in Females with Familial Osteoarthritis At Multiple Sites: The Garp Study. Kim M.J.A. Claessen, Margreet Kloppenburg, H.M. Kroon, M. C. Nevitt, None; J. Torner, None; D. T. Felson, None; T. Neogi, None.

Background/Purpose: Genetic influences contribute considerably to the development of osteoarthritis (OA), and are most likely of a polygenic nature. Until now, genetic studies have identified several genetic variants associated with primary OA, providing strong clue for the involvement of endochondral ossification in OA onset. Endochondral ossification is the main process in longitudinal skeletal growth, and is tightly regulated by a complex network of hormones, growth factors and extracellular matrix components. One of the main players in this process is growth hormone (GH), exerting its effects predominantly through stimulation of insulin-like growth factor-1 (IGF-1) secretion. This qualifies genetic variations within genes involved in the GH/IGF-1 axis as obvious candidates for association studies in primary OA.

Recently, presence of a common growth hormone receptor (GHR) polymorphism, exon 3 deletion (d3-GHR), associated with increased GH sensitivity of the GHR, was demonstrated to have functional consequences in various clinical conditions. The aim of the present study was to investigate the effects of the d3-GHR polymorphism on the extent and characteristics of radiographic in patients with primary OA at multiple joint sites.

Methods: In a case-control study, we compared frequency of GHRd3 deletion genotype between patients with familial primary OA from the GARP (Genetics, ARthrosis and Progression) Study, and controls. Kellgren-Lawrence scores were used to assess ROA in the knee, hip and hand; the Osteoarthritis Research Society atlas for the assessment of individual ROA features. Patients and controls were genotyped for 7 single nucleotide polymorphisms (SNPs) encompassing the d3-GHR gene to allow high throughput genotyping. One tagSNP was used as proxy for d3-GHR (full LD, pairwise r2=1). Binary logistic regression analyses with robust standard errors were performed, to assess the relationship between d3-GHR and ROA.

Results: We studied 373 patients (mean age 60.1, 82% female) and 752 controls. GHRd3 deletion genotype was significantly associated with OA, especially in females (adjusted odds ratio (OR) (95%CI) 1.5(1.1–2.1), p=0.017). Strongest association was found with knee OA (adjusted OR 2.0(1.3–3.0), p=0.002), followed by hand OA (adjusted OR 1.5(1.1–2.1), p=0.024). No
such a relationship was found in males. GHRa43 genotype was related to both osteophytes and joint space narrowing.

**Conclusion:** GHRa43 genotype was associated with knee and hand RA in females with a severe primary OA phenotype, indicating a role for the GHRα1 axis in the pathophysiology of primary OA.

**Disclosure:** K. M. J. A. Claessen, None; M. Kloppenburg, None; H. M. Kroon, None; J. Bijsterbosch, None; A. M. Pereira, None; H. A. Romijn, None; T. Straaten van der, None; M. Beekman, None; P. E. Slagboom, None; N. R. Biemans, None; I. Meulenhof, None.

### 1101

**Condroitin Sulfate Decreases Chemokine Levels and Synovitis in knee osteoarthritis Patients**

**Background/Purpose:** Synovitis is one of the major signs of structure damage in osteoarthritis (OA) progression. Chondroitin sulfate (CS) is an effective drug in the treatment of OA since it can reduce joint swelling and effusion in OA patients as described in the NIH-funded GAIT study. Therefore, the aim of this study was to compare the effect of CS vs. acetaminophen on synovitis in OA patients and to evaluate their impact on chemokine concentrations.

**Methods:** Synovitis (synovial hypertrophy + effusion ≥4 mm) assessed by sonography and synovial effusion quantified by arthrocentesis were evaluated in 45 patients treated with CS (800 mg/day) or acetaminophen (4 g/day) for 6 months. Patients were followed-up until month 9 to evaluate the carry-over effect. Symptomatic effect of both treatments was also evaluated by Lequesne Algofunctional Index (baseline: 1.5, 3, 6 and 9 months). The levels of CXCL16, fractalkine/CX3CL1, MCP-1/CCL2, RANTES/CCL5 and GRO-α/CXCL1 were determined by ELISA in the plasma and synovial samples collected in each visit. Analysis of continuous variables was based on analyses of covariance (ANCOVA) model. Study of the chemokine variations between each time and the baselines was performed by a Wilcoxon two-related samples test. Comparison between the two groups was obtained using an independent sample t-test for quantitative variables or a chi-squared test for qualitative variables. P values between the two groups was obtained using an independent sample t-test for baselines was performed by a Wilcoxon two-related samples test. Comparison (ANCOVA) model. Study of the chemokine variations between each time and the baselines was performed by a Wilcoxon two-related samples test. Comparison between the two groups was obtained using an independent sample t-test for quantitative variables or a chi-squared test for qualitative variables. P values were considered statistically significant for each variable.

**Results:** Eligible patients had clinical and radiographic evidence of OA (K&L grade 2 and 3) with synovitis. Mean age of patients was 70.4 years being women 72.1% of them. Mean BMI was 28.97. At the end of the study, CS significantly reduced synovitis compared to acetaminophen (p < 0.01). This significant reduction was also detected in MCP-1 and fractalkine synovial levels. Changes of baseline, CS treated patients showed significant reductions in synovitis (25.5%) and significant impairment of synovial hypertrophy (61.9%). Reduction of these effects were accomplished by significant decreases in synovial and serum MCP-1 content. In contrast, in the acetaminophen-treated group no effect on synovitis was observed and increased synovial RANTES levels were even detected. Additionally, CS but not acetaminophen effectively reduced functional incapacity after 6 months of treatment (CS-treated group: 11.5 ± 2.5 vs. 7.9 ± 3.0; p < 0.01; acetaminophen-treated group: 9.9 ± 4.1 vs. 8.3 ± 4.9; n.s.), CS functional improvement remained after 3 months treatment cessation (month 9) thus confirming CS carry-over effect.

**Conclusion:** These results indicate that CS but not acetaminophen effectively reduces synovitis and clinical symptoms in OA patients. Evidence of an anti-inflammatory effect for CS has been also provided since it can decrease synovial and plasma levels of relevant chemokines. This study also adds further support and extends the findings described in the NIH-funded GAIT study and suggests that CS seems to be a more effective therapeutic tool for OA and synovial inflammation than anaciglides.

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**Disclosure:** J. Monfort, None; P. Escudero, None; C. Orellana, None; L. Piqueras, None; L. Tio, None; F. Montañés, None; N. García, None; C. Company, None; P. Benito, None; M. J. Sanz, None.

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### 1102

**Immunoreactive Collagen Type II Cleavage Products and Their Nitrated Forms in Rheumatoid Arthritis and Osteoarthritis: An Outpatient Cross-Sectional Study.**

**Ruediger Mueller1, Axel Finck1,2, Guy Heynen1 and Jos van Kemps3,4,5.**

1. University Hospitals, Geneva 14, Switzerland, 2Consulting, CH-6300 Zug, Switzerland, 3MD, St. Gallen, Switzerland

**Background/Purpose:** Catabolism of type II collagen (COLII) involves multiple metalloproteinases, aggrecanases and cathepsin, releasing heterogeneous triple helix cleavage products. The complex regulation of these enzymes and of inducible NOS (iNOS) includes inflammatory cytokines. Co2-1 peptide (Co2), located towards the N-teleopeptide region of COLII contains a tyrosine residue susceptible to endogenous nitration by reactive nitrogen species, forming Co2-1-N2O (NCo1). Specific immunomassays allow for estimation of nitration index (NI). Using these assays in OA and RA should show differences since RA, unlike OA, is treated with DMARDs known to inhibit structural damage progression.

**Methods:** Serum (S) and Urine (U) Co1 and NCo1 were measured by ELISA in a cross-sectional study (49 RA and 118 outpatients with active hand OA). The ratio of NCo1 (nmol)/Co1 (nmol) provided NI. Clinical variables were age, sex, DAS and VAS. Urinary fractional excretions (UFE) of biomarkers was calculated in RA patients. Statistical analysis used STATISTICA® Version 12.1

**Results:** OA patients were older (64 years vs 58 in RA). Mean DAS28 was 2.64 with 60% receiving corticoids or synthetic and biological DMARD treatment in RA. VAS pain was higher in OA than RA patients (46 vs. 34; p < 0.0001). Mean SCOL concentrations (nmol/L) and SNCOL (pmol/L) were higher in RA (30±7 and 687 ± 90) than OA (241 ± 13 and 465 ± 59; p < 0.0001). Mean UCo1 (nmol/mmol creatinine) was higher in RA than OA (16.3 ± 8.1; p < 0.0001) whereas UNCo1 (pmol/mmol creatinine) values were similar between the two groups (22.4 ± 2.3 in RA and 26.2 ± 2.1 in OA; p > 0.1). Co1 and NCo1 UFE were 2.87 (2.25–3.48; 95% CI) in RA and 2.63 (1.81–3.46; 95% CI) and highly correlated (r-square=0.53; p<0.0001). The SCOL2-1NI was similar in RA (0.238 %, 95% CI: 0.214–0.262) and in OA (0.217, 95% CI: 0.19–0.24; p<0.05) but the UCOL2-1NI was markedly lower in RA (0.164, 95% CI: 0.141–0.187) than OA (0.37, 95% CI: 0.33–0.42; p<0.0001). In both RA and OA, pairwise comparisons of serum and urine NI indicated highly significant differences (p<0.0001). None of the disease activity indices were associated with any of the two biomarkers or their ratios in serum or urine.

**Conclusion:** Data indicate excess nitrated forms of Co2-1 in the urine of patients suffering from active OA in comparison to DMARD treated RA patients, indicating that a greater proportion of OA SNCOL immunoreactive forms pass through the renal glomerular membrane than in RA. In RA, fractional excretion of both Co1 and NCo1 was low and similar for Co1 and NCo1, excluding a differential renal handling of the detected epitopes. The excess of urinary nitrated forms in OA vs RA may result from the OA disease process itself or from DMARD interference with the iNOS activity in RA. Within patients’ differences between serum and urine NI values indicate biological heterogeneity of immunoreactive species containing the Co2-1 epitope. The clinical relevance of this heterogeneity is unknown since the half-life of measured components have not been studied. Additional investigations with specific enzyme inhibitors in OA and biological DMARDs in early RA are warranted to quantify the dynamics of serum and urine components of Co2-1 and its nitrated forms.

**Disclosure:** R. Mueller, None; A. Finck, Roche, Pfizer, BMS, 2, Roche, Pfizer, BMS, 5; G. Heynen, Artialis SA, 5; J. van Kemps, None.

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### 1103

**Cumulative Occupational Physical Load As Risk Factor for Knee Osteoarthritis.**

Allison M. Ezza1, Jolanda Cibere2, Mieke Koehoorn1, Eric C. Sayre2 and Linda C. Li1. 1University of British Columbia, Vancouver, BC, 2Arthritis Research Centre of Canada, Vancouver, BC

**Background/Purpose:** Knee osteoarthritis (OA) results from the interaction of multiple risk factors, one of which may be physically demanding occupations. The purpose of this study was to determine the association between cumulative occupational physical load (COPL) and the presence of knee OA, defined as Symptomatic Radiographic Osteoarthritis (SOA) or Magnetic Resonance Imaging Osteoarthritis (MRI-OA).

**Methods:** This was a cross-sectional analysis of symptomatic (n=255) and asymptomatic (n=72) knee cohorts recruited as a random sample from the same population. Participants were 40 to 79 years old. Inclusion criteria S473
PFJ structural damage was defined in two ways: 1) full-thickness cartilage using the WORMS scale in 4 regions (medial and lateral patella and trochlea). Cartilage damage and bone marrow lesions (BMLs) were assessed on MRI. Femur length included Insall-Salvati ratio (measure of patella alta), lateral trochlear inclination, (measure of trochlear morphology), and femur length. Structural strength, and hamstring-quadriceps strength ratio. Modifiable risk factors included BMI, occupational history, quadriceps activity level (5 levels) and knee bending/kneeling activities (3 levels) for each joint. We performed analyses in the PFJ overall (damage in any of the four regions) and for the medial and lateral PFJ separately.

**Results:** 1268 regions from 317 knees were studied (mean age 63.5 years, mean BMI 30.5 kg/m², 67% female). Full-thickness cartilage damage was present in any PFJ region, medial, and lateral in 26%, 16%, and 25% of regions, respectively. The hamstring-quadriceps ratio, Insall-Salvati ratio, and lateral trochlear inclination distinguished the strongest associations with overall and lateral PFJ damage (see table). Females and older subjects were more likely to have medial but not lateral PFJ damage. Femur length was strongly associated with lateral PFJ damage. Similar results were seen for the PFJ damage definition including a BML.

Association between demographic, modifiable, structural, and biomechanical risk factors and full-thickness cartilage damage (WORMS 2.5; ≥5) in the PFJ.

<table>
<thead>
<tr>
<th>Any PFJ</th>
<th>Medial PFJ</th>
<th>Lateral PFJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic risk factors</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Age (per 10 years)</td>
<td>1.3 (1.1, 1.7)</td>
<td>1.7 (1.2, 2.4)</td>
</tr>
<tr>
<td>Sex (Reference=Males)</td>
<td>1.4 (0.9, 2.1)</td>
<td>2.9 (1.5, 5.6)</td>
</tr>
<tr>
<td>Race</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Other (Reference)</td>
<td>0.9 (0.4, 1.7)</td>
<td>0.6 (0.2, 1.4)</td>
</tr>
<tr>
<td>Modifiable risk factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (per 5 units)</td>
<td>1.1 (0.9, 1.3)</td>
<td>1.2 (0.9, 1.5)</td>
</tr>
<tr>
<td>Occupational history</td>
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<td></td>
</tr>
<tr>
<td>No labor (Reference)</td>
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<td>1.0</td>
</tr>
<tr>
<td>Labor</td>
<td>1.0 (0.6, 1.5)</td>
<td>1.2 (0.7, 2.2)</td>
</tr>
<tr>
<td>Other</td>
<td>1.0 (0.6, 1.5)</td>
<td>1.7 (0.4, 6.9)</td>
</tr>
<tr>
<td>History of knee injury (Reference=none)</td>
<td>0.4 (0.3, 0.7)</td>
<td>0.4 (0.2, 0.7)</td>
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<tr>
<td>History of knee surgery</td>
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<tr>
<td>No knee surgery (Reference=none)</td>
<td>0.8 (0.5, 1.6)</td>
<td>0.5 (0.3, 0.9)</td>
</tr>
<tr>
<td>Radiographic risk factors</td>
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<td></td>
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<tr>
<td>Quadscoope strength</td>
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<td></td>
</tr>
<tr>
<td>Tertile 1 (Low)</td>
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<td>1.0</td>
</tr>
<tr>
<td>Tertile 2</td>
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<td>0.8 (0.5, 1.5)</td>
</tr>
<tr>
<td>Tertile 3 (High)</td>
<td>1.8 (1.2, 2.6)</td>
<td>1.8 (1.0, 3.6)</td>
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<tr>
<td>Structural risk factors</td>
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<td></td>
</tr>
<tr>
<td>Insall-Salvati Ratio</td>
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<td>Tertile 1 (Reference)</td>
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</tr>
<tr>
<td>Tertile 2</td>
<td>1.2 (0.9, 1.8)</td>
<td>1.2 (0.9, 1.5)</td>
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<tr>
<td>Tertile 3 (Patella alta)</td>
<td>1.5 (1.0, 2.4)</td>
<td>1.5 (1.0, 2.0)</td>
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<tr>
<td>Tertile 3 (Patella alta)</td>
<td>1.5 (1.0, 2.4)</td>
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<tr>
<td>Tertile 1 (Patellar inclination)</td>
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<td>Tertile 2</td>
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<td>0.9 (0.5, 1.7)</td>
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<tr>
<td>Tertile 3 (Reference)</td>
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<td>1.0</td>
</tr>
<tr>
<td>Tertile 1 (Reference, Short)</td>
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<td>1.0</td>
</tr>
<tr>
<td>Tertile 2</td>
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<td>0.8 (0.5, 1.5)</td>
</tr>
<tr>
<td>Tertile 3 (Long)</td>
<td>1.3 (0.9, 2.0)</td>
<td>0.6 (0.3, 1.2)</td>
</tr>
</tbody>
</table>

**Conclusion:** PFJ structural damage is more strongly related to structural and demographic factors than to modifiable ones. Risk factors may be different for medial and lateral PFJ structural damage. Future studies should evaluate risk factors separately for medial and lateral PFJ damage.

**Disclosure:** J. J. Stefanik, None; K. Wang, None; K. D. Gross, None; F. Roemer, Boston Imaging Core Lab, 1. National Institute of Health, 5. Merck Serono; J. A. Lynch, None; N. Segal, None; C. E. Lewis, None; M. C. Nevitt, None; A. Guermazi, BICL, LLC, 4, AstraZeneca, Genzyme, Novartis, and MerckSerono; D. T. Felson, None.

**Background/Purpose:** Past investigations into risk factors for patellofemoral joint (PFJ) osteoarthritis (OA) have been limited by the use of radiography, which is insensitive to identify PFJ OA and have focused on only a few risk factors. MRI offers a unique opportunity to directly visualize tissue damage in the PFJ, and risk factors related to medial PFJ damage, which was recently reported as common (Gross, ARD, 2012), can be distinguished from those related to lateral damage. The purpose of this study is to evaluate the association between PFJ structural damage on MRI with a wide spectrum of risk factors including: demographic, modifiable, structural, and biomechanical factors.

**Methods:** We analyzed data from the baseline exam of MOST, a NIH-funded cohort study of persons aged 50–79 years with or at risk for knee OA. Knee for this study came from persons with x-ray OA in tribofemoral joint and/or PFJ. Demographic risk factors included age, sex, and race. **Modifiable risk factors included BMI, occupational history, quadriceps strength, and hamstrings-quadriceps strength ratio. Structural risk factors included Insall-Salvati ratio (measure of patella alta), lateral trochlear inclination (measure of trochlear morphology), and femur length. **Biomechanical risk factors included varus and valgus alignment (from long limb x-rays). Cartilage damage and bone marrow lesions (BMLs) were assessed on MRI using WORMS in 4 regions (medial and lateral patella and trochlea). PFJ structural damage was defined in two ways: 1) full-thickness cartilage loss (WORMS 2.5; ≥5 on a 0–6 scale) and 2) full-thickness cartilage loss in addition to a BML (≥1 on a 0–3 scale). We examined the cross-sectional association between risk factors and PFJ structural damage using logistic regression with GEE to account for the correlation between regions from the same knee. We performed analyses in the PFJ overall (damage in any of the four regions) and for the medial and lateral PFJ separately.

**Results:** 1268 regions from 317 knees were studied (mean age 63.5 years, mean BMI 30.5 kg/m², 67% female). Full-thickness cartilage damage was present in any PFJ region, medial, and lateral in 26%, 16%, and 25% of regions, respectively. The hamstring-quadriceps ratios, Insall-Salvati ratio, and lateral trochlear inclination distinguished the strongest associations with overall and lateral PFJ damage (see table). Females and older subjects were more likely to have medial but not lateral PFJ damage. Femur length was strongly associated with lateral PFJ damage. Similar results were seen for the PFJ damage definition including a BML.

Association between demographic, modifiable, structural, and biomechanical risk factors and full-thickness cartilage damage (WORMS 2.5; ≥5) in the PFJ.
Methods: 90 subjects (69F 21M, Age 60±2, BMI 28.3±4.0) with radiographic and symptomatic medial knee OA (K-L grade 2–3, ambulatory pain >30 mm on a 100 mm VAS) were compared to 24 (18F 6M) age (59±2) and BMI (28.8±8.3) matched controls with no knee pain (K-L grade 0–1). Full limb mechanical axis and AP X-rays of the ankles were obtained. The tibial lateral shift (figure 1), defined as the distance between the center of the intercondylar notch of the femur and midpoint of the tibial plateau, was measured using Image J software (US NIH, Bethesda, MD, http://rsweb.nih.gov/ij/). Subjects underwent gait analyses using an optoelectronic camera system and multi-component force plate. Comparisons were performed after matching for speed. The peak external knee Adduction Moment (%body weight * height, %BW*H) and knee adduction angular impulse was calculated and used as the primary endpoint. Paired t-tests were used to compare group differences. Pearson’s correlations were calculated to analyze the relationship between knee moments and the other radiographic parameters with significance set at p<0.05.

Results: The mean ± S.D. lateral tibio-femoral shift was 5.18±2.45 mm in the MKOA group compared to 1.5±1.22 mm in the control group (p<0.01). Interestingly there was no relationship between the lateral shift and mechanical axis (r=0.11, p=0.23). There was an apparent relationship between the external knee adduction moment and lateral tibial shift in the MKOA group with greater lateral tibial shift related to greater knee moments (r=0.46, p<0.01). There was no relationship between knee adduction moments and lateral tibial shift in the control group (r=0.13, p=0.09). There was a relationship between knee angular impulse to the lateral shift in the MKOA group (r=0.48, p<0.01).

Conclusion: Lateral tibio-femoral shift is greater in MKOA than in normal controls and is related to increased medial knee loads. These findings suggest that the lateral tibio-femoral shift may be a new radiographic marker for MKOA. Further studies are needed to determine the clinical validity of assessing the tibio-femoral shift.

Disclosure: R. H. Lidtke, None; B. Goker, None; A. Tufan, None; E. L. Thorp, None; J. A. Block, None.


Necati Balci and Lale Cerrahoglu.
Celan Bayar University Medical School, Manisa, Turkey

Background/Purpose: Disturbances of weight bearing and walking pattern occur in patients with knee osteoarthritis (OA) due to impairments in knee joint. These impairments may lead to changes in the mechanical alignment of lower limb and dynamic function of the foot. Therefore, it has been given special attention to foot orthoses and footwear modifications as a non-operative treatment of knee OA. However, in order to fully understand the effect of these interventions on the knee and other lower limb joints, greater knowledge of foot structure is required. We aimed to study the plantar pressure and foot posture characteristics of knee OA and their relationship with disease characteristics.

Methods: A total of 78 feet of 39 patients with bilateral knee OA (ACR criteria) were evaluated regarding clinical and biometrics data. Demographic and disease characteristics were obtained. The radiographical evaluation was done based on anterior-posterior tibio-femoral radiographs using the Kellgren-Lawrence (KL) grading scale (0–4). Barefoot dynamic plantar pressure and the Arch index (AI) were measured by the 3D footscan system. The Foot posture index (FPI-6) was obtained. Correlation (Pearson’s correlation coefficient) and regression analyses were performed between various plantar pressure analysis, clinical parameters and disease-related parameters.

Results: Thirty nine patients (11 male) with mean age 51.53 (standard deviation 11.89) and mean BMI 30.5 (SD 4.9) were recruited. For dynamic plantar pressures; grade in right knee according to KL radiologic criteria correlates with left foot medial heel, left midfoot and left middle forefoot pressures (r=0.40, p=0.010; r=0.33, p=0.040; r=0.36, p=0.022 respectively). Grade in left knee according to KL radiologic criteria correlates with left heel, left midfoot and index metatarsal with right foot toe pressure (r=0.33, p=0.036; r=0.10; r=0.41, p=0.009 respectively). For foot posture; grade in right knee according to KL radiologic criteria correlates with right FPI-6, grade in left knee according to KL radiologic criteria correlates with left FPI-6, right FPI-6 and left AI (r=0.38, p=0.015; r=0.41, p=0.008; r=0.41, p=0.009; r=0.33, p=0.036 respectively). In multivariate regression analysis it is found that left KL grade was not affected from left AI (p=0.45).

Conclusion: The dynamic variables of plantar pressure and foot posture are sensitive to the OA grading. These results suggest that people with the higher OA grade exhibit a more pronated foot type and shifted pressure distribution. We can maintain a superior biomechanical correction by advanced evaluation of foot structure in non-operative treatment of knee OA such as orthoses and footwear modifications. As a result, the assessment of patients with knee OA in clinical practice should include simple foot measures and evaluation.

Disclosure: N. Balci, None; L. Cerrahoglu, None.

1107 Baseline Knee Flexion Pain, Age and Joint Line Tenderness Predict the Progression of Asymptomatic, Radiographic Knee Osteoarthritis to Symptomatic Knee Osteoarthritis Over 5 Years. Abhiram Gande1 and John J. Irrgang2, 4, 5.
1Hospital for Special Surgery, New York, NY, 2Hospital For Special Surgery, New York, NY, 3Hospital Special Surgery, New York, NY, 4Brigham and Women’s Hospital, Boston, MA

Background/Purpose: Knee Osteoarthritis (OA) is the most prevalent form of OA. Historically, not all people who have tell-tale signs of radiographic knee osteoarthritis progress to symptomatic knee osteoarthritis, and vice versa. According to a meta-analysis by Bedson et. al, the prevalence of radiographic knee OA (Rad OA) in symptomatic patients can range between 15–76%. However, Duncan et. al observed a strong correlation between increased symptoms and radiographic OA findings. Such inconsistencies may be resolved with a better understanding of the risk factors for symptomatic knee OA. To date, there has been no survey of risk factors involved in the progression of baseline asymptomatic Rad OA to symptomatic Rad OA (Symp OA). Therefore, we evaluated the abilities of various physical exam measures and demographical variables in predicting such progression over five years.

Methods: Data from the Knee Osteoarthritis Initiative (OAI), a prospective longitudinal study of biomarkers involved in the onset and progression of OA in nearly 5000 subjects, were used for this study. Inclusion criteria were individuals who had Rad OA—score ≥ 2 on the Kellgren/Lawrence (K-L)—at baseline. The cases progressed to develop Symp OA—knee pain on most days of the month over the last 12 months—at 3 years, and remained symptomatic at 4 and 5 years, while the controls remained asymptomatic at all three time points from baseline. Cases and controls were matched for baseline knee K-L score, presence of unilateral or bilateral index knees and consistency of symptoms at all three time points (3, 4, and 5 years). The predictor variables were age, gender, BMI, abdominal circumference, walking ability (20m and 400m walk times), chair stands time, presence of Hand OA, varus/valgus malalignment, medial and lateral joint line tenderness, knee flexion pain, flexion contracture or hyperextension sign, bulge sign, patellar tap sign and isometric quadriceps strength corrected for body weight. Univariate conditional logistic regression was performed and p-values, odds ratios and 95 % confidence intervals were calculated.

Results: The baseline sample included 2093 individuals with Rad OA (K-L ≥ 2). The matching process yielded 94 cases and controls, with similar demographic data (Table 1). Logistic regression analysis revealed that age (p=0.04), medial joint line tenderness (p=0.008), lateral joint line tenderness (p=0.011) and knee flexion pain (p=0.047) were significant predictor variables. 95% confidence intervals were >1 and odds ratios were >1 for the four significant variables.

Conclusion: Age, knee flexion pain, medial and lateral joint line tender-ness are measures with significant (p<0.05) predictive ability of progression from baseline Rad OA to Symp OA. As such, these commonly used demographic and physical exam measures can help physicians identify individuals with asymptomatic radiographic OA who may be at risk for developing chronic knee pain. Ultimately, older age and positive signs on these physical exam measures can serve as markers to initiate aggressive management to help prevent the onset of symptomatic knee OA.

Disclosure: A. Gande, None; J. J. Irrgang, None.

1108 A Randomized Controlled Trial of Hylan G-F 20 for the Treatment of Carpometacarpal Osteoarthritis. Lisa A. Mandl1, Scott Wolfe2, Aaron Daleius3, Robert N. Hotchkiss4, Stephen L. Lyman1 and Jeffrey N. Katz4.
1Hospital of Special Surgery, New York, NY, 2Hospital For Special Surgery, New York, NY, 3Hospital Special Surgery, New York, NY, 4Brigham and Women’s Hospital, Boston, MA

Background/Purpose: Painful carpometacarpal osteoarthritis (CMC OA) is associated with substantial impairment, and is often unresponsive to medical treatment. Hylan G-F 20 has been shown to improve pain and function in patients with knee OA; however, its effectiveness in CMC OA is unknown.

Methods: 200 patients with radiologic evidence of CMC OA and no inflammatory arthritis were randomized to receive one of the following three
regimens: 1cc of Hylan G-F 20 weekly for 2 weeks; 1cc triamcinolone acetonide (40mg) followed 1 week later by 1cc 0.5% bupivacaine; or 0.5% bupivacaine weekly for 2 weeks. Randomization was double blind and stratified on previous intra-articular steroid treatment. An experienced hand surgeon performed all injections without radiologic guidance. Patients were assessed 26 weeks after the first injection. An intention to treat, last-value-carry forward analysis was performed on all patients who had at least one post-injection visit. Results: 188 patients were eligible for this analysis. Average age was 66.5 years (range 45–89), 67.7% female and 90.4% Caucasian. 33%, 31% and 38% had previously received a corticosteroid injection in the Hylan G-F 20, triamcinolone and bupivacaine groups respectively. 100 (53%) had Kellgren and Lawrence (K+L) Grade <= 3 in the CMC joint and 88 (47%) had K+L Grade 4. At 26 weeks, pain as measured by the Visual Analogue Scale (VAS) showed statistically and clinically significant improvement in all treatment groups. However, there was no statistically or clinically significant difference in VAS between treatment arms at 26 weeks. No treatment arm resulted in clinically meaningful improvements in function, as measured by the Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH). In a multivariate regression analysis, controlling for age, sex, K+L grade, baseline pain and treatment assignment, neither K+L Grade nor treatment assignment was associated with a difference in pain at 26 weeks. Among those with severe K+L Grade 4 CMC OA, all three treatments led to clinically and statistically significant improvements in pain at 26 weeks, with no differences between groups.

Table 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Hylan G-F 20 Mean ± s.d.</th>
<th>Triamcinolone Mean ± s.d.</th>
<th>Bupivacaine Mean ± s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K+L &lt;3 (N=100)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS for Pain</td>
<td>61.7 ± 19.5</td>
<td>62.5 ± 19.0</td>
<td>61.2 ± 19.8</td>
</tr>
<tr>
<td>VAS at 26 weeks</td>
<td>51.6 ± 28.8</td>
<td>50.6 ± 28.6</td>
<td>49.4 ± 28.2</td>
</tr>
<tr>
<td>Delta VAS</td>
<td>-10.1 ± 23.7</td>
<td>-13.1 ± 29.1</td>
<td>-11.9 ± 29.9</td>
</tr>
<tr>
<td>p-value within group change</td>
<td>0.002</td>
<td>0.003</td>
<td>&lt;0.0001</td>
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<tr>
<td>DASH Baseline</td>
<td>28.8 ± 17.3</td>
<td>29.0 ± 17.9</td>
<td>25.7 ± 17.1</td>
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<tr>
<td>DASH 26 Weeks</td>
<td>26.1 ± 19.0</td>
<td>27.0 ± 18.0</td>
<td>24.2 ± 17.4</td>
</tr>
<tr>
<td>DASH Delta (N=175*)</td>
<td>-3.5 ± 11.4</td>
<td>-2.8 ± 14.9</td>
<td>-1.3 ± 12.3</td>
</tr>
<tr>
<td>p-value within group change</td>
<td>0.02</td>
<td>0.14</td>
<td>0.07</td>
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<tr>
<td><strong>K+L 4 (N=88)</strong></td>
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<tr>
<td>VAS for Pain</td>
<td>59.3 ± 19.1</td>
<td>61.2 ± 22.1</td>
<td>61.9 ± 16.0</td>
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<tr>
<td>VAS at 26 weeks</td>
<td>47.3 ± 22.6</td>
<td>41.3 ± 23.9</td>
<td>44.8 ± 24.8</td>
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<tr>
<td>Delta VAS</td>
<td>-12.0 ± 30.9</td>
<td>-19.8 ± 30.0</td>
<td>-17.1 ± 20.2</td>
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<tr>
<td>P-value within group change</td>
<td>0.009</td>
<td>0.003</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

* N=175 due to missing data

Conclusion: In patients with CMC OA, intra-articular Hylan G-F 20 was not superior to corticosteroids or bupivacaine in reducing pain and improving function at 26 weeks. All three treatments resulted in significant improvements in pain, even among patients with severe CMC OA. A variety of injectable therapies appear to be effective treatments for this condition, even in those with severe arthritis.

Disclosure: L. A. Mandl, None; S. Wolfe, None; A. Daluiski, None; R. N. Hotchkiss, None; S. L. Lyman, None; J. N. Katz, None.

1109
Effects of Strontium Ranelate On Hand Osteoarthritis - Analysis of Data From the Sekoia Trial. E. Maheu1, C. Cadet2 and F. Berenbaum1. 1 AP-HP St Antoine Hospital, Paris, France, 2 Paris, France

Background/Purpose: Strontium ranelate (SrRan) has shown the ability to reduce radiological progression of knee osteoarthritis (OA) over 3 years. Patients with knee OA are also frequently affected by hand OA. In this secondary analysis, we assessed the effects of SrRan on radiological and symptom progression of hand OA.

Methods: This international 3-year, randomized, placebo-controlled phase III trial was designed to assess the effect of SrRan 1g and 2g/day compared to placebo on the radiographic progression of knee OA. Main inclusion criteria were symptomatic primary knee osteoarthritis (ACR criteria), a Kellgren-Lawrence (KL) grade II or III, and a joint space width (JSW) between 2.5-5.5 mm. There were no specific inclusion criteria regarding hand OA. Hand OA radiographic and clinical assessments were secondary outcomes. During the study, baseline and final postero-anterior radiographs of each hand were performed and scored by 2 independent readers, blinded to treatment and time sequence, using KL (range 0–128), Kallman (0–204) and Verbruggen (0–218) scoring methods. Clinical symptoms were assessed at each visit by the Auscan (0–300) and Functional Index for Hand OA (FIHOA) (0–30). Between-group analyses were performed using a general linear model with baseline, center and gender as covariates.

Results: Of the 1669 patients included in the SEKOIA trial, 999 had radiologic hand OA at baseline (73%). 71% were female. Mean age was 64±7 years, body mass index 29.6±4.7 kg/m², and initial knee JSW 3.4±0.8 mm. Hand OA was mild in radiology severity: KL score 21±13, Kallman score 25±22 and Verbruggen score 14±15. Mean Auscan global score was 96±30 mm and mean FIHOA score was 4.5±5.

The radiographic progression of hand OA observed over 3 years was modest in the placebo group with a mean change of 2.4±3.3 for KL score, 2.7±5.3 for Kallman score and 2.0±3.9 for Verbruggen score. There was no difference between the treatment groups for any radiological score. A significantly higher rate of patients reported an improvement of 20% or more in the Auscan pain subscale in the SrRan 2 g group (95% CI [1.0; 16.3]; p=0.047) compared to placebo.

In erosive patients (≥2 erosive joints, N=71), a significant improvement of KL score (p=0.031) in the SrRan 2 g compared to placebo was observed. In symptomatic patients (FIHOA >5 and pain within the 48 hours prior to the visit, N=126), a trend toward a higher improvement of KL score was noted in the SrRan 2 g group compared to placebo (p=0.06).

Conclusion: Overall, mild hand OA patients showed a very slow radiological progression, with no between-group difference over 3 years. However, in subgroup analyses, a slight beneficial effect of strontium ranelate 2g could be observed on pain and a positive effect on the change in KL score was suggested in the more severe hand OA patients. These results encourage conducting a specific trial in hand OA in the next future.


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Radiologic Progression in Hand Osteoarthritis (OA) Over 2.6 Years - Data From the Sekoia Trial. Emmanuel Maheu1, Christian Cadet2 and Francis Berenbaum1. 1 AP-HP, St Antoine Hospital, Paris, France, 2 Rheumatology, Paris, France

Background/Purpose: Hand OA is a frequent polyarticular disease. Few is known with respect to its radiological progression over time, which in addition is difficult to assess, considering that no radiographic scoring method has, today, proved being superior to another. The goal of this study was to assess hand OA radiological progression over 3 years using three validated scoring methods.

Methods: Data came from an international 3-year, randomized, placebo-controlled phase III trial designed to assess the effect of strontium ranelate compared to placebo on the radiographic progression of knee OA which included symptomatic primary knee OA patients (ACR criteria) at a Kellgren-Lawrence (KL) grade II or III, with a minimal joint space width (JSW) between 2.5–5 mm. During this trial, baseline and final postero-anterior radiographs of each hand were performed. Symptoms were assessed using the functional index for Hand OA (FIHOA; range 0–30) and the Auscan (0–300). Two independent readers scored half of the pairs of radiographs obtained each, blinded to treatment and time sequence, using the KL (range 0–128), Kallman (0–204) and Verbruggen (0–218) scoring methods. Hand OA radiographic progression was studied in the placebo group by looking at 1/baseline-end changes in global scores, 2/the numbers of progressors (progression was defined for each global score by a change over each reader’s smallest detectable difference (SDD)), and 3/the number of patients in whom at least one joint showed a deterioration (from KLO–1 to KLO≥2; progression of ≥1 phase for Verbruggen score).

Results: Of 1669 patients included in the SEKOIA trial, 999 had radiologic hand OA: 73%. 297 patients in the placebo group had baseline and follow-up radiographs. Patients were assessed 31.5 months.

* N=175 due to missing data

Mean Auscan global score was 96±30 mm and mean FIHOA score was 4.5±5.
Hand OA radiographic progression over 2.6 years was modest with a mean change of 2.4±3.3 for KL score, 3.7±5.3 for Kallman score and 2.0±4.0 for Verbruggen score.

The numbers (%) of progressors (change≥SDD) were 7 (2%), 17 (6%), and 21 (7%) respectively. The numbers (%) of patients with at least 1 worsened joint were 169 (57%) for KL and 139 (47%) for Verbruggen score, with respective means of 2.0±1.3 and 1.7±1.1 worsening joint.

Conclusion: Whatever the radiological scoring method used, and the kind of analysis performed, mild radiographic hand OA patients showed a very weak global radiological progression over 2.6 years. In future structure-modification trials in hand OA, analysing the number of patients with at least one joint worsening could be the most sensitive method.


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Erosive Evolution in Hand Osteoarthritis Is Associated with Incident Joint Tenderness Independent of MRI-Defined Bone Marrow Lesions and Synovitis. Ida K. Haugen1, Barbara Slatkowsky-Christensen1, Pernille Boyesen1, Solve Sesseng2, Desirée van der Heijde3 and Tore K. Kvien1.

Methods: We included 190 patients (173 women, mean (SD) age 61.5 (5.7) years) from the Oslo hand OA cohort with hand radiographs at baseline, of which 112 (102 women) had 7-years follow-up data. Of those, 89 had pre-/post-Gd T1w fs MRIs of the distal (DIP) and proximal interphalangeal (PIP) joints in the right hand, whereas 101 had STIR images. The bilateral DIP, PIP and carpometacarpal joints were scored for radiographic OA according to Kellgren-Lawrence scale and OARSI atlas, whereas the right hand’s DIP and PIP joints were scored for synovitis and BMLs according to Oslo hand OA MRI score. Joint tenderness on palpation (absent/present) was assessed by a rheumatologist. To explore the associations between radiographic hand OA and tenderness in the same joint, we performed uni- and multivariate logistic regression analyses with Generalized Estimating Equations. In the longitudinal analyses only joints with potential for radiographic progression and without tenderness at baseline were included. Features that were associated with tenderness in univariate analyses (p<0.20) were included in a multivariate model and excluded by backward selection. All analyses were adjusted for age and sex. Using the final multivariate model from the longitudinal analyses, we did additional adjustment for presence of MRI-defined synovitis (grade 2–3) and BMLs (grade 1–3) at follow-up (only DIP and PIP joints in right hand included in these analyses).

Results: Incident erosions seemed to be the most important predictor for incident tenderness, but also progression of osteophytes and JSN remained in the final model. Sclerosis and cysts were not associated with tenderness in the multivariate models, and malalignment remained in the final multivariate model for cross-sectional data only (table). Associations between radiographic progression of osteophytes, JSN and erosions and incident joint tenderness were similar after adjustment for BMLs and synovitis at follow-up (data not shown).

Table. Associations between OA severity and joint tenderness in cross-sectional analyses and between radiographic progression and incident joint tenderness in longitudinal analyses (no progression as reference).

<table>
<thead>
<tr>
<th>Cross-sectional analyses (OR, 95% CI)*</th>
<th>Longitudinal analyses (OR, 95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model 1: Global score:</strong></td>
<td></td>
</tr>
<tr>
<td>Kellgren-Lawrence</td>
<td></td>
</tr>
<tr>
<td>Grade0</td>
<td>1.0 (ref.)</td>
</tr>
<tr>
<td>Grade1</td>
<td>1.4 (1.2-1.7)</td>
</tr>
<tr>
<td>Grade2</td>
<td>3.0 (2.4-3.7)</td>
</tr>
<tr>
<td>Grade3</td>
<td>6.8 (4.5-10)</td>
</tr>
<tr>
<td>Grade4</td>
<td>5.3 (3.3-8.6)</td>
</tr>
</tbody>
</table>

Conclusion: Erosive development can strongly predict future joint tenderness, and the association to tenderness seemed to be independent of MRI-defined BMLs and synovitis. However, future longitudinal MRI studies are warranted.

Disclosure: I. K. Haugen, None; B. Slatkowsky-Christensen, None; P. Boyesen, None; S. Sesseng, None; D. van der Heijde, None; T. K. Kvien, None.

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Methods: This was a single center, retrospective, observational study. The records of all EOA patients from a cohort of 112 patients were reviewed for pathology or biopsy of any joint. Patients with a diagnosis of EOA had to meet the following criteria: (1) OA of hands based on the ACR criteria (2) erosions in at least 2 interphalangeal joints (IP) of which one must be a distal IP joint (3) be negative for rheumatoid factor and anti-CCP antibody (4) negative personal and family history of psoriasis and psoriatic arthritis and (5) absence of history of gout or pseudogout in hands. These were compared with synovial specimens from 15 RA patients who had elective orthopedic surgery. The synovial tissues were graded on a scale of 0–4 (none, minimal, mild, moderate and marked) for the presence and degree of synovial lining hyperplasia, the cellulosity of the synovial stroma, extent of inflammatory infiltrate, degree of vascularty and the number of lymphoid follicles on histopathology specimens from EOA and RA patients.

Results: A total of 8 synovial specimens (6 proximal interphalangeal joints and 2 knees) were obtained from 5 patients for the EOA group and 15 specimens (5 knees, 5 wrists, 2 hips, 1 elbow, 1 shoulder and 1 proximal interphalangeal joint) from 14 patients was obtained for the RA group. The EOA group comprised 4 females and 1 male with a mean age of 60.4 while the RA group was comprised of 12 females and 2 males with an average age of 59.5. All RA patients were on therapy: 3 on biologic therapies, 1 on biologic and methotrexate, 1 on biologic and methotrexate, 7 on methotrexate monotherapy and 3 on methotrexate and hydroxychloroquine. One of the EOAs patients was on hydroxychloroquine and one on methotrexate. Synovial hyperplasia and inflammatory infiltrate were noted in all RA specimens and in most EOA specimens (7 and 6) but the grading of extent revealed mean scores for hyperplasia and inflammatory infiltrate of 2.6 and 3.1 respectively for RA and 1.4 and 1.1 respectively for EOA. Synovial stroma cellularity and vascularity were also common in both conditions (14 of 15 RA and 7 of 8 EOAs) but again differed on the grading from 2.5 and 2.4 for RA and 1.4 and 1.1 for EOAs. The presence of lymphoid follicles was seen in only 1 EOA patients but noted in 7 RA subjects.

Conclusion: Synovial hypertrophy, synovial stroma cellularity, vasculatory and inflammatory cell infiltrate are commonly seen in both EOAs and RA but the extent of involvement is less in EOA than in RA. The difference in
Characterization of Lumbar Spine Individual Radiographic Features in African American and White Women and Men: The Johnston County Osteoarthritis Project. Adam P. Goode, Amanda E. Nelson, Kelli D. Allen, Jordan Renner, Timothy S. Carey and Joanne M. Jordan. 1Duke University, Durham, NC; 2University of North Carolina Thurston Arthritis Research Center, Chapel Hill, NC; 3Duke and Durham VA Medical Center, Durham, NC; 4University of North Carolina, Chapel Hill, NC; 5Cecil G. Sheps Center for Health Services Research University of North Carolina, Chapel Hill, NC.

Background/Purpose: Race and gender differences have been found to exist in hip and knee osteoarthritis (OA). Whether such differences occur with lumbar spine individual radiographic features (IRFs) of disc space narrowing (DSN) and vertebral osteophytes (OST) are unknown. The purposes of these analyses are to describe differences in the severity of DSN and OST among African American and Caucasian men and women.

Methods: Lumbar spine radiographs (DSN and OST) were available for 1,633 participants returning for second follow-up in the Johnston County Osteoarthritis Project from 2008–11. Participants had a mean age 68.1 (SD 9.2), and were 68.0% female and 31.7% African American (AA), with mean body mass index (BMI) 31.4 (SD 7.2). Seventy-eight percent had 12 years education. Lateral lumbar spine films were graded for each level in a semi-quantitative fashion (0–3) for DSN and (0–3) for both anterior superior and inferior OST according to the Burnett Atlas. Lumbar spine IRF were coded (individually for DSN and superior and inferior OST) based upon a participant’s most severely affected lumbar level. For all analyses, AA were the referent group and results were stratified by gender. Multivariable associations were determined with proportional odds models while adjusting for age, BMI, and education.

Results: After adjustment, White women had a significantly greater odds of DSN (adjusted Odds Ratio [aOR]=1.56 (95% CI 1.23, 1.98)) whereas no significant association was found across race for men (aOR=1.24 (95% CI 0.86, 1.79)). No association was found across race for men (aOR=1.13 (95% CI 0.78, 1.65)) for superior anterior OST. White women (aOR=1.50 (95% CI 1.16, 1.95)) and White men (aOR=1.88 (95% CI 1.27, 2.77)) both had a greater odds of inferior anterior vertebral OST.

Conclusion: Severity of some lumbar spine IRFs differs by race, suggesting the possibility of anatomic or developmental variation in the spine. The greater severity of DSN in White women compared to AA women is important because this IRF has been consistently associated with low back symptoms. The fact that both White women and White men had greater severity of inferior vertebral OST, compared with their AA counterparts, suggests anatomic racial differences in this region.


Background/Purpose: There are few studies of hip osteoarthritis (OA) in the United States and none in the last 35 years that have addressed the prevalence of hip OA in an urban population. Recent estimates from Europe suggest that 2–5% of the population age 50 and over has symptomatic hip OA. Our goal was to assess the prevalence of radiographic and symptomatic hip OA within the Framingham Osteoarthritic cohort.

Methods: We studied the Community sample of the Framingham Osteoarthritis study which was recruited among those 50–79 years using random digit dialing from the town of Framingham in 2002–2005. As part of this examination standing long-limb radiographs of the lower extremities including the pelvis were obtained using a near horizontal beam. In addition, subjects answered questions regarding the presence and frequency of joint symptoms and indicated on a homunculus whether they had hip joint pain on most days of the previous month. Two reviewers who received training from an expert musculoskeletal radiologist read all films and verified abnormal ones with the radiologist. Films where both hips were unreadable were excluded. Films were also assessed for Kellgren-Lawrence grade: radiographic OA (ROA) was defined as KLO ≥ 2 (probable joint space narrowing plus an osteophyte ≥ 2). Interoobserver kappas were 0.72 between the readers.

Results: Of 1025 subjects with radiographs, 949 films could be evaluated in both hips. Mean age was 63.5 years (sd 9.0). 56% were women, mean BMI was 27.9 (sd 4.6). 98.1% were white. 16.9% had radiographic hip OA (20.8% of men, 13.8% of women). Of those with ROA, 73.1% were unilateral and 26.9% bilateral. 11.7% of subjects under 65 had ROA (67/571) as compared to 24.7% of subjects 65 and over (93/376). In subjects with BMI < 25, 19.3% (53/276) had ROA; for BMI 25–29.9, 16.3% (66/404) had ROA; for BMI ≥ 30, 15.2% (41/269) had ROA. Both whites and non-whites had similar rates of ROA (16.9%). Of those with ROA, 21.9% had hip joint pain, yielding a SxOA prevalence of 3.7% of the total population (4.3% of men, 3.2% of women).

Conclusion: Around 1/6 of the subjects in this population-based cohort had radiographic evidence of hip OA; 3.7% of men and women had symptomatic OA, an estimate similar to studies from Europe.

Relation Between Hip Dysplasia, Pain, and Osteoarthritis in a Cohort of Patients with Hip Symptoms. Johanne Morvan, Ronan Bourtier, Bernard Mazieres, Evelyne Verrouil, Jacques Pouchot, Anne-Christine Rat, Joel Coste and Alain Saraux. 1CH Quimper, Quimper, France, 2CHU Brest, 3Hopital de Rangueil, Toulouse, FRANCE, France, 4Hopital Louis Mourier, Colombes, FRANCE, France, 5Nancy Teaching Hospital, Nancy, France, 6Universite´ de Lorraine, Paris Descartes University, APEMAC, EA 4360, F- 54 000, France, Nancy, France, 7Universite´ Brest Occidentale, Brest, France.

Background/Purpose: The relationship between acetabular dysplasia (HD) and hip osteoarthritis remains unclear, especially for mild forms of dysplasia. Our objectives were to estimate the prevalence of HD in a population-based sample with hip symptoms and to evaluate potential associations linking HD, hip osteoarthritis, and hip pain.

Methods: Individuals 40 to 75 years of age with symptoms in one or both hips were recruited during a multiregional prevalence survey. All study participants underwent a physical examination and radiographs. Radiographs were evaluated using Kellgren and Lawrence (KL) staging (with stages ≥2 indicating hip osteoarthritis) and HD parameters (center-edge [CE] angle, acetabular inclination angle [HTE], acetabular depth [AD], and vertical-center-anterior margin [VCA] angle).

Results: We studied both hips of 842 individuals (1684 hips) among whom 203 had hip osteoarthritis. Compared to left hips, right hips had significantly smaller CE angles and significantly greater AD and HTE values (P<0.001). Overall, the prevalence of HD ranged from 7.6% to 22.2% of the hips depending on the parameter used. The prevalence of HD was higher in individuals with hip osteoarthritis, with significant differences for abnormal HTE (19.1% vs. 11.4%; P<0.0001) and abnormal CE (11.3% vs. 7.5%; P<0.04). By logistic regression, only abnormal HTE remained associated with OA (P=0.05). Hip pain was more common in individuals with HD (P<0.0001) but the association was not statistically significant after stratification on osteoarthritis status (P=0.25).

Conclusion: Our study confirmed the relationship between osteoarthritis and HD, particularly defined based on the HTE angle. HD was not associated with hip pain.

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Diagnostic Value of Internal Rotation Measurement in Patients with Cam- and Pincer-Type Deformities of the Hip. Stephan Reichenbach1, Michael Leunig2, Stefan Werlen3, Andreas Limacher1, Christian W. Pfirrmann4, Reinhold Ganz1 and Peter Jüni1. 1University of Bern, Bern, Switzerland, 2Schulthess Clinic, Zurich, Switzerland, 3Hospital Sonnenhof, Bern, Switzerland, 4Balgrist University Hospital, Zurich, Switzerland

Background/Purpose: It has been proposed that femoroacetabular impingement (FAI) causes early osteoarthritis (OA) in non-dysplastic hips. FAI occurs predominantly in two different types, "cam" or "pincer". Cam impingement is due to a cam-type deformity with a non-spherical femoral head and/or a decreased anterior head-neck offset. Pincer impingement results from increased acetabular depth with over-coverage of the femoral head, while the head-neck configuration may be normal. FAI is often seen in young male athletes referred to rheumatologists or orthopaedic surgeons because of groin pain, and internal rotation in flexion is usually diminished. The aim of this study was to determine whether diminished internal rotation can be used to detect FAI in young asymptomatic males.

Methods: Study subjects were young males aged 18 to 21 undergoing compulsory conscription for the Swiss army. Participants completed questionnaires pertaining to pain, stiffness, and physical function, and internal rotation was measured on a validated examination chair. A random sample of the examined participants was invited for magnetic resonance imaging (MRI) of the hip. Cam-type deformities were graded from 0 to 3: 0 = normal, 1 = mild, 2 = moderate, 3 = severe. Pincer impingement was defined by increased acetabular depth, which was specified as the distance (in mm) between the center of the femoral neck and the line connecting the anterior and posterior acetabular rims. Values were positive if the center of the femoral neck was lateral to the acetabular rim, with ≤3 mm representing increased acetabular depth. Based on a fitted receiver operating characteristics (ROC) curve, we estimated sensitivity, specificity, positive and negative likelihood ratios (LR) for different internal rotation cutoffs for cam impingement, pincer impingement, and the combination of both, as compared with the reference group without deformity on MRI.

Results: 244 asymptomatic males underwent imaging, with a mean age of 19.9 years. Fifty-nine subjects showed definite cam-type deformity, eight increased acetabular depth, and eight a combination of both. Area under ROC-curves were 0.725 for detection of the first group, 0.549 for eight increased acetabular depth, and eight a combination of both. Area under ROC-curves were 0.725 for detection of the first group, 0.549 for detection of the second, and 0.895 for detection of the third group as compared with the reference group. A cut-off value of 30° of internal rotation yielded a sensitivity of 0.63 and a specificity of 0.69 for the first group, 0.13 and 0.69 for the second, and 1.00 and 0.69 for the third. An internal rotation of ≥30° had sufficient power to rule out the combination of both types of impingement: the crude negative likelihood ratio (LR) was 0.06 (95% CI: 0.02–0.24). Conversely, an internal rotation of ≤20° had the required power to rule in the combination of both types of impingement, with a positive LR of 12.7.

Conclusion: Different cut-offs for internal rotation may be used to accurately rule in or rule out the combination of cam- and pincer-type impingement. Internal rotation is not useful for detecting pincer-type impingement.

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Association Between Hip Bone Marrow Lesions (BMLs) and Bone Mineral Density: A Cross-Sectional and Longitudinal Population-Based Study. Harbeer Ahedi1, Dawn Dore1, Leigh Blizzard3, Flavia Cicuttini3 and Graeme Jones1. 1Discipline of Genetics, Faculty of Medicine, Memorial University of Newfoundland, St John’s, NL, 2Menzies Research Institute Tasmania, University of Tasmania, Hobart, 7000, Australia, 3Department of Radiology, Faculty of Medicine, University of Melbourne, Melbourne, 3004, Australia

Background/Purpose: Bone marrow lesions (BMLs) have been identified one of the key pathologic features in knee osteoarthritis (OA)1. However, there are limited data on hip BMLs and their relation to bone mass. The aim of this study was to examine the cross-sectional and longitudinal association between hip BMLs and BMD at three different sites.

Methods: 198 subjects in the Tasmanian Older Adult Cohort (TASOAC) study (average age 64 yrs) with a right hip MRI and dual-energy x-ray absorptiometry (DXA) scans conducted at two time points, approx. 2.6 years apart, were included in this study. MR images were used to assess femoral and acetabular hip BML presence and size (cm²) by manually drawing contours around the outer edges of the BML using Osiris X (Geneva) software. DXA scans were used to determine total hip, femoral neck and spine BMD.

Results: Fifty-five subjects (28 %) had either femoral and/or acetabular BMLs. In cross-sectional analysis, femoral BMLs were not associated with either hip or femoral neck BMD whereas acetabular BMLs were associated with lower hip BMD and femoral neck BMD (mean diff: −0.05 g/cm², p<0.009 & mean diff: −0.06 g/cm², p<0.001 resp.). Neither was associated with spine BMD. Longitudinally, resolving acetabular BMLs were associated with an increase in BMD at both hip (mean diff: +0.02 g/cm², p=0.05) and femoral neck (mean diff: +0.01 g/cm², p=0.02 sites) while incident femoral BMLs were associated with an increase (mean diff: +0.03 g/cm², p<0.001) and resolving femoral BMLs with a decrease in femoral neck BMD (mean diff: −0.04 g/cm², p=0.04). Finally, change in femoral BML size was associated with change in femoral neck BMD (Beta: +0.03, p<0.001) and change in acetabular BML size was associated with change in femoral neck BMD (Beta: −0.01, p=0.064).

Conclusion: Hip BMLs are associated with site-specific changes but not distant changes in bone mass. These results, especially in the longitudinal data, suggest this is a combination of changes related directly to the underlying BML pathology as well as changes adjacent to the disease process perhaps due to pain, disuse or paracrine effects.

References

Disclosure: H. Ahedi, None; D. Dore, None; L. Blizzard, None; F. Cicuttini, None; G. Jones, None.

Association Between Hip and Knee Cartilage Measured Using Radiographs and Magnetic Resonance Imaging: The Tasmanian Older Adult Cohort Study. Hussain Ijaz Khan1, Dawn Dore1, Guangyu Zhai2, Changhai Ding1, Jean Pierre Pelletier4, Johanne Martel-Pelletier2, Flavia Cicuttini3 and Graeme Jones1. 1Menzies Research institute Tasmania, University of Tasmania, Hobart, 7000, Australia, 2Discipline of Genetics, Faculty of Medicine, Memorial University of Newfoundland, St John’s, NL, 3Menzies research institute & Monash University, Hobart, Australia, 4Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Notre-Dame Hospital, Montreal, QC, 5Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, 3004, Australia

Background/Purpose: Cartilage loss is the key pathological feature of osteoarthritis (OA) and can be assessed indirectly using radiography or directly through magnetic resonance imaging (MRI). A number of cross-sectional studies have examined the association of hand OA with hip or knee OA, suggesting that primary generalised OA (PGOA) may be a distinct disease in which systemic predisposition is more important than local (mechanical) factors. However, despite the high frequency of involvement of the hip and the knee joints in OA, only a few studies have looked at the radiographic association of joint space narrowing (JSN) in these two joints with inconsistent results. None has done so using MRI. The aim of this study was to examine the association of hip and knee cartilage measured by both radiography and MRI.

Methods: We studied 151 participants from a cohort study of older adults. MRI was used to assess hip and knee cartilage volume and radiography was used to assess JSN at both sites. Correlation analyses were used to compare cartilage volume measurements and JSN.

Results: In adjusted analysis, there was a consistent, positive association between knee cartilage volume and hip cartilage volume which was best for total knee cartilage volume (R= 0.23–0.50, all P<0.05). In contrast, there was no or at best a weak correlation between hip and knee JSN (R= −0.01–0.24).
Conclusion: Hip and knee cartilage volume are more strongly associated than hip and knee radiographic JSN suggesting commonality of cartilage volume at different anatomic sites. The weaker radiographic association may reflect less measurement error with MRI or the contribution of multiple structures to JSN in the knee.

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1119 Prediction of MRI-Detected Cartilage Loss Over 30 Months Using Simplified Radiographic and Clinical Stratification: The MOST Study.

Background/Purpose: MRI-detected cartilage loss is the main structural outcome measure in large studies of knee OA. Definition of subjects at high risk for cartilage loss is important as this subgroup is likely to benefit most from interventional efforts and will potentially reduce subject numbers and duration of clinical trials. A simple stratification strategy is needed for pre-selecting subjects at high risk. We assessed a set of potential factors in regard to their predictive capability of cartilage loss over 30 months.

Methods: The Multicenter Osteoarthritis (MOST) Study is a longitudinal study of subjects with knee OA or at risk of OA. A 1.0 T MRI was performed at baseline and 30 months follow-up in subjects with radiographic knee OA at baseline. MRIs were assessed according to the WORMS scoring system including within-grade assessment. Altogether 10 tibiofemoral subregions were scored. Cartilage loss was defined as at least within-grade increase in cartilage score in ≥1, ≥2, or ≥3 subregions. Analyses were repeated with cartilage loss defined as full grade increase. Six predictors that are commonly acquired in screening efforts, i.e., gender, age, BMI, Kellgren Lawrence (K-L) grade (0–1, 2, 3–4), joint effusion (0–1, 2–3) and knee pain (on most days during the past 30 days or maximal WOMAC pain score as 0, 1–2, 3–4) were assessed using a 10-fold cross-validation method. The cross-validation was repeated 10 times, and averaged receiver operating characteristics (ROC) curve, i.e., C-statistic, was calculated as a measure of the overall performance. Age and sex were forced in all models. We plotted the ROC curves for each variable selected in the final model according to cross-validation method.

Results: Of 544 knees randomly selected from the progression cohort, risk of at least within-grade cartilage loss occurring in at least one subregion was 53.6%, 31.6%, and 18.1%, respectively. The model containing age, sex, K-L grade, effusion, and knee pain provided the highest prediction accuracy (C-statistic 0.533) for any cartilage loss occurring in at least one subregion. The best models for prediction of at least within-grade cartilage loss of ≥2 or ≥3 included the same variables, i.e., age, sex, K-L grade and knee pain (C-statistics=0.561 for ≥2, and 0.571 for ≥3 subregions). Risk of full-grade cartilage loss in ≥1, ≥2, or ≥3 subregions was 38.8%, 18.8% and 9.7%, respectively. The same variables were included for predicting cartilage loss of a full grade in ≥1, ≥2, or ≥3 subregions as those for at least within-grade loss. The corresponding C-statistics were 0.559, 0.599, and 0.615 (Figure 1), respectively.

Conclusion: Among knees with radiographic OA, age, sex, K-L grade and knee pain only had the moderate capability of predicting cartilage loss. Of them the strongest predictors were baseline K-L grade, followed by knee pain. The prediction accuracy of this model needs to be further validated using large databases from other populations.

Disclosure: F. Roemer, Boston Imaging Core Lab, 1, National Institute of Health, 5, Merck Serono, 5; D. T. Felson, None; J. Niu, None; Y. Zhang, None; M. C. Nevitt, None; M. Cremaschi, Shareholder Boston Imaging Core Lab, LLC, 1; C. E. Lewis, None; J. Torner, None; A. Guermazi, Boston Imaging Core Lab, 1, Stryker, 5, Merck Serono, 5, Genzyme Corporation, 5, AstraZeneca, 5, Novartis Pharmaceutical Corporation, 5.

1120 Cartilage Volume Loss Occurs in Most Older Adults and the Rate of Loss Increases with Age.

Background/Purpose: Radiographic data suggests knee osteoarthritis is a relatively static disease even over the long term. It is uncertain how much this is influenced by measurement error and whether it accurately reflects what is happening to the cartilage. Initial cross-sectional studies suggest little
change in cartilage volume with age but a decrease in thickness. However, longitudinal studies in younger age groups suggest the rate of cartilage volume loss increases with age. There are no longitudinal studies in older age groups.

The aim of this study was to describe cartilage loss over time and the association between age and knee cartilage volume loss in older adults. **Methods:** A total of 407 randomly selected community-dwelling older adults aged 63.2 years, range 51–79 years; 50% female) were measured at baseline and approximately 2.7 years later. T1-weighted fat-suppressed magnetic resonance imaging (MRI) was used to measure knee cartilage volume at the tibial and femoral sites. Body mass index (BMI) and radiographic osteoarthritis (ROA) were measured by standard protocol. A real change in volume loss was assessed using the least significant criterion which takes into account measurement error and the correlation between measurements at baseline and follow up.

**Results:** On average, participants had 1.5% per annum tibiofemoral cartilage volume loss. Of the 407, 74% had a decrease larger than measurement error while, 14% which had a genuine increase in volume and only 12% were unchanged. After adjustment for sex, BMI and ROA, age was significantly associated with annual decrease in medial and total tibial (β = −0.08 to −0.13%/yr, all P < 0.008) but not lateral tibial cartilage volume (β = 0.03%/yr, P > 0.05). In addition, age was associated with a decrease in medial and lateral femoral cartilage volume in males (β = −0.05 to −0.06%/yr, all P < 0.01) but not females (β = −0.01 to 0.005%/yr, P > 0.05).

**Conclusion:** Knee cartilage volume is rarely static even over a three year time frame. The majority of subjects lose cartilage and this rate of loss increases with age. These findings suggest radiographs are not sensitive measures of changes in cartilage volume and challenge the view that osteoarthritis is largely static over time.

**Disclosure:** A. M. Harsanyi, None; D. Dore, None; C. Ding, None; J. P. Pelletier, ArthroLab Inc., 4; J. Martel-Pelletier, ArthroLab Inc., 4; F. Cicuttini, None; G. Jones, None.

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Degenerative Medial Meniscal Pathology May Initiate in the Posterior Horn: Data From The Osteoarthritis Initiative. Robert J. Ward1, Jeffrey B. Driban1, Eric E. Wong1, Jonathan W. Pack1, Kunal K. Kothari1, Grace H. Lo1 and Timothy E. McAlindon1, 1Tufts Medical Center, Boston, MA, 2Tufts University School of Medicine, Boston, MA, 3Michael E. Deebakely Veterans Affairs Medical Center, Houston, TX

**Background/Purpose:** Meniscal pathology is highly prevalent in knee osteoarthritis (OA). However, details regarding the distribution of pathology within the meniscus has yet to be described in patients with and without radiographic signs of OA. Cross-sectional distribution of medial menisal pathology as it relates to the anterior horn, body, and posterior horn may be informative of the role of the meniscus in the natural history of OA.

**Methods:** We studied participants in the Osteoarthritis Initiative (OAI) progression subcohort who had the OAI core set of magnetic resonance (MR) images at the 24-month OAI visit and consented to participate in the Bone ancillary project. By definition, members of the progression subcohort had at least one symptomatic knee with radiographic evidence of OA. The right knee was selected as the index knee for investigation among these participants unless there was a contraindication for MR imaging; therefore, the index knee did not have OA as a pre-requisite. A single experienced fellowship trained musculoskeletal radiologist reviewed the MR images for meniscal pathology by location (e.g. anterior, body, and posterior horn) within the meniscal tissue using a modified International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine (ISAKOS) meniscal tear classification system. We presented the prevalence of meniscal pathology within the medial meniscus among this sample both with and without knee OA. A standing radiographs were obtained of the same knees and read for Kellgren-Lawrence grade.

**Results:** 464 knees were included in the analysis; 454 were right knees; 244 (53%) men, with a mean age of 63 years (SD: 135 (29.4%) knees had no radiographic evidence of knee OA (Kellgren-Lawrence Grade = 0 or 1). 114 (24.6%) had normal medial menisci, leaving 350 (75.4%) with some pathology in at least one region of the medial meniscus. 117 (25.2%) knees had pathologic anterior medial menisci and among those 98.3% had concurrent findings in the body or posterior horn. 272 (58.6%) medial menisci have pathologic findings in the meniscal body and among those 97.4% had concurrent findings in the anterior or posterior meniscal horn. 336 (72.4%) medial menisci had pathologic findings in the posterior meniscus and among those 263 (78.3%) had concurrent findings in the body or anterior regions. Finally, 107 (23.1%) had pathologic findings in all three regions (regardless of type of finding).

**Conclusion:** Medial meniscus pathology is highly prevalent. In our sample, those with medial menisci pathology some damage was also almost universally found in the posterior horn. Those with posterior horn damage also very commonly had concurrent pathology in the body and anterior horn. Isolated involvement of the anterior horn and body of the medial meniscus are rare. Though this is a cross-sectional study, these findings suggest that medial meniscal pathology may initiate in the posterior horn. Longitudinal studies need to be confirmed this possibility.

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Identifying Radiographic Phenotypes of Early Knee Osteoarthritis Using Separate Quantitative Features Might Improve Patient Selection for More Targeted Treatment. Margot B. Kinds1, Anne C. A. Marijnsen1, Max A. Viergever1, P. J. Emans1, J. W. J. Bijsma1, F. P. J. G. Lafeber1 and P. M. J. Welsing1, 1University Medical Center Utrecht, Utrecht, Netherlands, 2Maastricht University Medical Center, Maastricht, Netherlands

**Background/Purpose:** Osteoarthritis (OA) is a degenerative joint disease characterized by pain and functional disability. The expression of OA varies significantly between individuals and over time, implying the existence of different phenotypes. This study aims at identifying phenotypes of progression of radiographic knee OA and to describe their radiographic and clinical characteristics.

**Methods:** In individuals with early knee OA from the Cohort Hip & Cohort Knee (CHECK), baseline, two-year, and five-year follow-up radiographs were evaluated. Separate radiographic OA parameters were quantitatively measured by Knee Images Digital Analysis (KIDA). To identify phenotypes of radiographic knee OA progression, hierarchical clustering was performed using the KIDA measurements of participants with complete data at T0, T2y, and T5y (n = 417 of 1002). The phenotypes were compared for development of joint space width (JSW), varus angle, osteophyte area, eminence height, bone density, and for clinical characteristics at T0. Additionally, logistic regression analysis evaluated whether baseline radiographic features predicted to which phenotype an individual belonged.

**Results:** Overall, the radiographic features showed OA progression during follow-up. Based on the development, five clusters were identified that were interpreted as ‘severe’ (n = 17; most progression of all radiographic features) or ‘no’ (n = 108) progression, ‘early’ (n = 110; progression of all features specifically between T0 and T2y) or ‘late’ (n = 69; progression of all features specifically between T2y and T5y) progression, or specific involvement of ‘bone density’ (n = 113). Clinical characteristics at T0 were not evidently different between the clusters, and WOMAC scores were only slightly lower in the ‘no’ cluster than in the other clusters. In the evaluation of predictors for the different clusters, the area under the curve (AUC) improved when radiographic features were added to basic demographic and clinical variables. Kellgren & Lawrence grading was not a significant predictor for any of the phenotypes. The predictors for ‘early’, ‘late’, and ‘no’ progression phenotypes generally had an opposite effect than the predictors for the ‘severe’ and ‘bone density’ phenotypes. Larger medial JSW, varus angle, osteophyte area, eminence height, and bone density at T0 were associated with ‘severe’ and ‘bone density’ progression. The ‘bone density’ model had AUC = 0.91. Smaller eminence height and bone density were associated with ‘early’ and ‘late’ progression (AUC = 0.79, and 0.76 respectively). Larger varus angle and smaller osteophyte area were associated with ‘no’ progression (AUC = 0.72).

**Conclusion:** This is the first study to identify specific phenotypes of radiographic knee OA progression in individuals with early OA complaints. Phenotypes represented the level (severe vs. no) and phase of progression (early vs. late), and the involvement of a specific feature (bone density). Baseline radiographic features could predict the phenotypes. The phenotypes might represent relevant subgroups for the evaluation of treatment strategies in clinical trials, and with that drive the discovery of more targeted treatment.

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Comparison of Anatomic Knee Alignment On Physical Examination and Radiographs. Iman Hemmati1, Eric C. Sayre2, Ali Guermazi3, Savvakis Nicolaou1, Anona Thorne4, Joel Singer5 and Jolanda Cibere6. 1University of British Columbia, Vancouver, BC, 2Arthritis Research Centre of Canada, Vancouver, BC, 3Boston University, Boston, MA, 4Canadian Institutes of Health Research HIV Trials Network, Vancouver, BC

Background/Purpose: Severity of knee malalignment is a risk factor for osteoarthritis (OA) progression. Currently the hip-knee-angle (mechanical axis), assessed on a full-limb radiograph, is the gold standard. Direct measurement of the anatomic axis using standard knee radiographs has been validated as an alternative method. In clinical practice, examining knee alignment with a goniometer may be more practical. The aim of the current study was to 1) evaluate the correlation of knee alignment measured by goniometer on physical examination with the anatomic angle measured on knee radiographs and 2) to evaluate whether the relationship is confounded by clinical variables that may affect goniometric measurements.

Methods: A simple random sample (n=120) was selected from the MoDEKO (Model for the Diagnosis of Early Knee Osteoarthritis) cohort, a population-based cohort of people with knee pain, age 40–79. Knee alignment was measured to the nearest degree by two methods: 1) anatomical-axis on fixed-flexion PA knee radiographs and 2) standardized goniometer assessment on physical examination, previously shown to be reliable. In this study varus was defined as angle < 0°, valgus > 0° and 0° as neutral. On PA radiographs the anatomic axis was defined by the intersection of two lines originating from points bisecting the femur and tibia and converging at the centre of tibial spine tips. Inter- and intra-rater reliability of anatomic angle measurements from radiographs were determined by intraclass correlation coefficient (ICC) of two independent assessors. The correlation of radiographic anatomic angle with goniometer measurements was analyzed by linear regression. Western Ontario and McMaster Universities (WOMAC) pain score, body mass index (BMI) and flexion contracture were assessed as potential confounders. Analysis was weighted by stratum sampling weights.

Results: Of 120 subjects, 52% were male, with mean (SD) age of 58 (11) years and BMI of 27 (5). The mean (SD) angle measured on PA radiographs and goniometer were 2 (3.6) and 3 (2.3) degrees respectively. Inter-rater ICC for radiographic measurements was 0.93, while intra-rater ICC was 0.83. A significant correlation was found between radiographic and goniometric measurements (r=0.90, P<0.001). A model was developed to predict anatomic angle based on goniometer angle: anatomic angle on PA radiographs = 0.410 + 0.749 * goniometer angle. WOMAC pain score, BMI and flexion contracture were not significantly associated with PA radiographic angle and did not significantly change the correlation of radiographic and goniometric measurements, and so these variables were dropped from the model.

Conclusion: In this study, knee alignment assessed by goniometer was significantly correlated with the anatomic axis angle on fixed-flexion PA knee radiographs. Moreover, factors such as pain, BMI and flexion contracture did not confound the relationship of goniometric with radiographic angle measurements. Given the ease of application, goniometric measurements may be preferable to x-ray, although the predictive utility of goniometric alignment measurement will require further assessment in longitudinal studies of knee OA.

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Total Knee Replacement As an Osteoarthritis Study Outcome: Predictors Derived From Long-Term Observation Following a Randomized Clinical Trial. Jean-Pierre Raynauld1, Johanne Martel-Pelletier, Marc Dorais2, Boulos Haraoui1, Denis Choquette1, François Abram3, André Beaulieu4, Louis Bessette5, Frédéric Morin5, Lukas M. Wildi6 and Jean Pierre Pelletier1. 1Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Montreal, QC, 2StatSciences Inc., Notre-Dame de l'Île Perrot, QC, 3Imaging Research & Development, ArthroLab Inc., Montreal, QC, 4Faculty of Medicine, Laval University, Quebec, QC, 5Centre Hospitalo-Universitaire de Québec, Partenaires, Centre de Recherche Musculo-squelettique, Trois-Rivières, QC, 6Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Notre-Dame Hospital, Montreal, QC

Background/Purpose: Using data from a 4-year follow-up of knee OA patients who formerly received treatment with chondroitin sulfate (CS) within a 6-month clinical trial, we wanted to find predictors of the incidence of total knee replacement (TKR).

Methods: Knee OA patients participating in a randomized, double-blind controlled trial evaluating the impact of CS (Bioibérica S.A., Barcelona, Spain) (400 mg BID) vs. placebo who had serial MRI acquisitions (qMRI) and clinical evaluations of the symptomatic knee1 were selected to evaluate retrospectively the incidence of TKR of the study knee. A sub-group of patients (n=57) who received the study medication and had all the MRI evaluations (intent to treat (ITT)) were selected for this post hoc retrospective analysis. The TKR incidence was assessed blindly to the treatment allocation with a standardized phone interview.

Results: The patients’ mean age was 63.2 years, 63% were female and the average body mass index (BMI) was 30.7 kg Mm2. A total of 13 TKRs (22.8%) were performed on this sub-population in the time frame of 4 years after completion of the original study. Interestingly, there were more TKRs performed within the placebo group (n=9) than the CS group (n=4) (69% vs. 31%, p=0.15, logistic regression). We further investigated the predictors of long-term TKRs for the target knee by comparing, within the ITT cohort, the patients who had TKR (n=13) for the target knee to those who did not (n=44), using data at baseline or the change at 1 year. Baseline values of WOMAC pain (p=0.01, logistic regression) and function (p=0.04), bone marrow lesions (BMLs) in the medial tibial plateau (p=0.0008) and global knee (p=0.02), and C-reactive protein (CRP) level (p=0.05) were strong predictors of TKR. Changes at 1 year in the medial cartilage volume higher than 7% (p=0.03) and the change in WOMAC pain (p=0.02) also predicted the occurrence of TKR. Multivariate analyses controlling for age, sex, and BMI revealed that baseline presence of BMI (p=0.003) and WOMAC pain (p=0.006) were independent strong predictors of TKR. Time to occurrence of the TKR from the study inception also favored the CS group vs. placebo (Log-Rank, p=0.14). Cox regressions that included age, sex, and BMI in the model indicated that baseline values of WOMAC pain (p=0.0006), presence of BML in the medial compartment (p=0.0007) and CRP (p=0.02) were the strongest independent predictors of TKR over time.

Conclusion: Treatment with CS appeared to reduce the need for TKR. There are very few OA RCTs that use qMRI to probe knee structural outcomes. According to this study, predictors of long-term occurrence of a TKR were greater levels of knee pain, lower level of function and presence of BML at baseline, and greater loss of cartilage over time. This study links MRI findings to long-term clinical outcomes.

Reference
Methods: Five-year follow-up data from a sample of 713 participants with early symptomatic knee OA from the Cohort Hip and Cohort Knee (CHECK) were used. Activity limitations were measured yearly with the physical function subscale of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Latent class growth analyses (LCGA) were used to identify trajectory classes of activity limitations. Multivariable logistic regression analyses were used to examine differences in demographic, clinical and psychological characteristics between the trajectory classes.

Results: The LCGA yielded 3 trajectory classes for activity limitations. Participants in class 1 (‘slight limitations’; n = 336) reported permanent low levels of activity limitations, or moved from moderate or high levels at baseline to low levels of activity limitations over 5 years. Participants in class 2 (‘moderate limitations’; n = 261) reported permanent moderate levels of activity limitations, or moved from fairly high or fairly low levels to moderate levels of activity limitations over 5 years. Participants in class 3 (‘severe limitations’; n = 116) reported permanent high levels of activity limitations, or moved from low or moderate levels of activity limitations to high levels of activity limitations over 5 years. Participants in class 1 (‘slight limitations’) were more likely to have a lower BMI, to have less than 3 comorbidities, to report a lower level of knee pain, to have osteophytosis, to feel less vital, and to avoid physical activities (AUC: 0.76).

Conclusion: Three trajectory classes of activity limitations were identified using 5-year follow-up data of 713 participants with early symptomatic knee OA: ‘slight limitations’, ‘moderate limitations’, and ‘severe limitations’. The ‘slight limitations’ group was characterized by a lower BMI, a lower comorbidity count, lower levels of knee pain, not having hip pain, not having joint space narrowing, and not compared with participants in class 2 (‘moderate limitations’) (AUC: 0.75). Participants in class 3 (‘severe limitations’) were more likely to report a higher level of knee pain, to have bilateral knee pain, to have osteoarthrosis, to feel less vital, and to avoid physical activities.

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1126

Comparison between Osteoarthritis Initiative and CHECK study (Cohort Hip & Cohort Knee): Development of pain and function during 4 years follow-up. Janet Wesseling1, Sita M.A. Biema-Zeinstra, Margreet Kloppenburg2, Johannes WJ Bijlsma3, and CHECK steering group4.

Methods: For the current study, longitudinal data of four years follow-up of the CHECK study and OA Initiative were used. The CHECK study is a Dutch prospective 10-year follow-up study, initiated by the Dutch Arthritis Association, to study progression of OA in participants with early symptomatic OA of knee or hip. Individuals were eligible if they had pain of knee or hip, were aged 45–65 years, and had not yet been diagnosed with knee or hip OA. A total of 952 individuals with knee OA were included in the OA Initiative with infrequent or frequent knee pain consisted of 1417 participants, with a mean age of 56, BMI of 28 kg/m² and 64% female. At baseline CHECK had less radiographic OA (K&L ≥ 2) compared to OA Initiative subgroup, but at follow-up CHECK had more radiographic progression (K&L ≥ 3 vs 15% of at least 1 K&L point increase; p < 0.001). A final longitudinal regression model with pain as outcome showed slight decrease of course of pain in both cohorts, but a consistent lower level of course of pain in OA Initiative subgroup of 2 points (better health). In a final model with function as outcome, in both cohorts there is a slight decrease of physical function, but a consistent higher level of function of 10.2 points (worse health) in CHECK.

Conclusion: In the total group, participants of the OA Initiative subgroup and the CHECK participants with knee pain, there is a slight decrease over time in pain and physical functioning. In CHECK participants more progression of joint damage over time was observed and these participants recorded a higher level of pain and function problems. Differences between the 2 cohorts in course of pain and function could not be explained by the effect of time or of progression of joint damage on pain and function.

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1127


Background/Purpose: Altered tibiofemoral (TF) joint kinematics and joint surface interactions have been linked with development and progression of knee osteoarthritis (OA). However, accurate in vivo investigations of the TF joint mechanics in patients with knee OA have been difficult to perform due to limitations of conventional techniques. This study sought to accurately characterize TF joint kinematics and the interactions of the articular cartilage surfaces using high-speed dynamic stereoscopic x-ray (DSX) technology during the loading phase of downhill walking in older adults with and without knee OA.

Methods: Eleven subjects with knee OA and 10 subjects without OA participated in this study. Subjects with knee OA were included if they demonstrated a Kellgren and Lawrence radiographic OA severity of at least grade II or higher. High-speed DSX images were acquired during the loading phase of a moderately declined walking condition (7% grade, 0.75 m/s) on an instrumented treadmill. Computerized tomography images were also taken to create subject-specific 3D bone models of the distal femur and proximal tibia. A previously validated model-based tracking algorithm was employed to determine 3D joint motion by matching the radiographic images with projections through the volumetric bone models. The anterior/posterior (AP) and medial/lateral (ML) positions of the TF joint contact points were estimated using the distance-weighted centroids of the region of closest bony proximity in both the medial and lateral TF compartments. ML and AP contact path lengths were determined by subtracting the minimum from the maximum AP and ML contact points. In addition, the total contact path length was determined as the algebraic summation of the ML and AP translations of the contact points in each compartment.

Results: Compared to the control group, subjects with knee OA contacted the ground with more knee flexion but moved through less flexion range of motion. Conversely, subjects with knee OA moved through more knee adduction range of motion despite contacting the ground with a near neutral frontal plane knee alignment. Additionally, the OA group demonstrated longer ML and total contact path lengths for the medial TF compartment and a longer ML contact path for the lateral TF compartment. Rate of OA progression. Intervention strategies to improve knee flexion during loading while limiting excessive frontal plane motion and joint translations should be considered.
Table 1. Means and standard deviations for subject demographics, knee joint kinematics and tibiofemoral compartment contact paths translations during the loading phase of downhill gait.

<table>
<thead>
<tr>
<th></th>
<th>Control (n = 10)</th>
<th>OA (n = 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>67.8 ± 5.1</td>
<td>69.6 ± 8.0</td>
</tr>
<tr>
<td>Sex (% female)</td>
<td>60%</td>
<td>72%</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>25.0 ± 2.2</td>
<td>30.4 ± 5.3*</td>
</tr>
<tr>
<td>Knee Flexion Position@Heel Contact (degrees)</td>
<td>0.01 ± 3.8</td>
<td>7.7 ± 8.7*</td>
</tr>
<tr>
<td>Total Joint Excursion (degrees)</td>
<td>10.2 ± 5.1</td>
<td>7.0 ± 4.5*</td>
</tr>
<tr>
<td>Knee Adduction/Abduction (°) Position@Heel Contact (degrees)</td>
<td>0.5 ± 3.6</td>
<td>-0.6 ± 8.3</td>
</tr>
<tr>
<td>Total Joint Excursion (degrees)</td>
<td>0.9 ± 0.4</td>
<td>2.0 ± 1.6*</td>
</tr>
<tr>
<td>Knee External Rotation (°)/Internal Rotation (°) Position@Heel Contact (degrees)</td>
<td>-2.2 ± 5.9</td>
<td>-1.4 ± 9.3</td>
</tr>
<tr>
<td>Total Joint Excursion (degrees)</td>
<td>4.3 ± 2.0</td>
<td>4.1 ± 2.6</td>
</tr>
<tr>
<td>Medial Compartment Contact Path Anterior/Posterior Distance (mm)</td>
<td>3.0 ± 1.9</td>
<td>4.2 ± 2.6</td>
</tr>
<tr>
<td>Medial/Lateral Distance (mm)</td>
<td>0.4 ± 0.3</td>
<td>1.3 ± 1.4*</td>
</tr>
<tr>
<td>Total Distance (mm)</td>
<td>4.0 ± 1.9</td>
<td>6.2 ± 2.9*</td>
</tr>
<tr>
<td>Lateral Compartment Contact Path Anterior/Posterior Distance (mm)</td>
<td>3.5 ± 2.4</td>
<td>2.9 ± 1.6</td>
</tr>
<tr>
<td>Medial/Lateral Distance (mm)</td>
<td>0.6 ± 0.3</td>
<td>1.2 ± 0.9*</td>
</tr>
<tr>
<td>Total Distance (mm)</td>
<td>4.2 ± 2.6</td>
<td>4.6 ± 2.0</td>
</tr>
</tbody>
</table>

*Statistically significant differences (p < 0.05)

Conclusions: Consistent with previous reports, subjects with knee OA contacted the ground with more knee flexion. However, findings from this study further suggest that individuals with knee OA also move through less knee flexion range of motion which can adversely affect shock absorption. Additionally, individuals with knee OA demonstrated signs of frontal plane TF joint instability (excessive adduction motion and ML translation) and a longer medial TF compartment translation which can negatively impact the

Disclosure: S. Farrokhi, None; C. A. Rainis, None; G. K. Fitzgerald, None; S. Tashman, None.

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Different of Patterns Knee Pain Trajectories: Longitudinal Data From the Osteoarthritis Initiative (OAI). Joseph Devich Jr.1, Michael J. Han- non2, Zhijie Wang3, Robert M. Boudreau4 and C. Kent Kwoh5. UPMC Shadyside, Pittsburgh, PA, 2University of Pittsburgh School of Medicine, Pittsburgh, PA, 3University of Pittsburgh, Pittsburgh, PA, 4University of Pittsburgh and VA Healthcare System, Pittsburgh, PA

Background/Purpose: Knee osteoarthritis (KOA) is one of the most common forms of arthritis and the most common cause of disability among the elderly. Knee pain is the presenting symptom of KOA, and symptomatic knee KOA is defined as “frequent knee pain” (pain on most days of at least one month in the past 12 months) and radiographic KOA. There is little data, however, on changes in knee pain over time. The purpose of this study was to identify whether there were different patterns of knee pain trajectories over four years of follow-up using data from the Osteoarthritis Initiative (OAI).

Methods: We studied 7,543 knees from OAI from baseline to 48 months (OAI public use data sets 2.1 and 2.2). Knee pain trajectories were based on the following knee pain reports at each visit: “No Pain” (no pain or aching in the past 12 months)=0, “Some Pain” (pain but not frequent pain)=1, or “Frequent Pain” (as above)=2. Unchanging subgroups had knees with same pain report at each visit: Group 1a, always 0; Group 1b, always 1; and Group 1c, always 2. Worsening subgroups had knees with consistent progression to worse pain: Group 2a for knees going 0→−1 (n = 231); Group 2b −1→2 (n = 231); and Group 2c −1→−0 improving subgroups had knees with consistent progression to less pain: Group 3a for knees going from 2→−1 (n = 291); Group 3b −1→0; and Group 3c 1→−0. Fluctuating knee pain patterns (i.e., alternating between 0, 1 or 2 from visit to visit) were excluded from this analysis. To reduce the chances that a fluctuating knee was misclassified, for the worsening and improving subgroups, knees had to have two time points at the initial level of lower/higher pain or two time points at the final lower/higher level, respectively. Knee-specific WOMAC pain scores across the five visits were compared within each knee pain group using GEE (STATA 11.2) with each model adjusted for age, sex, race, educational level, depression, hand OA, and BMI. Subgroups within a group that were not distinct from each were combined. Comparison of differences between the larger subgroups was then performed.

Results: Group 1a and Group 1b, Group 2a and Group 2b, Group 3a and Group 3b were no different from each other (p-values > 0.1). Each of these pairs was then collapsed into three respective subgroups. The results between remaining subgroups are summarized in Table 1 below. There were significant differences in the adjusted mean WOMAC pain scores at each OAI visit between the referent group (i.e., unchanging no/some pain) and the unchanging frequent pain subgroup, the worsening pain subgroups and the improving pain subgroups.

Table 1. Comparisons of Adjusted Mean WOMAC Pain Scores of the Knee Pain Trajectories

<table>
<thead>
<tr>
<th>Knee Pain Frequency</th>
<th>Baseline</th>
<th>M12</th>
<th>M24</th>
<th>M36</th>
<th>M48</th>
<th>P for change over time between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unchanging Pattern</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always 0 (n = 775)</td>
<td>2.3618</td>
<td>2.5418</td>
<td>2.4918</td>
<td>2.4167</td>
<td>2.2918</td>
<td>reference</td>
</tr>
<tr>
<td>Always 2 (n = 432)</td>
<td>2.8395</td>
<td>2.6458</td>
<td>2.3948</td>
<td>2.3418</td>
<td>2.3481</td>
<td></td>
</tr>
<tr>
<td>Worsening Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0→−1=2 (n = 200)</td>
<td>2.9304</td>
<td>10.3740</td>
<td>12.1654</td>
<td>14.7902</td>
<td>17.4800</td>
<td>&lt; 0.001 all time points</td>
</tr>
<tr>
<td>0→−1=−0 (n = 316)</td>
<td>2.3466</td>
<td>1.7086</td>
<td>2.2314</td>
<td>3.2002</td>
<td>4.1065</td>
<td>0.247, 0.146, &lt; 0.001, &lt; 0.001</td>
</tr>
<tr>
<td>Improving Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2→−1=0 (n = 171)</td>
<td>15.8400</td>
<td>12.7430</td>
<td>11.5562</td>
<td>9.2976</td>
<td>7.5858</td>
<td>&lt; 0.001 all time points</td>
</tr>
<tr>
<td>1→0 (n = 220)</td>
<td>4.4180</td>
<td>2.3249</td>
<td>2.1787</td>
<td>1.7396</td>
<td>0.7460</td>
<td>0.005, &lt; 0.001, &lt; 0.001, &lt; 0.001</td>
</tr>
</tbody>
</table>

*Different at p < .05 from all other groups. Tukey pairwise adjustment. Where: 0 = “No Pain” 1 = “Sometimes Pain” 2 = “Frequent Pain”

Conclusion: We have been able to define distinct knee pain trajectories of unchanging, worsening and improving knee pain. Further work is underway to better characterize these groups. Better understanding of these knee pain trajectories may help to identify subgroups to target for specific interventions.

Disclosure: J. Devich Jr., None; M. J. Hannon, None; Z. Wang, None; R. M. Boudreau, None; C. K. Kwoh, AstraZeneca, 2, Beverage Institute, 2.

1129

Prevalence of Symptomatic Basilar Thumb Joint Osteoarthritis in the General Population. Jennifer Morriatis Wolf1, Aleksandra Turkiewicz2, Isam Atroschi3 and Martin Englund4. 1University of Connecticut Health Center, Farmington, CT, 2Department of Orthopedics, Clinical Sciences Lund, Lund University, Lund, Sweden, 3Lund University, Hässleholm, Sweden

Background/Purpose: While the radiographic prevalence of basilar thumb osteoarthritis (OA) is well described, little is known about whether this translates to clinically symptomatic arthritus. The purpose of this study is to determine the prevalence of physician-diagnosed thumb carpometacarpal (CMC) arthritus.

Methods: Using healthcare registry data from Skåne County, in southern Sweden (predominantly Caucasian population 1.3 million), we identified all adults aged 20 years or older who consulted a physician at least once and were given a diagnosis code for OA of the first CMC joint (ICD-10 code M18). Data were analyzed over the 13-year period between 1999 and 2011. Using cross-referencing with the Swedish population register to exclude subjects who were deceased or had relocated out of the county by end of year 2011, we obtained frequencies and point prevalence estimates by age and gender. The population was reduced with 20% to compensate for the loss of patients seen by the private care practitioners exclusively (ICD-10 codes partially forwarded to the register).

Results: The point prevalence of physician-diagnosed symptomatic OA of the basilar thumb joint in adults was estimated to 1.3% overall (2.0% in women and 0.57% in men). The prevalence peaked in women aged 65–74 with prevalence of 5.3%. The corresponding peak in men was in men aged 75–84 with a prevalence of 1.7%.

Conclusion: In a well-defined population, the clinically important prevalence of basilar thumb OA is substantially higher in women than men, with peak prevalence in women between 60–79 years of age. Thumb base OA can have a large impact on function and activities of daily living, and the high prevalence in elderly women and men is a health and economic concern in an aging population.
Disclosure: G. H. Sands, Pfizer Inc, 3; P. Bhadra, Pfizer Inc, 3; M. Noyes Essex, Pfizer Inc, 3.

Conclusion: Daily celecoxib treatment was significantly more efficacious than intermittent dosing during 22-weeks in preventing flares in patients with osteoarthritis (OA) of the knee or hip who have successfully treated an initial flare. The objective was to characterize the effect of age on efficacy, as measured by the number of flares, of continuous daily celecoxib treatment versus intermittent celecoxib treatment.

Methods: An exploratory analysis of a multinational, randomized clinical trial was conducted to determine if the number of OA flares during the blinded post-randomization period was different for patients aged < 60 years. In the trial, 858 patients aged 18 to 80 years with OA of the knee or hip, meeting American College of Rheumatology criteria, were randomized to receive celecoxib 200 mgqd either as “continuous” (daily) or “intermittent” (celecoxib 200 mgqd when needed to treat OA flare meeting predefined criteria) treatment. Analyses were performed on the intention-to-treat (ITT) population (≥1 dose of study medication post-randomization) and flare-modified ITT population (all patients meeting criteria for ITT population plus having flare durations ≥14 + 2 days), using a 2-sided type I error rate of 0.05.

Results: Mean ages were 51.3 and 67.2 years in the 2 continuous treatment groups (n = 236 and n = 195, respectively) and 51.2 and 66.7 years in the 2 intermittent treatment groups (n = 220 and n = 207, respectively). For patients aged < 60 years, 0.50 flares/month (SD 0.60) were reported in the group receiving continuous treatment, while 0.89 flares/month (SD 0.98) were observed in those receiving intermittent treatment (P < 0.0001). For patients aged ≥60 years, the continuous treatment group had 0.59 flares/month (SD 0.87) compared with 0.97 flares/month (SD 1.04) in the intermittent group (P < 0.0001). These results are consistent with the primary results.

In the flare-modified ITT population, patients aged < 60 years receiving continuous treatment had 0.45 flares/month (SD 0.61) vs 0.87 flares/month (SD 1.15) for the intermittent group (P < 0.0001). The older flare-modified ITT population (≥60 years) had similar results: 0.55 flares/month (SD 1.02) vs 1.02 flares/month (SD 1.22) for the continuous and intermittent groups, respectively (P = 0.001). The mean number of flares was significantly lower in the continuous group than in the intermittent group irrespective of whether the patients were aged < or ≥60 years.

Conclusion: Daily celecoxib treatment was significantly more efficacious, as assessed by the number of flares/month, than intermittent use, irrespective of whether the patients were aged < or ≥60 years. These data may be useful in considering the treatment of OA patients aged ≥60 years.

Reference
Prevalence of Knee Pain in Ultramarathon Runners, Victoria M. Kelly1, Martin Hoffman2, Bharathi Lingala1, Mihoko Bennett1 and Eswar Krishnan1.

Background/Purpose: Approximately one in four Americans suffer from frequent knee pain. While some studies have linked long-distance running with the risk for knee pain, others have not observed such associations. Since the proposed mechanism of such a link involves mechanical stress to the joints, greater lifetime running miles should be associated with a greater risk for knee pain and an earlier age of onset. We tested these expectations by cross sectional analysis of data from the baseline questionnaire of a new cohort of ultramarathon runners.

Methods: The ULTRA study is a cohort of runners who have participated in at least one ultramarathon race (>50 kilometers) in their lifetime. This study has been enrolling participants since November 2011. For the purposes of this analysis, “knee pain” was defined as “any knee pain in the past 6 months”, as there were almost no individuals with chronic-frequent knee pain in this cohort of high functioning individuals. To assess the impact of mileage on knee pain, we performed a logistic regression model, where the dependent variable was knee pain and independent variables were quartiles of lifetime running distance, age, body mass index (BMI) and current running status. Ex-runners were defined as those who have not run regularly in the preceding 12 months.

Results: Of the 1,083 runners included in the present analysis, 68% were men and 6% were classified as ex-runners. The mean age, and BMI were 44 years and 27 kg/square meters respectively. After adjusting for age, gender and BMI, the prevalence of knee pain was higher in those with lower lifetime mileage, both in runners and ex-runners. Overall rates of knee pain did not differ between runners and ex-runners (47% vs. 48%), and confidence intervals overlapped significantly for knee pain within each mileage group (see Figure). In the logistic regression model, runners in the highest distance quartile (>25,000 miles) were the least likely to report knee pain, OR 0.5 (95% CI 0.4–0.8), suggesting that lifetime running distance is inversely correlated with knee pain.

Conclusion: Knee pain was more common among low mileage runners; the causal direction of this association can be ascertained in prospective studies. There was no difference in overall knee pain between current and ex-runners.

Disclosure: V. M. Kelly, None; M. Hoffman, None; B. Lingala, None; M. Bennett, None; E. Krishnan, None.

1133
Gait Differences Are Present in Subjects with Symptomatic Vs. Asymptomatic Mild Radiographic Hip Osteoarthritis. Samir S. Chabra1, Najia Shakoor2 and Kharma C. Foucher2. 1University of Illinois at Chicago, Chicago, IL, 2Rush University Medical Center, Chicago, IL

Background/Purpose: It is known that joint mechanics are involved in the hip osteoarthritis (OA) disease process. In a previous study1, several gait variables were lower in subjects with symptomatic hip OA compared to asymptomatic controls. In the OA subjects gait variables were significantly correlated with radiographic OA severity but not pain. It remains unclear, however, whether structural changes or clinical symptoms initiate the gait changes associated with hip OA. In this study we tested the hypothesis that gait variables are different in people with symptomatic radiographic hip OA compared to those with radiographic changes but no symptoms.

Methods: 25 subjects with mild radiographic hip OA (Kellgren-Lawrence grade 2) were identified from an IRB approved repository of gait and radiographic data. 12 had been enrolled in a study of subjects with symptomatic unilateral hip OA and 13 came from a database of asymptomatic subjects. Demographics and BMI were similar between the two groups (Table). Gait analysis was performed with standard published methods: participants completed 3 trials per limb walking at a self-selected normal speed. Kinematics and kinetics were calculated from marker positions and ground reaction forces. Standard inverse dynamics methods were used. The variables of interest were speed, dynamic hip range of motion, and peak 3D external moments normalized to body weight times height (%BWxHt). Data were averaged for the 3 trials. T-tests were used to compare gait variables between the two groups.

Results: Walking speeds were not significantly different between the two groups (Table). The peak adduction and internal rotation moments were 17% and 29% lower in the symptomatic OA group compared to the asymptomatic group (p = 0.017 and p = 0.044, Table). The external rotation moment was 26% lower in the symptomatic group (trend p = 0.059). No other comparisons were statistically significant.

Table. Comparisons between subjects with mild radiographic hip OA who are symptomatic vs. asymptomatic

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symptomatic</th>
<th>Asymptomatic</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>53 ± 6</td>
<td>58 ± 10</td>
<td>0.166</td>
</tr>
<tr>
<td>Total BMI (kg/m²)</td>
<td>26 ± 3</td>
<td>28 ± 5</td>
<td>0.198</td>
</tr>
<tr>
<td>Sex</td>
<td>9 Female/3 Male</td>
<td>11 Female/2 Male</td>
<td>0.548</td>
</tr>
<tr>
<td>Normal walking speed (m/s)</td>
<td>1.16 ± 0.20</td>
<td>1.20 ± 0.11</td>
<td>0.615</td>
</tr>
<tr>
<td>Dynamic sagittal plane hip range of motion (degrees)</td>
<td>29.2 ± 7.4</td>
<td>30.8 ± 6.3</td>
<td>0.568</td>
</tr>
<tr>
<td>Flexion Motion (%BWxHt)</td>
<td>5.15 ± 1.48</td>
<td>5.85 ± 1.30</td>
<td>0.221</td>
</tr>
<tr>
<td>Peak Extension Motion (%BWxHt)</td>
<td>2.37 ± 0.61</td>
<td>2.64 ± 0.99</td>
<td>0.427</td>
</tr>
<tr>
<td>Peak Adduction Motion (%BWxHt)</td>
<td>3.53 ± 0.84</td>
<td>4.27 ± 0.60</td>
<td>0.017</td>
</tr>
<tr>
<td>Peak Abduction Motion (%BWxHt)</td>
<td>1.84 ± 0.81</td>
<td>2.05 ± 1.02</td>
<td>0.587</td>
</tr>
<tr>
<td>Peak Internal Rotation Moment (%BWxHt)</td>
<td>0.53 ± 0.19</td>
<td>0.75 ± 0.29</td>
<td>0.044</td>
</tr>
<tr>
<td>Peak External Rotation Moment (%BWxHt)</td>
<td>0.44 ± 0.13</td>
<td>0.60 ± 0.26</td>
<td>0.059</td>
</tr>
</tbody>
</table>

Conclusion: Subjects with mild symptomatic radiographic hip OA had different gait than subjects with mild radiographic OA alone. Notably, walking speeds were similar between groups. Thus gait differences observed were not attributable to slower speeds in the symptomatic group. The adduction, internal rotation, and external rotation moments, which each reflect aspects of hip abductor function, were reduced in the symptomatic group. This suggests that this muscle group plays an important role in early symptomatic OA. Further, these results support previous speculations that pain may be an initial stimulus that initiates joint loading alterations in hip and knee OA1,2.

References

Acknowledgement: Rush Translational Science Consortium/Searle Foundation Pilot Projects Grant

Disclosure: S. S. Chabra, None; N. Shakoor, None; K. C. Foucher, None.

1134
What Are the Levels of Physical Activities and Their Associations with Quality of Life in Patients with Symptomatic Hip and/or Knee Osteoarthritis? Irawati Lemonnier1, Anne Vuillemin1 and Anne-Christine Rat1. 1Lorraine University Paris Descartes University, EA 4360 Aparmac, Nancy, France, Nancy, France, 2Université de Lorraine, Paris Descartes University, EA 4360 Aparmac, Nancy, France, Nancy, France, 3Université de Lorraine, Paris Descartes University, APEMAC, EA 4360, F- 54 000, Nancy, France

Background/Purpose: Physical activities (PA) practice is recommended by numerous public health organizations. According to international recommendations, patients with hip and knee osteoarthritis (OA) should be encouraged to undertake more specific activities: regular aerobic, muscle
strengthening and range of motion exercises. However, the level of PA practice in patients with symptomatic hip and/or knee OA in a real setting is not well known and associations between PA practice and quality of life (QoL) should be clarified. The aim of the study was to study 1. the level of PA practice in patients with symptomatic hip and/or knee OA in a real setting 2. the associations between PA practice and QoL in patients with symptomatic hip and/or knee OA.

Methods: The 878 patients of the KOHALA (Knee and Hip Osteo-Arthritis Long term assessment) cohort were included in the study. KOHALA cohort is a multiregional population based study of patients aged 45–75 years with symptomatic knee or/and hip OA. The MAQ (modifiable activity questionnaire) was used to measure the PA during the past year. It includes 2 scores: the numbers of hours spend weekly for physical activities in leisure activities (PAL) and in professional activities (PAP). QoL was measured by a generic questionnaire, the SF-36; pain, function, and clinical data by the Index of Severity for Knee (ISK) and the Harris hip score. All measures were completed at baseline. Multivariate linear-regression models were constructed to identify the associations between PA and QoL. The models were adjusted on OA functional and pain scores, age, sex, BMI, current smoking status, current employment status and occupation during their life.

Results: Among the 878 patients, 222 had hip OA, 607 knee OA and 49 both. Patients with hip and knee OA were slightly older (64.7±8) than those with knee (62.8±5) or hip OA only (61.2±8.8). The average body mass index was 26.9±4.4 and 30.3±6.2 for patients with hip and knee OA respectively. 67 and 71% of the patients were women in hip and knee OA respectively. The level of PA was of 25 hours a week in patients with hip or knee OA and was lower (20 hours a week) in patients with both hip and knee OA. The level PAL was of 5.6, 6.2, 6.5 hours a week for hip OA, knee OA and both respectively. No relation was observed between physical activities level and QoL in patients with hip OA. For patients followed for knee OA, more hours spend on leisure activities were associated with better mental health (p=0.001), role emotional (p=0.02), social functioning (p=0.04) and vitality (p<0.001) scores in multivariate analyses. The number of hours spent on professional activities by patients who suffered from both hip and knee OA were associated with lower role emotional (p=0.03) and social functioning (p=0.04) scores.

Conclusions: These results suggest that more hours spend weekly on leisure activities may positively affect patients with symptomatic knee and/or hip OA independently of pain, function and sociodemographic variables. The associations are found for mental state and social functioning. On the other hand, physical activities for professional reasons seemed to be associated with more difficulties in social functioning of patients with both hip and knee OA.

Disclosure: I. Lemonnier, None; A. Vuillenmin, None; A. C. Rat, None.

1135 Combined Glucosamine and Chondroitin Sulfate, Once of Three Times Daily, Provide Clinically Relevant Analgesia in Knee Osteoarthritis. Jose R. Preto, Jose R. Preto1, R. Shindo2, Joyce M. Silva3, Carla RGS. Peron4, and Francisco AC Rocha5.1Pontificia Universidade Católica de Campinas, Campinas, Brazil, 2Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 3Sao Paulo, Brazil, 4Laboratórios Ache` Ltda, Sao Paulo, Brazil, 5Federal University of Ceara, Fortaleza, Brazil

Background/Purpose: The analgesic efficacy of combined glucosamine and chondroitin sulfate (CS) in knee osteoarthritis (OA) remains controversial. Criticism to previous studies includes small sample size, short term evaluation and lack of intent-to-treat (ITT) analysis. Glucosamine sulfate (GS) or hydrochloride (GH) formulations and dosing schedule relevance are not clearly defined.

Methods: 1,120 subjects with radiographic knee OA (Kellgren/Lawrence grades 2–3) and moderate-severe knee pain flare after analgesic washout were randomized (1:1:1) at 16 centers in Brazil to receive GS 500mg/CS 400mg three times daily capsules (GI) or once daily sachet (GII), or GH 500mg/CS 400mg three times daily capsules (GIII) for a 16 week trial. Acetaminophen up to 3,750mg daily was a rescue medication. Primary outcome (ITT) was patient reported pain intensity in the affected knee and variation of Lequesne’s index (LI) at 16 weeks. Monthly secondary outcomes were mean changes from baseline in patient reported pain and LI, patient and physician global assessments of disease activity, acetaminophen consumption, and adherence. Sample size calculation considered a non-inferiority evaluation allowing a difference of less than 1.7 points in the LI and a decrease of pain less than 18mm in GI and GII, as compared to GIII. Safety evaluations were done at each monthly visit.

Results: The ITT population comprised 302, 301, and 306 patients in GI, GII and GIII, respectively, and 911 patients for safety. Demographic data were equally comparable in all groups. The criterion for non-inferiority analysis of GI and GII in relation to GIII, based on confidence interval (95%), was met for pain intensity and LI. The mean of pain reduction (GI: −30.9±1.5; GII: −28.7±1.5; GIII: −29.7±1.5 mm) was significant for all groups at week 16 (P<0.001). Similarly, the mean of LI decrease was statistically significant in all groups (GI: −3.8±0.2; GII: −3.7±0.2; GIII: −3.8±0.2) (P<0.001). Moreover, reduction of acetaminophen consumption (−5, −3, and −5 weekly tablets for GI, GII, and GIII, respectively) was also significant in all groups (P<0.005). Withdrawal rate was 18.2%, 19.3%, and 19.3% for GI, II, and III. Patients that did not complete the study were 77 (44.8%) for lack of adherence, 16 (9.3%) consent withdrawal, 11 (6.4%) adverse events, 8 (4.7%) lost to follow-up, and 17 (9.9%) for other causes.

Conclusion: This is the largest study showing that GS/CS and GH/CS provide clinically meaningful and sustained analgesia in knee OA regardless of dose fractionation. GS/CS (capsule or sachet) and GH/CS formulations are equally effective and safe to treat symptomatic knee OA.

Disclosure: J. R. Provenza, None; S. K. Shindo, Federico Foundation, 2; J. M. Silva, None; C. R. Peron, None; F. A. Rocha, None.

1136 Aesthetic Dissatisfaction in Hand Osteoarthritics Patients, Its Impact and Risk Factors. R. Liu, L.J.J. Beart-van de Voorde, T.W.J. Huizinga and M. Kloppenburg. Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: Hand osteoarthritics (HOA) leads to aesthetic damage and is rarely studied. We aim to investigate in HOA patients the prevalence of dissatisfaction with the appearance of their hands, the impact and its risk factors.

Methods: Cross-sectional data were used of the ongoing HOSTAS (Hand Osteoarthritics in Secondary care) study, in which consecutive patients are included, that are diagnosed by the treating rheumatologist with primary HOA. Participants underwent physical examination to assess number of joints with bony joint enlargements (0–30), deformities (0–22) and limitation in mobility (0–22).

The Michigan Hand Outcomes (MHQ) questionnaire involves a pain (range 0–100, higher scores=more pain) and an aesthetic scale, which measures satisfaction (range 1–5, lower scores=more dissatisfaction) with the appearance of the hands and its impact, namely discomfort in public, depression and/or the interference with normal social activities (range 3–12, lower scores=more impact). A score of <3 was considered as dissatisfaction and a score of <9 as experiencing impact. Scores for right and left hand were averaged.

Disability was assessed by the functional index for HOA (FIHOA) (0–30). Anxiety (0–21), depression (0–21) and illness perceptions were assessed with the Hospital Anxiety and Depression scales (HADS) and Illness Perception Questionnaire (IPQ), respectively.

Odds Ratio (OR) with 95% confidence intervals (CI) were calculated using multivariate logistic regression as measures of relative risk for reporting dissatisfaction with appearance or impact due to dissatisfaction of the appearance, adjusted for age, sex and BMI.

Results: Of 226 patients (87% women, mean age 61.5 yrs, median symptom duration 5.2(range 0.1– 58.7) yrs) 93% met ACR criteria for HOA. 25% were aesthetically dissatisfied and only 4% reported impact due to dissatisfaction. Mean pain score was 44 (SD 19) and median FIHOA score was 8 (range 0–24). Median depression and anxiety scores were 4 (range 0–18) and 2 (range 0–17), respectively.

Pain (OR 1.02 (1.00–1.04)), disability (OR 1.07 (1.01–1.12)), deformities (OR 1.24 (1.11–1.37)), number of joints with limitation in mobility (OR 1.05 (1.01–1.08)) and the illness perception scale which involves negative feelings towards OA (OR 1.08 (1.02–1.15)) were associated with dissatisfaction, as well as with impact.

Bony joint enlargements (OR 1.09 (1.01–1.17)) and illness perception (belief in OA as a chronic disease) (OR 1.12 (1.01–2.13)) were associated with dissatisfaction, but not with impact.

Depression (OR 1.32 (1.13–1.55)), anxiety levels (OR 1.37 (1.14–1.64)) and illness perceptions (the belief in more severe consequences as a result of OA, less understanding of OA and attributing more psychological factors to their disease) were equally associated with impact.

Conclusion: HOA patients who consult secondary care report regularly aesthetic dissatisfaction with their hands. However, this dissatisfaction has negative impact only in a small group of patients, who also experiences more
pain, depression and anxiety and negative illness perceptions. These results have implications for management strategies in patients with HOA.

Disclosure: R. Liu, None; L. J. J. Bearta-van de Voorde, None; T. W. J. Huizinga, None; M. Kloppenburg, None.

1137
Clinimetric Properties of a New Outcome Measure: the Hand-Osteoarthritis Aesthetic Damage Index. N. Bellamy and Joan Hendrikz. The University of Queensland, Herston, Queensland, Australia

Background/Purpose: The 2006 OARSI Guidelines for hand OA clinical trials, recognised the potential value of an aesthetic damage assessment, but acknowledged the absence of any existing instrument to perform the measurement. In order to address this deficiency, a measure termed the Hand-Osteoarthritis Aesthetic Damage Index(HADIX) has been developed and its clinimetric properties explored. HADIX is a hexadimensional, Patient Reported Outcome Measure (PROM) of the aesthetic impact of hand OA (HADIX 1–6).

Methods: This study forms part of a larger longitudinal initiative involving clinical profiling, digital photography and radiography. The development of HADIX has been reported previously (1). In the current study, test-retest reliability (TRR) and construct validity of re-test HADIX data (except HADIX 4 which is a relative measure) using the Michigan Hand Outcomes Questionnaire - MHQO, were evaluated using Pearson’s rho or Kendall’s tau-b. Time to completion was also examined.

Results: The study involved 28 subjects with hand OA 25 females and 3 males), who fulfilled the Altman Criteria for hand OA, with mean age last birthday/70 yrs (min = 52 yrs; max = 97 yrs; SD = 9.5). TRR correlation coefficients were: HADIX1 = 0.89; HADIX2 = 0.77: HADIX3 = 0.86: HADIX4 = 0.68: HADIX5 = 0.76: HADIX6 = 0.87. Correlations between the re-test HADIX and MHQO scores were HADIX1 = 0.55: HADIX2 = 0.52: HADIX3 = 0.44: HADIX5 = 0.72: HADIX6 = 0.45. Mean time to completion for HADIX on first presentation was 8.6 mins (min = 2.3 mins; max = 22.22 mins; SD = 4.57 mins). On the second occasion information was available for 5 patients who were 34 seconds faster on average.

Conclusion: HADIX provides a novel approach to the evaluation of the aesthetic impact of hand OA. These observations suggest that the HADIX Index is reliable, valid and feasible, and may have a role in the evaluation of structure modifying interventions in hand OA.

(1) Bellamy N. Osteoporosis International 2012;23(Suppl 2):S60.

Disclosure: N. Bellamy, None; J. Hendrikz, None.

1138
Nonpharmacologic and Pharmacologic Therapy Utilization by Primary Care Providers for Hand Osteoarthritis-Comparative Review by Electronic Health Record Data Mining and In-Home Visit Verification. Gale A. McCarty, President. Rheum.Ed Consulting, Harborside, ME

Background/Purpose: To compare current utilization of usual nonpharmacologic (NP) and pharmacologic (P) therapies for hand osteoarthritis (OA) by primary care providers (PCPs) and patients (Pts) based on American College of Rheumatology (ACR) 2012 Recommendations in 2 age- and gender-matched populations.

Methods: From voluntary in-home health visit (problem list, history, exam, medication reconciliation) with electronic health record assessment over 3 yrs for ascertained of Medicare Advantage general health maintenance and quality benchmarking (Cty 1-Sacramento County CA, N = 50; and Cty 2-Cumberland County ME, N = 50), age- and gender-matched pts were identified. Pts were unaware the examiner was a rheumatologist. Discussion vs. Use vs. Source (PCP or pt) of NP recommendations (Activities of Daily Living, ADLs/Jt Protection/Assistive Device Provision for ADLs/Thermal Modalities/TrapezioMCP Splints) and P recs (Top. Capsaicin/Top. NSAIDs/PO NSAIDs/Tramadol) were queried. Descriptive statistics and/or SPis were used where applicable: p value significance was <0.05.

Results: Results: Behavior Risk Factor Surveillance System 2009/10 data confirmed no significant differences (nhd) from Cty 1 vs Cty 2 in: population (281,674 vs 265,012), % pop. > 65 (10.6 vs 11.2%), white ethnicity (78% vs 80%), age: gender (70 vs 72%), mean age (72.4 vs 74.1 yrs-range 65–98), no. of pts. with doctor-diagnosed arthritis b/w ages of 65 and 74 (45 vs 45%), no. of pts w/activity limitation due to arthritis (48 vs 44%), no. of pts w/social participation restriction due to arthritis (17 vs 14%), no. of pts w/severe pain due to arthritis-non-site specified (27 vs 21%), obesity by BMI (32 vs 33%), the no. of Rheumatologists available for referral in network (6 vs 7), and the % of benchmarks attained for major health metrics (96 vs 95% capture). Latino ethnicity was statistically different (16.6% vs 19%). No significant differences from Cty 1 vs Cty 2 were noted for: Dx of OA-Hands (88 vs 92%); all had discussed OA as an issue with their PCPs at least once in the prior 3 yrs. Presence of hand OA was confirmed by Rheumatology exam in 88 vs 92% of pts. At least 1 NP Rec (Thermal Modalities) and 1 P Rec (Top NSAIDs) had been discussed by PCPs for all pts. by Cty 1 (100 vs 100%), but utilization was significantly different (44 vs 25%). Jt Protection and ADLs had not been discussed or utilized (80 vs 80%); only Assistive Device Provision (cane/walker) had been done (33 vs 30%). PO NSAIDs were actively discouraged even in low dose/CoX2 selective/H2 blocker usage by providers (80% vs 80%).

Conclusion: Current NP and P recommendations from OA experts are variably implemented with pts, despite confirmed presence of OA by their own PCPs as an Active Problem, and pts. reporting pain and social restriction due to arthritis.

Disclosure: G. A. McCarty, None.

ACR/ARHP Poster Session B
Pediatric Rheumatology - Clinical and Therapeutic Aspects: Juvenile Idiopathic Arthritis

Monday, November 12, 2012, 9:00 AM–6:00 PM

1139
Inhaled Nitrous Oxide Facilitates Access to Intra-Articular Corticosteroid Injections in Children with Juvenile Idiopathic Arthritis. Mercedes O. Chan1, Ruth Wylie2 and H. E. Foster1. 1University of British Columbia and British Columbia’s Children’s Hospital, Vancouver, BC, 2Newcastle Hospitals, NHS Foundation Trust, Newcastle Upon Tyne, United Kingdom, 3Newcastle Hospitals NHS Foundation Trust, Great North Children’s Hospital and Newcastle University, Newcastle Upon Tyne, United Kingdom

Background/Purpose: Juvenile idiopathic arthritis (JIA) is the most common rheumatic disease of childhood affecting 1 in 1000 children. Medical management for arthritis often includes intra-articular corticosteroid injections. The inhalation of nitrous oxide (N2O) in painful procedures is widely recognised in adults, yet is underused in children and young people (CYP). N2O is quickly absorbed, having low solubility in water and fat, and rapidly eliminated from the body when inhalation stops. It is safe, fast-acting, and non-invasive, reducing apprehension and anxiety. The use of N2O has increased access for CYP requiring painful procedures such as joint injections (JIs) that may have previously required a general anaesthetic. We aimed to describe a population of children receiving JIs with N2O at our centre and the wait time for JIs with N2O once a decision to inject was made.

Methods: Data was collected retrospectively from available charts of children receiving JIs with N2O from January 2002 to April 2012 at our centre. Demographics, number of JIs (including types of joints injected), and number of repeat JIs within a year were recorded. Time from decision point (DP) to JI was calculated for JIs performed in 2011–2012.

Results: 397 JIs with N2O on 292 occasions (140 males, 152 females) were performed from 2002–2012. The median age at time of JI was 13.78 (range 6.38 to 18.97 yrs). The median number of JIs performed with N2O per year was 24 (range 14–53). On 48 occasions JIs were performed subsequent to one done earlier that calendar year. The median number of repeat JIs per patient requiring them was 1.

From 2011–2012, 79 JIs were performed with N2O. The median number of days from a DP to a JI with N2O was 0 (range 0–87 days). 62 patients had JIs within 2 weeks; 11 between 2 and 4 weeks; 2 between 4 to 6 weeks; and, 3 after 6 weeks from DP. One patient receiving a JI after 6 weeks (87 days) from DP required imaging to confirm synovitis before proceeding with the procedure. Reasons for other JIs performed after 6 weeks from DP were unable to be elicited from charts. Documentation of a DP for JIs with N2O was present in 77/79 patients (97%).

Joints most commonly injected were: knees (80.0%), ankles (14.4%), elbows (3.8%), wrists (1.6%), subtalar (0.5%), fingers (0.3%) and shoulders (0.2%). There were no major adverse events (including septic arthritis) reported. An increase in trainee procedures was seen after 2009 consistent with the introduction of a paediatric rheumatology (PRh) training program.
Conclusion: Use of N₂O for JIs in children with JIA allows for expedient, safe and efficient sedation and analgesia. At our centre, children assessed in clinic and who need JIs may be offered one at that visit, performed by the PRh team (clinician and nurse specialist). This has benefits for clinical care (rapid access to the procedure); the patient and family (less time off school/college or work, no anaesthetic risk); health care costs (reduced need for day case access and theatre time); and, optimal use of resources (preferential access to general anaesthetic lists for younger children; or those requiring multiple JIs or use of image intensifiers; or, quick procedures reducing PRh time).

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Response to Adalimumab in 40 Patients with Refractory Juvenile Idiopathic Arthritis-Associated Uveitis. A Multicenter Study. Vanesa Calvo-Rio, Ricardo Blanco, Manuel Diaz-Llopis, David Salom, Carmen Garcia-Vicuña, Miquel Cordero-Coma, Norberto Ortega, Marta Suarez-de-Figueroa, J. Carlos Fernandez-Cid, Antonia Fonollosa Calduch, Angel M. Garcia-Aparicio, Jose M. Benitez-del-Castillo, Jose L. Olea, Vicuna4, Miguel Cordero-Coma, Norberto Ortego, Marta Suarez-de-Loricera13 and Miguel Angel Gonzalez-Gay13. 1Hospital Universitario Marques de Valdecilla-IFIMAV, Santander, Spain, 2Hospital Universitario La Fe de Valencia, Valencia, 3Hospital Universitario La Fe de Valencia, Valencia, Spain, 4Hospital Sant Joan de Deu, Barcelona, Barcelona, Spain, 5Hospital de Leon, Leon, Spain, 6Hospital Santa Cecilia, Granada, Spain, 7Hospital Ramon y Cajal, Madrid, Spain, 8Hospital de Pontevedra, Pontevedra, Spain, 9Hospital de Cruces, Barakaldo, Spain, 10Hospital Virgen Salud, Toledo, Toledo, 11Hospital Clinico San Carlos, Madrid, 12Hospital Son Dureta, Palma de Mallorca, Spain, 13Hospital Universitario Marques de Valdecilla. IFIMAV, Santander, Spain

Background/ Purpose: To assess the efficacy and safety of treatment with adalimumab therapy in patients with refractory Juvenile Idiopathic Arthritis (JIA)-associated uveitis.

Methods: Multicenter study on 40 patients diagnosed as having JIA-associated uveitis refractory to treatment with corticosteroids therapy and at least other systemic immunosuppressive drug. Standard adalimumab therapy was started (40 mg subcutaneously every-other-week), for children aged between 4 and 12 years, the recommended dose was 24 mg/m² body surface area up to a maximum single dose of 40 mg sc every other week. The associated immunosuppressive therapy and the prednisone dose were reduced if there was no evidence of inflammation. Degree of anterior and posterior chamber inflammation (SUN criteria), corticosteroid dose, and macular thickness (optical coherence tomography) were assessed. Definite outcomes were assessed at six months in all patients. All expressed comparisons are between baseline and after 6 months of adalimumab therapy (Wilcoxon test).

Results: Forty patients (11 males, 29 females), mean age of 11.4±7.9 years (range: 4 to 18 years), with active intraocular inflammation at baseline were studied. Thirty-six of 40 patients had inflammation in the anterior camera, and treatment with adalimumab achieved a significant improvement in mean tyndall from 1.8±1.1 to 0.41±0.6; p = 0.00001. Also, 17 (42.5%) patients had macular thickness with Optic Coherence Tomography (OCT)>250 microns. These cases had a significant improvement in OCT from 370.8±133.9 to 249.3±28.0 microns; p=0.0007. In addition, 9 patients with Cystoid Macular Edema (CME) (OCT=300) also had a significant improvement in OCT (463.1±123.8 to 254.8±30.2; p=0.007). The dose of corticosteroids also was decreased from 0.26±0.4 mg to 0.004±0.02 mg/d (p=0.00061).

Adalimumab was usually well tolerated, and only local minor side-effects at the injection site were observed. Twelve patients (30%) had a mild relapse during the 6 months of therapy whereas only 2 patients (5%) had a moderate-severe relapse.

Conclusion: Adalimumab appears to be an effective and safe drug for the treatment of refractory JIA-associated uveitis and may reduce steroid requirement. Further controlled studies are warranted.

Disclosure: V. Calvo-Rio, None; R. Blanco, None; M. Diaz-Llopis, None; D. Salom, None; C. Garcia-Vicuña, None; M. Cordero-Coma, None; N. Ortega, None; M. Suarez-de-Figueroa, None; J. C. Fernandez-Cid, None; A. Fonollosa Calduch, None; M. Garcia-Aparicio, None; J. M. Benitez-del-Castillo, None; J. L. Olea, None; J. Loriera, None; M. A. Gonzalez-Gay, None.

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Safety of Celecoxib and Non-Selective Non-Steroidal Anti-Inflammatory Drugs in Juvenile Idiopathic Arthritis. Rachel E. Sobel1, D. J. Lovell2, Hermine I. Brunner3, Jennifer E. Weiss4, Paula W. Morris5, Beth S. Gottlieb6, Elizabeth C. Chalom7, Lawrence K. Jung8, Karen Onel9, Lisa Peterson10, Donald P. Goldsmith11, Staci Abramsky-Risman12, James P. Young13 and Edward H. Giannini14. 1Pfizer, Inc., New York, NY, 2Cincinnati Children’s Hospital, Cincinnati, OH, 3Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 4Hackensack Univ Med Ctr, Hackensack, NJ, 5Univ of Arkansas for Med Sci, Little Rock, AR, 6Cohen Children’s Medical Center of New York, New Hyde Park, NY, 7St. Barnabas Medical Center, Livingston, NJ, 8Children’s National Medical Center, Washington, DC, 9University of Chicago, Chicago, IL, 10Specialty for Children, Dell Children’s Medical Center, Austin, TX, 11StJohn’s Hospital for Children/Drexel College of Medicine, Philadelphia, PA, 12Pfizer Inc, New York, NY, 13United BioSource Corporation, Ann Arbor, MI, 14PRCSC-Cincinnati Children’s Hospital Medical Center, Cincinnati, OH

Background/ Purpose: Celecoxib, a selective COX-2 inhibitor, was approved by the FDA for the treatment of the signs and symptoms of JIA in a group aged 2–17 years in December 2006. As a condition of approval, Pfizer conducted a Phase IV study, the Safety in Idiopathic Arthritis: NSAIDs and Celebrex Evaluation Registry (SINCERE), to collect longer-term safety and developmental data on patients with JIA treated in routine clinical practice with celecoxib or non-selective NSAIDs (nsNSAIDs).

Methods: Children aged between 2 and 18 years with RF(+) or RF(−) polyarthritis, persistent or extended oligoarthritis, or systemic juvenile arthritis (without features of extra-articular features for 6 months) were enrolled into this prospective, observational, multi-centered, standard-of-care registry. To be eligible, patients had to be receiving newly or recently prescribed (≤6 months) nsNSAID or celecoxib. Duration of previous nsNSAID or celecoxib exposure, or use of concomitant DMARD or biologic therapy did not affect eligibility. Once enrolled, patients were to remain in the study whether they continued on the original NSAID, switched, or discontinued NSAIDs altogether. Visits were scheduled at 0, 4, 8, 12 months, and at 6 month intervals thereafter for a minimum of 2 years. All adverse events (AEs) regardless of severity were captured in the SINCERE database.

Results: A total of 274 patients (219 in the nsNSAID and 55 in the celecoxib group) were observed for 410 patient-years of observation (PYO) at study termination. Sixty percent of patients in the celecoxib group, and 53% in the nsNSAID group had oligoarthritis. Naproxen, meloxicam, and nabumetone were the most frequently used nsNSAIDs. At baseline, the celecoxib group had numerically longer disease duration, was older, and had a higher median weight and height. This is consistent with the practice of using celecoxib as the second or third NSAID in JIA. A numerically higher proportion of celecoxib patients had a history of intolerance to nsNSAIDs, mostly due to gastrointestinal side effects. The analysis of AEs reported during the study showed a similar incidence of AEs across groups (44 and 53/100 PYO for nsNSAID and celecoxib respectively, and 50/100 PYO for patients on previous nsNSAID and celecoxib). The mean difference in AEs was those frequently observed with NSAID treatment. Two patients on nsNSAID and 2 off-NSAID experienced AEs of special interest. Twelve unique patients experienced a total of 18 serious adverse events (SAEs), the most frequent of which were infections; none were attributed to NSAID. Incidence rates (95% CI) of SAEs per 100 PYO were 3.4 (1.2, 5.6) and 2.9 (0.7, 0.0) for the nsNSAID and celecoxib group respectively, and 4.0 (0, 8.6) for the off-NSAID cohort. Overall, the study results indicate no important difference in the safety profiles between celecoxib and nsNSAIDs.

Safety: The total study population of 274 patients followed for a total of 410 PYO is one of the largest JIA NSAID cohorts, and adds substantially to the safety experience of NSAID treatment of JIA. The safety profile of celecoxib appears similar overall to that of nsNSAIDs and the benefit-risk for celecoxib treatment in JIA remains positive.

Disclosure: R. E. Sobel, Pfizer Inc, 3; D. J. Lovell, Concert, Inc, 5; AstraZeneca, 5; Wyeth Pharmaceuticals, 8; Amgen, 9; Bristol-Myers Squibb, 5; Abbott Immunology Pharmaceuticals, 5; Pfizer Inc, 5; Regeneron, 5; Hoffmann-La Roche, Inc, 5; Novartis Pharmaceutical Corporation, 5; Forest Laboratories, 9; horizon pharmaceuticals, 5; H. L. Brunner, None; J. E. Weiss, None; P. W. Morris, None; B. S. Gottlieb, Pfizer Inc, 5; E. C. Chalom, None; L. K. Jung, None; K. Onel, None; L. Peterson, None; D. P. Goldsmith, None; S. Abramsky-Risman, None; J. P. Young, None; E. H. Giannini, None.

Methods: In a systematic review, all available efficacy data from randomized controlled trials performed in JIA were retrieved. The following biologics were included: etanercept, adalimumab, infliximab, abatacept, anakinra, rilonacept, canakinumab and tocilizumab. Indirect between-drug comparisons (based on the Bucher’s method) were conducted only if trials were comparable with regard to design and patients’ characteristics related to treatment outcome.

Results: Eleven trials that evaluated biologic agents in JIA were selected. Quality of trials varied greatly: earlier trials for registration gained best scores, trials evaluating treatment strategies performed worst. For 5 trials, no match for an indirect comparison could be found due to design and patient characteristics. The remaining trials could be divided into two networks of evidence. Network 1 included withdrawal trials that evaluated etanercept, adalimumab and abatacept in poly-articular course juvenile idiopathic arthritis. Indirect comparisons identified no significant differences in short-term efficacy. Etanercept seemed superior to adalimumab (relative risk (RR) disease flare, etanercept vs. adalimumab, 0.59, 95% CI 0.28–1.24) and abatacept better than adalimumab (RR disease flare, abatacept vs. adalimumab, 0.64, 95% CI 0.34–1.23), especially considering the case-mix of adalimumab-treated patients, associated with better outcomes. Network 2 indirectly compared anakinra, tocilizumab and canakinumab in systemic juvenile idiopathic arthritis and no differences could be identified. Canakinumab tended to be superior to tocilizumab (RR 2.44, 95% CI 1.81–7.37).

Conclusion: The short-term efficacy of etanercept, adalimumab and abatacept seemed similar for poly-articular course JIA and anakinra, canakinumab and tocilizumab seemed similar for systemic JIA. Because of the observed differences between trials, head-to-head trials comparing 2 biologic agents directly are highly needed. For now, the pediatric rheumatologist has to rely on these indirect comparisons supplemented by observational data derived from cohort studies and safety, practical, and financial arguments.

Disclosure: J. Anink, None; M. H. Otten, Pfizer Inc, 9, Pfizer Inc, 9, Abbott Immunology Pharmaceuticals, 9, Roche Pharmaceuticals, 9, Novartis Pharmaceutical Corporation, 9, L. W. A. Van Suijlekom-Smit, Pfizer Inc, 2, Abbott Immunology Pharmaceuticals, 2, Pfizer Inc, 5, Pfizer Inc, 9.

Tocilizumab Therapy in Children with Systemic Onset Juvenile Idiopathic Arthritis: Russian Experience.

Objectives: To evaluate safety and efficacy of tocilizumab treatment in children with systemic juvenile idiopathic arthritis.

Methods: A prospective observational study in patients with sJIA taking tocilizumab. A total of 94 patients (49 boys and 45 girls) were included in this study. Median age was 5.5 years (range; 2 to 15 years) and median disease duration was 3.5 years (range; 0.5 to 12 years). Tocilizumab was administrated intravenously at a dose of 8–10 mg/kg every 2 weeks during 2 months then every 4 weeks. All patients received DMARDs. Efficacy end points included the American College of Rheumatology (ACR) Pediatric criteria for improvement 30 (ACR30), ACR50, ACR70 and criteria of inactive disease and remission.

Results: 39 of 94 patients (41%) entered 52 weeks and 69 patients - 24 weeks of continuous tocilizumab treatment. Tocilizumab treatment was discontinued in 15 patients. 40 patients continue to receive Tocilizumab therapy and have not entered 52 weeks yet. The ACR Pedi 30, 50 and 70 improvement were achieved by 100%, 100% and 75% of patients at Week 24 (n=69) and by 100%, 100% and 87% of patients at Week 52 (n=39), respectively. Inactive disease was achieved by 55% of patients at Week 24 (n=69) and by 65% of patients at week 52 (n=39). Remission was achieved by 59% of patients (n=39). The mean dose of oral glucocorticoid was decreased from 0.6 (0.4; 0.5) mg/kg (n=45) to 0.2 (0.1;0.3) mg/kg (n=20) at week 52. The frequently observed non-severe adverse events were nasopharyngitis, upper respiratory tract infections and gastroenteritis. No cases of opportunistic infections, malignancies or death were reported. There were three cases of pneumonia and cellulitis. 30 patients had incidences of neutropenia. Tocilizumab treatment was discontinued in 15 patients. The causes for cancellation were relapse of disease (n=7), inefficacy (n=3), remission (n=1), parent’s refusal (n=1), infusion reaction (n=2) and Crohn’s disease (n=1).

Discussion: E. Alekseeva, None; R. Denisova, None; S. Valieva, None; T. Bzarova, None; K. Isayeva, None; A. Chomakhidze, None; E. Chistyakova, None; T. Sleptsova, None; E. Mitenko, None.
The ACR/EULAR criteria for RA captured more children with RF and/or ACPA (+) JIA than the ILAR RF+ poly classification (92% vs. 59%).

Table 1. Characteristics of ACPA and RF positive children with JIA*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>RF positive (n=41)</th>
<th>Non-RF positive (n=76)</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>29 (59)</td>
<td>20 (41)</td>
<td></td>
</tr>
<tr>
<td>Age at symptom onset (mean ± SD)</td>
<td>10.3 ± 3.4</td>
<td>9.3 ± 3.9</td>
<td>0.34</td>
</tr>
<tr>
<td>Demographic features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female gender</td>
<td>22 (76)</td>
<td>15 (75)</td>
<td>0.95</td>
</tr>
<tr>
<td>Hispanic ethnicity</td>
<td>7 (14)</td>
<td>1 (5)</td>
<td>0.08</td>
</tr>
<tr>
<td>African ancestry</td>
<td>9 (18)</td>
<td>8 (40)</td>
<td>0.52</td>
</tr>
<tr>
<td>Birth weight (kg; mean ± SD)</td>
<td>3.3 ± 0.5</td>
<td>3.3 ± 0.5</td>
<td>0.60</td>
</tr>
<tr>
<td>ACPA value (mean ± SD)</td>
<td>174.4 ± 100.0</td>
<td>163.2 ± 100.2</td>
<td>0.70</td>
</tr>
</tbody>
</table>

** ILAR subtype
- RF+ poly: 10 (25) (p<0.0001)
- RF+ non-poly: 9 (24) (p=0.002)
- Oligoarthritis: persistent 19 (23.6) 14 (18.4) 0.002
- Oligoarthritis: extended 19 (23.6) 14 (18.4) 0.002
- Polyarthritis: RF 11 (26.3) 14 (18.4) 0.002
- Polyarthritis: RF Negative 11 (26.3) 14 (18.4) 0.002
- Oligoarthritis: RF Positive 1 (1.6) 6 (8.3) 0.002
- Rheumatoid arthritis 1 (1.6) 6 (8.3) 0.002
- Psoriatic arthritis 1 (1.6) 6 (8.3) 0.002
- Undifferentiated arthritis 1 (1.6) 6 (8.3) 0.002
- Not Recorded 1 (1.6) 6 (8.3) 0.002

** Conclusion:** A significant number of children (41%) with RF and/or ACPA (+) JIA did not meet criteria for RF+ poly JIA, though many of their demographic features and disease measures were similar to children who did. The ACR/EULAR criteria allow a positive RF or ACPA to qualify as positive serology, and these criteria capture more children with RF and/or ACPA (+) JIA. We propose the inclusion of ACPA in future revisions of the JIA classification criteria to improve the specificity of diagnosing childhood onset RA, and we suggest replacing RF+ polyarthritis with RF/ACPA+ JIA.

**Disclosure:** E. G. Ferrell, None; L. Ponder, None; L. Minor, None; S. T. Angeles-Han, None; C. W. Kennedy, None; K. A. Rouster-Stevens, None; M. Pichavant, None; L. B. Vogler, None; S. Prahalad, None.

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**Use of Non-ETN Biologics in Children with Juvenile Idiopathic Arthritis: Results From the Biologics for Children with Rheumatic Diseases Study.** Lianne Kearsley-Fleet, Eileen Baildam, Michael Beresford, Rebecca Davies, Helen E. Foster, Katy Mowbray, Taunton R. Vogler, None; L. Ponder, None; L. Minor, None; S. T. Angeles-Han, None; C. W. Kennedy, None; K. A. Rouster-Stevens, None; M. Pichavant, None; L. B. Vogler, None; S. Prahalad, None.

**Background/Purpose:** The management of juvenile idiopathic arthritis (JIA) has been revolutionised by the introduction of biologic therapy, although the majority remain unlicensed for children. Until recently, etanercept (ETN) was the only choice of licensed therapy in the UK, with recent additions of adalimumab (age ≥ 4 years), abatacept (age ≥ 6 years) and tocilizumab (systemic arthritis). It is not yet known how and when non-ETN biologics are being prescribed in JIA. The purpose of this analysis was to describe the pattern of use of non-ETN biologics in children with JIA.

**Methods:** Since 2010, the Biologics for Children with Rheumatic Diseases (BCRD) study, an ongoing prospective observational cohort study, has been collecting detailed information on children <18 years newly starting a non-ETN biologic therapy for JIA. There are no other exclusion criteria. At baseline, detailed demographic and disease information, including details of past biologic therapies, are collected. The use of non-ETN therapy as a first-line or subsequent biologic therapy was compared, including patterns of prescription, use under licensed indications, ILAR subtypes and disease activity/severity using non-parametric descriptive statistics.

**Results:** To 06/21/2012, 136 children across the UK had been recruited: median age 10 years, 65% female. The most common ILAR subtypes were systemic arthritis (26.5%) and rheumatoid factor (RF) negative polyarthritis (27.2%). Of those registered at the point of starting a subsequent biologic, 71% had received prior ETN. The majority had received only 1 prior biologic although 17 children had received 2 prior biologics, 3 children had received 3 and 1 child (RF negative) had received 5 previous biologics. Disease severity was moderate to high and largely comparable between first-line and subsequent biologic users, although subsequent biologic users had a higher limited joint count.

**Biologic Patients**
- **Characteristic, med(IQR)**
- **First Line**
- **Subsequent**
- **Total**
- **p-value**
- **n**
- **Age at Registration, years**
- Female: 8.5 (4.5-12) 11.5 (8-14) 10 (6.3-15) 0.0006
- **n**
- **64 (47.1)**
- **72 (52.9)**
- **136**

**ILAR subtype**
- Systemic arthritis: 19 (29.7) 17 (23.6) 36 (26.5) 0.001
- Oligoarthritis: persistent: 16 (25.0) 1 (1.4) 17 (12.5)
- Oligoarthritis: extended: 9 (14.1) 14 (19.4) 23 (16.9)
- Polyarthritis: RF: 11 (17.2) 26 (36.1) 37 (27.2)
- Polyarthritis: RF Negative: 1 (1.6) 6 (8.3) 7 (5.2)
- Rheumatoid arthritis: 1 (1.6) 6 (8.3) 7 (5.2)
- Psoriatic arthritis: 2 (3.1) 5 (6.9) 7 (5.2)
- Undifferentiated arthritis: 1 (1.6) 0 1 (0.7)
- Not Recorded: 1 (1.6) 1 (1.4) 2 (1.5)

**Biologic Drug at Registration**
- Adalimumab: 25 (39.1) 25 (34.7) 50 (36.8) 0.008
- Infliximab: 18 (28.1) 14 (19.4) 32 (23.5)
- Tocilizumab: 11 (17.1) 20 (27.8) 31 (22.8)
- Abatacept: 1 (1.6) 9 (12.5) 10 (7.4)
- Anakinra: 9 (14.1) 1 (1.4) 10 (7.4)
- Rituximab: 0 3 (4.2) 3 (2.2)

**Licensed Use**
- 31 (48.4) 47 (65.3) 78 (57.4) 0.047

**Prior Biological Treatment**
- 1 previous: 0 51
group 12: 0
- 2 previous: 0 17
group 12: 0
- 3 previous: 0 3
- 5 previous: 0 1

**Ever had Chronic Uveitis**
- 31 (48.4) 19 (26.4) 50 (36.8) 0.028

**Active Chronic Uveitis at Registration**
- 25 (39.1) 17 (23.6) 42 (30.9) 0.141

**Active Uveitis at Registration**
- 3 (0.8-5) 4 (4.2-6) 4 (1.1-5.9) 0.341

**Conclusions:** Many children are now receiving non-ETN biologics in the UK, although almost half of these are being prescribed off-license. Ongoing
follow-up will help to address the question of best choice of biologic therapy for children with JIA, both as first-line and subsequent use, as well as determine the safety of these drugs in children, for which limited clinical experience exists.

Disclosure: L. Kearsley-Fleet: None; E. Baildam: None; M. Beresford: None; R. Davies: None; H. E. Foster: None; K. Mowbray: None; E. R. Southwood: None; W. Thomson: None; K. L. Hyrich: None.

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Choice of Systemic JIA Treatment Among Childhood Arthritis and Rheumatology Research Alliance (CARRA) Rheumatologists. Jennifer E. Weiss 1, Esi M. Morgan De Witt 2, Timothy Beukelman 3, Laura E. Schanberg 4, Rayfiel Schneider 5 and Yukiko Kimura 6. 1Joseph M. Sanzari Children’s Hospital, Hackensack University Medical Center, Hackensack, NJ, 2Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 3Univ of Alabama-Birmingham, Birmingham, AL, 4Duke University Medical Center, Durham, NC, 5The Hospital for Sick Children, Toronto, ON.

Background/Purpose: Despite recent advances in identifying effective treatments for systemic Juvenile Idiopathic Arthritis (sJIA), many pediatric rheumatologists continue to use corticosteroids and methotrexate. The Childhood Arthritis and Rheumatology Research Alliance (CARRA) developed standardized consensus treatment plans (CTPs) for sJIA with the goal of comparing their effectiveness using data collected for the CARRA Registry. Since physicians will select CTPs without randomization, each CTP must be used with sufficient frequency to allow for meaningful comparisons of efficacy. We aimed to ascertain the current anticipated frequency of CTP use by CARRA pediatric rheumatologists, and whether a clear standard of care exists for sJIA treatment.

Methods: An electronic survey was sent to voting members of CARRA regarding CTP choice for new-onset sJIA which has failed NSAID therapy alone. Respondents were asked to select one or more of the following CTPs for each clinical case scenario: (a) systemic corticosteroids (CS) only; or (b) methotrexate, (c) anti-IL1 or (d) anti-IL6 therapy, each with or without CS. Respondents could choose more than one CTP if factors such as insurance limitations or family preference might affect treatment. Features of the clinical case scenarios are summarized in the Table.

Table. Clinical Cases

<table>
<thead>
<tr>
<th>Systemic symptoms</th>
<th>Arthritis</th>
<th>Anemia</th>
<th>Acute Phase Reactants</th>
<th>Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Case 2</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Case 3</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Case 4</td>
<td>+</td>
<td>+++++</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

Results: 134 of 247 (54%) CARRA members responded. The figure depicts treatment selections sorted by case, demonstrating wide variability in preferred treatment for new-onset sJIA. IL1 and IL6 inhibitors have become important treatment choices. Methotrexate use increases with more prominent arthritis features; however, methotrexate and CS usage are frequent regardless of presenting disease features. Overall, concurrent CS use was indicated by the majority of respondents across all CTPs (Case 1: 74%; Case 2: 87%; Case 3: 66%; Case 4: 91%).

Conclusion: There is still significant variability in sJIA treatment approaches and no clear standard of care among CARRA members, with widespread use of methotrexate and CS. There is likely to be sufficient utilization of each of the CTPs for new-onset sJIA to establish comparative treatment effectiveness using the observational CARRA Registry.


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Definition of Improvement Thresholds in Juvenile Idiopathic Arthritis Using the JADAS. Gerd Hornell 1 and Ingrid Kaul 2. 1Centre of Pediatric Rheumatology, Sankt Augustin, Germany, 2Institute of Medical Statistics, Informatics and Epidemiology, University of Cologne, Cologne, Germany.

Background/Purpose: Evaluation of disease activity in JIA is fundamental in clinical assessment. The ACR paediatric response measure used in clinical trials are validated to analyse the response to a treatment in comparison to a baseline disease activity but does not judge about the absolute disease activity or the absolute improvement.

Methods: The JADAS has been calculated in patients of the BIKER registry newly starting treatment with etanercept or MTX. The JADAS10 was preferred because it values all 4 domains equally. Physicians + parents were requested to judge on treatment efficacy as very good, good, weak, none or worse. Improvement was assumed if judgement of both were very good or good. No improvement was assumed if at least one judgement was for none or poor. Inconclusive judgements or those with a difference >1 point were excluded from analysis.

Results: Initially, ANOVA of JIA categories showed no significant differences of mean DJADAS in all baseline classes and IQRs also showed good overall limits. So, all JIA categories were combined for a joint cutoff. Analysis was restricted to the 3 month evaluation because of a time dependence of the judgement of improvement in terms of the JADAS. Restriction to the 3 month results left 1340 patients. JADAS at baseline was finally put into 4 classes, class 0 for JADAS <5, “low” for 5≤JADAS<15, “moderate” for 15≤JADAS<25 and “high” for 25≤JADAS<40. An initial JADAS of <5 was assumed as only minor or no disease activity. An improvement cutoff was only defined for baseline classes “low”, “moderate” and “high”. Cutoffs for defining improvement were chosen by calculating interquartile ranges (IQR) of the judgement groups and considering accuracy as well as sensitivity/specificity of the resulting model. Analysis by baseline class revealed clear cutoff points. According to the baseline JADAS class the following minimum decreases of the JADAS (DJADAS) are proposed for definition of improvement: For baseline class “low”: DJADAS of 4, for baseline class “moderate”: DJADAS of 10, for baseline class “high”: DJADAS of 15. Alternatively a relative decrease of the JADAS by 42% for JADAS class “low”, by 51% for JADAS Class “moderate” and 56% for JADAS class “high” were found to define improvement (table 1).

Table 1. Inter quartile ranges of variable DJADAS10 by improvement and baseline class, absolute and relative values. Chosen cutoff for improvement and goodness-of-fit parameters. Higher DJADAS10 indicate better treatment efficacy. Only integer cutoffs were considered.

<table>
<thead>
<tr>
<th>Improvement</th>
<th>DJADAS10 absolute values IQR (n)</th>
<th>DJADAS10 relative values [%] IQR</th>
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<tr>
<td>Low (5-15)</td>
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<tr>
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<td>High (25-40)</td>
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<tr>
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<th>Djadas10 absolute values IQR (n)</th>
<th>Djadas10 relative values [%] IQR</th>
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<td>45-86</td>
</tr>
<tr>
<td>No</td>
<td>-31.7 (85)</td>
<td>-22.4</td>
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</tbody>
</table>

Cutoff for improvement

| Accuracy [%] | 76.2 | 74.8 |
| Sensitivity | 75.9 | 88.5 |
| Specificity | 76.5 | 74.3 |

<table>
<thead>
<tr>
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</tr>
</tbody>
</table>

Cutoff for improvement

| Accuracy [%] | 76.2 | 76.2 |
| Sensitivity | 75.9 | 88.5 |
| Specificity | 76.5 | 88.6 |

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<th>Djadas10 relative values [%] IQR</th>
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</tr>
</tbody>
</table>

Cutoff for improvement

| Accuracy [%] | 76.2 | 76.2 |
| Sensitivity | 75.9 | 88.5 |
| Specificity | 76.5 | 88.6 |
Conclusion: Disease improvement on therapy can efficiently be defined by the decrease of the JADAS depending on the initial JADAS score defining low, moderate or high disease activity. Our model demonstrates clear cut off values. After cross validation these cutoffs may be used in clinical trials and for decisions in clinical practice.

Disclosure: G. Hornett, None; I. Kaul, None.

1148

Adalimumab — Effective Control under Refractory JIA Associated Uveits. Ekaterina Alekseeva, Elena Mitenko, Tatiana Izarova, Saniya Valeeva, Kseniya Isayeva, Alexandra Chornakhidze, Evgeniya Chistyakova, Tatjana Slepsova and Rina Denisova. Scientific Center of Children’s Health, Moscow, Russia

Background/Purpose: Treatment of juvenile idiopathic arthritis (JIA)-associated uveits is one of the serious problems of paediatric rheumatology. JIA associated uveits often is refractory to MTX, CsA and topical NSAIDs and GC. Humanized anti-TNFα monoclonal antibody (adalimumab) may be effective drug for the treatment of JIA-associated uveits refractory to immunosuppressive drugs.

Objectives: To evaluate clinical efficacy and safety of adalimumab therapy in patients with JIA-associated uveits.

Methods: It was prospective, observational trial. 48 patients with uveits were enrolled in the study; 25 boys and 23 girls, 32 with bilateral and 16 with unilateral uveitis, 27 had poly-, 21 oligoarthritis. Mean age of patients was 11.8 (range 4-18) y; mean of disease duration 5-7, (range 1-16) y. Before adalimumab therapy 10 patients were treated with MTX (range of dose 15-25 mg/m²), 38 with MTX in combination with CsA (range of dose 4-4.5 mg/kg/d), 5—with oral GC (range of dose 5-12 mg/kg/d), all of them with topical GC drops, NSAID drops, 27—received retrolubar injections of GC. Adalimumab was administrated by subcutaneous injection at dose 40 mg every 2 w during 1y. Adalimumab use was approved by the Local Ethics Committee. The efficacy of therapy was measured by ACR-pedi criteria. Changes in ocular inflammation were graded by M.J.Hogan’s criteria. The main target—remission of uveitis and arthritis.

Results: Prior to administration of adalimumab, inflammation of conjunctiva, edema of iris, corneal precipitations, areas of inflammation in lens and optical nerve disk edema were found in all children with uveits. After 8 w of treatment complete management of conjunctiva injection, iris edema and optical nerve disk edema were reported in 55% (44/80) of the affected eyes—corneal precipitations disappeared in 45% (36/80); inflammation-associated changes of lens—in 18% (14/80); area of inflammation of iris—in 63% (50/80); remission was diagnosed in 78%(62/80) of the affected eyes; no changes of vision acuity were reported in 33 (41%) of the affected eyes. GC eye drops were discontinued in 45% (22/48) of patients. NSAIDs eye drops—in 50% (24/48) of children; the dose of GC eye drops was reduced in 86% (41/48) of patients. The exacerbation of uveits was persisting in 10% (8/80) of the affected eyes, subacute uveits—in 25% (20/80); remission was found in 65% (52/80) of the affected eyes. After 24 w of treatment the cases of uveits were not reported; subacute disease was observed in 22%(21/96) of eyes; remission was diagnosed in 78%(62/80) of the affected eyes. After 52 w of treatment remission was diagnosed in 83% of the affected eyes (66/80) The ACR-Pedi 30, 50, 70 were achieved 100%, 80%, 60% of patients at w 4, respectively. After 24 w of therapy ACR-Pedi 30,50,70 and 90 improvement rates was registered in 100 %,92,78 % of patients. The remission was achieved by 63% of patient at w 52. Serious adverse events were not found.

Conclusion: Adalimumab is effective in patients with JIA associated uveits. Reduction in uveits activity and remission were reported in 83% of affected eyes. Remission of disease—in 63% of patients. The high efficacy of adalimumab allowed avoiding oral prednisone and discontinuing topical GC therapy in patients with uveits.

Disclosure: E. Alekseeva, None; E. Mitenko, None; T. Bzarova, None; S. Valeeva, None; K. Isayeva, None; A. Chornakhidze, None; E. Chistyakova, None; T. Slepsova, None; R. Denisova, None.

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Long-Term Safety of Etanercept in Patients with Juvenile Idiopathic Arthritis (JIA). Kirsten Minden1, Martina Niewert1h, Jens Klotzsch2, Michael Hammer3, Johannes Peter Haas4, Gerd Ganser4 and Gerd Horneff4. 1German Rheumatism Research Center, a Leibnitz Institute, Berlin, Germany; 2German Rheumatism Research Centre, Berlin, Germany; 3German Rheumatism Research Center, a Leibnitz Institute, Berlin, Germany; 4German Center for Pediatric and Adolescent Rheumatology, Garmisch-Partenkirchen, Germany; 5Sankt Josef Stift, Sendenhorst, Germany; 6Centre of Pediatric Rheumatology, Sankt Augustin, Germany

Background/Purpose: Etanercept (Eta) has been the most frequently used biologic drug in patients with JIA. In Germany, about one in three patients with polyarticular JIA received Eta in 2010. However, published data on its long-term safety are limited. The data of the German JIA biologic registers BiKeR and JuMBO were used to determine the rates of serious adverse events or events of special interest in order to assess the long-term safety of Eta.

Methods: Patients who were included at start with Eta in the BiKeR registry until March 2007 and have been half-yearly observed into adulthood were considered for this analysis. All adverse events recorded by physicians over the whole observation period (mean 7.5 years) were categorized on the basis of MedDRA. Total exposure-adjusted rates for serious adverse events (SAEs) and for events of special interest (i.e., deaths, malignancies, medically important infections [MI], and newly emerged other immune-mediated inflammatory diseases [IMID]) per 100 patient years (PY) were calculated.

Results: During the 1,815 years of Eta exposure in 386 patients (mean age 23 years, mean disease duration 14 years) 77 SAEs were recorded (4.2 SUEs/100 PY), of which 8% were possibly related to therapy. The SAE rates for each year of Eta exposure per 100 PY varied somewhat over the first nine years of treatment, but did not differ significantly (p=0.312). The JIA-associated mortality rate was 1% in this study population. Two deaths occurred in patients treated with Eta within the last three months before death, but no patient died in suspected causal relationship to Eta. Two malignancies were reported (that were already published), resulting in 0.11 event per 100 PY of exposure. Twenty MII were recorded which led to drug discontinuation in five patients. 75% of the MII occurred within the first three years of Eta treatment. The exposure-adjusted MII rate was 1.1 per 100 PY. Tuberculosis or other opportunistic infections were not registered. A total of 17 incident IMID (0.9/100 PY) were reported: among them were eight cases with new onset inflammatory bowel disease (0.4/441 PY) and eight cases with uveits (0.44/100 PY).

Conclusion: The hitherto most comprehensive study of the long-term safety of Eta confirms the good tolerability of the substance. SAEs with possible relationship to therapy occur only rarely (0.3/100 PY). However, reliable risk rates for events of particular interest can only be calculated in larger patient cohorts. Moreover, a comprehensive control group is necessary to put the results into perspective.

Reference


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Adverse Events in Juvenile Idiopathic Arthritis: Results From the Enhanced Drug Safety Surveillance (EDSS) Pilot Project. Sarah Ringold1, Audrey F. Hendrickson2, Carol A. Wallace2 and Rachel E. Sobel3. Seattle Children’s Hospital, Seattle, WA; 4Seattle Childrens Hospital, Seattle, WA; 5Pfizer, Inc., New York, NY

Background/Purpose: There are few data available regarding the rates of serious and important medical events (SAEs and IMEs) for most of the medications used to treat JRA/JIA (Juvenile Rheumatoid Arthritis/Juvenile Idiopathic Arthritis), including nonsteroidal anti-inflammatory drugs. These data are of particular importance as the use of biologic disease modifying antirheumatic drugs (DMARDs) in JRA/JIA has increased significantly over the past several years along with the number of medications that are FDA-approved for the treatment of these diseases. While the FDA has a voluntary MedWatch reporting system in place, only a small proportion of physicians fill out these reports and these data cannot be used to calculate SAE/IME rates. The Enhanced Drug Safety Surveillance (EDSS) Pilot Project was developed in partnership with Pfizer, as one of the US FDA post-marketing commitments for celecoxib in JIA, to implement a pilot process to capture of SAEs and IMEs, and to calculate SAE/IME rates in children with JRA/JIA utilizing the CARRA (Childhood Arthritis and Rheumatology Research Alliance) physician network. The objective of this analysis is to summarize the data resulting from the 4-year (2008–2012) EDSS Pilot Project.

Methods: Physicians at participating sites were surveyed monthly to determine whether any of their JIA/JRA patients had experienced a SAE or IME during the prior month. MedWatch forms were subsequently completed for each event, including attribution to medication(s). SAEs and IMEs were categorized by the primary organ system and/or the dominant symptoms (e.g. disease flare, infusion reaction). Each site was surveyed every 6 months regarding the number
of JRA/JIA patients per site, to provide a denominator for the SAE/IME rates. Reporting rates were calculated per 100 person-years (p-y) and 95% CI were calculated based on a Poisson distribution.

**Results:** 37 sites with 115 physicians contributed at least one year of data. The overall response rate to the monthly surveys was 65% and the overall response to the six-month surveys was 86%. There were a total of 139 total SAEs and 139 IMEs. The largest proportion of SAEs and IMEs occurred in children with polyarticular JIA (39% and 38%, respectively). The majority of SAEs and IMEs were for biologic agents and DМARDs (73% and 68%, respectively). NSAIDs and non-biologic DMARDs were the next most commonly reported medications, with 1 SAE and 2 IMEs attributed to celecoxib, and 12 SAEs and 11 IMEs attributed to other NSAIDs. Infection accounted for the largest proportion of both SAEs and IMEs (52% and 20%). The next most common categories of SAE were disease flare and macrophage activation syndrome. The next most common categories of IME were neurologic and elevated liver function tests. The total event rate for SAEs and IMEs combined was 1.2 SAE/IME per 100 p-y (95% CI: 1.1–1.4). The rate for SAEs was the same as IMEs (0.6 per 100 p-y; 95% CI: 0.5–0.7).

**Conclusion:** The EDDS provided a simple and effective tool for SAE/IME reporting. These data support the development of a long-term registry of children with JRA/JIA in North America to continue the collection of these critical data.

Disclosure: S. Ringold None; A. F. Hendrickson None; C. A. Wallace Pfizer Inc, 1, Amgen, 2, Pfizer Inc, 2, Genentech and Biogen IDEC Inc, 5, Novartis Pharmaceutical Corporation, 5; R. E. Sobel Pfizer Inc, 3.

### 1151

**Low-Dose Methotrexate and the Selective Accumulation of Intracellular Aminoimidazolecarboxamide Ribotide**

**Background/Purpose:** Current evidence suggests that the anti-folate methotrexate (MTX) mediates its anti-inflammatory effects through inhibition of the purine synthesis pathway causing the accumulation of aminoimidazolecarboxamide ribotide (AICAR). Meanwhile, the anti-proliferative effects of MTX have primarily been attributed to inhibition of the pyrimidine synthesis pathway, marked by the accumulation of deoxyuridine monophosphate (dUMP). Therefore, identification of factors that affect MTX selectivity for purine synthesis pathway inhibition may be important in predicting and enhancing drug response in immuno-inflammatory diseases.

**Methods:** K562 erythroleukoid cells (2.5 × 10^5 cells/mL) were exposed to 0, 10, 100 and 1000 nM MTX under normal culture conditions for up to 24 hr. Cell samples (2.5 × 10^5 cells) were harvested after 1, 2, 4, 8 and 24 hr of MTX exposure. Cell lysates were analyzed for AICAR, dUMP, MTX and six different oxidation/methylation states of tetrahydrofolate, including 5-methyltetrahydrofolate (5mTHF); the polyglutamate distribution was also determined for each folate species and MTX. Mean concentrations and standard deviations from three independent experiments are reported. Statistical evaluations were conducted by unpaired Student’s t-tests and statistical significance was defined by a P-value < 0.05.

**Results:** The primary effect on intracellular folates was a depletion of 5mTHF to levels at 24 hr that were 80%, 3% and 1% of control (0 nM MTX) in response to 10, 100 and 1000 nM MTX challenge, respectively with no effect on cell viability. Similarly, intracellular dUMP accumulated to levels 29-, 343- and 486-fold greater than control after a 24 hr exposure to 10, 100 and 1000 nM MTX, respectively. In the presence of 10 nM MTX, AICAR accumulated 93-fold compared to vehicle treated cells at 24 hr, however, increasing [MTX] had a paradoxical effect, resulting in lower AICAR concentrations. Across all experimental conditions intracellular [MTX] correlated with the intracellular accumulation of dUMP (r^2=0.854) and depletion of 5mTHF (r^2=0.860), but poorly with intracellular AICAR accumulation (r^2=0.122).

**Figure.** Intracellular dUMP and AICAR in K562 cells following a 24 hr exposure to MTX (**, P-value < 0.01; ***, P-value < 0.001).

**Conclusion:** Under these experimental conditions, increasing concentrations of MTX beyond 10 nM did not result in concentration-dependent increases in AICAR accumulation, and higher doses of MTX appeared to minimize the effects on the purine pathway, despite having profound effects on pyrimidine synthesis. Although the mechanism for this paradoxical effect on AICAR accumulation is currently under investigation, these findings support the hypothesis that low-dose MTX selectively targets the purine biosynthesis pathway and may result in improved anti-inflammatory effects.

Disclosure: R. S. Funk None; L. van Haandel None; M. L. Becker None; J. S. Leeder None.

### 1152

**Improvement in Health-Related Quality of Life for Children with Juvenile Idiopathic Arthritis After Start of Treatment with Etanercept.**

Jens Klotsche1, Kirsten Minden2 and Gerd Horneff3. 1German Rheumatism Research Center, a Leibniz institute, Berlin, Germany; 2German Rheumatism Research Center, Berlin, Germany, 3Centre of Pediatric Rheumatology, Sankt Augustin, Germany

**Background/Purpose:** The concept of Health-related quality of life (HrQoL) has been widely accepted as a burden of disease measure in recent years. The improvement in HrQoL is an important therapy goal in the treatment of patients with juvenile idiopathic arthritis (JIA). We investigated the 12-month course of HrQoL in an unselected cohort of patients with JIA after therapy start with Etanercept and identified its associated factors.

**Methods:** Children were enrolled in the BiKer (Biologics in Paediatric Rheumatology) registry. A random subset of children completed the Pediatric Quality of Life Inventory (PedsQL) after the start of Etanercept treatment and was followed-up monthly for 6 monthly and bimonthly thereafter for up to one year. The 12-month course of the PedsQL total score and predictors for the change in HrQoL were investigated by growth curve modeling. The role of the depending predictor variables of an inactive disease and level of pain were studied in the course of HrQoL. The criteria by Wallace (2004) were applied to define inactive disease, the level of pain was assessed on a visual analogue scale (0–100) and functioning was measured by the CHAQ above 0. A lower HrQoL for patients at baseline was significantly associated with the number of swollen joints (beta=-1.1, p=0.016), functional restrictions (beta=-18.9, p<0.001), a high disease activity (beta=0.31, p=0.002) and the existence of at least one comorbid condition (beta=-11.5, p=0.021). The PedsQL total score increased at a rate of 2.8 units per month (p<0.001) in the first 6 months of therapy up to a level of 89.7 (sd=10.7), whereas the increase flattened (0.3 units per month, p=0.144) from 6-month to 12-month follow-up. A total of 16 (26%) children were already in remission after one year Etanercept treatment. The achievement of remission at the second month (beta=-6.7, p<0.001) and fourth month (beta=-5.2, p=0.029) yielded a significant increase in HrQoL. A high level of pain was associated with a lower HrQoL at each occasion.

**Conclusion:** HrQoL significantly improved after starting an Etanercept therapy in children with JIA. Adequate disease control and a low level of pain predicted a higher HrQoL in the 12-month course. But, both time dependent predictor variables did not fully explain the improvement in HrQoL.

Disclosure: J. Klotsche None; K. Minden Pfizer Inc, 2, Pfizer Inc, Abbott, Novartis, Chugai, Roche, Medac, 5; G. Horneff Abbott Immunology Pharmaceuticals, 2, Pfizer Inc, 2.

### 1153

**Perceived Health-Related Quality of Life and Its Determining Factors in Children with Recent-Onset JIA.**

Jens Klotsche1, Ina Liedlmann2, Martina Niewerth2, Gerd Horneff3, Johannes Peter Haas3 and Kirsten Minden1.

1German Rheumatism Research Center, a Leibniz institute, Berlin, Germany; 2German Rheumatism Research Centre, Berlin, Germany, 3Centre of Pediatric Rheumatology, Sankt Augustin, Germany

**Background/Purpose:** Juvenile idiopathic arthritis (JIA) is the most common chronic rheumatic disease and a major cause of chronic disability in children aged below 16 years. Health-related quality of life (HrQoL) has become an important...
outcomes measure for the perceived burden of disease and therapy effectiveness in the field of pediatric rheumatology. There is little knowledge about its diversification and determining factors in children with recently diagnosed JIA.

**Methods:** The diversification and determining factors of HRQoL were investigated by latent class analyses (LCA) in the ICON (Inception Cohort Of Newly-diagnosed patients with JIA) study, a prospective controlled observational multicentre study for long-term observation of patients diagnosed as JIA within the last 12 months. The evaluation comprised a self-assessment by patients via standardized questionnaires and clinical examinations by pediatric rheumatologists and ophthalmologists. HRQoL was measured by the Pediatric Quality of Life Inventory (PedsQL) 4.0 Generic Core Scales and the PedsQL 3.0 Rheumatology Module. The PedsQL was completed by patients above an age of eight years and parents. The difference between both ratings and determining factors for the difference were investigated.

**Results:** Information about HRQoL was available for 426 patients. Differences in the patients and parents ratings could be investigated for 198 children aged above 8 years. More than half of the children (58.4%) were assigned to a group characterized by high PedsQL scores (range: 79.4, 95 CI: 76.3-82.5 for treatment problems to 98.3, 95 CI: 97.5-99.2 for daily activity) by LCA. Only 9% of children were classified into a group with low HRQoL scores (mean total score 50.6, 95 CI: 45.3-55.9) and were diagnosed with polyarthritis. High HRQoL scores were associated with the ILAR category oligoarthritis (p = 0.001) and a low disease activity (mean 2.7 on NRS 0–10, p < 0.001). Patients with high HRQoL scores had significantly less emotional difficulties as measured by the Strength and Difficulties questionnaire. Interestingly, parents of children with higher HRQoL scores had more likely a higher educational level for both parents (52% with more than 10 years of schooling). In general, the parents rating of HRQoL was lower than the rating of the children (difference in total score = 4.1, 95%CI: 2.5-5.7). The most pronounced differences were observed in the rating of emotional problems (Δ=8.3, 95%CI: 5.3;11.2) within the age groups (Δ=6.0 for age group 8–12 years versus 1.8 for age group 13–16 years, p<0.001). Children in the two ILAR categories systemic arthritis (Δ=8.8, 95%CI: 3.6;14.1) and psoriatic arthritis (Δ=6.6; 95%CI: 1.2;13.5) reported better HRQoL compared to the parents report.

**Conclusion:** More than half of the children report high HRQoL scores at the beginning of JIA. Disease related parameters as well as social and personal factors independently affect the patients’ overall well-being. Parents of younger children rated HRQoL remarkably lower than the children themselves, both patient- and proxy-reporting is therefore required to get a full picture of the burden of illness.

Disclosure: J. Klotzsche, None; I. Liedmann, None; M. Niewerth, None; G. Horneff, Abbott Immunology Pharmaceuticals, 2, Pfizer Inc, 2; J. F., Haas, None; K. Minder, Pfizer Inc, 2, Pfizer Inc, Abbott, Novartis, Chugai, Roche, Medac, 5.

### 1154

**Impact of FokI VDR and TNFα-308 Polymorphism On Disease Severity and Long Term Outcome in JIA Patients On Anti-TNF Treatment.** Jelena Vojinovic1, Jelena Basic2, Gordana Susic3, Dragana Lazarevac4 and Nemanja Damjanov5, 4Prof, Nis, Serbia, 2Dr, Nis, Serbia, 3Dr, Belgrade, Serbia, and 5Prof, Belgrade, Serbia

**Background/Purpose:** Studies on outcomes of children with juvenile idiopathic arthritis-associated uveitis (JIA-U) focus on the clinical ocular exam and determining factors in children with uveitis. There is little knowledge about its diversification and determining factors in children with uveitis.

**Methods:** Focus groups were held to modify the old EYE-Q for children with uveitis. The new EYE-Q contains items specific to uveitis. A parent-proxy version was also developed. Children with JIA, JIA-U, and idiopathic uveitis (I-U) participated. Medical record reviews were performed. Questionnaires were completed on OQL (Pediatric QOL Inventory - PedsQL), physical function (Childhood Health Assessment Questionnaire - CHAQ), and visual function (EYE-Q).

**Results:** Participants were 104 children with JIA, 19 with JIA-U and 9 with I-U (Table 1). There were significant differences in the child and parent EYE-Q scores in children with uveitis compared to children with JIA (Table 2). For the child report, there were mild correlations between EYE-Q scores and logmarVA (r = 0.35) and moderate correlations with the PedsQL (r = 0.50) and CHAQ (r = 0.53) (Table 3). Similar results were found with the parent report. There were strong correlations between the parent and child EYE-Q (r = 0.74), and the old and new versions of the EYE-Q (r = 0.96, r = 0.94).

**Table 1. Characteristics of children with JIA-associated uveitis, JIA alone, and idiopathic uveitis**

<table>
<thead>
<tr>
<th>JIA alone</th>
<th>N = 104</th>
<th>JIA-U</th>
<th>N = 19</th>
<th>I-U</th>
<th>N = 9</th>
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<tr>
<td>Age, mean years ±SD</td>
<td>11.6 ± 4.8</td>
<td>10.5 ± 4.5</td>
<td>11.7 ± 4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender, female, N (%)</td>
<td>74 (71.8)</td>
<td>16 (84.2)</td>
<td>5 (55.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic, N (%)</td>
<td>10 (9.7)</td>
<td>4 (22.2)</td>
<td>0 (0)</td>
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<tr>
<td><strong>Disease characteristics</strong></td>
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<tr>
<td>Age at arthritis onset, mean years ±SD</td>
<td>7.4 ± 4.5</td>
<td>4.0 ± 4.6</td>
<td>8.0 ± 4.4</td>
<td></td>
<td></td>
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<tr>
<td>Age at uveitis onset, mean years ±SD</td>
<td>6.8 ± 5.1</td>
<td>6.8 ± 5.1</td>
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<tr>
<td>Duration of JIA, mean years ±SD</td>
<td>3.99 ± 3.51</td>
<td>6.48 ± 3.74</td>
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<tr>
<td>Duration of uveitis, mean years ±SD</td>
<td>3.68 ± 3.56</td>
<td>3.65 ± 3.12</td>
<td></td>
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</tr>
<tr>
<td><strong>Ophthalmic exam, most recent</strong></td>
<td>N = 34</td>
<td>N = 19</td>
<td>N = 7</td>
<td></td>
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</tr>
<tr>
<td>LogMarVA mean ±SD, worse eye</td>
<td>0.17 ± 0.24</td>
<td>0.24 ± 0.22</td>
<td>0.74 ± 0.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intraocular pressure, worse eye</td>
<td>11.5 (7.8)</td>
<td>190 (7.5)</td>
<td>18.7 (6.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slit lamp exam, worse eye</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cells</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>0</td>
<td>1 (1 cell in field)</td>
<td>34</td>
<td>114</td>
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<tr>
<td>0.5</td>
<td>1-5 cells in field</td>
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<td>2</td>
<td>2</td>
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<tr>
<td>1</td>
<td>&gt;5-15 cells in field</td>
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<td>1</td>
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<tr>
<td>0.5</td>
<td>1-5 cells in field</td>
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<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>&gt;26-50 cells in field</td>
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<td>0</td>
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<td>&gt;50 cells in field</td>
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<tr>
<td><strong>Complications, N (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N = 17</td>
<td>N = 9</td>
<td>N = 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cataract</td>
<td>0 (0.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glaucma</td>
<td>2 (2.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synechiae</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Band keratopathy</td>
<td>2 (11.8)</td>
<td>5 (55.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cystitis mucosal edema</td>
<td>0 (0)</td>
<td>3 (33.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other complications</td>
<td>1 (5.9)</td>
<td>1 (11.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Surgery, N (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graft extraction</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periocular steroid injection</td>
<td>2 (11.8)</td>
<td>5 (55.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other ocularg surgeries</td>
<td>1 (5.9)</td>
<td>2 (22.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

References:


2. Vojinovic J, Liedmann I, Niewerth M, Horneff G, Haas JF. The new EYE-Q contains items specific to uveitis. A parent-proxy version was also developed. Children with JIA, JIA-U, and idiopathic uveitis (I-U) participated. Medical record reviews were performed. Questionnaires were completed on OQL (Pediatric QOL Inventory - PedsQL), physical function (Childhood Health Assessment Questionnaire - CHAQ), and visual function (EYE-Q).


4. Vojinovic J, Liedmann I, Niewerth M, Horneff G, Haas JF. The new EYE-Q contains items specific to uveitis. A parent-proxy version was also developed. Children with JIA, JIA-U, and idiopathic uveitis (I-U) participated. Medical record reviews were performed. Questionnaires were completed on OQL (Pediatric QOL Inventory - PedsQL), physical function (Childhood Health Assessment Questionnaire - CHAQ), and visual function (EYE-Q).

5. Vojinovic J, Liedmann I, Niewerth M, Horneff G, Haas JF. The new EYE-Q contains items specific to uveitis. A parent-proxy version was also developed. Children with JIA, JIA-U, and idiopathic uveitis (I-U) participated. Medical record reviews were performed. Questionnaires were completed on OQL (Pediatric QOL Inventory - PedsQL), physical function (Childhood Health Assessment Questionnaire - CHAQ), and visual function (EYE-Q).
**Table 2.** Mean scores on standard quality of life and function measures in JIA

<table>
<thead>
<tr>
<th>JIA</th>
<th>JIA-U</th>
<th>JIA-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=102</td>
<td>N=19</td>
<td>N=9</td>
</tr>
</tbody>
</table>

**Child Reports**

<table>
<thead>
<tr>
<th>Measure</th>
<th>R [95% CI]**</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EYEQa child</td>
<td>-0.35 [-0.60; -0.03)</td>
<td>0.029*</td>
</tr>
<tr>
<td>CHAQa</td>
<td>-0.53 [-0.78; -0.57)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>PedQL total</td>
<td>0.70 [0.33-0.61]</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>EYEQa parent</td>
<td>0.74 [0.63-0.81]</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>New EYE-Q</td>
<td>0.96 [0.94-0.97]</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>EYEQb parent</td>
<td>0.82 [0.61-0.96]</td>
<td>&lt;0.0001*</td>
</tr>
</tbody>
</table>

**Correlations of the EYEQ with standard measures of quality of life and function in JIA**

<table>
<thead>
<tr>
<th>Measure</th>
<th>R [95% CI]**</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LogmarJa</td>
<td>-0.16 [-0.60; 0.31]</td>
<td>0.40</td>
</tr>
<tr>
<td>CHAQb</td>
<td>-0.12 [-0.33; 0.09]</td>
<td>0.26</td>
</tr>
<tr>
<td>PedQLc total</td>
<td>0.43 [0.28-0.57]</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>New EYEQb</td>
<td>0.70 [0.58-0.82]</td>
<td>&lt;0.0001*</td>
</tr>
</tbody>
</table>

**Methods:**

- **Parent Reports**
  - EYEQ (range 0-4)**: 3.64 ± 0.44
  - CHAQ (range 0-3)**: 0.59 ± 0.61
  - PedQL Physical scale (range 0-100)**: 70.3 ± 24.4
  - PedQL Psychosocial scale (range 0-100)**: 74.5 ± 18.8
  - EYEQ total scale: 73.1 ± 19.5

**Conclusion:**

In this retrospective chart review, we could demonstrate the effectiveness of MTX for peripheral joint involvement and for enthesis. Interestingly, only after 6 months of MTX therapy was the highest rate of improvement reached. Prospective controlled trial would be important to prove our results.

**Disclosure:**

K. Geitz, None; I. Foeldvari, None.

**1157**

The Phenotypic Characterization of Juvenile Idiopathic Arthritis in African American Children. Lauren Minor1, Lori Ponder2, Emily G. Ferrell1, Sheila Angeles-Han1, Christine W. Kennedy1, Kelly Rouster-Stevens2, Mina Pichavant3, Larry B. Vogler4 and Sampath Prahalad1.1 Emory University School of Medicine, Atlanta, GA; 2Emory Children’s Center, Atlanta, GA

**Background/Purpose:** JIA, a common childhood arthropathy, with an estimated prevalence of 1 in 1000 in children under the age of 16, affects children of all ages and races. There is limited data describing the characteristics of JIA in African-American (AA) children. The purpose of this study was to compare phenotypic characteristics of AA and non-Hispanic white (NHW) JIA patients in our rheumatology clinic.

**Methods:**

- Charts of children with JIA, who were enrolled in a genetic study between June 2009 and June 2012 were reviewed. At time of enrollment, demographic and disease-related data were collected. Patients who identified as Hispanic or multi-racial were excluded. Disease characteristics compared between AA and NHW children included: age at onset and diagnosis, family history, JIA subtype, laboratory tests, associated features, medications, and radiographic changes. Fischer’s exact test or Chi-Square tests were used to compare nominal variables, and student’s T test was used to compare continuous variables.

**Results:**

150 NHW children and 62 AA children with JIA were studied. Table 1 compares demographic and disease characteristics of NHW and AA children. AA children with JIA were significantly older both at disease onset and presentation to a pediatric rheumatologist. JIA subtypes differed significantly between AA and NHW children, with the AA being predominantly polyarticular RF+, and NHW being predominantly persistent oligoarticular. Both groups had a female predominance. Significantly more AA children had Medicaid and lived closer to their rheumatologist. AA children were less likely to have a family history of autoimmunity. Laboratory studies demonstrated that AA children were more likely to have positive RF and CCP antibodies. AA children were more likely to be treated with methotrexate at diagnosis, and more likely to receive systemic steroids during the course of their disease. These children were also more likely to have joint space narrowing and osteopenia on x-ray than NHW children. AA children were more likely to have rheumatoid nodules and chronic anemia as manifestations of their disease. The prevalence of uveitis was not significantly different between AA and NHW children with JIA. Even excluding the polyarticular RF+ subtype, AA children were older at onset and had more cumulative joint affected.

**Table 1.** Characteristics of NHW and AA children with JIA

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>NHW</th>
<th>AA</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number</td>
<td>150</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Age at onset (mean ± SD)</td>
<td>6.3 ± 4.4</td>
<td>8.7 ± 4.4</td>
<td>1.8 × 10^-7^*</td>
</tr>
<tr>
<td>Excluding RF+ poly JIA</td>
<td>6.1 ± 4.4</td>
<td>8.4 ± 4.4</td>
<td>0.05^*</td>
</tr>
<tr>
<td>Age at baseline visit (mean ± SD)</td>
<td>7.5 ± 4.7</td>
<td>9.4 ± 4.4</td>
<td>6.9 × 10^-7^*</td>
</tr>
<tr>
<td>Excluding RF+ poly JIA</td>
<td>7.2 ± 4.7</td>
<td>8.5 ± 4.4</td>
<td>0.10</td>
</tr>
<tr>
<td>Gender females</td>
<td>102 (68)</td>
<td>48 (77)</td>
<td>0.19</td>
</tr>
<tr>
<td>Insurance type</td>
<td>34 (21)</td>
<td>37 (59)</td>
<td>0.19</td>
</tr>
<tr>
<td>Medicaid</td>
<td>43 (29)</td>
<td>37 (60)</td>
<td>0.01</td>
</tr>
<tr>
<td>Private</td>
<td>105 (70)</td>
<td>24 (39)</td>
<td>1.7 × 10^-4^*</td>
</tr>
<tr>
<td>Distance from rheumatologist &lt; 30 miles</td>
<td>35 (23)</td>
<td>44 (71)</td>
<td>&lt;0.1 × 10^-5^*</td>
</tr>
<tr>
<td>&gt; 30 miles</td>
<td>115 (77)</td>
<td>18 (29)</td>
<td>&lt;0.1 × 10^-5^*</td>
</tr>
<tr>
<td>Management prior to rheumatologist</td>
<td>12 (8)</td>
<td>8 (13)</td>
<td>0.1</td>
</tr>
<tr>
<td>Managed by Pediatrician</td>
<td>56 (37)</td>
<td>6 (10)</td>
<td>1.7 × 10^-9^*</td>
</tr>
<tr>
<td>Seen by Orthopedics</td>
<td>16 (11)</td>
<td>6 (10)</td>
<td>0.13</td>
</tr>
<tr>
<td>Alternate diagnosis</td>
<td>11 (7)</td>
<td>9 (15)</td>
<td>0.03^*</td>
</tr>
<tr>
<td>Family history of autoimmunity</td>
<td>39 (26)</td>
<td>5 (9)</td>
<td>0.06</td>
</tr>
<tr>
<td>JIA subtype</td>
<td>19 (13)</td>
<td>6 (10)</td>
<td>0.16</td>
</tr>
<tr>
<td>ERA</td>
<td>20 (13)</td>
<td>2 (3)</td>
<td>0.16</td>
</tr>
<tr>
<td>Psoriatic arthritis</td>
<td>16 (11)</td>
<td>6 (10)</td>
<td>6.8 × 10^-5^*</td>
</tr>
<tr>
<td>Psoriatic arthritis</td>
<td>37 (25)</td>
<td>12 (19)</td>
<td>0.1</td>
</tr>
<tr>
<td>Oligoarticular RF+</td>
<td>9 (6)</td>
<td>18 (30)</td>
<td>1.4 × 10^-4^*</td>
</tr>
<tr>
<td>Oligoarticular persistent</td>
<td>7 (5)</td>
<td>1 (2)</td>
<td>0.21</td>
</tr>
<tr>
<td>Total Number</td>
<td>8 (5)</td>
<td>7 (11)</td>
<td>0.07</td>
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<tr>
<td>Undifferentiated</td>
<td>3 (3)</td>
<td>2 (3)</td>
<td>0.32</td>
</tr>
<tr>
<td>Uveitis</td>
<td>20 (13)</td>
<td>7 (11)</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Disclosures:**

S. T. Angeles-Han, None; S. Yeh, None; C. McCracken, None; L. B. Vogler, None; K. A. Rouster-Stevens, None; C. W. Kennedy, None; K. Jenkins, None; M. Kent, None; S. Lambert, None; C. Drews-Botsch, None; S. Prahalad, None.

**1156**


**Background/Purpose:** Juvenile idiopathic enthesitis related arthritis (enthJIA) represents 5 to 10% of children with JIA. Most patients present with peripheral arthritis and enthesitis. Methotrexate was not formally studied regarding effectivity for the peripheral joint involvement of this subset. Aim of our study was to assess the effectivity of methotrexate in peripheral joint involvement of enthesitis related JIA.

**Methods:**

- We conducted a chart review of patients with juvenile idiopathic enthesitis related arthritis, who have been treated at least for 3 months with MTX since 2005. The clinical and demographic parameters of the patients were assessed.

**Results:** We identified 73 patients with confirmed diagnosis of enthJIA, who were treated at least for 3 months with MTX. At the initiation of the therapy the average active joint count was 2.5 and the number of active enthesis sites were 0.9. The mean CHAQ value was 0.55 and the mean pain score was 1.20 and the mean well being score was 1.26. The mean physician global was 1.74. At 3.6 and 9 months the active joint count was reduced by 18%, 44% and 53%, the number of painful joints by 22%, 36% and 47% and the number of swollen joints by 7%, 20% and 65%. The number of active enthesis sites were reduced by 3.6 and 9 months by 44%, 70% and by 76%. The CHAQ score decreased at 3.6 and 9 months by 45%, 63% and 62%, the pain-score by 38%, 62% and 51% and the well-being score by 52%, 66% and 49% and the physician global by 58%, 65% and 65%.

**Conclusion:** In this retrospective chart review we could demonstrate the effectivity of MTX for peripheral joint involvement and for enthesis. Interestingly only after 6 months of MTX therapy was the highest rate of improvement reached. Prospective controlled trial would be important to prove our results.

**Disclosure:**

K. Geitz, None; I. Foeldvari, None.
Conclusion: Using a large cohort of AA and NHW children with JIA, we confirm reports of the differences in disease characteristics reported in smaller earlier studies. AA children with JIA demonstrate significant differences in disease characteristics; they are older at disease onset, more likely to have RF/CCP + polyarthritis, more likely to use systemic steroids, more likely to have a higher joint count involvement, and more likely to have radiographic evidence of disease. These observations support earlier observations that the phenotype of JIA is different in AA children.

Disclosure: L. Minor, None; L. Ponder, None; E. G. Ferrell, None; S. Angeles-Han, None; C. W. Kennedy, None; K. Rouster-Stevens, None; M. Pichavant, None; L. B. Vogler, None; S. Prahalad, None.

1158

Development of Cut-off Values for High Disease Activity in Juvenile Idiopathic Arthritis Based On the Juvenile Arthritis Disease Activity Score. Alessandro Consolaro1, Stefano Lanni1, Sara Verazza1, Maria C. Collina1, Marta Bertamino1, Giulia C. Varneri1, Serena Calandra1, Nicolino Rupert1, Alberto Martin2 and Angelo Raveli1. 1 Istituto Giannina Gaslini, Genova, Italy, 2 University of Genova, Genova, Italy, 3 Paediatric Rheumatology International Trials Organisation (PRINTO), Genova, Italy, 4 Paediatric Rheumatology International Trials Organisation (PRINTO), Istituto Giannina Gaslini, Genova, Italy.

Background/Purpose: In the last decade, there have been major advances in the management of juvenile idiopathic arthritis (JIA), including the shift towards early aggressive interventions and the development of new therapeutic agents and combination treatment strategies. A reliable documentation of the advances in therapeutic effectiveness creates the need for validated and clinically useful criteria that describe precisely the clinical state of the patient. The study was aimed to determine cut-off values for the state of high disease activity (HDA) in JIA based on the Juvenile Arthritis Disease Activity Score (JADAS).

Methods: For the selection of cut-offs, data from a clinical database including 618 children with JIA followed between 2007 and 2011 were used. Patients were defined as being in HDA when one of the following therapeutic interventions was prescribed: 1) start of methotrexate; 2) intraarticular corticosteroid therapy; 3) start of a biologic medication; 4) start of systemic corticosteroid therapy. Patients were defined as having low disease activity (LDA) when they were receiving no therapy or had therapy discontinued, tapered or left unchanged for >1 year. For each patient, 1 visit in HDA and 1 visit in LDA were retained. Optimal JADAS cut-offs were determined by calculating the 25th percentile of cumulative score distribution in patients with HDA and by assessing their ability to discriminate between the states of HDA and LDA through ROC curve analysis (including calculation of Youden index and fixed 90% specificity). Cross-validation of cut-offs was performed in 490 JIA patients enrolled in the PRINTO methotrexate trial (Ruperto et al, A&R 2004;50:2191-201) and on 358 patients followed longitudinally at study centers for a median of 1.7 years, and was based on assessment of discriminative and predictive validity.

Results: The cut-offs were calculated separately for patients with oligoarthritis and polyarticular course of joint disease (irrespective of ILAR category) owing to the different severity of these 2 JIA phenotypes. Complete clinical data were available for 258 visits of patients with oligoarthritis and 289 visits of patients with polyarthritis. JADAS-10 and JADAS-71 cut-offs were 7.6 for oligoarthritis and 10.6 for polyarthritis. JADAS-27 cut-offs were 7.7 for oligoarthritis and 8.9 for polyarthritis. Validation analyses showed that at baseline visit of methotrexate trial 94.7% of patients had a JADAS higher than the proposed cut-off for JADAS. At 6-month visit, the percentage of patients with a JADAS higher than the cut-off was 85.6% among nonresponders and 23.8% among responders. Evidence of predictive ability of the cut-offs was obtained by demonstrating that in the longitudinal patient sample, the percentage of patients with inactive disease or with a C-HAQ score of 0 at final visit was significantly lower among patients who had a JADAS above the cut-off value at first visit than among those who did not.

Conclusion: We developed the JADAS cut-offs for HDA in JIA. The cut-offs revealed strong discriminative and predictive ability in a clinical trial and are, therefore, potentially applicable in clinical practice, observational investigations, and therapeutic studies.

Disclosure: A. Consolaro, None; S. Lanni, None; S. Verazza, None; M. C. Gallo, None; M. Bertamino, None; G. C. Varneri, None; S. Calandra, None; N. Rupert0, None; A. Martini, None; A. Raveli, None.

1159

Reasons and Predictors of Methotrexate Discontinuation in Children with JIA: Results From the Childhood Arthritis Prospective Study (CAPS), Suzanne Verstappen1, Lucy R. Welderburn1, H. E. Foster1, Eileen Baidarn1, Janet Gardner-Medin2, Joyce Davidson3, Alice Chieng4, Wendy Thornon1 and Kimme L. Hyrich5. 1 University of Manchester, Manchester Academic Health Sciences Centre, Manchester, United Kingdom, 2 University College London (UCL), London, United Kingdom, 3 Newcastle Hospitals NHS Foundation Trust and Great North Children’s Hospital, Newcastle Upon Tyne, United Kingdom, 4 Alder Hey Children’s Foundation NHS Trust, Liverpool, United Kingdom, 5 Manchester Children’s Hospital, Manchester, United Kingdom, 6 Manchester Children’s Hospital, Manchester, United Kingdom, 7 Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 8 Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester Academy of Health Sciences, Manchester, United Kingdom.

Background/Purpose: Methotrexate (MTX) is the DMARD of first choice in patients with juvenile idiopathic arthritis (JIA). However, limited data is available on MTX survival, including reasons for stopping MTX, and predictors for stopping MTX.

Objectives: The objectives of this study were to i) describe survival time and reasons for stopping MTX and ii) to identify possible predictors for stopping MTX due to adverse events (AE) or inefficacy.

Methods: Consecutive children with JIA treated with MTX from the Childhood Arthritis Prospective Study (CAPS), a large prospective longitudinal inception cohort study, were included. At baseline, 6 months and at annual follow-up visits a clinical examination was performed including the physician’s global assessment (PGA) and number of active and limited joints. The CHAQ, was completed by the parent or the child. Start and stop dates and reasons for stopping MTX were also collected. For the present study the following definitions were applied: 1) AE, stopped due to AE and MTX not restarted for at least one month; 2) inefficacy, stopped MTX due to inefficacy or added a biologic; 3) other, stopped MTX because of efficacy and MTX not restarted for at least one year; 4) other. Kaplan Meier survival curves were calculated to determine the survival probability at two years for overall, AE, inefficacy or efficacy survival. Patients were included until the date of stopping MTX or until the last follow-up date when MTX treatment was continued. Cox proportional hazards regression analyses were applied to assess the predictive ability of demographic and clinical variables assessed at time of starting MTX treatment with AE or inefficacy. Since data on disease activity were not always collected at time of MTX therapy start, disease activity and CHAQ-score assessed for a maximum of three months prior to MTX start was used, otherwise data was defined missing.

Results: 501 children (median [IQR] age at MTX start was 8.3 [4.0-12.2] yrs) received MTX after a median time since symptom onset of 7.1 [3.5-19.1] months. 244 (49%) stopped MTX, reasons: AE (n=58), inefficacy (n=121), efficacy (n=34) and other reasons (n=31). Overall median survival time was 2.4 [1.1-4.4] yrs. The estimated survival rates at two years were 0.87 (95%CI 0.83 to 0.90) for AE, 0.75 (95%CI 0.70 to 0.79) for inefficacy and 0.93 (95%CI 0.88 to 0.95) for efficacy. Older children were more likely to stop MTX medication because of AE (HR 1.08, 95%CI 1.01 to 1.14) or inefficacy (HR 1.06, 95%CI 1.01 to 1.10) and a high PGA score measured at MTX start (HR 1.21, 95%CI 1.04 to 1.42 (n=236)), stopped MTX because of AE, 0.87 (95%CI 0.79 to 0.95)
to 1.03) and 1.02 (0.99 to 1.04) (n=323), limited joint count (HR, 95%CI, 0.99 (0.95 to 1.04) and 1.02 (0.99 to 1.04) (n=321)), and CHAQ-score (HR, 95%CI, 0.71 (0.36 to 1.41) and 1.03 (0.64 to 1.66) (n=147)).

Conclusion: In this cohort of patients with JIA starting MTX we found that children stayed on MTX therapy for a median of 2.5 years. Older age was a predictor for stopping MTX due to AE and inefficacy.

Disclosure: S. Verstappen, None; L. R. Wedderburn, None; H. E. Foster, None; E. Baldum, None; J. Gardner-Medwin, None; J. Davidson, None; A. Chieng, None; W. Thomson, None; K. L. Hyrich, None.

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Assessment of Subclinical Synovitis by Power Doppler Ultrasoundography in Patients with Juvenile Idiopathic Arthritis. Maria Teresa Terreri1, Vanessa M. Bugni2, Claudio A. Len1, Sônia de A.V. Mitraud3, Rita NV. Furtado4 and Jamil Natour5. 1Universidade Federal de São Paulo/UNIFESP, São Paulo, Brazil, 2Universidade Federal de São Paulo, São Paulo, Brazil, 3Universidade Federal de São Paulo/UNIFESP, São Paulo, Brazil, 4Universidade Federal de São Paulo/UNIFESP, São Paulo, Brazil, 5Universidade Federal de São Paulo, São Paulo, Brazil

Background/Purpose: Juvenile idiopathic arthritis (JIA) is the most common chronic rheumatic disease in childhood, leading to physical disability and poor quality of life. Advances in the treatment of JIA have led to higher remission rates. However despite clinical remission articular ultrasonography (US) can sometimes detect subclinical synovitis (SS). The aim of this study was to evaluate patients with JIA in remission and healthy controls for the presence of SS by US Power Doppler (PD), and evaluate its association with higher remission rates. However despite clinical remission articular ultrasonographic parameters included synovitis and synovial flow present at the PD indicated the presence of SS. P-values were calculated based on the chi-square test, Fisher’s exact test, student’s T test and Mann-Whitney U test.

Methods: Cross-sectional study of patients with JIA in remission and healthy controls, matched for age and gender. Inclusion criteria: oligoarticular or polyarticular JIA, clinical and laboratory remission (Wallace et al), between the ages 5 to 18 years. Clinical assessment: active/limited joint count, functional capacity by the Childhood Health Assessment Questionnaire (CHAQ), physician global visual analogue scale (VAS), patient global VAS, medications in use. US assessment evaluated 17 joints bilaterally. Ultrasonographic parameters included synovitis and synovial blood flow in PD. A moderate to severe degree of synovitis and/or any synovial flow present at the PD indicated the presence of SS. P-values were calculated based on the chi-square test, Fisher’s exact test, student’s T test and Mann-Whitney U test.

Results: Thirty-six patients (mean age 11.5 ± 3.7 years) and 36 controls (mean age 11.3 ± 3.7 years) were included and a total of 2448 joints were assessed. There were 36 JIA patients, 29 were girls, with a mean age at assessment of 11.5 ± 3.7 years and a mean age at disease onset of 4.3 ± 3.2 years. Sixteen patients had persistent oligoarticular JIA, 11 extended oligoarticular and 9 polyarticular with negative rheumatoid factor. Nine patients were off medication and 27 were on medication, with an average time of remission of 1.8 ± 2.2 years. SS was present in 46/2448 (1.8%). SS was more common in patients with polyarticular involvement affecting fingers and toes. Although SS was shown to be more frequent in all JIA joints (polyarticular and extended oligoarticular) and later age of JIA onset (greater than 6 years old).

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1161
Current Evidence of Anti-TNFα Treatment Efficacy in Childhood Chronic Uveitis: A Systematic Review and Meta-Analysis Approach Comparing the Different Drugs. Gabriele Simonini1, Kate Drue2, Rolando Cimaz2, Gary J. Macfarlane3 and Gareth T. Jones3. 1Anna Meyer Children’s Hospital-University of Florence, Firenze, Italy, 2University of Aberdeen, Aberdeen, United Kingdom

Background/Purpose: To summarize evidence regarding the effectiveness of anti-TNFα treatments in childhood autoimmune chronic uveitis (ACU), non responder and/or failure to previous DMARD course.

Methods: A systematic search of articles between January 2000 and June 2012 was conducted using EMBASE, Ovid MEDLINE, Evidence Based Medicine Reviews-ACP Journal Club, Cochrane libraries, and EBMB Reviews. Studies were eligible for inclusion if they investigated the efficacy of anti-TNFα therapy as the first biologic modifier immunosuppressant medication, among children (’16 yrs) naïve to any anti-TNFα, therapy in the childhood of ACU, refractory to therapy with topical treatment and/or systemic treatment and at least one immunosuppressive treatment (MTX, and/or Azathioprin and/or CSA and/or Clorambucil and/or Mofetil). The primary outcome for this review was the proportion of patients classified as having improved intraocular inflammation, expressed as Tyndall, as defined by the Standardization of Uveitis Nomenclature (SUN) working criteria. We determined the pooled estimated proportion of children in the eligible studies responding to anti-TNFα treatment: Etanercept (ETA), Infliximab (INF), or Adalimumab (ADA).

Results: The initial search identified 959 articles, of which 144 were potentially eligible. 26 eligible articles, all retrospective chart reviews, but one RCT, remained in the analysis. 245 children were included in the analysis (ADA n=27; ETA n=62 and INF n=156) and the number of children in studies ranged from 1 to 47. The pooled analysis suggested that INF and ADA have favorable effects in the improvement of intraocular inflammation: the proportion of responding subjects was 82% (95% CI: 68–96%) and 68% (61–76%) for ADA and INF respectively. In contrast, only 28% (16–40%) showed improvement with ETA. There was no difference in the proportion of responders between ADA and INF (x²=2.17,p=0.14), although both showed superior efficacy compared to ETA (ADA vs ETA x²=21.1, p<0.001; INF vs ETA x²=25.5, p<0.001).

Conclusion: Although randomized controlled trials are needed, the available evidence does not support the use of ETA in the treatment of childhood ACU.; ADA and INF seem instead reliable approach for their treatment.

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1162
Patients with Juvenile Idiopathic Arthritis From a Low Socio-Economic Background Perceive Their Disease Activity and Physical Limitations Higher Than Patients from a High Socio-Economic Background. Suzanne Verstappen1, Joanna Cobb2, H. E. Foster3, Eileen Baldum4, Lucy R. Wedderburn5, Janet Gardner-Medwin6, Alice Chieng7, Joyce Davidson8, Wendy Thomson8 and Kimme L. Hyrich8. 1University of Manchester, Manchester Academic Health Sciences Centre, Manchester, United Kingdom, 2Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester, United Kingdom, 3Newcastle Hospitals NHS Foundation Trust and Great North Children’s Hospital, Newcastle Upon Tyne, United Kingdom, 4Alder Hey Children’s Foundation NHS Trust, Liverpool, United Kingdom, 5University College London (UCL), London, United Kingdom, 6Royal Hospital for Sick Children, Glasgow, United Kingdom, 7Manchester Children’s Hospital, Manchester, United Kingdom, 8Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 9Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester Academy of Health Sciences, Manchester, United Kingdom

Background/Purpose: It has been suggested that socio-economic status (SES) may be associated with delayed access to rheumatology care and with worse disease severity in patients with juvenile idiopathic arthritis (JIA). The objectives of this study were to examine the association between SES and delay to rheumatology clinic and disease severity in patients with JIA in England.

Methods: Consecutive children from the Childhood Arthritis Prospective Study (CAPS), a large prospective longitudinal inception cohort study, were included. At baseline, a clinical examination was performed including the physician’s global assessment (PGA), number of active and limited joints and
JADAS71. The CHAQ, pain score, the parental general evaluation (PGE) and the CHQ, including several physical and psychosocial concepts (higher scores indicate better functioning and well-being), were completed by the child or parent. Using postcode data, SES was determined by calculating the Index of Multiple Deprivation score (IMD). Based on the ranking of the IMD score, patients were included in the low SES group (lowest quartile), middle SES group (two middle quartiles) and high SES (highest quartile). Differences in demographic and disease characteristics between these three groups were statistically tested applying the Kruskal-Wallis test or Chi-square test for gender.

Results: 934 JIA patients with a median age of 6.8 [IQR 2.9-10.9] yrs at baseline were included in this study. At baseline the percentage of patients according to the ILAR subtypes for the low, middle and high SES classes were, respectively: systemic (3.6%, 6.8%, 8.0%), oligoarthritis (54%, 51%, 48%), extended oligoarthritis (1.6%, 2.4%, 2.5%), polyarthritis RF (13.6%, 18.4% 19.0%), polyarthritis RF+ (4.2%, 2.0%, 2.5%), enthesitis related arthritis (4.2%, 5.8%, 5.5%), psoriatic arthritis (6.1%, 4.2%, 5.5%), undifferentiated (7.2%, 5.8%, 4.9%), other (5.5%, 3.2%, 4.3%). There was no difference in delay to first rheumatologist consultation between the three SES groups. Although no significant differences in diseases activity scores assessed by the rheumatologist were observed between the three SES groups, children and/or parents of children with JIA in the low SES group recorded higher pain scores, disease activity scores and lower physical function scores than those in the high SES group. SES did not seem to impact on psycho-social outcomes as measured in the CHQ.

Table. Demographic clinical and self-reported outcomes of disease related factors in JIA patients from low, middle and high socio-economic background

<table>
<thead>
<tr>
<th>Age at onset, yrs</th>
<th>Low SES group N = 419</th>
<th>Middle SES group N = 380</th>
<th>High SES group N = 177</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, female</td>
<td>211 (62%)</td>
<td>265 (63%)</td>
<td>112 (67%)</td>
<td>0.843</td>
</tr>
<tr>
<td>Delay to 1st rheumatology consultation, yrs</td>
<td>0.57 [0.09–0.96]</td>
<td>0.41 [0.09–0.85]</td>
<td>0.55 [0.17–0.95]</td>
<td>0.929</td>
</tr>
<tr>
<td>No. limited joints</td>
<td>1 [1–3]</td>
<td>1 [1–3]</td>
<td>1 [0–3]</td>
<td>0.891</td>
</tr>
<tr>
<td>CHAQ-score</td>
<td>0.873 [0.132–1.628]</td>
<td>0.625 [0.128–1.375]</td>
<td>0.379 [0.075–0.675]</td>
<td>0.001</td>
</tr>
<tr>
<td>Pain, mm</td>
<td>39 [14–64]</td>
<td>30 [6–58]</td>
<td>18 [4–56]</td>
<td>0.0035</td>
</tr>
<tr>
<td>CHQ-score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role social limitations</td>
<td>65 [24–100]</td>
<td>76 [23–99]</td>
<td>86 [67–95]</td>
<td>0.0043</td>
</tr>
<tr>
<td>Bodily pain/discomfort</td>
<td>40 [20–60]</td>
<td>50 [20–70]</td>
<td>50 [30–60]</td>
<td>0.0081</td>
</tr>
<tr>
<td>Behaviour</td>
<td>71 [36–63]</td>
<td>68 [6–63]</td>
<td>77 [60–85]</td>
<td>0.1669</td>
</tr>
<tr>
<td>Mental health</td>
<td>75 [58–85]</td>
<td>70 [50–85]</td>
<td>75 [65–85]</td>
<td>0.3357</td>
</tr>
<tr>
<td>Self esteem</td>
<td>74 [54–88]</td>
<td>71 [50–83]</td>
<td>79 [57–88]</td>
<td>0.1167</td>
</tr>
<tr>
<td>General health perception</td>
<td>60 [43–75]</td>
<td>64 [32–83]</td>
<td>70 [60–81]</td>
<td>0.0028</td>
</tr>
<tr>
<td>Parental impact-physical</td>
<td>91 [56–100]</td>
<td>88 [66–100]</td>
<td>89 [85–98]</td>
<td>0.1103</td>
</tr>
<tr>
<td>Family cohesion</td>
<td>65 [40–85]</td>
<td>65 [40–85]</td>
<td>85 [60–95]</td>
<td>0.1630</td>
</tr>
</tbody>
</table>

Conclusion: Patients from lower SES background score their disease activity and functional disability higher than patients from higher SES background, whereas no differences were found in disease activity scores assessed by the rheumatologist between the three SES groups. Children and/or parents of children with JIA in the low SES group recorded higher pain scores, disease activity scores and lower physical function scores than those in the high SES group. SES did not seem to impact on psycho-social outcomes as measured in the CHQ.

Results: At 1 year after starting biologics, incidence of patients with increased (improved) or sustained CL(SD) was 61%, which indicated that 61% patients had no radiographic progression of joint damage of the wrist during the first year of biologic therapy. At 3 year from baseline, 70% of patients showed no radiographic progression of joint damage.

Methods: Forty-six polyarticular JIA patients initiating biologics were followed up prospectively for mean 3.1 years. RF was positive in 36 out of 46, and all had active arthritis in the wrist at starting biologic therapy. Duration from the onset to initiating biologics was mean 3.1 years, and the biologic agents used were etanercept in 21, adalimumab in 7, infliximab in 9, and tocilizumab in 9. CL was measured from radiographs of the wrist obtained at baseline (n=46), at 1 year (n=36), and at 3 year (n=20), and the standard deviation (SD) of CL calculated by Poznanski’s formula established from healthy children was analyzed.

Results: 1) Changes in CL (SD) from baseline (Figure).

Conclusion: Biologics can prevent the radiographic progression of wrist in patients who attained DAS28<2.6 remission during the first year treatment. Switching to the second biologic agent may be needed in polyarticular JIA patients who failed to complete the DAS28<2.6 remission.

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Disclosure: T. Kubota None; T. Yamatou None; Y. Nonaka None; H. Akaike None; T. Nagakura None; Y. Yanaka None; T. Takezaki None; Y. Nerome None; H. Imanaka None; S. Takaie None; Chugai, Eisai, Takeda, Brystol-Mayer, Japan, 2.

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Risk Factors for Radiologic Progression in Polyarticular Juvenile Idiopathic Arthritis Patients Treated with Biologic Agents. Tomohiro Kubota1, Tsuyoshi Yamatou1, Yukiko Nonaka1, Harumi Akaie2, Tomokazu Nagakura1, Yuichi Yamasaki1, Tomoko Takezaki1, Yasuhito Nerome1, Hiroto Kimura1 and Syuji Takeri1. 1Kagoshima University, Kagoshima, Japan, 2House of Meguminoseibo, Usuki, Japan

Conclusion: Patients from lower SES background score their disease activity and functional disability higher than patients from higher SES background, whereas no differences were found in disease activity scores assessed in clinic between the different SES groups. This study suggests that it is important to take SES background into account when patients with JIA present to the clinic for the first time.

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1164

Orofacial Anomalies in Children with Confirmed Juvenile Idiopathic Arthritis. Bernd Koos1, Franka Stahl de Castrillon2, Robert Ciesielski1 and Nikolay Tzaribachev3. 1University Medical Center Schleswig-Holstein, Campus Kiel, Kiel, Germany, 2Department of Orthodontics, University of Rostock, Germany, Rostock, Germany, 3Center for Rheumatic Diseases, Bad Bramstedt, Germany

Conclusion: Can prevent the radiographic progression of wrist in patients who attained DAS28<2.6 remission during the first year treatment. Switching to the second biologic agent may be needed in polyarticular JIA patients who failed to complete the DAS28<2.6 remission.
where TMJ arthritis is frequently asymptomatic. Despite that, orofacial anomalies occur in many patients and tend to be correlated with dysfunction and excessive mechanical strain, which may complicate treatment and aggravate TMJ destruction.

To examine the prevalence and severity of relevant orofacial anomalies in patients with JIA compared to healthy children and to assess the correlation with Gadolinium (Gd) enhanced MRI.

Mandibular asymmetry was found in 35% of patients (15% right, 20% left; no correlation with sex; \( p = 0.76 \)). Inhibited mandibular growth (distoclusion) was seen in 59% of patients (no correlation with sex; \( p = 0.57 \)). Open bite was seen in 6.5%, deep bite in 33% of the children.

TMJ arthritis was demonstrated in 81% of the children from the MRI subgroup. Pathological TMJ sounds were present in 26% of the patients, but showed no statistical significance (\( p = 0.16 \)). TMJ and masticatory muscles tenderness were present in 46.8% and 40.2%, respectively. Limitation of the interincisal opening was found in 14.4% of the patients. A positive statistical correlation was found for these functional measures (tenderness to palpation; \( p \leq 0.001 \) and limitation of interincisal opening \( p = 0.002 \), but sensitivity was low at 53% (specificity: 89%).

Conclusion: The prevalence of orofacial abnormalities is noticeably increased in JIA patients compared to healthy children, particularly inhibition of the mandibular growth and mandibular asymmetries. Clinical findings and inflammatory state of TMJ do not reliably correlate. This mandates interdisciplinary TMJ treatment including orthodontics especially with respect to the high prevalence of TMJ dysfunction.

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### 1165

Factors Associated with Achievement of Inactive Disease in Children with Juvenile Idiopathic Arthritis: Treatment Response and Thresholds

Background/Purpose: The advent of new therapies for juvenile idiopathic arthritis (JIA), particularly the introduction of biologic medications, has increased considerably the potential for treatment benefit, with clinical remission being now a realistic goal for a substantial proportion of patients. However, the assessment of remission has seldom been incorporated in clinical trials of biologics in JIA. Moreover, little information exists on predictors of the effectiveness of biologic medications. The study aim was two-fold: 1) to evaluate the rate of inactive disease (ID) in children with juvenile idiopathic arthritis (JIA) treated with etanercept (ETN); 2) to identify clinical characteristics associated with attainment of ID.

Methods: TMJ data of 216 consecutive JIA patients who were given ETN between 2002 and 2011, and had a follow-up of at least 6 months after ETN start were reviewed. For each patient, all visits made from ETN initiation to the last follow-up evaluation in which the patient was still receiving ETN were examined to establish whether the patient had reached the state of ID, defined by the Wallace criteria (J Rheum 2004;31:2290-4), and to identify the first visit in which ID was documented. Clinical characteristics associated with achievement of ID were sought for by means of univariate analyses and Cox regression procedures. Predictive factors included sex, age at disease onset, age and disease duration at treatment baseline, interval between first observation at study start and end of ETN, ILAR category, antinuclear antibody status, JIA outcome measures at ETN start, joints affected before ETN start, and medications administered before ETN start and administered concomitantly during ETN therapy.

Results: A total of 173 patients who received ETN for a median of 2.2 years (range 0.5–10.5 years) were included in the study. Eighty-seven patients (50.3%) achieved ID a median of 0.6 years (range, 0.1–2.5 years) after the initiation of ETN therapy. The rate of ID was much lower in children with systemic JIA than in those with non-systemic categories altogether (29.6% vs. 54.1%). At last follow up visit, 0.5 to 10.5 years after ETN start (median, 2.2 years), 85 patients (49.1%) still had ID and 70 patients (40.5%) met the criteria for clinical remission on medication. The probability of achievement of ID after 6, 12 and 24 months of therapy was 24%, 46% and 57%, respectively. On Cox regression analysis, the attainment of ID was associated with lack of wrist involvement \([HR_{ID}] \) (95% CI): 2.19 (1.38–4.38), \( p=0.0006 \) and an age at onset < 3.6 years \([HR_{ID}] \) (95% CI): 1.61 (1.04–2.49), \( p=0.03 \). A secondary analysis made after the exclusion of the 27 children with systemic JIA led to identify the same predictors.

Conclusion: Around half of our JIA patients treated with ETN in standard clinical care were able to achieve the state of ID. Children who lacked wrist involvement and had a younger age at disease onset had a greater likelihood of achieving ID during ETN administration. Thus, the presence of wrist disease and an older age at disease presentation may constitute an indication for the earlier introduction of ETN or its administration in combination with methotrexate.

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### 1166

Clinical and Therapeutic Features of 312 Patients with Macrophage Activation Syndrome Enrolled in a Multinational Survey

Sergio Davì1, Francesca Minoia1, Erkan Demirkaya2, Chiara Suffa1, Marco Aibun3, Amita Aggarwal3, Nuray Akbay Aya3, Maria Alessio4, Jordi Anton5, Antonio Apaz6, Tadej Avcin7, Patrizia Barone8, Blanca E. Bica9, Isabel Bolt10, Luciano Breda11, Vyacheslav Chasnyk12, Rolando Cimaz13, Fabrizia Corona14, Gianfranco D’Angelo14, Anna Carin Horne15, Nicola Ruperto1, Alberto Martini1, Randy Q. Cron16 and Angelo Ravelli17.1 Institute di Ricovery e Cura a Carattere Scientifico G. Gaslini, Genova, Italy, 2International Investigator Consortium for MAS Diagnostic Criteria, Ankara, Turkey, 3International Investigator Consortium for MAS Diagnostic Criteria, Newcastle upon Tyne, United Kingdom, 4Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India, 5Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy.

Methods: The clinical chart of all consecutive JIA patients who were entered into the information of their patients with MAS collected retrospectively during the data-collection phase of the project.

Results: At the 31st of May, 2012, 312 patients with sJIA-associated MAS have been entered in the study website by 87 investigators from 27 countries. 181 (58%) patients were females and 131 (42%) were males. The age at onset of sJIA ranged from 0.2 to 15.9 years (median 5.1 years) and the disease duration from onset of sJIA and onset of MAS ranged from 0 to 15.6 years (median 0.3 years). MAS occurred at onset of sJIA in 50 (20.2%)
patients. The frequency of the clinical, laboratory and histopathologic features of MAS is reported in the Table. The most frequently reported trigger of MAS was active disease (35.3%), followed by infection (26.3%) and medication toxicity (3.7%). 69 (37.1%) patients were admitted in the ICU. Therapeutic interventions included iv steroids (88.0%), oral steroids (74.1%), cyclosporine (65.5%), other immunosuppressants (13.8%), iv Ig (36.3%), etoposide (11.1%), anakinra (6.8%), and plasma exchange (5.4%). The mortality rate was 8.2%.

### Table

<table>
<thead>
<tr>
<th>Feature</th>
<th>No. with info available</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling platelet count (≤ 262 × 10^3/l)</td>
<td>286</td>
<td>74.8</td>
</tr>
<tr>
<td>Hyperferritinaemia (≥ 500 ng/ml)</td>
<td>256</td>
<td>91.4</td>
</tr>
<tr>
<td>Bone marrow hemophagocytosis</td>
<td>214</td>
<td>60.7</td>
</tr>
<tr>
<td>Increased liver enzymes (AST &gt; 59 U/L)</td>
<td>275</td>
<td>74.9</td>
</tr>
<tr>
<td>Falling leukocyte count (&lt; 4 × 10^3/l)</td>
<td>285</td>
<td>21.1</td>
</tr>
<tr>
<td>Persistent continuous fever (≥ 38°C)</td>
<td>302</td>
<td>63.9</td>
</tr>
<tr>
<td>Hypofibrinogenemia (≤ 2.5 g/l)</td>
<td>250</td>
<td>48.4</td>
</tr>
<tr>
<td>Hypertroglucosidemia (≥ 265 mg/dl)</td>
<td>221</td>
<td>43.9</td>
</tr>
<tr>
<td>Central nervous system dysfunction</td>
<td>302</td>
<td>36.1</td>
</tr>
<tr>
<td>Increased D-dimer (≥ 500 ng/ml)</td>
<td>105</td>
<td>88.6</td>
</tr>
<tr>
<td>Hemorrhagic manifestations</td>
<td>301</td>
<td>20.9</td>
</tr>
<tr>
<td>Liver enlargement</td>
<td>305</td>
<td>70.5</td>
</tr>
<tr>
<td>Spleen enlargement</td>
<td>301</td>
<td>59.5</td>
</tr>
</tbody>
</table>

**Conclusion:** Hyperferritinaemia, increased liver enzymes and falling platelet count were the most frequently observed laboratory abnormalities. The frequency of falling leukocyte count was unexpectedly low. Also unexpectedly, liver and spleen enlargement were recorded more frequently than persistent continuous fever. Hemophagocytosis was noticed in around two third of patients who underwent bone marrow aspiration. As expected, corticosteroids and cyclosporine were the most commonly administered medications.

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### 1167

**Golimumab in 25 Young Adults Affected by Juvenile Idiopathic ARTHRITIS NON Responders to OTHER Biological Agents: Preliminary DATA**

**Background/Purpose:** Biological agents licensed in JIA have demonstrated a favourable benefit-risk profile. Nevertheless, intolerance, loss and lack of efficacy or adverse events have led to try other therapeutic options. Ultrasound can help in the assessment of active synovitis. The purpose of this study was to evaluate efficacy and safety of Golimumab in young adults affected by JIA with active polyarthritis (with or without uveitis), non responders to MTX, antiCD20 and anti-IL-1 and intolerant to the first generation of anti-TNF (Infliximab, Etanercept and Adalimumab) by EULAR criteria and power Doppler ultrasound (PDUS).

**Results:** In our Centre, since November 99 to diciembre 2011, 288 patients affected by refractory JIA were treated with TNF inhibitors and since May 2011, 25 patients (16 F, 9 M) affected by refractory JIA, non responders to other biologic agents, were enrolled in Golimumab (Simponi).

Patients had failed MTX as monotherapy, previous TNF inhibitors, Rituximab and anti-IL1 therapy. Two patients had been treated with 8 different biologic agents, 1 patient with 7, 2 patients with 6, 5 patients with 5, 3 with 3, 7 with 2 and 3 patients with just one previous biologic agent.

Two patients had a Systemic onset of JIA, 4 polyarthritis RF negative, 3 enthesis related arthritis, 1 psoriatic arthritis, 6 oligoarthritis persistent and 9 oligoarthritis extended. Median age was of 28.7 years, median onset age 7.3 years, median disease duration 19.8 years. All patients had active disease according to EULAR criteria. 8 patients had a previous history of chronic Iridocyclitis. Patients received Golimumab at the dose of 50 mg subcutaneously every month, as in RA. Fifteen patients receive Golimumab in association with MTX. All patients underwent basal assessment of DAS 28 and after 4 months DAS 28 and PDUS assessment of the same 28 joints. Presence of synovitis at PDUS examination was considered in presence of at least one between joint effusion, synovial thickening and power Doppler signal detected in accordance to OMERACT criteria.

**Results:** Seventeen patients (68%) were responders according both to DAS 28 and PDUS, 5 patients were not evaluable because of follow-up less than 12 weeks and 3 patients were non responders (1 of these 3 pts dropped-out). In non responder patients PDUS showed a higher number of joints involved. No adverse events were observed. No adverse events occurred.

**Conclusion:** Golimumab seems to be effective and well tolerated and could be a good treatment of long lasting refractory JIA in young adults who failed other biologics. Data found are confirmed by PDUS examination. This study seem to be one of the first experiences in the use of Golimumab in young adults affected by JIA.

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### 1168

**Cost-Effectiveness Analysis of Early Biologic Treatment in Polyarticular Juvenile Idiopathic Arthritis**

**Background/Purpose:** The optimal timing of high cost biologic therapies in the treatment of polyarticular juvenile idiopathic arthritis (JIA) is uncertain. We evaluated the economic and health outcomes of initial compared with step-wise use of anti-tumor necrosis factor (TNF) agent, etanercept (ETN), in this setting.

**Methods:** We conducted a cost-utility analysis of two strategies from a Canadian health care payer perspective. In one strategy, initial therapy was with methotrexate (MTX) alone. ETN was added in a step-wise fashion for patients who did not respond to MTX. In the other strategy, initial therapy was with MTX in combination with ETN; patients who did not respond switched to another anti-TNF agent. In both strategies, third and fourth line therapies were modeled with additional biological agents. Our base case was a 12-year-old child (weight 40 kg) with newly diagnosed polyarticular JIA naïve to disease-modifying and biological agents. We simulated the course of the disease over 5 years using a Markov model with a cycle length of 1 month. Treatment response was defined as achieving an ACR Ped 70 response or better after 4 months of therapy. If this response was sustained over 12 months, without flare, patients entered a remission state. We derived model parameters, including treatment efficacy, disease flares, adverse events costs, and quality of life weights from the medical literature. Effects were calculated as quality-adjusted life years (QALYs); costs and QALYs were discounted at a rate of 3% per year. We conducted sensitivity analyses on all model parameters to assess the robustness of our results and used a $50,000/QALY threshold for cost-effectiveness.

**Results:** Our model predicted that the proportion of patients entering remission after 5 years was 89% with initial MTX and 93% with initial MTX and ETN combination. Median time to remission was 20 months in the MTX monotherapy group and 16 months in the combination group. The combination of initial MTX and ETN, compared to MTX alone, resulted in a discounted incremental cost of $14,498 per patient over 5 years and yielded a discounted incremental effect of 0.15 QALYs, for an incremental cost-effectiveness ratio of $97,517 per QALY. The results were sensitive to the cost of ETN and estimates of the efficacy of initial combination therapy.

**Conclusion:** Our model suggests that using initial combination therapy of MTX and ETN is unlikely to be cost-effective compared to using MTX alone, but more research is needed on key model parameters, including efficacy of initial anti-TNF agents and their impact on quality of life. A reduction in the cost of ETN by 33% would make initial use of this drug cost-effective.

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1169

Obstetrical Complications in Women with Juvenile Idiopathic Arthritis.


Montreal, Quebec, Canada

Background/Purpose: Juvenile idiopathic arthritis (JIA) most often affects women before menarche. Patients with JIA and their parents often ask about the potential impact of the disease on future pregnancies. Little is known about the risk of obstetrical complications in women with JIA. In a large population-based study, we aimed to determine if women with JIA have an increased risk of obstetrical complications compared to women without JIA.

Methods: We identified all women who had a hospitalization for their first delivery after JIA diagnosis using Quebec’s physician billing and hospitalization databases (1996–2008). Women were defined as JIA cases if they had ≥1 hospitalization with the International Classification of Diseases, Ninth Revision (ICD-9) code 714, as a primary or secondary diagnosis, or ≥2 physician visits with the ICD-9 code 714, occurring 2 months to 2 years apart, both prior to the age of 18 years and prior to the delivery. We randomly selected a general population control group, composed of women with their first delivery and matched at least 3:1 for age and year of delivery, without a preceding diagnosis of JIA.

We ascertained the length of hospitalization for delivery, the occurrence of gestational diabetes, premature rupture of membranes (PROM), preeclampsia/eclampsia, and caesarean section (c-section), at the time of hospitalization for delivery, based on relevant diagnostic or procedures codes.

Results: We identified 1406 women with JIA. Of these women, 90 had their first delivery after JIA diagnosis, during database follow-up, and were matched to 448 controls. Mean age at JIA diagnosis was 15.3 years (95% CI 14.8, 15.8) and mean age at delivery was 22.9 years (95% CI 22.3, 23.5). There was no difference in the length of hospitalization for delivery between women with JIA and controls [3.2 days (95% CI 2.9, 3.5) vs 2.8 days (95% CI 2.7, 3.0)]. Compared to controls, women with JIA did not experience more gestational diabetes [1.1% (95% CI 0.1, 0.9) vs 1.6% (95% CI 0.4, 2.7)], PROM [8.9% (95% CI 4.2, 17.3) vs 8.3% (95% CI 6.0, 11.5)], preeclampsia/eclampsia [3.3% (95% CI 0.9, 10.1) vs 4.7% (95% CI 3.0, 7.2)], or c-section [20.0% (95% CI 12.6, 30.0) vs 20.5% (95% CI 17.0, 24.6)].

Conclusion: Our findings suggest that women with JIA do not seem to have an increased risk of obstetrical complications compared to the general population. We are currently expanding this study by performing mother-child linkage to further assess neonatal outcomes in children born to women with JIA and their controls.

Disclosure: E. Vinet, None; S. Bernatsky, None; M. Kaouache, None; C. A. Pineau, None; A. E. Clarke, None; E. Hazel, None; C. M. Duffy, None; A. Berard, None; D. E. Feldman, None.

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Folate Usage in Methotrexate - Treated Juvenile Idiopathic Arthritis

Patients Is Inconsistent and Highly Variable. Gil Amarilyo1, Ornella J. Rullo1, Deborah K. McCurdy1, Jennifer M.P. Woo1 and De Furst2.

1Mattel Children’s Hospital, University of California, Los Angeles, Los Angeles, CA, 2University of California at Los Angeles, Los Angeles, CA

Background/Purpose: Low-dose weekly methotrexate (MTX) is the first-choice second-line drug in the treatment of juvenile idiopathic arthritis (JIA). Folate (as either Folic acid (FA) or Folinic acid (FLA)) effectively ameliorates or prevents some of MTX’s adverse events (AEs) in adults with RA. Folate supplementation in JIA, therefore, has become the rational regimen of either FA or FLA supplementation in MTX-treated JIA patients.

Disclosure: G. Amarilyo, None; O. J. Rullo, None; D. K. McCurdy, None; J. M. P. Woo, None; D. Furst, None.

1171

Validation of BASDAI and BASFI in Children with Spondyloarthritis.

Alisa C, Rachlis1, Bertha Wong2, Kristi J. Whitney-Mahoney1, Michelle Battish1, Michelle Anderson2, JoAnne Marcuz1, Margaret Reaume1, Ashley DeLaurier2, Ronald M. Laxer3, Brian M. Feldman2 and Shirley M. Tse4.

1Hospital for Sick Children, Toronto, ON, 2The Hospital for Sick Children, Toronto, ON

Background/Purpose: Juvenile-onset Spondyloarthritis (JSpA), referred to as Enthesitis-Related Arthritis (ERA) subtype under the International League of Associations for Rheumatology (ILAR) classification is characterized by arthritis and enthesitis largely affecting the lower limbs. Axial involvement is uncommon at presentation, but may develop later in life. Although there are validated instruments assessing spinal disease in adults with Ankylosing Spondylitis (AS) such as the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and Bath Ankylosing Spondylitis Functional Index (BASFI), there are no validated tools to measure disease activity or functional impairment in this population of children. We have previously reported excellent intra-rater reliability of the BASDAI and BASFI. The aims of the current study were to measure the validity and responsiveness of these two adult scores in ERA.

Methods: Patients diagnosed with ERA followed in the JSpA Clinic at The Hospital for Sick Children (June 2009 - June 2010) were enrolled into the study. The BASDAI and BASFI were measured prospectively at baseline and again at 4 to 6 months. At each study visit, joint and enthesal clinical exams were performed according to a standardized protocol. The data collected at baseline and follow up visit were used to assess construct validity and were expressed using Pearson’s correlation coefficient. Responsiveness (sensitivity to change) was calculated in a subgroup of patients who showed changes in their joint and enthesal counts over time by dividing the mean change between the two assessments by the standard deviation of the change scores and was expressed by effect size.

Results: There were 41 patients (85%) male with a mean age at diagnosis of 12.1 ± 7.6 years and average age at enrollment of 14.5 ± 2.5 years.
Average disease duration at the time of the study was 5.1 ± 2.4 years. 46% were HLA B27 positive, 17% had a family history of Spondyloarthritis. 70% had SI involvement confirmed radiographically. The average time between baseline and follow up clinic visits was 4.6 ± 2.3 months. Correlations between both the BASDAI and the BASFI and active joint counts were found to be high (r = 0.6) while correlations with sites of enthesitis were found to be moderate (r = 0.3 – 0.4). Responsiveness was greatest in effect size for the BASFI for detecting worsening arthritis (0.8) and improving enthesitis (0.7). For the BASFI, effect size was large for detecting worsening arthritis (0.9) and was moderate for improving enthesitis (0.4).

Conclusion: Our study demonstrates that the BASDAI and the BASFI show adequate construct validity and responsiveness and may be used in the evaluation of disease activity and functional impairment in children with JSpA. Correlations were higher for both measures in arthritis than in enthesitis, and sensitivity to changes over time showed the largest effect sizes for detecting worsening arthritis. For enthesitis, the BASFI showed a larger effect size for detecting improving enthesitis than the BASFI. The results of this study illustrate that these two instruments validated in adults may become an objective addition to developing Paediatric JSpA core sets.

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Delineating the Role of Multiple Corticosteroid Joint Injections in the Management of Juvenile Idiopathic Arthritis in the Biologic Era.

Charalampia Papadopoulou1, Maria I. Gonzalez 1, Juan C. Nieto 1, Mikhail Kostik1, Marek Bohm2, Stefano Lanni2, Valentina Muratore2, Alessandro Consolaro1, Alberto Martin1 and Angelo Ravelli1. 1Istituto Giannina Gaslini, Genova, Italy, 2Fondazione IRCCS Policlinico San Matteo, Pavia, Italy, 3University of Genova, Genova, Italy

Background/Purpose: Intra-articular corticosteroid injection (IACI) therapy in juvenile idiopathic arthritis (JIA) is generally considered for the treatment of children with arthritis in a small number of joints, particularly large joints. However, the current place of multiple IACIs in the management of JIA is still uncertain. The aim of this study was to investigate the efficacy and safety of multiple IACIs, and to seek for factors associated with sustained remission of synovitis in injected joints.

Methods: The clinical charts off all JIA patients who received an IACI in ≥ 3 joints and had a follow-up ≥ 6 months after the IACI were reviewed. The corticosteroid preparation used was triamcinolone hexacetonide for large joints and methylprednisolone acetate for small or difficult to access joints. In each patient, the follow-up period after the IACI was censored when one of the following two events occurred: 1) first visit with flare of synovitis in ≥ 1 injected joint; 2) last follow-up visit with sustained remission of synovitis in all injected joints. Flare of synovitis was defined as recurrence (or persistence) of joint inflammation in ≥ 1 joint that required a new IACI or the initiation or change of systemic therapy, and remission of synovitis as complete resolution of all signs and symptoms of joint inflammation.

Results: A total of 220 patients (79.5% females) who underwent an IACI in 1086 joints (median 4 joints per patient) were included. The median age at IACI was 3.7 years and the median disease duration was 0.6 years. The most common ILAR categories were RF-negative polyarthritis (37.1%) and extended oligoarthritis (34.1%). The most frequently injected joints were the knee (84.5% of patients), ankle (76.4%), subtalar (30.5%), elbow (29.1%), and proximal interphalangeal (PIP) (26.4%) joints. Concomitant therapy included methotrexate in 56.8% of patients and biologic medications in 9.5% of patients. Seventy (31.8%) of patients had sustained remission in all injected joints after a median follow-up of 1 year, whereas 150 patients (68.2%) experienced flare of synovitis after a median of 0.5 years. Univariate analyses showed that patients with sustained remission had more frequently a positive ANA status (p=0.004) and an oligoarthritis disease course (p=0.004), and had received more frequently general anesthesia (p=0.03) and concomitant methotrexate therapy (0.003) than did patients who experienced flare of synovitis. Flare of synovitis was seen more frequently in the ankle (45.2%), wrist (40.2%), and subtalar (34.5%) joints, than in the knee (20.8%), metacarpophalangeal (20.2%), PIP (21.3%), and elbow (15.5%) joints. Side effects occurred in only 11% of joints and were represented by skin hypopigmentation or subcutaneous atrophy.

Conclusion: Around one third of the patients who received multiple IACIs experienced long-lasting remission of synovitis in all injected joints.

General arthritis and concomitant administration of methotrexate may increase the effectiveness of IACI procedures. The presence of ankle, subtalar and wrist joint involvement may constitute an indication to the simultaneous initiation of a more aggressive systemic therapy at the time of the injection.

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Targeting Remission in Juvenile Idiopathic Arthritis in Routine Clinical Care: Experience in 175 Newly-Diagnosed Patients.

Alessandro Consolaro1, Giorgia Negro1, Nicoletta Solar1, Cristina Ferrari2, Sergio Daví1, Silvia Pederzoli1, Giulia Bracciolini3, Maria C. Gallo1, Alberto Martin1 and Angelo Ravelli1. 1Istituto Giannina Gaslini, Genova, Italy, 2University of Genova, Genova, Italy, 3Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

Background/Purpose: The recent advances in the management of juvenile idiopathic arthritis (JIA) have increased considerably the potential to achieve disease remission or, at least, low levels of disease activity, and have consequently moved the therapeutic aims increasingly towards the attainment of an inactive disease (ID) status. Complete disease quiescence is regarded as the ideal therapeutic target because its achievement helps preventing further joint damage and disability and may enhance physical function and quality of life. These issues have lead to suggest that a tight control approach be adopted in the management of children with JIA. We describe our experience with treating JIA patients to specified targets.

Methods: Starting in March 2007, a treat-to-target approach to the management of all children with JIA first seen in the senior author’s clinic was implemented, setting achievement of ID as primary goal and achievement of minimal disease activity (MDA) or parent-acceptable symptom state (PASS) as secondary goal. In case primary goal was not reached, treatment was intensified as deemed necessary. For the purpose of this study, patient records were reviewed to evaluate the frequency of achievement of primary and secondary therapeutic goals at 6, 12, 18 and 24 months following initial evaluation. ID, MDA and PASS were defined according to both established criteria and Juvenile Arthritis Disease Activity Score (JADAS) cutoffs. The outcome of patients who achieved or did not achieve ID at last follow-up visit was compared by means of the Juvenile Arthritis Functionality Scale (JAFS) and the Pediatric Rheumatology Quality of Life scale (PRQL).

Results: A total of 175 patients (77.7% females) were enrolled. The most common ILAR subtypes were persistent oligoarthritis (53.1%), extended oligoarthritis (14.9%), and RF-negative polyarthritis (14.3%). 3.4% of patients had systemic arthritis. The median age at disease onset was 2.8 years. At baseline visit, the median age was 3.5 years and the median disease duration was 0.2 years. Initial therapeutic interventions included intra-articular corticosteroid injection (84%), methotrexate (28%), systemic corticosteroids (5.7%), and biologic medications (1.1%). The frequency of achievement of treatment goals at study endpoints is shown in the table. At last follow-up visit, patients who had achieved ID had better functional ability (p=0.007) and physical well-being (p=0.007) than those who did not. The frequency of clinical remission on medication was 29.2%.

<table>
<thead>
<tr>
<th></th>
<th>6 months</th>
<th>12 months</th>
<th>18 months</th>
<th>24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inactive disease (ID)</td>
<td>50 (35.2)</td>
<td>48 (41)</td>
<td>46 (47.4)</td>
<td>45 (50.6)</td>
</tr>
<tr>
<td>Minimal disease activity (MDA)</td>
<td>62 (43.7)</td>
<td>71 (60.7)</td>
<td>60 (61.9)</td>
<td>53 (59.6)</td>
</tr>
<tr>
<td>Parent-acceptable symptom state (PASS)</td>
<td>76 (66.1)</td>
<td>77 (74.8)</td>
<td>69 (82.1)</td>
<td>53 (70.7)</td>
</tr>
<tr>
<td>JADAS10 ≤ 1 (ID)</td>
<td>43 (31.6)</td>
<td>46 (41.4)</td>
<td>43 (46.2)</td>
<td>33 (39.3)</td>
</tr>
<tr>
<td>JADAS10 ≤ 2.38 (MDA)</td>
<td>51 (37.5)</td>
<td>58 (52.3)</td>
<td>60 (64.5)</td>
<td>40 (47.6)</td>
</tr>
<tr>
<td>JADAS10 ≤ 3.5/4 PASS</td>
<td>64 (47.1)</td>
<td>67 (59.5)</td>
<td>67 (72)</td>
<td>52 (61.9)</td>
</tr>
</tbody>
</table>

Conclusion: At 2 years after initial visit, a substantial percentage of patients had reached the states of ID or MDA or were in PASS. Patients who achieved ID had better physical function and well-being than those who did not. These findings suggest that the implementation of a treat-to-target approach may help improve patient outcomes.

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1174
Severe Adverse Events Associated with Use of Biologic Therapy in Juvenile Idiopathic Arthritis: A Single-Center Study, Ricardo A. G. Russo1 and Maria M. Katsicas2. Hospital de Pediatría Garrahan, Buenos Aires, Argentina, 2Hospital de Pediatría Garrahan, Buenos Aires, Argentina

Background/Purpose: biologic agents have revolutionized the treatment of Juvenile Idiopathic Arthritis (JIA) and other conditions due to their high efficacy and safety. However, with the increased and prolonged use of these agents there is uncertainty regarding adverse events, especially in the long-term. The purpose of this study is to describe and analyze SAEs occurring during biologic therapy in a cohort of patients with JIA.

Methods: unicenter, retrospective longitudinal study based on review of a prospectively built, ad-hoc database and medical records. Observation period was January 2000-December 2011. Demographic data, JIA class, disease duration at start of biologic treatment, time from start of biologic treatment to occurrence of SAEs, type and dosage of biologic agents, total time of biologic therapy, concomitant methotrexate (MTX) and prednisone therapy, system involvement during SAEs, and outcomes were recorded. SAEs were defined as any untoward medical occurrence that occurs during observation and results in death, a life-threatening illness, hospitalization, persistent or significant disability or incapacity, or a medically significant event that jeopardized the health of the patient and required intervention to prevent one of the other outcomes listed.

Results: 218 biologic treatments were administered to 145 RA patients (83 girls: 63 systemic [SJIA], 35 RF, 5 extended oligo and 4 psoriatic). Age at start of biologic therapy: 12 years; disease duration at start of biologic therapy: 30 months. One biologic agent was prescribed to 101 children, 2 (sequentially) to 28, 3 to 11, 4 to 5 and 5 to 2 patients. Biologics used: etanercept (ETA, 136 treatments), infliximab (INF, 29), adalimumab (ADA, 25), tocilizumab (TOC, 12), abatacept (ABA, 10), anakinra (ANA, 5), and rituximab (2). MTX was used in combination with biologic therapy in 172 (79%) cases, prednisone in 80 (37%). Total time of biologic therapy: 4444 months (3342 corresponding to ETA); median duration of each biologic therapy: 13 months. Eighteen SAEs were recorded in 15 children (11 SJIA): 14 infectious (6 varicella zoster), 2 hematologic, 1 systemic autoimmune, 1 anaphylaxis. Symptomatic with macrophage activation syndrome developed in 2 patients. SAEs occurred at 3.5 (median) months after start of biologic therapy. SAEs rate was 4.9 per 100 patient-years. SAEs were observed during ETA (11 episodes, 8% of treatments), TOC (3, 25%), and INF (1, 3%), ADA (1, 4%), ABA (1, 10%), ANA (1, 20%) therapy. Median dose of concomitant MTX was 15 mg/week, prednisone 0 mg. All patients required admission (2 JCAU) and eventually improved after discontinuation of biologics and appropriate therapy. One SJIA patient on ETA developed a lupus-like disease. No malignancy or TB reactivation were observed.

Conclusion: SAEs arising during biologic therapy are infrequently observed in children with JIA They usually appear during the initial months of therapy. Patients with SJIA are at a higher risk of developing SAEs. Varicella zoster is the most common infection. Multicenter studies and international registries may provide evidence on short- and longer-term, comparative safety of different biologics.

Disclosure: R. A. G. Russo, None; M. M. Katsicas, None.

ACR/ARHP Poster Session B
Rheumatoid Arthritis - Human Etiology and Pathogenesis
Monday, November 12, 2012, 9:00 AM–6:00 PM

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Galactosylation, and Not Sialylation, of Immunoglobulin G Is Associated with Improvement of Rheumatoid Arthritis During Pregnancy, Albert Bondt1, Maurice H.J. Selman1, André M. Deelder2, Johanna M.W. Hazes1, Manfred Wuhrer2 and Radboud J.E.M. Dolhain1. 1Erasmus University Medical Center, Rotterdam, Netherlands, 2Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: Rheumatoid arthritis (RA) is known to improve during pregnancy and to flare after delivery [1]. Changes in the glycosylation of immunoglobulin G’s fragment crystallizable (IgG-Fc) have been suggested to play a role in this phenomenon [2]. Animal studies indicate sialylation is the effector of galactosylation mediated immune suppression [3]. In this study technical advances allowed further insight into sialylation, a previously elusive feature. We aim to find new associations between IgG-Fc N-glycosylation (galactosylation and sialylation) and the improvement of rheumatoid arthritis during pregnancy, which can give more insight into RA pathogenesis.

Methods: Sera of RA patients (n=251 pregnancies) and healthy controls (n=32), all participating in a prospective cohort study on RA and pregnancy (PARA study), were collected before conception if possible, during pregnancy, and after delivery. At all time points disease activity (DAS28-CRP) was measured, and medication was recorded. Using a newly developed mass spectrometric method [4] the glycosylation of IgG-Fc glycoepitopes was measured in a subclass specific manner.

Results: In both patients and controls changes in glycosylation of IgG-Fc were observed. In patients IgG1 galactosylation changed from 21.4±1.1 to 64.4±1.0% (mean±SEM); sialylation from 18.7±0.5 to 21.4±0.5%. Similar results were obtained for IgG2/3 and IgG4. Patient galactosylation and sialylation levels are lower compared to controls. Our data show that in patients increased galactosylation, but not sialylation, is associated with lower disease activity. Increased sialylation rates are associated with higher DAS28-CRP.

Conclusion: In contrast to animal studies, in patients increased galactosylation, and not sialylation, is associated with low disease activity. Our data suggest sialylation could partially inhibit the positive effect of galactosylation. These data do not only have implications for understanding the pathogenesis of RA, but may also shed new light on how glycosylation determines the function of IgG. This latter could have major consequences for the development of new monoclonals to treat human disease.

Disclosure: I. Arroyo-Villa, None; M. B. Bautista-Caro, None; A. Balsa, None; P. Aguado, None; L. Nuño, None; G. Bonilla, None; A. Puig-Krüger, None; E. Martin-Mola, None; M. E. Miranda-Carús, None.

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Background/Purpose: Vitamin D (VitD) exerts immunoregulatory activities of potential importance to rheumatoid arthritis and acts by binding to nuclear vitamin D receptors (VDRs) and regulating gene expression including cathecalcin which is an important mediator of host innate responses to infection. VDR genetic polymorphisms (VDP) have been variably linked to disease activity in rheumatoid arthritis and to chronic infections. Altered host response to infection may break tolerance leading to disease. We sought to assess the association of VDR polymorphisms (FokI, BsmI, ApaI, and TaqI) with clinical disease activity at baseline and one year, baseline serum vitD levels, and antibody responses to common pathogens in a cohort of patients with inflammatory arthritis of less than 1 year symptom duration.

Methods: VDR SNPs at the restriction sites BsmI (B/B (T/C)) (rs154410), Apal(A/a (T/G)) (rs7975322), Taq1(T/T (C/T)) (rs731236), FokI (F/F(C/T)) (rs10738158), and Cdx2-GA (rs11888820) were detected by polymerase chain reaction sequencing and analyzed using genotyping (DD vs Dd vs dd), dominant (DD, Dd vs dd), and recessive (DD vs Dd, dd) models. At first visit before DMARD treatment, 250H VitD levels, antibody titers to E Coli and P. mirabilis (IgG, IgA and IgM), and CCP2 antibodies were measured in serum by ELISA. Smoking was assessed by self report and serum cotinine levels. Associations of VDR SNPs with clinical disease activity at baseline and one year and achievement of remission (DAS28CRP (3 variable) <2.6) or EULAR treatment response at one year were tested.

Results: Subjects (n=228) were predominantly female (72%) and Caucasian (87%), with mean age at first visit of 47.8 years (range 17–82, SD 14), a mean DAS28CRP (3 variable) (baseline) 3.91 (1.35), and at one year had higher DAS28CRP (3 variable) scores (2.92 vs 2.44 p<0.05) and were less likely to achieve remission (41% vs 73% p<0.01). In multivariate models including CCP2, rheumatoid factor, shared epitope smoking (ever), and baseline serum VitD, only lower baseline DAS28CRP (3 variable) (p=0.001), FokI recessive alleles (f) (p=0.01) and higher IgM.E.Coli titers (p<0.05) predicted remission at one year.

Conclusion: Vitamin D receptor polymorphisms, especially FokI, associate with immune responses to common pathogens and associate with disease outcome in EIA but do not associate with baseline disease activity. Vitamin D receptor mediated regulation of immune responses may be important for the predisposition to inflammatory arthritis by breaking immune tolerance.

Disclosure: C. A. Hitchen None; L. Larcombe None; N. Moorkherjee None; C. A. Peschken None; M. M. Newkirk None; H. S. El-Gabalawy None.

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IL-6 and IL-21 in Rheumatoid Arthritis. Gustavo Carbone 1, Augusta Wilson 1, Sean Diehl 1, Janice Bunn 1, Sheldon Cooper 1 and Mercedes Rincon 1. 1University of Vermont College of Medicine, Burlington, VT, 2University of Vermont College of Medicine, Burlington, Vermont, 3Univ Vermont College of Med, Burlington, VT

Background/Purpose: Interleukin-6 (IL-6) levels are known to be increased in patients with rheumatoid arthritis (RA). Tocilizumab, a monoclonal antibody to the IL-6 receptor (IL-6R), reduces disease activity in RA, although its mechanisms of action remain unclear. IL-6 has been shown to regulate cytokine production by CD4 T cells in RA patients. We determined if treatment with tocilizumab altered the phenotype and cytokine production by RA CD4 T cells after incubating with RA patient PBMC. Moreover, GST-talin fusion protein was cleaved into the short-talin after incubating with RA patient PBMC lysate, but was not cleaved when GCN PBMC lysate. Surprisingly, Western Blot analysis using H-18 also showed predominant expression of the 32kDa short-talin in RA patient plasma. findings suggest that the intracellular talin in RA patients is cleaved into short-talin and expressed predominantly in RA patient PBMC and plasma (Fig.3). This short-talin might be related to the pathogenesis of RA.

Disclosure: K. Tsuzaka None; M. Takaoka None; N. Shinozaki None; J. Nishida None.

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Vitamin D Receptor Polymorphisms Are Associated with Clinical Outcomes and IgM Responses to Common Pathogens but Not Baseline IL-6 Production. Tony R. Merriman 1, Nicola Dalbeth 1, Andrew Harrison 1, John Highton 1, Lisa K. Stamp 1, Malcolm D. Smith 1, Benedicte A. Lie 2, Tore K. Kven 2, Timothy Radstake 3, Marieke J.H. Coenen 3, Barbara Franke 3, Jasper Broen 3, Piet Van Riel 3, Malcolm T. Konhjemmet 1 and Wan Rohani Wan Taim 3. 1University of Otago, Dunedin, New Zealand, 2University of Auckland, Auckland, New Zealand, 3Rheumatology, Adelaide, Australia, 4Oslo University Hospital, Oslo, Norway, 5Radboud University Nijmegen Medical Centre, University Medical Center Utrecht, Nijmegen, Utrecht, Netherlands, 6Radboud University Nijmegen Medical Centre, Nijmegen, Nijmegen, Netherlands, 7De partment of Rheumatology & Clinical Immunology, University Medical Center Utrecht, Utrecht, Netherlands, 8The Sloane Ct East Flat 7, London, United Kingdom, 9Universiti Sains Malaysia, Malaysia

Background/Purpose: Vitamin D (VitD) exerts immunoregulatory activities of potential importance to rheumatoid arthritis and acts by binding to nuclear vitamin D receptors (VDRs) and regulating gene expression including cathelicadin which is an important mediator of host innate responses to infection. VDR genetic polymorphisms (VDP) have been variably linked to disease activity in rheumatoid arthritis and to chronic infections. Altered host response to infection may break tolerance leading to disease. We sought to assess the association of VDR polymorphisms (FokI, BsmI, ApaI and TaqI) with clinical disease activity at baseline and one year, baseline serum vitD levels, and antibody responses to common pathogens in a cohort of patients with inflammatory arthritis of less than 1 year symptom duration.

Methods: VDR SNPs at the restriction sites BsmI (B/B (T/C)) (rs154410), Apal(A/a (T/G)) (rs7975322), Taq1(T/T (C/T)) (rs731236), FokI (F/F (C/T)) (rs10738158), and Cdx2-GA (rs11888820) were detected by polymerase chain reaction sequencing and analyzed using genotyping (DD vs Dd vs dd), dominant (DD, Dd vs dd), and recessive (DD vs Dd, dd) models. At first visit before DMARD treatment, 250H VitD levels, antibody titers to E Coli and P. mirabilis (IgG, IgA and IgM), and CCP2 antibodies were measured in serum by ELISA. Smoking was assessed by self report and serum cotinine levels. Associations of VDR SNPs with clinical disease activity at baseline and one year and achievement of remission (DAS28CRP (3 variable) <2.6) or EULAR treatment response at one year were tested.

Results: Subjects (n=228) were predominantly female (72%) and Caucasian (87%), with mean age at first visit of 47.8 years (range 17–82, SD 14), a mean DAS28CRP (3 variable) (baseline) 3.91 (1.35), and at one year had higher DAS28CRP (3 variable) scores (2.92 vs 2.44 p<0.05) and were less likely to achieve remission (41% vs 73% p<0.01). In multivariate models including CCP2, rheumatoid factor, shared epitope smoking (ever), and baseline serum VitD, only lower baseline DAS28CRP (3 variable) (p=0.001), FokI recessive alleles (f) (p=0.01) and higher IgM.E.Coli titers (p<0.05) predicted remission at one year.

Conclusion: Vitamin D receptor polymorphisms, especially FokI, associate with immune responses to common pathogens and associate with disease outcome in EIA but do not associate with baseline disease activity. Vitamin D receptor mediated regulation of immune responses may be important for the predisposition to inflammatory arthritis by breaking immune tolerance.

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The Sex-Determining Region Y Box 6 Locus: Shared Genetic Susceptibility Between Rheumatoid Arthritis and Psychiatric Disease. Nicola Dalbeth 1, Andrew Harrison 2, John Highton 2, Lisa K. Stamp 2, Malcolm D. Smith 2, Benedicte A. Lie 3, Tore K. Kven 3, Timothy Radstake 4, Marieke J.H. Coenen 4, Barbara Franke 4, Jasper Broen 4, Piet Van Riel 4, Malcolm T. Konhjemmet 5 and Wan Rohani Wan Taim 6. 1University of Otago, Dunedin, New Zealand, 2University of Auckland, Auckland, New Zealand, 3Hutt Hospital, Lower Hutt, New Zealand, 4Univ of Otago Med Sch, Dunedin, New Zealand, 5University of Otago, Christchurch, Christchurch, New Zealand, 6Rheumatologist, Adelaide, Australia, 7Oslo University Hospital, Oslo, Norway, 8Dia- konenhemmet Hospital, Oslo, Norway, 9Radboud University Nijmegen Medical Centre, University Medical Center Utrecht, Nijmegen, Utrecht, Netherlands, 10Radboud University Nijmegen Medical Centre, Nijmegen, Nijmegen, Netherlands, 11Department of Rheumatology & Clinical Immunology, University Medical Center Utrecht, Utrecht, Netherlands, 12The Sloane Ct East Flat 7, London, United Kingdom, 13Universiti Sains Malaysia, Malaysia

Background/Purpose: Rheumatoid arthritis (RA) is a common autoimmune disease and schizophrenia (SZ) is a common psychotic disorder. There is an established negative association between RA and SZ, with some evidence for a similar relationship in bipolar disorder (BDP) (Okken and SchafKühn, Lancet 2013). We hypothesized that the genetic relationship is determined by disease-specific mutually-exclusive (genetic and environmental) factors that provide input into a common pathway, driving disease progression in both the brain and immune system. An allele confer-
ring susceptibility to RA will stimulate the hypothetical disease-causing pathway in the immune system, but will protect from SZ by preventing activation of the pathway in the brain, and vice versa. Our hypothesis predicts a molecular pathway(s) containing shared genetic risk variant(s) driving the pathogenesis of both diseases.

Methods: We exploited genome-wide association scan (GWAS) data by comparing the top 1000 associations from the Genetic Association Information Network (GAIN) SZ dataset and the Wellcome Trust Case Control Consortium (WTCCC) RA dataset for candidate SNPs associated with both RA and SZ in the same direction of association. Replication in RA was done over Australasian, UK, Dutch and Norweigan Caucasian case-control sample sets (3753 cases and 3084 controls) using TaqMan technology. For psychotic disorder, replication was done in silico from publicly-available non-GA data on 373 cases and 729 controls.

Results: SNP rs900865 from the chromosome 11 INS-COX6 region fitted the selection criteria of consistent direction of association (OR=1.14, P=0.002 in WTCCC RA and OR=1.22, P=5×10^-4 in GAIN SZ). In replication there was evidence for association in both the meta-analyzed RA replication dataset (OR=1.09, P=0.009) and in the combined SZ/BPD replication dataset (OR=1.09, P=0.004). Meta-analysis of all datasets (psychotic disease datasets GAIN Sz, non-GAIN Sz and BPD; and RA datasets Australasian, UK, Dutch, Norwegian and WTCCC) provided evidence of association with rs900865 at the genome-wide level of significance (OR=1.11, P=1.8×10^-5).

Conclusion: We conclude that the minor allele (C) of SNP rs900865 confers susceptibility to both RA and psychotic disease. The SNP maps between INS-COX6 (sex-determining region X; Y box 6) genes. INS-C is not well characterized, but is known to be involved in retinal development. SOX6 encodes a transcriptional factor that plays a role in a number of cell developmental processes including development of the central nervous system and human skeletal development (chondrogenesis), and is expressed in both the immune and central nervous systems. Whilst the mechanism is unclear, our data do suggest a genetic relationship between RA and psychosis, perhaps in a common signaling pathway.

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The Role of α-Defensin-1 and Its Signal Transduction Mechanisms in the Production of IL-6, IL-8 and MMPs in Rheumatoid Fibroblast-Like Synoviocytes. Joong Kyong Ahn 1, Bo Huang 2, Eun-Jung Park 2, Jiwon Hwang 1, M. J. H. Coenen 1, C. H. Jeon 2, Hsiao-Chun Chang 2, Weiya Zhang 1 and Michael Doherty1.

1Kangbuk Samsung hospital, Sungkyunkwan University School of Medicine, Kangbuk Samsung hospital, Sungkyunkwan University School of Medicine, Seoul, South Korea, 2Chang Gung Memorial Hospital, Taoyuan, Taiwan, 2Chang Gung University, Taoyuan, Taiwan, 3St. Thomas’ Hospital, King’s College London, London, United Kingdom

Background/Purpose: Fibroblast-like synoviocytes (FLS) play an essential role in the pathophysiology of rheumatoid arthritis (RA). Also, neutrophils are the most abundant cell type of synovial fluid (SF) in flare-up of RA patients, suggesting that this cell plays an important role in overt inflammation in RA. α-defensin-1 is released into the extracellular milieu from neutrophils during inflammation. However, little is known of the role of α-defensin-1 in RA. We investigated the effect of α-defensin-1 on the expression of IL-6, IL-8, and MMPs and the signal transduction mechanisms responsible for these expressions in RA FLS.

Methods: The concentrations of SF α-defensin-1 from 51 RA patients and OA patients were measured using ELISA. In rheumatoid FLS, IL-6, IL-8, and MMPs mRNA expression was examined using real-time PCR. The activation of signaling molecules was evaluated by Western blotting and EMSA.

Results: SF α-defensin-1 concentration was significantly increased in RA patients compared to OA patients (39.3±3.5 vs. 18.0±5.6 ng/ml, p=0.002). IL-6, IL-8, and MMP-3 mRNA expressions were significantly increased in RA FLS after α-defensin-1 stimulation compared to control (n=5) (all p<0.05). JNK and ERK were significantly phosphorylated in FLS stimulated with α-defensin-1 compared to control (n=3) (25.2±3.4-fold, p=0.008 and 1.42±0.24-fold, p=0.05, respectively), while no significant change was found in p38 activity. Treatment of RA FLS with ERK inhibitor prior to α-defensin-1 stimulation significantly resulted in approximately 71% and 98% reduction, respectively, in IL-6 and MMP-1 production compared with control (p<0.05 for each). Blocking JNK pathway significantly suppressed α-defensin-1-induced MMP-1 production by approximately 73% compared with control (p<0.01). α-defensin-1-induced IL-8 expression was reduced by approximately 68% and 52% by inhibition of ERK and JNK, respectively. Also, α-defensin-1-induced MMP-3 expression was reduced by approximately 22% and 50% by ERK and JNK inhibitor, respectively. However, these differences did not reach statistical significance. In addition, there was a significant induction of NF-κB DNA binding activity in response to the stimulation of α-defensin-1 in rheumatoid FLS.

Conclusion: Our results are notable to suggest that increased SF α-defensin-1 released mainly by neutrophils can induce the expression of IL-6 and MMP-1 in rheumatoid FLS and these processes were dependent on the regulation of JNK and/or ERK and NF-κB pathway. These data provide new insight regarding the mechanism by which α-defensin-1 participates in joint inflammation and destruction in RA.

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1University of Nottingham, Nottingham, United Kingdom, 2Chang Gung Memorial Hospital, Taoyuan, Taiwan, 3Chang Gung University, Taoyuan, Taiwan, 4St. Thomas’ Hospital, King’s College London, London, United Kingdom

Background/Purpose: The present study was to estimate the familial relative risk (RR) of rheumatoid arthritis (RA) in individuals with affected first-degree relatives compared to individuals with no affected first-degree relatives. We also estimated the heritability to assess the magnitude of genetic contribution to susceptibility to RA.

Methods: Using data from the National Health Insurance Research Database in Taiwan, we conducted a nationwide cross-sectional study of data collected from 11,449,138 men and 11,800,070 women in 2010. RA cases were those receiving a catastrophic illness certificate for RA. The identification of first-degree relatives of each individual was determined using the NHIRD registry for beneficiaries. This specifies relationships between the insured person who paid the insurance fee and his/her dependents, allowing first-degree relatives (father, mother, son, daughter, brother, sister, twin) to be identified directly. Full siblings were identified as individuals who shared the same parents. Twins were full siblings who shared the same date of birth. The marginal Cox proportional hazard model with an equal follow-up time, adjusting for age and sex, was used to estimate RR (95% confidence interval [95% CI]) of RA in individuals with affected first-degree relatives. This model was used to account for shared environment and case clustering within families with robust variance. Heritability was estimated using multifactorial polygenetic model.

Results: There were 8,010 men (0.07%) and 30,200 women (0.26%) who had RA catastrophic illness certificate in 2010. The prevalence of RA was higher in individuals with affected first-degree relatives (0.51%) than those without (0.16%). The overall familial RR was 4.79 (95% CI, 4.08-5.63). An individual’s risk for RA varied depending on which of their family members were affected. The RRNs (95% CIs) for an individual with an affected twin, sibling, offspring and parent were 20.95 (6.59-66.62), 8.93 (5.59-14.27), 4.46 (3.63-5.47) and 4.60 (3.90-5.44), respectively. The RR (95% CI) increased with the number of affected first-degree relatives, from 4.65 (3.95-5.46), 44.46 (18.90-3.09) and 118.34 (13.11-1068.55) for one, two or three or more affected relatives. The heritability of RA was 0.54 (95% CI, 0.42-0.67).

Conclusion: This population-based study confirms that RA aggregates within families and the heritability of RA is high. Genetic predisposition contributes to a significant proportion of RA development.

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Podoplanin-Mediated Interaction of Rheumatoid Arthritis Synovial Fibroblasts with Platelets Modulates IL-8 Expression. Manuel J. Del Rey1, Elena Izquierdo1, Regina Fare1, Alicia Usategui1, Vanessa Miranda1, Gabriel Criado1, J. D. Cañete1 and Jose L. Pablos1. Instituto de Investigación Hospital 12 de Octubre (I+12), Madrid, Spain, Hospital Clínico de Barcelona, Barcelona, Spain

**Background/Purpose:** Synovial fibroblasts (SF) are the most abundant resident stromal cells in the synovium. In rheumatoid arthritis (RA), SF expand and undergo phenotypic changes that contribute to the pathogenesis of chronic arthritis. Among these changes, expression of podoplanin, a membrane protein expressed by normal lymphatic endothelium and cancer cells, has been reported (Ekwall, Arthritis Res Ther 2011). Podoplanin is up-regulated on the invasive front of tumors and participates in tumor cell migration. The only known specific receptor for podoplanin is the platelet membrane signaling protein CLEC-2. We have analyzed the expression and potential functions of podoplanin in rheumatoid arthritis synovial fibroblasts (RASF).

**Methods:** Podoplanin expression was analyzed by immunohistochimistry (IHC), immunofluorescence labeling (IF), quantitative real-time polymerase chain reaction (qrt-PCR) and flow cytometry in synovial tissue and SF cultures from RA and osteoarthritis (OA) patients and healthy donors. Podoplanin RASF expression was silenced with podoplanin specific and control siRNA lentiviral expression vectors. Transduced cells were used in RASF-cartilage co-culture experiment to measure cartilage glycosaminoglycan degradation products in supernatants (Blyscan Assay; Biocolor, Northern Ireland, UK). Matrigel invasion and in vitro wound healing assays were performed to evaluate migration capability of silenced fibroblasts. Finally, silenced RASF were co-cultured for 24h with human platelets prepared from healthy donors and RASF RNA was extracted to quantify IL-6, IL-8, MCP-1, MMP-1 and MMP-3 mRNA expression by qrt-PCR. Quantitative data from at least three independent experiments were analyzed by Mann-Whitney U-test or t-test as required and p-value<0.05 was considered significant.

**Results:** Abundant podoplanin expression was detected by IHC in synovial lining and sublining fibroblasts in RA biopsies (n=40) whereas minimal or absent expression was observed in OA (n=15) or healthy synovium (n=6) respectively. Cultured SF displayed abundant podoplanin membrane expression irrespective of their source (RA, OA or healthy synovium). Treatment of cultured SF with TNF-α induced up-regulation of podoplanin mRNA and protein expression, as determined by qRT-PCR and flow cytometry. Podoplanin expression was effectively down-regulated by specific siRNA lentiviral transduction. Cell migration in matrigel and wound healing assays and ex vivo cartilage degradation were not modified in RASF transduced with podoplanin siRNA compared to RASF transduced with scrambled control siRNA. Co-culture of RASF with platelets induced a significant increase in IL-6 and IL-8 but no MCP-1, MMP-1 or MMP-3 mRNA expression in RASF. siRNA podoplanin silencing in RASF blocked the expression regulation of IL-6 but not IL-6 mRNA expression in response to platelet co-culture.

**Conclusion:** Our results confirm previous data on the up-regulation of podoplanin in RASF. Functional studies do not support a role for podoplanin on RASF migratory and invasive properties as reported in cancer cells. Podoplanin is potentially involved in the pro-inflammatory response that results from RASF-platelet interaction.

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Negative Association Between Testosterone Levels and Risk of Future Rheumatoid Factor Negative Rheumatoid Arthritis in Men. Mitra Pikwer1, Aleksander Giwercman2, Ulf Bergström1, Jan-Åke Nilsson1, Lennart Nilsen1, T.H. Jacobsson1 and Carl Turesson1. 1Lund University, Malmö, Sweden, 2VA Sacramento Medical Center, UC Davis School of Medicine, Mather, CA.

**Background/Purpose:** Fibroblast like synoviocytes (FLS) and T lymphocytes are considered as major effector cells in the pathogenesis of autoimmune arthritis. FLS and T lymphocytes (T lymphocytes) are activated by mediators of inflammation and are key players in the pathogenesis of RA. FLS can be activated by cytokines and growth factors to produce pro-inflammatory cytokines, chemokines, and growth factors, which contribute to the pathogenesis of RA. We have previously demonstrated that FLS and T lymphocytes are co-cultured in synovial tissue. We hypothesized that FLS and T lymphocytes are co-cultured in synovial tissue and that the interaction of FLS and T lymphocytes plays a role in the pathogenesis of RA.

**Methods:** We analyzed the interaction of FLS and T lymphocytes in synovial tissue of RA patients. FLS and T lymphocytes were co-cultured in a 3D culture system and the interaction was analyzed by immunofluorescence and confocal microscopy. We also analyzed the interaction of FLS and T lymphocytes in vitro using a co-culture system. We used FLS and T lymphocytes isolated from RA patients and healthy controls.

**Results:** We found that FLS and T lymphocytes are co-cultured in synovial tissue of RA patients. FLS and T lymphocytes are co-cultured in synovial tissue and that the interaction of FLS and T lymphocytes plays a role in the pathogenesis of RA. We also found that FLS and T lymphocytes are co-cultured in vitro using a co-culture system. We used FLS and T lymphocytes isolated from RA patients and healthy controls.

**Conclusion:** Our results indicate that FLS and T lymphocytes are co-cultured in synovial tissue of RA patients. FLS and T lymphocytes are co-cultured in synovial tissue and that the interaction of FLS and T lymphocytes plays a role in the pathogenesis of RA. We also found that FLS and T lymphocytes are co-cultured in vitro using a co-culture system. We used FLS and T lymphocytes isolated from RA patients and healthy controls.

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Regulatory Role of 1, 25 Dihydroxyvitamin D3 in the Pathogenesis of Autoimmune Arthritis. Siba P. Raychaudhuri1, Ananya Datta Mitra2, Anupam Mitra1, Christine Abria3 and Smriti K. Raychaudhuri2. 1VA Sacramento Medical Center, UC Davis School of Medicine, Mather, CA, 2VA Sacramento Medical Center, Mather, CA.

**Background/Purpose:** 1, 25 Dihydroxyvitamin D3 (1,25D) is an active metabolite of Vitamin D3 and induces immunomodulatory effects in cells. It is known to have anti-inflammatory and anti-proliferative effects in various cell types, including FLS and T lymphocytes. The role of 1,25D in the pathogenesis of autoimmune arthritis is not well understood.

**Methods:** We used FLS and T lymphocytes isolated from autoimmune arthritis patients and healthy controls. FLS and T lymphocytes were stimulated with 1,25D and the effects on proliferation and cytokine production were analyzed by MTT and ELISA, respectively.

**Results:** We found that 1,25D significantly inhibited the proliferation of FLS and T lymphocytes in a dose-dependent manner. This inhibition was accompanied by a significant decrease in IL-6 and TNF-α production by FLS and T lymphocytes.

**Conclusion:** Our results suggest that 1,25D has an inhibitory effect on the proliferation and cytokine production of FLS and T lymphocytes, which may play a role in the pathogenesis of autoimmune arthritis. Further studies are needed to understand the mechanisms by which 1,25D regulates FLS and T lymphocyte function in autoimmune arthritis.

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proliferation (11.21 ± 2.28 vs. 17.54 ± 2.48%, p<0.01) (Figure 2A). We also observed that Vit D significantly induced apoptosis (Annexin V+ PI-) of T lymphocytes (26.1 ± 2.05% vs. 3.28 ± 0.17%, p<0.001) (Figure 2B).

**Background/Purpose:** Recent genome-wide association studies have disclosed several single nucleotide polymorphisms (SNPs) associated with rheumatoid arthritis (RA) susceptibility. Among them, it is reported that the SNP of tumor necrosis factor (TNF) receptor-associated factor 1 (TRAF1) (+16860A/G) is associated with pathophysiology of RA in both Asians and Caucasians. Therefore, in this study, we assessed the usefulness of TRAF1 genotyping as a genetic predictor of the response to anti-TNF treatments in Japanese RA patients, and examined an underlying mechanism of the association between TRAF1 polymorphism and the clinical response to anti-TNF treatments.

**Methods:** TRAF1 (+16860A/G) was genotyped using TaqMan® SNP genotyping assay. 101 Japanese RA patients were enrolled, and retrospectively analyzed the association between the SNP and the clinical response to treatment with anti-TNF drugs as a first biologic agent, such as infliximab, etanercept and adalimumab. The clinical response was assessed by the 28-joint Disease Activity Score (DAS28)-ESR response criteria at 24 weeks after the initiation of anti-TNF treatments. To investigate the effect of the SNP on the expression of TRAF1, CD4+, CD8+, CD14+ or CD19+ cells were isolated using magnetic activated cell sorting from peripheral blood mononuclear cells obtained from healthy subjects with AA (n=6), AG (n=6), or GG (n=3) genotype, and then the mRNA expression of TRAF1 in CD4+, CD8+, CD14+ or CD19+ cells were evaluated by TaqMan™ quantitative RT-PCR. The expression of TRAF1 was evaluated by intracellular staining in combination with staining for CD4, CD8, CD14 or CD19 using flowcytometry.

**Results:** In 101 RA patients received anti-TNF treatments, 63 (62.4%), 28 (27.7%), and 10 (9.9%) patients achieved good, moderate, and no response, respectively. There was no statistical difference in DAS28-ESR at baseline among each patient group with AA, AG, or GG genotype. However, the relative change in DAS28-ESR from baseline to 24 weeks after the initiation of anti-TNF treatments tended to be decreased in patients with GG genotype compared to those with AA or AG genotype (1.27 versus 2.16, P=0.057). GG genotype was more frequently detected in patients with no response compared to those with good or moderate response (30.0% versus 5.5%, P=0.031, OR 7.4, 95%CI 1.5–37.5). Patients with no response more frequently possessed G allele than those with good or moderate response (55.0% versus 25.8%, P=0.006, OR 3.5, 95%CI 1.4–9.0). Quantitative RT-PCR revealed that mRNA expression of TRAF1 was highly expressed in CD8+ or CD14+ cells with AG or GG genotype compared to those with AA genotype (P=0.045). Flowcytometric analysis also showed that the expression of TRAF1 tended to be increased in CD14+ cells with AG or GG genotype compared to those with AA genotype (p = 0.09).

**Conclusion:** TRAF1 (+16860A/G) is possibly useful for prediction of the clinical response to anti-TNF treatments, and may contribute to resistance to anti-TNF treatments in RA patients with GG allele via increased expression of TRAF1 in circulating inflammatory cells.

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**A Single Nucleotide Polymorphism of Tumor Necrosis Factor Receptor-Associated Factor 1 Predicts Clinical Response to Anti-Tumor Necrosis Factor Treatments in Japanese Patients with Rheumatoid Arthritis.**

Tetsuya Nishimoto1, Noriyuki Seta1, Ryuuseki Anan1, Tatsuya Yamamoto1, Yuko Kaneko2, Masataka Kuwana1 and Tsutomu Takeuchi3. 1Keio university, Tokyo, Japan, 2Keio Univ School of Medicine, Shinjuku-ku, Japan, 3Keio University School of Medicine, Tokyo, Japan

**Background/Purpose:** Smoking is a major risk factor for rheumatoid arthritis (RA) and has been associated with increased disease severity and lower rates of disease remission. We hypothesized that levels of disease activity would be associated with smoking status and this would be related to levels of anti-citrullinated protein antibodies (ACPA) and/or serum cytokines.

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**Smoking Status Is Associated with Inflammatory Cytokine Profile and Disease Activity in Anti-Citrullinated Protein Antibody Positive Rheumatoid Arthritis: Decreased Inflammation and Disease Improvement with Smoking Cessation?**

Catrina Cram1, Jeremy Sokolove2, Geoffrey M. Thiele3, Gail S. Kerr4, Grant W. Cannon5, Andreas M. Reimold6, Ted R. Mikuls7 and William H. Robinson8. 1VA Palo Alto Health Care System and Stanford University, Palo Alto, CA, 2VA Palo Alto Health Care System and Stanford University, Palo Alto, CA, 7Univ of Nebraska Med Ctr, Omaha, NE, Washington DC VAMC and Georgetown University, Washington, DC, 4Salt Lake City VA and University of Utah, Salt Lake City, UT, 5Salt Lake City VA and University of Texas Southwestern, Dallas, TX, 6Dallas VA and University of Nebraska Medical Center, Omaha, NE, 8Stanford University, Palo Alto, CA

**Background/Purpose:** This demonstrates showed that Vit D has a regulatory role in pannus formation by exerting anti-proliferative effect on two major effector cells of AA such as FLS and T lymphocytes. Moreover the pro-apoptotic effect of Vit D on activated T lymphocytes further suggests its immunomodulatory effect in AA.

**Conclusion:** These demonstrated showed that Vit D has a regulatory role in pannus formation by exerting anti-proliferative effect on two major effector cells of AA such as FLS and T lymphocytes. Moreover the pro-apoptotic effect of Vit D on activated T lymphocytes further suggests its immunomodulatory effect in AA.

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Methods: The Veterans Affairs RA (VARA) registry was initiated in 2003 with routine collection of clinical demographics including disease activity score (DAS28) as well as baseline serum sampling. 1468 veterans with RA were included in the current study (76.9% anti-CCP2+, 90.7% male, mean age median age 63 (IQR 57–72), Median disease duration 8.45 years (IQR 2.8–18). Baseline serum samples were evaluated for levels of 19 distinct ACtPA and 17 cytokines using the BioPlex platform on the Luminex 200 instrument. Smoking status was recorded as current, former, or never smoker. We evaluated the association of smoking status with disease activity (DAS28) by ANOVA and with levels of ACtPA and cytokines using significance analysis of microarray (SAM) and output sorted based on false discovery rates (FRDs) in order to identify cytokines or autoantibodies with the greatest difference between different categories of smoking status.

Results: RA disease activity was significantly higher among current compared with former or never smokers (P<0.01). Among anti-CCP2 positive patients, levels of several cytokines associated with RA pathogenesis including TNF, IL-17, IFNγ, GM-CSF, MCP-1, IL-2, and IL-7 were found to be significantly higher among current smokers compared with both former and non-smokers (FDR (q-value) <0.1%). Cytokine levels were similar between former and never smokers. Notably, levels of many ACtPA were higher among current compared with never smokers, but similar between current and former smokers. Though number of subjects was smaller, the effect of smoking status on cytokine profile was not observed in the anti-CCP2 negative population.

Conclusion: Among anti-CCP2 positive RA patients, current smoking status is strongly associated with increased RA disease activity as well as elevation in several serum cytokines. This effect does not seem to be related to level of ACtPA. The observation that higher levels of DAS28 and serum cytokines was only seen in current, and not former, smokers suggests that the effect of smoking may be minimized by smoking cessation. The effect of smoking cessation on RA disease activity should be evaluated in a prospective manner and multiplex cytokine profiling may provide a surrogate endpoint for efficacy of this intervention.

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Fibrinogen Induced Inhibition of Osteoclastogenesis Is Reversed by Citrullination of Fibrinogen by Peptidylarginine Deiminase. Eun Young Lee1, Ji Soo Kim1, Hye Won Kim1, Sung Hae Chang1, Jin-Su Song2, Ji Soo Kim1, Hye Won Kim1, Sung Hae Chang1, Jin-Su Song2

Background/Purpose: In rheumatoid arthritis (RA) patients, increased levels of citrullinated fibrinogen, which are abundant in RA, on the in vitro osteoclastogenesis.

Methods: Fibrinogen (human and bovine; 1mg/ml) was citrullinated in vitro by reactivity with rabbit skeletal muscle peptidylarginine deiminase (rmPAD2). Soluble fibrinogen, citrullinated or non-citrullinated, were applied with increasing doses to buffy coat-derived CD14+ cells, and osteo-clastogenesis was induced in the presence of M-CSF (20 ng/ml) and RANKL (40 ng/ml). To confirm a migration shift due to citrullination, western blotting was performed. The citrullinated sites of fibrinogen were analyzed using mass spectrometry.

Results: Fibrinogen inhibited osteoclastogenesis in a dose-dependent manner. In contrast, citrullinated fibrinogen via rmPAD2 did not show inhibition of osteoclastogenesis, which were evident with non-citrullinated fibrinogen (Figure). Several osteoclastogenesis related genes, especially DC-STAMP, were suppressed by fibrinogen during osteoclastogenesis, but restored by citrullinated fibrinogen. Citrullination of fibrinogen was confirmed by Western blot analysis and Mass spectrometry, showing peak changes between citrullinated and non-citrullinated fibrinogen at 1576 and 1593 m/z. Western blot with anti-citrullinated antibody showed that proteins from RA synovial fluid were more citrullinated that those from osteoarthritides (OA) synovial fluid.

Conclusion: Fibrinogen was successfully citrullinated by PAD and confirmed by Western blot and Mass spectrometry. In contrast to fibrinogen, citrullinated fibrinogen did not show inhibition of osteoclastogenesis. These results may suggest that citrullinated fibrinogen can contribute to osteoclas-togenesis in RA patients.

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Stromal Cell Markers in the Synovial Tissue of Patients with Early Arthritis and Preclinical Rheumatoid Arthritis. Yuen Kei Choi1, Olga N. Karpea, Paul Peter Tak2, Jörg Hamann1, Christopher D. Buckley3, Andrew Filer4 and Danielle M. Gerlag1. 1Academic Medical Center, Amsterdam, Netherlands, 2Division of Clinical Immunology and Rheumatology, Department of Experimental Immunology, Academic Medical Center/University of Amsterdam and GlaxoSmithKline, Amsterdam, Netherlands, 3School of Immunity and Infection, MRC Center for Immune Regulation, Birmingham, United Kingdom, 4Rheumatology Department, Birmingham, United Kingdom

Background/Purpose: Stromal cells in synovial tissue (ST) of patients with arthritis may have an important role in the initiation and persistence of the inflammatory infiltrate. Previous studies showed increased expression of stromal markers in ST of patients with established rheumatoid arthritis (RA) (Maia et al, Arthritis Rheum 2010:62:3595; Ekwall et al, Arthritis Res Ther 2011:13:R40). Here we investigated the expression of CD248, gp38, CD55 and PDI in early arthritis in relationship to diagnosis and outcome. Furthermore, these markers were tested in the ST of individuals without clinically apparent arthritis who are at risk for developing RA.

Methods: Forty-seven patients with early inflammatory arthritis (<1 year disease duration) and 19 IgM rheumatoid factor and/or anti-citrullinated peptide antibody (ACPA) positive individuals with arthralgia but without arthritis were included in this study. Of the latter group, 9 individuals developed arthritis after a mean follow-up time of 3.4 years. In the early arthritis cohort, patients were diagnosed at baseline and at 2 years follow up as gout (n = 10), psoriatic arthritis (PsA, n = 9), undifferentiated arthritis (UA-UA, n = 10), UA-RA (n = 4) and RA-RA (n = 14). Patients were also classified based on diagnostic outcome after 2 years into self-limiting, persistent non-erosive and persistent erosive disease. Synovial tissue was obtained by miniarthroscopy and analyzed by immunofluorescence to detect CD248, gp38, CD55 and PDI on stromal cells. Slides were examined by confocal microscopy. Expression was quantified as pixel/um². Kruksal-Wallis test and Mann-Whitney U test were used for statistical analysis. A P-value <0.05 was considered statistically significant.

Results: We observed clear expression of CD248, gp38, CD55 and PDI in ST of patients with early arthritis, independent of diagnosis or outcome (table 1). In the autoantibody positive subjects at risk of developing RA, the expression of gp38 was lower compared to early RA (p = 0.0025). Expression levels were not different between individuals who developed RA after follow up (n = 9) compared to those who did not (n = 10).
Conclusion: The stromal cell markers CD248, gp38, PDI and CD55 are all expressed in the earliest stages of clinical arthritis, independent of the diagnosis and outcome after follow up. In preclinical gpl3 is lower compared to early RA. Stromal markers seem to be expressed in a stable way in the ST during the development from being at risk of RA to early RA.

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Fine Specificity of Anti-Citrullinated Peptide Antibodies Discloses a Heterogeneous Antibody Population in Rheumatoid Arthritis (RA). John D. Goules, Andreas V. Goules and Athanasios G. Tzioufas. School of Medicine, National University of Athens, Athens, Greece

Background/Purpose: Anti-citrullinated protein antibodies (ACPA) are highly specific for the diagnosis of patients with RA. However, the predominant B cell epitopes have not yet been defined. The aim of this study was to examine in parallel the individual ACPA antibodies against different peptides derived from citrullinated proteins and investigate whether these antibodies constitute a homogeneous population.

Methods: Sera from patients with RA (n = 141), systemic lupus erythematosus (n = 60), Sjögren’s syndrome (n = 54), and healthy controls (n = 100) were tested for their reactivity against 6 citrullinated peptides (pep#2/pep#7) derived from peptides citrullinated arginine (PAD), vimentin, alpha-enolase, fibrin, type II collagen and filagrin respectively. A non citrullinated-control peptide derived from PAD was used as control (pep#1). Antibody reactivity was evaluated for each individual peptide by ELISA. Third generation anti-cyclic citrullinated peptide (anti-CCP3) antibodies were also determined. Specificity and sensitivity for anti-peptide antibodies were tested by homologous and cross inhibitions assays. Cross reactivity between anti-peptide antibodies was evaluated, after affinity purification, by cross-inhibitions assays.

Results: Sera from patients with RA reacted diversely with the six citrullinated peptides. More specifically, pep#2 PAD (210–230aa) displayed 29.08% sensitivity, pep#3 vimentin (60–75aa) 29.08%, pep#4 alpha-enolase (5–21aa) 37.59%, pep#5 fibrin (617–631aa) 31.21%, pep#6 type II collagen (358–375aa) 29.97% and pep#7 filagrin (306–324aa) 28.37% while control pep#1 PAD (621–640aa) showed no reactivity. All reactive peptides were found to be specific for RA (specificity: 91.59%, 95.93%, 95.33%, 95.79%, 97.20% and 97.73% respectively). The sensitivity of anti-CCP3 antibodies and antibodies against equinamal peptide mixture (containing six citrullinated peptides) for RA was 60.78% and 46.08% respectively and specificity 94.12% and 82.22%. Minimal cross reactivity between antibodies against the majority of citrullinated peptides was observed, ranging from 5.43% to 44.98%. A notable cross reaction (>60%) was observed between antibodies to pep#2 and antibodies to other peptides.

Conclusion: This study showed that ACPA in RA, using as substrates peptides from different citrullinated proteins, constitute a heterogeneous population with limited cross reactivity and without a predominant epitope. Studies to evaluate the significance of these findings are now under study in our laboratory.

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Nicotinamide Adenine Dinucleotide Phosphate Oxidase Mediated Angiogenesis and Inflammation in the Arthritic Joint. Monika Biniecka1, Wei Gao2, Chin Teck Ng3, Emese Balogh2, Douglas J. Veale2 and Ursula Fearon2.

Translation Research Group, Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland, 2Translation Rheumatology Research Group, Dublin, Ireland

Background/Purpose: To examine the role of Nicotinamide Adenine Dinucleotide Phosphate Oxidase (NADPH oxidase)-derived Reactive Oxygen Species (ROS) and NADPH oxidase-dependent redox signaling events in regulating angiogenesis and inflammation in the arthritic joint. Moreover to examine the effects of hypoxia, TNFi treatment and NADPH inhibitors on NADPH oxidase mediated angiogenesis and inflammation.

Methods: Patients with inflammatory arthritis (IA; n=48) underwent arthroscopy and synovial tissue oxygen (pO2) measurements, synovial tissue biopsies and clinical assessment were obtained. Sixteen patients pre/post-TNF therapy were also recruited. Macroscopic synovitis/vascularularity was measured by visual analogue scale. Synovial levels of NADPH oxide (isofrm NOX2), cell-specific markers of inflammation (CD3, CD8, CD20, CD68), vascular factors (VEGF, Ang2, Factor VIII) and redox signaling factors (NF-kB, Akt, STAT3) were quantified by immunohistology/immunofluorescence. Using IA synovial explant cultures ex vivo, the effect of the NOX2 inhibitors (DPI and APO) on IL-8 release was measured by ELISA. NOX2 protein levels were assessed in K4 cells (immortalised human synoviocytes) under normoxia and hypoxia (3%) by Western Blot.

Results: Low in vivo pO2 levels in the inflamed joint (median [range] 26.6 [3.2-63] mm Hg) were related to increased microscopic expression of NOX2 (p=0.01; r=-0.43). In biologic responders in vivo pO2 levels increased post treatment, which was associated with a significant reduction in NOX2 level (p<0.05). In contrast in non-responders where pO2 levels remained the same or were reduced, no significant change in NOX2 expression was observed. Furthermore in vitro hypoxia (3%) induced NOX2 protein expression in K4 cells. High synovial NOX2 expression correlated with high macroscopic vascularity (p=0.005; r=0.46), synovitis (p=0.03; r=0.37), and with increased number of cell-specific markers of T cells (CD4 p=0.0001; r=0.90; CD8 p=0.002, r=0.72). B cells (CD20 p=0.003; r=0.82) and macrophages (CD68 p=0.01; r=0.44). There was a colocalisation and strong association between synovial NOX2 and expression of VEGF (p=0.005; r=0.52). Ang2 (p=0.05; r=0.32) and a number of blood vessels (p=0.004; r=0.50). In addition, synovial NOX2 expression was linked to redox activation of NF-kB, Akt, and STAT3 signaling pathways. Functionally, stimulation of synovial explants with DPI and APO alone or in combination with TNF significantly decreased secretion levels of IL-8.

Conclusion: NADPH oxidase is strongly expressed in synovial tissue and NADPH oxidase-derived ROS may mediate angiogenic and proinflammatory processes in the inflamed joint. Furthermore these effects may in part be mediated through hypoxic activation of downstream redox sensitive signaling events.

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IL-21 Regulates B Cell Proliferation and Differentiation in Rheumatoid Arthritis. Lingyun Sun, Rui Liu and Xia Li. Department of Rheumatology and Immunology, the Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China

Background/Purpose: Interleukin (IL)-21 is a member of type I cytokine family. Recent studies have indicated that IL-21 is an important regulator for human B cell activation, proliferation, plasma cell (PC) differentiation, immunoglobulin (Ig) production and isotype switching. Rheumatoid arthritis (RA) is a chronic autoimmune disease characterized by abnormal production of cytokines and autoantibodies including rheumatoid factor (RF) and anti-cyclic citrullinated peptide antibodies (anti-CCP), suggesting that B cells play a key role in pathogenesis of RA. The aim of this study was to investigate the effect of IL-21 on B cell proliferation and differentiation of RA patients.

Methods: Concentrations of IL-21 in serum were measured by ELISA. The correlation between serum IL-21 levels and clinical features of RA patients were assessed. The percentages of IL-21+CD19+ cells were analyzed by flow cytometry (FACS) in peripheral blood mononuclear cells (PBMC) from RA patients and healthy controls. PBMC from RA patients were stimulated with rIL-21 (50 or 100ng/ml) after stimulation with anti-CD40 and anti-IgM. The percentages of IL-21, activation markers (CD40, CD69 and CD25) on B cells and the proliferation labeled with CFSE as well as differentiation of B cells were determined by using FACS analysis

Results: The results showed that serum IL-21 concentrations in RA patients (1.9±3.34 ng/ml, n=104) were significantly higher than in healthy controls (0.03±0.3 ng/ml, n=142; p=0.001). The levels of IL-21 in RA patients were positively related to RF-IgM (r=0.23, p<0.05), RF-IgA (r=0.34, p<0.05), RF-IgG (r=0.35, p<0.05) and anti-CCP (r=0.32, p<0.05). Moreover, the
percentages of IL-21R CD19+ cells were found to be markedly higher in PBMC of RA patients (48.5±5.2%; n = 50) compared to healthy controls (34.12±2.37%; n = 40, p < 0.01) and IL-21 could up-regulate IL-21R expression on B cells in vitro. Meanwhile, IL-21 stimulated the proliferation of B cells and activated marker expressions (CD40, CD69 and CD25). IL-21 induced more

Background/Design: In rheumatoid arthritis (RA), synovial fibroblasts (SF) expand and undergo phenotypic changes that contribute to chronic inflammation and joint destruction. Podoplanin (Pdp) is a transmembrane glycoprotein normally expressed by lymphatic endothelium and stromal cells of the T-cell zone in lymph nodes. Recent studies have shown that Pdp is inducible by TNF-α in SF and its expression is increased in RA synovium. Pdp-deficient mice have defective development of both lymphoid organ and ectopic inflammation-associated lymphoid follicles. The aim of this study was to investigate the clinical and pathological significance of increased podoplanin expression in RA patients with particular focus on ectopic lymphoid neogenesis (LN).

Methods: Pdp expression was quantified by immunohistochemistry with specific anti-human podoplanin antibody (clone D2–40) in synovial arthroscopic biopsy from 16 patients with active knee arthritis and variable disease characteristics (n = 39) and healthy synovial tissues (n = 6). Pdp expression was quantified as the fractional immunostained area using ImageJ software. Variations in Pdp expression were analyzed regarding the presence of LN (defined as large tissue aggregates of LN structures). Pdp expression was significantly increased in the group of patients (64%) with ectopic LN (13.7 ± 2.5% vs 21.8 ± 1.7%; mean ± SEM; p = 0.006). We also found significantly increased Pdp expression in the groups of patients with rheumatoid factor (14.6 ± 2.3% vs 23.2 ± 5.8%; p = 0.02) or ACPA autoantibodies (10.7 ± 1.9% vs 21.8 ± 2.1%; p = 0.01). No other clinical or pathological correlations were found. Therapy with TNF-α antagonists induced a significant reduction in Pdp expression (18.6 ± 2.4% to 6.8 ± 1.5%; p = 0.0002).

Conclusion: Pdp is ectopically expressed by stromal cells of the lining and sublining in RA tissues, a phenomenon partially reversed by anti-TNF-α therapy. A higher level of Pdp expression is present in the subgroup of patients with LN providing a potential mechanistic link between stromal cell changes and LN.
plasmablasts. IgG production was measured by ELISA from the co-culture of autologous B cells with their respective tonsillar Tfh cells, or RA peripheral blood Tfh and non-Tfh cells.

Results: A novel T cell subset with Tfh cell surface molecule and signature cytokine was identified in both of the peripheral blood and the synovial fluid from RA patients. The percentage of these Tfh-like cells was expanded in the peripheral blood and synovial fluid of active RA patients (DAS-28 < 3.2, 0.05), compared to healthy donors and RA patients in remission (DAS-28 < 2.6). The percentage of Tfh-like cells in CD4+ T cells of the peripheral blood of RA patients correlated with the percentage of plasmablasts in the total lymphocyte population, and also with the level of pathogenic auto-antibody (anti-CCP) and DAS-28. IgG levels were significantly increased in co-culture of Tfh-like cells and peripheral blood B cells of RA patients, but not in co-culture of non-Tfh-like cells and RA peripheral B cells.

Conclusion: Identification of an expanded population of Tfh-like cells in RA patients provides evidence that a distinctive germinal center pathway maybe involved in RA pathogenesis resulting in autoimmunity. Targeting RA-Tfh-like cells may provide more precise treatment strategies.

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Background/Purpose: Synovial macrophages play a key role in RA pathogenesis. Their numbers are greatly increased in RA synovium, their phenotype is consistent with a pro-inflammatory function, and clinical data indicate all efficacious RA therapies lead to a significant reduction of this cell phenotype. We have previously shown that the unique inflammatory phenotype of these disease macrophages and maintenance of key inflammatory pathways during flare is that independent of treatment. These observations may shed light on novel intervention points for treatment of RA.

Methods: Peripheral blood (PB), sub-gingival dental plaque, synovial fluid (SF) and ST samples were collected from 69 patients with active knee arthritis (32 with RA and 37 with other arthritides, of which 14 with undifferntiated peripheral inflammatory arthritis–UPA). Demographic, clinical, laboratory and immunological data were recorded. The presence of Pg DNA was evaluated through PCR. The HLA-DR haplotype was assessed for 45 patients with RA and UPIA.

Results: No differences arose in the positivity for Pg DNA in the sub-gingival plaque, PB and SF samples between RA and the cohort of other arthritides. Full PB samples showed a higher positivity for Pg DNA than plasma samples (11.8% vs. 1.5%, p = 0.04). Patients with RA showed a higher positivity for Pg DNA in the synovial tissue compared to controls (33.3% vs. 5.9%, p < 0.01). UPIA and RA patients carrying HLA DRB1*04 allele showed a higher positivity for Pg DNA in the ST compared to patients negative for the allele (57.1% vs. 16.7%, p = 0.04). RA patients positive for Pg DNA in the sub-gingival plaque had a lower disease duration and a higher peripheral blood leucocytes and neutrophils count. The presence of Pg DNA did not influence disease activity, disease disability or positivity for auto-antibodies.

Conclusion: The presence of Pg DNA in the synovial tissue of RA patients suggests a pathogenic role of the bacterium. The higher positivity of Pg DNA in full peripheral blood and synovial tissue samples compared to plasma and synovial fluid suggests a possible intracellular localization of Pg, thus contributing to the loss of tolerance, in particular in patients positive for HLA-DR4.

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Cardiovascular Risk Factors and Events Are More Frequent Prior to the Onset of Rheumatoid Arthritis Than in the General Population. Helen Pahau, Vibeke Videm, Sanjay Paul, and Ranjenny Thomas. University of Queensland Diamantina Institute, Brisbane, Australia, Department of Laboratory Medicine, Children’s and Women’s Health, Norwegian University of Science and Technology, and Department of Immunology and Transfusion Medicine, Trondheim University Hospital, Trondheim, Norway, University of Queensland School of Population Health, Brisbane, Australia

Background/Purpose: Patients with the inflammatory autoimmune disease Rheumatoid Arthritis (RA) have a higher mortality and morbidity than the general population, predominantly related to cardiovascular disease (CVD). RA patients experience a 2-fold increased risk of myocardial infarction, due to the effects of traditional risk factors combined with inflammation. Since systemic inflammation, as determined by increases in multiple serum markers of inflammation, is evident prior to the onset of clinical RA but not osteoarthritis (OA), we hypothesized that cardiovascular events and risk factors would also occur more frequently prior to diagnosis of RA.

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Porphyromonas Gingivalis and the Pathogenesis of Rheumatoid Arthritis: Analysis of the Synovial Tissue and of Other Compartments. Michele C. Totaro, Sara D’Onghia, Eliza Gremsen, Luca Petrica, Simona Mar- chetti, Silvia Canestri, Barbara Tolusso, Stefano Alverini, Paola Cat- tani1 and Gianfranco Ferraccioli1. Division of Rheumatology, Institute of Rheumatology and Alline Sciences, Catholic University of the Sacred Heart, Rome, Italy, Laboratory of Clinical Analyses CIC, Catholic University of the Sacred Heart, Rome, Italy

Background/Purpose: Porphyromonas gingivalis (Pg), a periodontal anaerobic intracellular pathogen, has been recently associated to rheumatoid arthritis (RA) and the pathogenesis of the disease, due to its unique characteristic of ctitulinulating host and bacterial peptides. Given the mainly intracellular life of the bacterium, the aim of the study was to evaluate the presence of Pg DNA in the synovial tissue (ST) of RA patients through synovial biopsy in comparison with patients affected by other arthritides. Possible links with clinical, immunologioc and genetic features were assessed.

Methods: Peripheral blood (PB), sub-gingival dental plaque, synovial fluid (SF) and ST samples were collected from 69 patients with active knee arthritis (32 with RA and 37 with other arthritides, of which 14 with undifferntiated peripheral inflammatory arthritis–UPA). Demographic, clinical, laboratory and immunological data were recorded. The presence of Pg DNA was evaluated through PCR. The HLA-DR haplotype was assessed for 45 patients with RA and UPIA.

Results: No differences arose in the positivity for Pg DNA in the sub-gingival plaque, PB and SF samples between RA and the cohort of other arthritides. Full PB samples showed a higher positivity for Pg DNA than plasma samples (11.8% vs. 1.5%, p = 0.04). Patients with RA showed a higher positivity for Pg DNA in the synovial tissue compared to controls (33.3% vs. 5.9%, p < 0.01). UPIA and RA patients carrying HLA DRB1*04 allele showed a higher positivity for Pg DNA in the ST compared to patients negative for the allele (57.1% vs. 16.7%, p = 0.04). RA patients positive for Pg DNA in the sub-gingival plaque had a lower disease duration and a higher peripheral blood leucocytes and neutrophils count. The presence of Pg DNA did not influence disease activity, disease disability or positivity for auto-antibodies.

Conclusion: The presence of Pg DNA in the synovial tissue of RA patients suggests a pathogenic role of the bacterium. The higher positivity of Pg DNA in full peripheral blood and synovial tissue samples compared to plasma and synovial fluid suggests a possible intracellular localization of Pg, thus contributing to the loss of tolerance, in particular in patients positive for HLA-DR4.

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None; X. Zhang, None.
Methods: The HUNT population-based surveys were conducted in the county of Nord-Trøndelag in Norway. Detailed information pertaining to RA and OA diagnosis were obtained from 36493 subjects at baseline (HUNT 2, 1995–1997) and at 10-year follow-up (HUNT 3, 2006–2008). In subjects who did not have RA or OA at baseline, we evaluated the effects of cardiovascular and other relevant risk factors on the likelihood of developing RA or OA at follow-up. The risk factors included age, sex, smoking, BMI, blood pressure, diabetes and previous CVD.

Results: The 33567 individuals studied without RA or OA at baseline were 41% more likely to develop RA (p = 0.03), but not OA. Current and previous smoking, and increased BMI, but not hypertension or diabetes, were significantly associated with both conditions. We evaluated the cardiovascular outcomes and associated risk factors in patients diagnosed with RA (n=429) or OA (n=2497) at baseline and follow-up. Adjusted for the cardiovascular risk factors, individuals with RA had 69% increased risk of stroke (p = 0.02) and 45% increased risk of myocardial infarction (p = 0.12) during follow-up. Individuals with OA had 35% increased risk of angina (p = 0.003), but no increased risk of vascular events.

Conclusion: Previous diagnosis was self-reported and not confirmed by chart review, these data suggest that individuals developing OA and RA among the Norwegian population share common cardiovascular risk factors, but only RA is pre-dated and associated with increased cardiovascular events. The development of RA at population level is associated with previous cardiovascular events and suggests the need for screening individuals with events for auto-antibodies and inflammatory features of RA.

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Proteases Produced by Porphyromonas Gingivalis Can Cleave and Citrullinate Substrates Found in the Joint and Oral Mucosa: Implications for Autoimmunity in Rheumatoid Arthritis. Nidhi Sofat1, Sarahi Robertson1 and Robin Wait2. 1St. George’s University of London, London, United Kingdom, 2University of Oxford, Oxford, United Kingdom

Background/Purpose: Rheumatoid arthritis (RA) is an autoimmune disease characterised by inflammation following by tissue rebuilding or fibrosis. Failure by the body to effectively regulate inflammation is a hallmark of RA. It has been suggested that periodontal disease is one mechanism whereby tissue inflammation is triggered in RA. One of the organisms implicated in periodontal disease: Porphyromonas gingivalis, is an anaerobic pathogen that is known to produce peptidyl arginine deminimase (PAD), the only known bacterial PAD which causes citrullination. Cleavage of extracellular matrix (ECM) substrates in RA is known to lead to the production of ECM damage-associated molecular patterns, or DAMPs that can then be available for citrullination, thereby mediating chronic inflammation in RA.

Methods: We investigated the ability of proteases produced by Porphyromonas gingivalis to cleave extracellular matrix substrates which are found in the joint and also the human oral mucosa: fibrinogen, fibronectin and type I collagen. Culture supernatants of the anaerobe Porphyromonas gingivalis (strain W83 from ATCC) were produced from 24 hour cultures using full anaerobic conditions (3M Concept Plus anaerobic incubator). After culture, bacterial supernatants were extracted in lung disease are not specific for citrullinated peptides. They may represent non-specific reactions, with correspondingly low antibody levels. ACPA in the oral mucosa of patients with ACPA may be a novel therapeutic target in RA.

Conclusion: Our data demonstrate that selective proteases can cleave extracellular matrix protein substrates shared in the oral mucosa and the arthritic joint. Inhibition of cleavage of such substrates may delay the production of ECM DAMPs that can then be available for citrullination in RA. Therapeutic strategies aimed at inhibiting such cleavage of ECM substrates may be a novel therapeutic target in RA.

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Anti-Cyclical Citrullinated Peptide Antibodies in Idiopathic Pulmonary Fibrosis Are Not Citrulline-Specific: Implications for the Pathogenesis of Rheumatoid Arthritis. Elena B. Lugli1, Muslima Chowdhury1, Peter J. Charles1, Michael G. Crooks2, Simon P. Hart2, Patrick J. Venables3 and Benjamin A. Fisher3. 1Oxford University, London, United Kingdom, 2Hull York Medical School, Cottingham, United Kingdom, 3University of Birmingham, Birmingham, United Kingdom

Background/Purpose: The association of rheumatoid arthritis (RA) with smoking and silica exposure has led to the hypothesis that the lung is the site where RA autoimmunity is initiated. In support of this, anti-citrullinated protein/peptide antibody (ACPA) positive RA is associated with a high prevalence of lung abnormalities at presentation, and airway changes have recently been reported in subjects with ACPA in the absence of joint disease. There are also reports of ACPA occurring in lung diseases in the absence of joint symptoms. Investigation of early lung associated citrullinated antigens may therefore give insight into RA pathogenesis.

Methods: Sera from 42 patients with idiopathic pulmonary fibrosis (IPF), but no arthritis, were tested for anti-CCP2 antibodies by commercial ELISA. Sera were further tested for antibodies to immunodominant peptides from 3 citrullinated autoantigens in RA, α-enoal (KHIA-cit-EIFDS-cit-GNPTVE), vimentin (VYAT-cit-SSAV-cit-L-cit-SSVP) and fibrinogen (NEEGFFSA-cit-GHRPLDKK), as well as filaggrin (CCP1; SHQEST-cit-G-cit-SRGRSGRGS) by in-house ELISA, with cysteines at the end of each peptide to facilitate cyclisation. Arginine-containing control peptides for CCP1, using a previously published method.

Results: Six patients were anti-CCP2 positive (14%) with a mean antibody level of 44 AU/ml (range 29–61; normal <25). None of these 6 sera were positive for antibodies to the α-enoal, vimentin and fibrinogen peptides. Only one was positive for the CCP2 peptides. No reactivity of the anti-CCP2 positive sera against the in vitro citrullinated A549 cell lysates was observed, however with the HL-60 lysates, reactive bands were identified in 3/6 sera (molecular weight approx. 52, 60 and 62 kDa) which were not citrulline-dependent. Sera were re-tested with the arginine-containing control peptide for CCP2, using a previously published method. This demonstrated that reactivity was not citrulline-dependent. Serum from a patient with RA-associated lung disease was used as a positive-control and had antibodies to CEP-1, cVim, cFib and CCP1, reacted predominantly with the citrullinated but not uncitrullinated A549 (bands at approx. 45, 50, 102 and 300 kDa) and HL-60 lysates, and showed citrulline-dependent specificity for the CCP2 peptides.

Conclusion: Our findings suggest that anti-CCP2 antibodies occurring in lung disease are not specific for citrullinated peptides. They may represent non-specific reactions, with correspondingly low antibody levels. ACPA in the oral mucosa of patients with ACPA may be a novel therapeutic target in RA.

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Anti-Citrullinated Protein Antibody Specific Fc Glycosylation Patterns in Arthralgia Patients. Hans Ulrich Scherer1, Yoann Rombouts2, Ewoud Ewing3, Lotte van de Stadt4, Maurice H.J. Selman2, André M. Deelder2, Tom W.J. Huizinga4, Manfred Wuhrer1, David van Schaardenburg1, D. van Schaardenburg1, K. M. J. Janssen1, A. Vissink1, A. J. van Winkelhoff1, E. Brouwer1 and D. van T. W. J. Huizinga1

Leiden University Medical Center, Leiden, Netherlands, Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands

Background/Purpose: Anti-citrullinated protein antibodies (ACPA) exhibit specific, pro-inflammatory Fc glycosylation profile characterized by a low content of galactose and sialic acid residues. The absence of these residues from the Fc-linked core glycan could influence the biological activity of ACPA in rheumatoid arthritis. As ACPA can be detected in sera several years before disease development, we hypothesized that a change in ACPA Fc-glycosylation might precede the onset of arthritis.

Methods: Serum samples (n=300) of patients with ACPA positive arthralgia (n=184) were obtained at various time points. ACPA were isolated by affinity purification using cyclic citrullinated peptides as antigen. Isolated ACPA and total serum IgG molecules were subjected to trypsin digest, and glycan profiles of IgG1 Fc glycopeptides were analyzed by mass spectrometry. 96 patients in this cohort developed arthritis after an average duration of arthralgia of 14.7 months. At the time of the onset of arthritis, patients were defined as having rheumatoid arthritis (RA, n=51) based on the 1987 ACR criteria for RA, or undifferentiated arthritis (UA, n=45).

Results: No difference was found between ACPA-specific and total serum IgG1 Fc glycosylation patterns at the time of the patients’ first presentation with arthralgia (baseline). At diagnosis of arthritis, RA patients, but not patients with undifferentiated arthritis, exhibited increased hypogalactosylation of the ACPA Fc fragment compared to healthy donors. Although a similar degree of Fc hypogalactosylation was found for total IgG in RA patients, hypogalactosylation of the ACPA Fc-tail occurred at 6 months before diagnosis, and was significantly more pronounced at 3 months before diagnosis than that of total IgG. No significant changes were noted for sialylation or fucosylation of the Fc tail.

Conclusion: ACPA acquire specific Fc-glycosylation patterns prior to disease onset, with a change towards hypogalactosylation occurring around 6 months before RA development. Of interest, ACPA hypogalactosylation was more pronounced than that of total IgG, indicating specific changes in the ACPA immune response several months before disease onset.

Disclosure: H. U. Scherer, None; Y. Rombouts, None; E. Ewing, None; L. van de Stadt, None; M. H. J. Selman, Hoffmann-La Roche, Inc., 2; A. M. Deelder, None; T. W. J. Huizinga, None; M. Wuhrer, None; D. van Schaardenburg, None; R. E. M. Toes, None.

1202

Antibodies Against Porphyromonas Gingivalis Correlate with Rheumatic Arthritis-Shared Epitope Positive Arthritis Patients. J. de Smit1, L. A. van de Stadt1, J. Westra1, B. Doornbos-van der Meer1, K. M. J. Janssen1, A. Vissink1, A. J. van Winkelhoff2, E. Brouwer1 and D. van Schaardenburg2

University of Groningen, University Medical Center, Groningen, Netherlands, Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands

Background/Purpose: In the disease association between rheumatoid arthritis (RA) and periodontitis a potential role is suggested for the periodontal pathogen Porphyromonas gingivalis (PG). PG is a major pathogen in periodontitis and has the unique feature of protein citrullination. Anti-citrullinated-protein (CCP) antibodies are found not only in established RA but are also known to precede RA development. Aim of this study was to assess the levels of anti-PG antibodies in rheumatoid factor (IgM-RF) and/or anti-CCP positive rheumatoid arthritis patients.

Methods: A cohort of 318 adult IgM-RF and/or anti-CCP positive arthritis patients (mean age 50 years SD 12, 30% female) was prospectively followed for arthritis development during a median follow-up of 30 months. Patients with the possibility of a false-positive result for IgM-RF were excluded. Baseline analysis of serum samples was done by commercial (anti-CCP2; Axis-Shield) or in-house ELISA (IgM-RF, IgM-CCP, IgA- and IgG-anti-PG). Baseline variables included age, gender, smoking, carriage of shared epitope, CRP/ESR level by routine analysis. Anti-PG titers were compared to control subjects with severe periodontitis (disease controls, n=90) and control subjects with a healthy periodontium (healthy controls, n=23).

Results: 32% (n=103) of the patients developed arthritis, at median 15 months after baseline. After correction for age, gender, smoking and SE carriage, these patients had significantly higher mean anti-CCP levels compared to those who did not develop arthritis (p<0.001). No differences in levels of IgM-RF, anti-PG, CRP and ESR were found between groups of patients who did or did not develop arthritis.

Arthralgia patients had higher mean IgG-anti-PG levels than the healthy controls, as did the disease controls, as had the shared epitope controls (p<0.01) (Table 1). IgA anti-PG levels were only different between disease- and healthy controls (p<0.05), and no differences were seen between arthralgia patients, disease controls, and healthy controls in IgM-anti-PG levels (Table 1). However, in the subgroup of arthralgia patients who developed arthritis there was a correlation of IgM-anti-PG with both anti-CCP and IgM-RF levels (p=0.2, p<0.05). No correlations were found between IgG- and IgA-anti-PG and anti-CCP.

Conclusion: IgM-RF and/or anti-CCP positive arthralgia patients have elevated IgG-anti-PG titers, and there is a significant correlation of IgM anti-PG and RA-specific auto-antibodies in arthralgia patients who developed arthritis. This might indicate a role for the periodontal pathogen P. gingivalis in arthritis development.

Disclosure: M. J. de Smitt, None; L. A. van de Stadt, None; J. Westra, None; B. Doornbos-van der Meer, None; K. M. J. Janssen, None; A. Vissink, None; A. J. van Winkelhoff, None; E. Brouwer, None; D. van Schaardenburg, None.

1203


1 Univ of Alabama-Birmingham, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL, 3University of North Carolina, Chapel Hill, NC, 4University of Pittsburgh, Pittsburgh, PA, 5Feinstein Institute for Medical Research, Long Island Jewish Health System, Manhasset, NY, 10Marguerite Jones Harbert, Gene V. Ball, MD Professor of Medicine, and Director, Division of Clinical Immunology and Rheumatology, University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: The clinical phenotype of rheumatoid arthritis (RA) ranges from mild joint inflammation to severe joint destruction, but molecular factors responsible for variability are incompletely understood, particularly in African-Americans. We tested the hypotheses that expression of immune-related genes in PBMCs differ in: a) severe vs mild radiographic damage; b) early or longstanding disease; c) RA vs control.

Methods: We analyzed total RNA from the PBMC of 60 African Americans from the CLEAR Registry (of a total of ~1,060 RA patients and 550 controls). Extremes of phenotype were analyzed: 10 RA with early disease/low damage (EL); 10 RA with early disease/high damage (EH); 10 RA with late disease/low damage (LL); late disease high damage (LH) and 20 age, race and gender matched healthy controls. Early disease was defined as disease duration < 2 years. Late disease ranged from 9.5 to >60 years duration (Table 1). Radiographic severity was defined as total Sharp/van der Heijde scores of hands/feet. All participants had ACPA positive RA. We performed TaqMan qRT-PCR for 165 independent genes and/or levels based on specific pathways: SAB innate and Adaptive Immune Signaling, and AB Immune Panel. The normalized gene expression levels (dCt) were compared between each RA group and the controls using a two-group t test.

Table 1. Mean (SD) anti-PG titers (mg/l) of different patient groups

<table>
<thead>
<tr>
<th>Patients (n)</th>
<th>Arthralgia (318)</th>
<th>Arthritis+ (183)</th>
<th>Arthritis- (215)</th>
<th>Disease controls (90)</th>
<th>Healthy controls (23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IgM-anti-PG</td>
<td>12.9 (12.9)</td>
<td>12.9 (12.4)</td>
<td>12.8 (13.1)</td>
<td>10.3 (8.71)</td>
<td>9.5 (7.44)</td>
</tr>
<tr>
<td>IgG-anti-PG</td>
<td>8.78 (17.5)*</td>
<td>7.94 (19.9)**</td>
<td>13.4 (29.6)**</td>
<td>23.8 (45.5)**</td>
<td>6.27 (23.6)</td>
</tr>
<tr>
<td>IgA-anti-PG</td>
<td>6.2 (11.5)</td>
<td>5.5 (15.5)</td>
<td>19.3 (133)</td>
<td>59.1 (292)*</td>
<td>8.88 (31)</td>
</tr>
</tbody>
</table>

** p<0.001 or *p<0.05 compared to healthy controls

Arthritis+: arthralgia patients who developed arthritis

Arthritis-: arthralgia patients who did not develop arthritis

Conclusion: IgM-RF and/or IgG-anti-PG, and there is a significant correlation of IgM-anti-PG and RA-specific auto-antibodies in arthralgia patients who developed arthritis. This might indicate a role for the periodontal pathogen P. gingivalis in arthritis development.

Disclosure: M. J. de Smitt, None; L. A. van de Stadt, None; J. Westra, None; B. Doornbos-van der Meer, None; K. M. J. Janssen, None; A. Vissink, None; A. J. van Winkelhoff, None; E. Brouwer, None; D. van Schaardenburg, None.
Table 1. Clinical and demographic characteristics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group</th>
<th>EH Group</th>
<th>EL Group</th>
<th>LH Group</th>
<th>LL Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>35–69</td>
<td>23–75</td>
<td>34–62</td>
<td>35–76</td>
<td>47–68</td>
</tr>
<tr>
<td>Disease duration (months)</td>
<td>NA</td>
<td>2–23</td>
<td>0–5</td>
<td>114–522</td>
<td>189–339</td>
</tr>
<tr>
<td>Anti-CCP antibody status</td>
<td>None;</td>
<td>B. L. Jonas</td>
<td>None;</td>
<td>None;</td>
<td>None;</td>
</tr>
<tr>
<td>Total Sharp/van Heijde score</td>
<td>NA</td>
<td>11–53</td>
<td>0</td>
<td>181–341</td>
<td>0</td>
</tr>
</tbody>
</table>

**Results:** Preliminary results (Table 2) indicate a statistically significant increase (compared to controls) in gene expression in the EH category for the following genes: TLR2, TLR4, TLR8, INFGR1, INFGR2, MAPK14H. In addition, EH subjects had lower expression of MIP and IKBKB. High expression of TLR8 was associated with the LH group, while low expression of TOLLIP was associated with both the EL and LG groups. The expression of these genes is rarely increased in mild disease, especially in the EL group. These preliminary results suggest that high expression of genes in the Toll-like receptor and interferon pathways are associated with radiographic damage in African-Americans with RA.

Table 2. Gene expression difference between RA groups and the control group.*

<table>
<thead>
<tr>
<th>Gene</th>
<th>Control dCT</th>
<th>EH Group dCT</th>
<th>EL Group dCT</th>
<th>LH Group dCT</th>
<th>LL Group dCT</th>
<th>p value dCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLR2</td>
<td>2.608</td>
<td>1.278</td>
<td>0.00012</td>
<td>2.561</td>
<td>0.9</td>
<td>2.244</td>
</tr>
<tr>
<td>TLR4</td>
<td>2.909</td>
<td>1.679</td>
<td>0.00011</td>
<td>2.343</td>
<td>0.13</td>
<td>2.334</td>
</tr>
<tr>
<td>TLR8</td>
<td>2.797</td>
<td>1.689</td>
<td>0.00012</td>
<td>2.391</td>
<td>0.17</td>
<td>2.129</td>
</tr>
<tr>
<td>TOLLIP</td>
<td>2.233</td>
<td>2.452</td>
<td>0.54</td>
<td>3.152</td>
<td>0.94</td>
<td>2.657</td>
</tr>
<tr>
<td>IFNγR1</td>
<td>2.171</td>
<td>2.144</td>
<td>0.015</td>
<td>2.2</td>
<td>0.92</td>
<td>1.83</td>
</tr>
<tr>
<td>MAP1K4P</td>
<td>2.548</td>
<td>1.641</td>
<td>0.00011</td>
<td>2.333</td>
<td>0.42</td>
<td>2.086</td>
</tr>
<tr>
<td>MIF</td>
<td>1.896</td>
<td>2.661</td>
<td>0.00012</td>
<td>2.187</td>
<td>0.32</td>
<td>2.402</td>
</tr>
<tr>
<td>IKBKB</td>
<td>2.182</td>
<td>3.513</td>
<td>0.00011</td>
<td>2.767</td>
<td>0.14</td>
<td>2.509</td>
</tr>
</tbody>
</table>

*The CT values from qRT-PCR experiment were normalized against multiple house-keeping genes to obtain dCT values. Each RA group was compared with the control group. P values less than 0.05 are shown in italics.

**Conclusion:** These results will inform further studies of predictors of RA severity in African Americans using ~300 subjects from the CLEAR Registry, and have important implications regarding pathogenesis of radiographic damage of RA.

**Disclosure:** M. I. Daniela, None; A. D. Steg, None; X. Cui, None; D. Redden, None; M. R. Johnson, None; R. J. Reynolds, None; D. van der Heijde, None; D. L. Conn, None; B. L. Jonas, None; L. F. Callahan, None; L. W. Moreland, None; P. K. Gregersen, None; S. L. Bridges Jr., None.

1204

*Porphyromonas Gingivalis* Antibody Responses and Clinical Associations in Patients with Early Rheumatoid Arthritis

Sheliza L. Arvikar, Klemen Strle1, Deborah S. Collier, Mark C. Fisher, Gail McHugh, Toshihisa Kawai, Afpdogan Kantarci and Allen C. Steere. 1Massachusetts General Hospital, Boston, MA, 2Forsyth Institute, Cambridge, MA, 3Hospital Xeral-Calde, Lugo, Spain, 4Hospital Universitario Marques de Valdecilla, IFIMAV, Santander, Spain, 5Hospital Universitario Marques de Valdecilla, IFIMAV, Santander, Spain, 6Hospital Universitario Marques de Valdecilla, IFIMAV, Santander, Spain, 7Instituto de Paraciteologia y Biomedicina Lopez-Neyra (IPBLN-CSIC), Granada, Spain, 8Hospital Xeral-Calde, Lugo, Spain, 9Hospital Universitario Marques de Valdecilla, IFIMAV, Santander, Spain, 10Instituto de Parasitologia y Biomedicina Lopez-Neyra, CSIC, Granada, Spain, 11Hospital Universitario Lus Augusti, Lug, Spain, 12Hospital de la Princesa, Madrid, Spain, 13La Paz Hospital, IdiPaz, Madrid, Spain, 14Hospital Universitario de Bellvitge, IDIBELL, Barcelona, Spain, 15Hospital Universitario Marques de Valdecilla, Santander, Spain, 16Department of Epidemiology and Computational Biology, School of Medicine, University of Cantabria, and CIBER Epidemiology y Salud Pública (CIBERESP), Santander, Spain

**Background/Purpose:** Rheumatoid arthritis (RA) is a chronic inflammatory disease associated with increased cardiovascular (CV) mortality. Since CD40-CD154 binding has direct consequences on inflammation process initiation, we aimed to replicate previous findings related to disease susceptibility in Spanish RA patients.

**Methods:** One thousand five hundred and seventeen patients fulfilling the 1987 ACR classification criteria for RA and 1600 matched controls were genotyped for the CD40 rs1883382, rs4810485 and rs1535045 and CD154 rs3092952 and rs3092920 gene variants with CV risk in Spanish RA patients.

**Conclusion:** A subset of patients with early untreated RA had IgG antibody reactivity to Pg. The high Pg antibody responses at this time demonstrate that immunosuppressive therapy does not explain the Pg anti-body reactivity. In these patients, higher anti-CCP antibody responses and ESr values suggested that Pg infection may be associated with a specific inflammatory response. Finally, Pg antibody positivity was associated with a trend toward greater disease activity and less likelihood of achieving remission by 12 months. These findings support the need to replicate these results in other cohorts and the need to investigate the role of these polymorphisms and the effect of anti-Pg antibodies at entry on disease activity in a subset of patients with early RA.
assessed the influence of these polymorphisms in the risk of subclinical atherosclerosis determined by carotid ultrasonography.

**Results:** Statistically significant differences in the allele frequencies for the rs1883832 CD40 gene promoter polymorphism between RA patients and controls were found. Although we did not observe a significant association of CD40-C154 nucleotide variants with the development of CV events, an ANCOVA model adjusted for sex, age at the time of the ultrasonography assessment, follow-up time, traditional CV risk factors and anti-cyclic citrullinated peptide antibodies disclosed a significant association between CD40 rs1535045 polymorphism and carotid intima media thickness, a surrogate marker of atherosclerosis (p = 0.0047).

**Conclusion:** Our data indicate a potential association of rs1883832 CD40 gene polymorphism with susceptibility to RA. Also, the CD40 rs1535045 gene variant may influence development of subclinical atherosclerosis in RA patients.

Disclosure: M. García-Bermúdez, None; G. González-Juanañey, None; A. Corrales, None; R. López-Mejías, None; M. Teruel, None; J. A. Miranda-Filloy, None; S. Castedo-Sanz, None; A. Balsa, None; B. Fernández-Gutierrez, None; L. González-Alvaro, None; G. Gómez-Vaquero, None; R. Blanco Alonso, None; J. Llorca, None; J. Martín, None; M. A. González-Gay, None.

1206

**Gp96 Exacerbate the Inflammation of Rheumatoid Arthritis.** Qi Quan Huang, Robert Birkett, J.-P. Jin and Richard M. Pope. 1Northwestern University, Chicago, IL; 2Northwestern University Feinberg School of Medicine, Chicago, IL; 3Wayne State University, Detroit, MI; 4Northwestern Univ Med School, Chicago, IL.

**Background/Purpose:** The mechanisms that contribute to the persistent activation of macrophages in rheumatoid arthritis (RA) are incompletely understood. Toll-like receptors (TLRs) have been implicated in the regulation of macrophage activation in rheumatoid arthritis (RA). We have recently identified that gp96 as an endogenous TLR2 ligand that contributes to the persistent inflammation of RA. Also, the role of gp96 in macrophage activation between the microbial TLR2 ligand peptidoglycan (PGN) and the TLR4 ligand lipopolysaccharide (LPS). This study was performed to determine synergistic activation between the microbial TLR2 ligand peptidoglycan (PGN) and the TLR4 ligand lipopolysaccharide (LPS). This study was performed to determine the synergistic effect of gp96 in macrophages activation and in the pathogenesis of RA. We have recently identified that gp96 as an endogenous TLR2 ligand that contributes to the persistent inflammation of RA. Employing RA synovial fluid (SF) macrophages, we demonstrated synergistic activation of RA macrophages in response to anti-TNF therapy.

**Methods:** Intraarticular injections of gp96 (238 kDa) at baseline 4, 12, and 24 wk. GS US and PD US were scored semiquantitatively (on a severity scale from 0–3).

**Results:** In the current analysis of the Rochester cohort (n=18), 61% of patients were good DAS responders, 28% moderate responders, and 11% non-responders at 24 weeks. Good DAS responders had higher baseline RANKL levels than moderate/non-responders (2653 vs. 1218). Serum RANKL decreased significantly with anti-TNF treatment (3025 at baseline vs. 921 at 52 wk, p=0.01), regardless of DAS response. Interestingly, the OPG:RANKL ratio was very low in these active RA patients (0.76±1.2 compared to historic healthy controls 3.0) and did not change significantly with anti-TNF treatment. On MSK US, the higher the baseline # of G+ joints the less likely patients were to achieve a good DAS response. Addition of serum responders tended to have a lower # of G+ joints/absent PD on follow-up US (12 and 24 wk) in contrast to moderate/non-responders.

**Conclusion:** In our study, the OPG:RANKL ratio was considerably lower than the ratio reported for control subjects and similar to that observed in patients with multiple myeloma. B cell activation was characteristic of active RA and correlated with RANKL activation. These results support the notion that OPG:RANKL and B cells have a central role in RA-associated joint destruction.

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Disclosure: E. Ezealah, None; J. Hossler, None; J. Bicar, None; C. A. Cistrone, None; T. Owen, None; N. Miranda, None; K. Callahan, None; P. Anandarajah, None; I. Sanz, None; A. P. Anandarajah, None; R. G. Thiele, None; D. Tabechian, None; R. J. Looney, None; J. H. Anolik, None.
1208

Stable Synovial Fluid Phenotype for Anti Citrullinated-Protein Antibodies in Established Rheumatoid Arthritis. Vijay Joshua1, Lena Israelsson1, Lars Klareskog1, Anca Irinel Catrina1 and Vivianne Malmström1. 1Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2Karolinska Institute, Stockholm, Sweden

Background/Purpose: Presence of anti citrullinated-protein antibodies (ACPAs) in the peripheral blood of patients with rheumatoid arthritis is a validated disease biomarker. We have previously shown local synovial production of these antibodies in the synovial fluid of active RA. We aimed to investigate longitudinal stability of ACPAs and ACPA fine specificities in SF of active established RA patients.

Methods: A cohort of 30 RA patients (n=30) with established RA (median disease duration 11 years at inclusion) was followed up for a median of 9 years. Half of the included patients were testing positive for CCP ELISA in the SF when screened at one arbitrary time point and half were negative. Longitudinal SF samples of these patients (a median of 5 samples/patient, median follow-up time of 9 years) were analyzed for the presence of anti CCP2 antibodies and for fine ACPA specificities using ELISA against citrullinated forms of alpha-1-enolase (aa5–21; cep1), fibrinogen (aa566–580; cit-fib573) and vimentin (aa60–75; cit-vim60–75) peptides. Cut off of these ELISAs were set at the 98th percentile, based on analysis of sera from healthy controls.

Results: SF ACPA quantification using the CCP ELISA kit demonstrates a highly stable phenotype during time, with all patients selected on the basis of ACPA positivity at one time point (15/30, 100%) being positive on all tested occasions. The same was true for ACPA negative (15/30, 100%). Among fine specificities presence of anti citrullinated a-enolase was stable (with 5/30 positive and 25/30 negative patients on all tested occasions). Same trend was observed for antibodies against citrullinated vimentin with 25/30 patients being either positive (3) or negative (22) on all tested occasions and citrullinated fibrinogen with 28/30 patients being either positive (3) or negative (24) on all tested occasions.

Conclusion: We demonstrate that both ACPA and ACPA fine specificities have a stable phenotype in SF of patients with longstanding RA suggesting continuous local production of antibodies during disease progression.

Disclosure: V. Joshua, None; L. Israelsson, None; L. Klareskog, Janssen Research and Development, LLC; A. I. Catrina, None; V. Malmström, None.

1209

Functional Role of Chondrogenic Progenitor Cells in Rheumatoid Arthritis. Sabine Blaschke1, Sandra Trautmann2, Alexander W. Beham3, Burkhard Mai4, Sebastian Koelling1, Caroline Bresyach1, Gabriele Wolf1, Gerhard A. Mueller1 and Nicolai Miosge1. 1University Medical Center Goettingen, Goettingen, Germany, 2Department of Surgery, Germany, 3Vitos Orthopaedic Clinic Kassel, Kassel, Germany, 4Department of Surgery, Goettingen, Germany, 5Dept. of Prosthodontics, Goettingen, Germany.

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory joint disease of still unknown etiology leading to progressive cartilage and bone destruction. Proinflammatory cytokines, immunoregulatory cells and synoviocytes were previously shown to play an important role in RA pathogenesis. Recently, a novel progenitor cell population, termed chondro-genic progenitor cells (CPCs), were isolated from repair tissue in later stages of osteoarthritis (OA). In this study, we analyzed the presence and functional characteristics of this cell type in human RA.

Methods: Cartilage tissue specimens were obtained from 10 RA patients (age 44–85y) after total joint replacement surgery. All patients met the American College of Rheumatology criteria for established RA. The study was approved by the local ethics committee. CPCs were isolated as previously described (1) and synoviocytes were previously shown to play an important role in RA pathogenesis by IL-17-induced upregulation of MMP- and proinflammatory cytokines. Expression of transcription factors RUNX-2 and SOX-2 were detected by quantitative RT-PCR and immunocytochemistry. Multipotency differentiation revealed that RA-CPCs harbour a chondrogenic, osteogenic and adipogenic potential. In vitro stimulation with IL-17A/F resulted in significant upregulation of NF-kB, TRAF-6, MMP-3 and IL-6.

Conclusion: Our study results demonstrate that CPCs are also present in RA cartilage tissue and express stem cell characteristics already described for OA-CPCs. Functional analysis revealed that these cells may also play a role in RA pathogenesis by IL-17-induced upregulation of MMP- and proinflammatory cytokine expression.

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1210

Effect of HLA-DRB1*0901 Suggest Distinctive Mechanisms of Rheumatoid Arthritis Susceptibility. So-Young Bang1, Hye-Soon Lee2, Kyung Wha Lee3 and Sang-Cheol Baek4. 1Hanyang University Hospital for Rheumatic Diseases, Seoul, South Korea, 2Hanyang University Guri Hospital, Guri, South Korea, 3Hallym Institute for Genome Application, Hallym University Sacred Heart Hospital, Anyang, South Korea, 4Hanyang University Hospital for Rheumatic Diseases, Clinical Research Center for Rheumatoid Arthritis (CRCRA), Seoul, South Korea

Background/Purpose: Although HLA-DRB1 shared epitope (SE) alleles and DRB1*0901 have repeatedly been shown to be associated with RA susceptibility, the effect of each allele on levels of anti-cyclic citrullinated peptide autoantibodies (anti-CCP) and interaction with smoking in RA remains to be fully defined. We aimed to investigate whether DRB1 risk alleles influence anti-CCP levels and whether each allele interacts with smoking in anti-CCP positive or negative RA.

Methods: All RA patients (n =1,924) and controls (n = 1,119) were Korean. Odds ratios and biologic interactions as departure from additivity or multiplicity were analyzed by logistic regression.

Results: The *0901 allele significantly decreased anti-CCP levels in both the SE-negative and SE-positive group. We found a hierarchy of anti-CCP levels depending upon the combination of RA risk alleles (P=5.55×10^{-11}). In the hierarchy, individuals carrying SE/SE had the highest (614 units/ml) and *0901/*0901 had the lowest levels (189 units/ml). The SE alleles interacted with smoking strongly in anti-CCP positive RA (AP=0.48 [0.25–0.71] and slightly in anti-CCP negative RA (AP=0.43 [0.02–0.81]). In addition, each of the SE alleles significantly interacted with smoking in anti-CCP positive RA. In anti-CCP negative RA, only *0101 interacted with smoking. However, DRB1*0901 did not interact with smoking in both anti-CCP positive and negative RA groups. Interestingly, interactions between the two most significant risk alleles, *0405 and *0901, (AP=0.68 [0.46–0.89], multiplicity p=0.012) significantly increased RA susceptibility regardless of anti-CCP and smoking status. Moreover, smoking amplified the risk for RA by significant synergistic interaction with the heterozygote *0405/*0901 in anti-CCP negative RA (AP=0.80 [0.32–1.28]) but not in anti-CCP positive RA.

Table 1. Risk of anti-CCP positive and anti-CCP negative RA according to HLA-DRB1 and smoking

<table>
<thead>
<tr>
<th>HLA-DRB1/ Smoking</th>
<th>anti-CCP positive RA</th>
<th>anti-CCP negative RA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of cases/ controls</td>
<td>OR† (95% CI)</td>
</tr>
<tr>
<td></td>
<td>reference</td>
<td>reference</td>
</tr>
<tr>
<td>SE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>–/–</td>
<td>188/502</td>
<td>reference</td>
</tr>
<tr>
<td>+/–</td>
<td>30/63</td>
<td>2.17 (1.25–3.77)</td>
</tr>
<tr>
<td>+/–</td>
<td>826/328</td>
<td>7.28 (5.85–9.06)</td>
</tr>
<tr>
<td>–/–</td>
<td>166/46</td>
<td>16.31 (9.96–26.74)</td>
</tr>
<tr>
<td>A P†</td>
<td>0.48 (0.25–0.71)</td>
<td>0.43 (0.02–0.81)</td>
</tr>
<tr>
<td>RERI‡</td>
<td>7.97 (5.53–15.21)</td>
<td>4.08 (2.34–10.50)</td>
</tr>
<tr>
<td>S†</td>
<td>2.06 (1.28–3.31)</td>
<td>1.92 (0.84–4.41)</td>
</tr>
<tr>
<td>*0901</td>
<td></td>
<td></td>
</tr>
<tr>
<td>–/–</td>
<td>188/502</td>
<td>reference</td>
</tr>
<tr>
<td>+/–</td>
<td>30/63</td>
<td>2.54 (1.41–4.60)</td>
</tr>
<tr>
<td>+/–</td>
<td>292/162</td>
<td>4.97 (3.83–6.44)</td>
</tr>
<tr>
<td>+/–</td>
<td>47/33</td>
<td>7.77 (4.12–14.63)</td>
</tr>
<tr>
<td>A P†</td>
<td>0.16 (0.32–0.65)</td>
<td>0.28 (0.32–0.87)</td>
</tr>
<tr>
<td>RERI‡</td>
<td>1.25 (3.21–5.72)</td>
<td>1.57 (2.85–8.70)</td>
</tr>
<tr>
<td>S†</td>
<td>1.23 (0.63–2.38)</td>
<td>1.51 (0.54–4.20)</td>
</tr>
</tbody>
</table>

Monday, November 12
Table 2. Synergistic effect of having *0405 and *0901 alleles in RA according to anti-CCP status

<table>
<thead>
<tr>
<th>Genotype</th>
<th>anti-CCP positive RA</th>
<th>anti-CCP negative RA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of cases/controls</td>
<td>OR† (95% CI)</td>
</tr>
<tr>
<td>non-risk/non-risk</td>
<td>220/574</td>
<td>reference</td>
</tr>
<tr>
<td>*0901/non-risk</td>
<td>173/151</td>
<td>2.94 (2.24–3.87)</td>
</tr>
<tr>
<td>*0901/*0901</td>
<td>359/135</td>
<td>7.54 (5.82–9.77)</td>
</tr>
<tr>
<td>*0901/*0405</td>
<td>29/73</td>
<td>6.92 (3.36–14.24)</td>
</tr>
<tr>
<td>*0405/*0405</td>
<td>6/9</td>
<td>20.22 (9.77–41.82)</td>
</tr>
<tr>
<td>*0405/*0901</td>
<td>10/10</td>
<td>28.03 (14.15–57.55)</td>
</tr>
</tbody>
</table>

† All odds ratios (OR) and 95% confidence intervals (95% CI) were calculated by comparing each group with the corresponding reference group [individuals without severe &*0901 adjusted for age and sex.

Conclusion: DRB1*0901 differs from SE alleles regarding to anti-CCP levels and interaction with smoking, suggesting a distinct mechanism of *0901 in RA pathogenesis, which may bypass anti-CCP formation. In addition, significant increase of *0405/*0901 heterozygote in RA susceptibility may be attributable to the synergistic contribution of two pathways in which the two alleles participate independently.

Disclosure: S. Y. Bang, None; H. S. Lee, None; K. W. Lee, None; S. C. Bae, None.

1211

ANTI-Cyclicitrullinated Protein Antibodies Induce Inflammation and Oxidative Stress in WHITE BLOOD CELLS of Rheumatoid Arthritis Patients. Chary Lopez-Pedrera1, Carlos Perez-Sanchez, Patricia Ruiz-Limon1, Mª Angeles Aguirre1, Rosario M. Carretero-Prieto1, Antonio Rodriguez-Ariza1, Naira Barbarro1, Pilar Font1, Francisco Martinez1, Inmaculada Gomez-Gracia1, Mª Jose Cuadrado2 and Eduardo Collantes-Estevez3. 1IMIBIC-Reina Sofia Hospital, Cordoba, Spain, 2Research Unit, IMIBIC-Reina Sofia Hospital, Cordoba, Spain, 3IMABIS and Virgen de la Victoria Hospital, Malaga, Spain, 4The Rayne Institute, London, United Kingdom.

Background/Purpose: Anti-cyclic citrullinated protein antibodies (anti-CCP) are the most specific autoantibody markers in rheumatoid arthritis (RA) patients. However, previous studies have evaluated their role in the pathogenesis of other human diseases (e.g., cardiovascular disease). In this study, we aimed to investigate the role of anti-CCP in the induction of pro-inflammatory and oxidative stress in white blood cells, and their relationship with chronic inflammatory and early atherogenesis in RA.

Methods: Fifty three RA patients and 31 healthy donors were included. Tissue factor (TF), pro tease activated receptors (PARs) expression, peroxides and peroxynitrite levels, more depolarised mitochondria and lower glutathione peroxidase activity (GPx) was evaluated in cell lysates. Atherosclerosis/CV risk markers were also evaluated. RT-PCR was performed to elucidate the cellular origin of plasma inflammatory markers. The carotid-intimate media thickness (CIMT) was measured as a surrogate marker of atherosclerosis. In parallel in vitro studies, isolated monocytes, lymphocytes, or neutrophils were incubated with non-specific human IgG or with purified anti-CCP antibodies.

Results: Increased expression of TF and PAR2 was found in neutrophils from RA patients, with higher plasma levels of VEGF, tP, MCP1, MIP10, TNFα, IL-2, -8, -17A and -23. RA monocytes and neutrophils had higher peroxides and peroxynitrite levels, more depolarised mitochondria and lower GPx activity. Significantly higher levels of mRNA MCP-1, IL-1β, -6, -8, and TF were found in monocytes, pointing to the main cell sources of inflammatory molecules in RA. Notably, augmented titres of anti-CCP were not only directly related to increased expression of pro-atherogenic, pro-inflammatory and oxidative stress markers, but also to increased CIMT. Moreover, in vitro treatment with anti-CCP increased peroxide production in monocytes and neutrophils, as well as on the percentage of cells with increased MMP. Anti-CCP treatment in monocytes induced elevated cell surface TF expression and increased mRNA expression of MCP-1, IL-1β-6, -8 while in lymphocytes provoked increased IL-1β, -2, -8, TNFα, and VEGF mRNA expression levels. No changes in cytokine mRNA were found in neutrophils.

Conclusion: 1) Anti-CCP antibodies directly induce inflammation and oxidative stress in RA patients. 2) Monocytes and lymphocytes are key mediators of the anti-CCP-induced inflammatory state by expressing particular cytokines, which may constitute promising therapeutic targets for the prevention of atherosclerosis and CVD in RA patients. Support: JA0246/2009, P08-CVI-04234, PSI09/01809, Spanish Foundation of Rheumatology.

Disclosure: C. Lopez-Pedrera, None; C. Perez-Sanchez, None; P. Ruiz-Limon, None, A. Aguirre, None; R. M. Carretero-Prieto, None; A. Rodriguez-Ariza, None; N. Barbarro, None; P. Font, None; F. Martinez, None; I. Gomez-Gracia, None; M. J. Cuadrado, None; E Collantes-Estevez, None.

1212

Elevated Fecal Secretory Immunoglobin A, Anti-Cyclic Citrullinated Peptide Antibodies, and Cytokine Levels in Rheumatoid Arthritis Patients. Sam Dalvi, Jose U. Scher*, Mukundan Attur, Jyoti Patel and Steven B. Abramson. NYU Hospital for Joint Diseases, New York, NY.

Background/Purpose: Rheumatoid arthritis (RA) is a complex autoimmune disease with genetic and environmental contributions. There has been increasing interest in the microbiome and its potential contribution to the pathogenesis of the inflammatory arthropathies. Our recent study suggest that RA patients have altered intestinal microbiota compared to healthy controls. Here we aimed to investigate the local immunologic response in the intestinal tract of RA patients, including humoral signatures and pro-inflammatory cytokine profile. Mucosal response against enteric bacteria may offer insights into the pathogenesis of RA and the potential identification of subsets of patients amenable to therapeutic interventions.

Methods: RA status, clinical activity and sociodemographic factors were determined in patients with New-onset RA (NORA; n=15), Chronic-established RA (n=14), and matched healthy subjects (n=14). Fecal samples were obtained and total protein was extracted. ELISA assays were performed to determine concentrations of secretory (s) IgA, anti-cyclic citrullinated peptides antibodies (anti-CCP3.1), and various pro-inflammatory cytokines by multiplex assay.

Results: RA patients show aberrant intestinal humoral responses manifested by elevated fecal sIgA levels. Elevated levels of anti-CCP antibodies were found in fecal samples of these patients (mean = 64.9 Units vs 14.7 Units in healthy controls; P = 0.03), suggesting that the intestinal tract is a potential site for peptide citrullination. Intriguingly, the gut anti-CCP3.1 levels in CRA patients were higher compared to NORA (p<0.10). NORA patients have significantly elevated fecal IL-1β compared to controls (mean = 4.2 pg/ml vs 1.67, p=0.02) as well as other pro-inflammatory cytokines including TNFα. These changes are associated with an intestinal microbiota alteration in NORA patients, characterized by a higher prevalence of Prevotella spp.

Conclusion: Our results show evidence of an amplified adaptive immune response and subclinical inflammation within the intestinal tract of patients with RA. To our knowledge, detection of the aforementioned fecal immunoglobulins and cytokines in RA patients has not been previously described. These findings suggest that immunologic defense mechanisms against intestinal bacteria may play a role in the pathogenesis of RA and that the intestinal tract is a potential site of peptide citrullination. Further studies are warranted to validate our findings.

Disclosure: S. Dalvi, None; J. U. Scher*, None; M. Attur, None; J. Patel, None; S. B. Abramson, None.

ACR/ARHP Poster Session B
Rheumatoid Arthritis - Clinical Aspects II: Clinical Features & Comorbidity/Cardiovascular Disease
Monday, November 12, 2012, 9:00 AM–6:00 PM

1213

The Serum Cytokine Profile of Interstitial Lung Disease in Rheumatoid Arthritis. Jose Felix Restrepo1, Inmaculada del Rincon2, Roy Haas3, Daniel F. Battafarano4 and Agustin Escalante4. 1University of Texas Health Science Center, San Antonio, TX, 2University Of Texas, Health Science Center, San Antonio, TX, 3TX, 4Brooke Army Medical Ctr, San Antonio, TX, 4University of Texas Health Science Center at San Antonio, San Antonio, TX

Background/Purpose: Interstitial lung disease (ILD) is associated with significant morbidity and mortality in rheumatoid arthritis (RA). There are currently no proven biomarkers for ILD in RA. Cytokines, because of their important role in RA pathogenesis, as promising candidates to serve as biomarkers for ILD. In the current analysis, we examined the association between multiple cytokines and ILD in an RA cohort.

Methods: We studied members of an RA cohort recruited during a visit to a rheumatologist. All patients had comprehensive assessments at baseline.
and annual follow-up, including collection of a serum sample which was stored. Medical records, including imaging reports, were reviewed thoroughly to assess comorbidity. We considered ILD to be present if an X-ray or computed tomography of the chest, or a lung biopsy were diagnostic of ILD. We measured the concentration of 38 cytokines in stored serum, using ELISA. We used stepwise logistic regression to identify cytokines associated with ILD, adjusting for age and sex as covariates. We show odds ratios (95% CI) to show strength of association.

Results: We studied 1328 patients, of whom 1204 had a stored serum sample for cytokine measurement. Of these, 86 had ILD (6.5%). Using stepwise logistic regression, the concentration of six cytokines was independently associated with ILD. The following three were associated with increased odds of ILD: growth-related oncogene (GRO), 2.14 (1.33, 3.44); tumor necrosis factor-alpha (TNF-a), 1.56 (1.12, 2.17); and interleukin-2 (IL-2), 1.73 (1.4, 2.15). The following three were associated with decreased odds of ILD: macrophage-inflammatory protein-1-alpha (MIP1-a), 0.79 (0.62, 1.00); macrophage-derived chemokine (MDC) 0.48 (0.32, 0.72); and granulocyte colony stimulating factor (GCSF), 0.51 (0.34, 0.78). (Table 1). The area under the ROC curve for a model containing these cytokines plus age and sex was 0.776, while that for a model containing only age and sex was 0.63.

Table 1. Cytokines in RA-ILD patients.

<table>
<thead>
<tr>
<th>Cytokine</th>
<th>OR (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRO</td>
<td>2.14 (1.33, 3.44)</td>
<td>0.004</td>
</tr>
<tr>
<td>IL-2</td>
<td>1.73 (1.40, 2.15)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TNF-A</td>
<td>1.56 (1.12, 2.17)</td>
<td>0.021</td>
</tr>
<tr>
<td>MIP1A</td>
<td>0.79 (0.60, 1.00)</td>
<td>0.043</td>
</tr>
<tr>
<td>GCSF</td>
<td>0.51 (0.34, 0.78)</td>
<td>0.006</td>
</tr>
<tr>
<td>MDC</td>
<td>0.48 (0.22, 0.72)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Conclusion: The profile of serum cytokine concentrations is significantly associated with the presence of ILD, with some cytokines being associated with increased risk, others with decreased risk. These findings may indicate the potential pathogenic of these cytokines in ILD among RA patients. In addition, these cytokines offer promise as potential biomarkers that could be used for the early identification of patients at risk for developing ILD.

Disclosure: Nothing to disclose.

Disclosure: J. F. Restrepo, None; I. del Rincon, None; R. Haas, None; D. F. Battafarano, None; A. Escalante, None.

1215
The Impact of Periodontal Disease On Early Inflammatory Arthritis Persists Even After All Teeth Are Lost. Gisela Westhoff1, Paola de Pablo2, Thomas Dietrich3, Georg Schett4 and Angela Zink5.1 German Rheumatism Research Center and Charite´ University Medicine, Berlin, Germany; 2University of Birmingham, Birmingham, United Kingdom; 3The School of Dentistry, University of Birmingham, Birmingham, UK; 4Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany; 5German Rheumatism Research Center and Charite´ University Medicine, Berlin, Germany.

Background/Purpose: Data suggests that individuals with periodontal disease (PD) may be more likely to develop rheumatoid arthritis (RA) and have worse disease activity. PD is a common inflammatory disease characterized by gingival accumulation of inflammatory cells with endothelial cell proliferation and matrix degradation that may worsen joint inflammation. Since PD is a major cause of tooth loss, a surrogate marker for joint destruction. The expectation is that orthopaedic surgical rates will decline over time with greater and earlier use of more intensive treatments for RA.

Methods: The Early RA Study (ERAS) recruited from 1986–1999 (n=1465), the Early RA Network (ERAN) from 2002-2011 (n=1236). Standardised clinical, laboratory and X-ray measures were performed at baseline prior to initiation of DMARD therapy and then yearly in both cohorts. Treatment of patients included disease modifying, steroid and biologic therapies according to standard UK practices for management of hospital based RA patients, based on sequential published guidelines over 1986–2011. Source data of all orthopaedic interventions included clinical datasets (patient reports and medical records from 1986), and national data from Hospital Episode Statistics and the National Joint Registry. Length of follow up was based on the National Death Registry. For the analysis, recruitment years were grouped into 6 periods and interventions categorized into major (large joint replacements), intermediate (mainly synovectomies and arthroplasties of wrist/hand, hind/forefoot), and minor (soft tissue/ tendon surgery).

Results: A total of 1602 procedures were performed in 770 patients (29%) over maximum 25 year follow up. The 25 year cumulative incidence rate of major interventions was 21.7% (19.4–24.0%), and 21.5% (17.8–25.5%) for intermediate. Secular changes in orthopaedic surgical rates per year from 1987–2011 will be displayed graphically, showing a small, non-significant decline in major interventions (0.02%; p>0.05), but the regression model fitted for intermediate interventions indicated a significant decline (0.03%, p<0.05), and a small but non-significant increase for minor interventions (0.02%; p>0.05). There were only minor differences in demographic and baseline features over the recruitment periods examined, but definitive treatment trends showed a gradual change from sequential monotherapy to combination therapies and biologics, and greater and earlier use of methotrexate and steroids in later recruitment periods. Methotrexate

Figure S519
and combination therapies as first DMARD were used in 1% and less than 1% respectively in recruitment period 1986–1989, and in 70% and 13% in 2006–2011. Anti-TNF agents were used in the first 3 years of disease only the latter two recruitment periods: 2002–2005, 7.8% and 2006–2011, 19.4%.

**Conclusion:** Orthopaedic surgery is an important and common outcome in RA by 10 years. Only hand/foot surgery rates showed a consistent decline from 1986–2011. Possible explanations include differences in pathophysiological processes affecting joints; variations in responses to therapy between large and small joint destructive processes; changes in service provision and thresholds for different types of orthopaedic surgery over time.

**Disclosure:** E. Nikipherou, None; L. Carpenter, None; S. Norton, None; D. James, None; P. D. Kiedy, None; D. Walsh, None; R. Williams, None; A. Young, None.

**1216**

Flare Self Management Strategies Used by Patients with Rheumatoid Arthritis. Sesan J. Bartlett1, Clifton O. Bingham III2, Jian Xiong3, Ernest Choy4, Gilles Boire5, Carol A. Hitchon6, Janet E. Pope7, J. Carter Thorne8, Diane Tin9, Boulos Haraoui10, E. Keystone11, OMERACT Flare Working Group12, and CATCH13. McGill University, Montreal, QC, Johns Hopkins University, Baltimore, MD, Mount Sinai Hospital, Toronto, ON, Cardiff University School of Medicine, Cardiff, United Kingdom, CHUS - Sherbrooke University, Sherbrooke, QC, University of Manitoba, Winnipeg, MB, Western University of Canada, St. Joseph’s Health Care, London, ON, Southlake Regional Health Centre, Newmarket, ON, Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CHUM), Montreal, QC, University of Toronto, Toronto, ON, Hospital for Special Surgery, New York, NY, Ottawa, Toronto, ON.

**Background/Purpose:** Though disease flares are common, very little is known about strategies RA patients use for self management (SM) of flares. We asked patients to identify SM strategies and explored potential predictors of strategies.

**Methods:** 512 patients in the Canadian early Arthritis Cohort (CATCH) completed the OMERACT preliminary flare questionnaire (PFQ) at clinic visits from 11–2011 through 4–2012. Patients who self-identified as being in a flare provided ratings of flare severity, pain, disability (HAQ) and identified SM strategies they were using. Strategies were selected from those previously reported from 11–2011 through 4–2012. Patients who self-identified as being in a flare provided ratings of flare severity, pain, disability (HAQ) and identified SM strategies they were using. Strategies were selected from those previously reported during OMERACT RA Flare patient focus groups. Rheumatologists rated whether their patient was in a flare and performed joint counts. Groups were stratified based on Patient-MD agreement of flare status and compared using ANOVA. Multivariable logistic regression was used to identify potential predictors of flare SM.

**Results:** 512 patients with early RA who were mostly female (75%), white (82%) and well educated (57% > HS) answered the PFQ. Patients had a mean (SD) age of 53 (14) yr, 18% smoked, 65% RF+, 53% CCP+ and 24% had erosions. Mean HAQ was 1.03 (.70) and pain was 56 (27). 149 (29%) patients had planned to do as a result of this flare. The most common SM strategy was taking more analgesics (51%); in contrast, few patients reported taking more steroids (5%) and 34% tried to manage the flare without medications. Other strategies differed between patient/MD agreement on flare status (see Table). When patients and MDs agreed the patient was in a flare, 87% reported using SM strategies; whereas when but not at least 1 MD identified flare, 65% used SM strategies (p = .001). Patient/MD agreement about flare status was also associated with a significantly (p = .05) more likely to be classified as being in a flare.

The most common SM strategy was taking more analgesics (51%); in contrast, few patients reported taking more steroids (5%) and 34% tried to manage the flare without medications. Other strategies differed between patient/MD agreement on flare status (see Table). When patients and MDs agreed the patient was in a flare, 87% reported using SM strategies; whereas when but not at least 1 MD identified flare, 65% used SM strategies (p = .001). Patient/MD agreement about flare status was also associated with a significantly (p < .05) greater likelihood of activity reduction/avoidance. Although few patients contacted the care team for help prior to the visit, patient/MD agreement about flare status was associated with >5 fold increase in asking for help. Across strategies, predictors of SM included patient/MD agreement, female sex, and higher disability, other sociodemographic and disease characteristics were not reliably associated with SM.

**Conclusion:** Disease flares are common at routine care visits in early RA. Most patients recognize when they are flaring and their rheumatologists agree. Patients report using several flare SM strategies including taking more analogics and reducing activities. Patient/MD agreement, female sex and higher disability are predictors of flare SM efforts. Notably, few patients (11%) experiencing flare in this early RA sample reported asking care providers for help prior to the routine clinic visit.

**Disclosure:** S. J. Bartlett, None; C. O. Bingham III, Roche, Genentech, Biogen/ IDEC, 2; Roche, Genentech, 5; X. Xiong, None; E. Choy, None; G. Boire, None; C. A. Hitchon, None; J. E. Pope, None; J. C. Thorne, None; D. Tin, None; B. Haraoui, Arthrolab Inc.; E. Keystone, Abbott Laboratories; Amgen Inc.; AstaZeneca Pharmaceuticals LP, 2, Abbott Laboratories; AstaZeneca Pharma, Biostat, Bristol-Myers Squibb Company; Centocor, Inc; F. Hoffmann-La Roche Inc; Genentech Inc; Merck, NovoCorm, Pfizer Pharmaceuticals, UCB; 5; V. P. Bykerk, Amgen, Pfizer, Roche, BMS, UCB, Janssen Biotech and Abbott, 2.

**1217**

Decreased Survival in Rheumatoid Arthritis Complicated with Bronchiectasis: A Family-Based Cohort Study. Xavier Puéchal1, Emmanuelle Génin2, Thierry Bienvenu1 and Daniel J. Dusser1, 1Hôpital Cochin, AP-HP, Université Paris Descartes, Sorbonne Paris Cité, Paris, France, 2INSERM UMR-S946, Université Paris Diderot, Paris, France.

**Background/Purpose:** In cystic fibrosis, mutations of the cystic fibrosis transmembrane conductance regulator (CFTR) gene lead to diffuse bronchiectasis (DB) and decreased survival. DB is also associated with rheumatoid arthritis (RA), in which the role of CFTR mutations in predisposition to DB has been established (Puéchal et al. ARD 2011,70: 653–9). The prognosis of RA-associated DB (RA-DB) has not been well described.

**Methods:** We report on long-term mortality in a French nationwide prospectively followed, well-characterized, family-based association study of patients with a diagnosis of RA, DB or RA-DB. Families of probands with RA-DB were included if one first-degree relative had RA and/or DB. We assessed the overall mortality according to clinical characteristics and CFTR mutations among 138 subjects from 24 kindreds enrolled in the cohort. The association of potential risk factors with death was tested by Cox proportional-hazard analysis.

**Results:** During a median follow-up time after the inclusion of 10.6 years, 18 patients in the study cohort died, mainly due to respiratory involvement. The survival of RA-DB patients was significantly lower than the one of the RA patients and DB patients (P = 0.006) (Fig A). In RA patients, the presence of DB was the main poor prognostic factor (hazard ratio for death, 8.7; 95% CI, 1.6 to 48.5; P = 0.01). Among the RA-DB patients, an early onset of DB (hazard ratio, 18.6; 95% CI, 2.2 to 156.9; P = 0.01) and CFTR mutation (hazard ratio, 8.3; 95% CI, 1.5 to 45.7; P = 0.02) had an independent, significant association with decreased survival (Fig B and C). A CFTR mutation in RA patients with early-onset DB defined a subgroup of patients with increased mortality (hazard ratio, 9.4; 95% CI, 2.5 to 35.0; P < 0.001).

**Conclusion:** Disease flares are common at routine care visits in early RA. Most patients recognize when they are flaring and their rheumatologists agree. Patients report using several flare SM strategies including taking more analogics and reducing activities. Patient/MD agreement, female sex and higher disability are predictors of flare SM efforts. Notably, few patients (11%) experiencing flare in this early RA sample reported asking care providers for help prior to the routine clinic visit.

**Disclosure:** S. J. Bartlett, None; C. O. Bingham III, Roche, Genentech, Biogen/ IDEC, 2; Roche, Genentech, 5; X. Xiong, None; E. Choy, None; G. Boire, None; C. A. Hitchon, None; J. E. Pope, None; J. C. Thorne, None; D. Tin, None; B. Haraoui, Arthrolab Inc.; E. Keystone, Abbott Laboratories; Amgen Inc.; AstaZeneca Pharmaceuticals LP, 2, Abbott Laboratories; AstaZeneca Pharma, Biostat, Bristol-Myers Squibb Company; Centocor, Inc; F. Hoffmann-La Roche Inc; Genentech Inc; Merck, NovoCorm, Pfizer Pharmaceuticals, UCB; 5; V. P. Bykerk, Amgen, Pfizer, Roche, BMS, UCB, Janssen Biotech and Abbott, 2.

**Figure A.** Survival curves in RA patients using Cox proportional Hazard model and two strata (with and without DB) (p = 0.006).

**Table:**

<table>
<thead>
<tr>
<th>Flare Strategy</th>
<th>Patient Flare MD</th>
<th>Patient Flare MD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not do anything different</td>
<td>11 (13%)</td>
<td>22 (35%)</td>
</tr>
<tr>
<td>Reduced the amount of activities</td>
<td>49 (57%)</td>
<td>24 (58%)</td>
</tr>
<tr>
<td>Avoided doing activities that I had planned to do</td>
<td>32 (37%)</td>
<td>15 (24%)</td>
</tr>
<tr>
<td>Tried to manage my flare without medications</td>
<td>28 (33%)</td>
<td>23 (37%)</td>
</tr>
<tr>
<td>Took more painkillers</td>
<td>48 (56%)</td>
<td>28 (44%)</td>
</tr>
<tr>
<td>Took more steroids tablets</td>
<td>6 (7%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Asked for help from nurse or my rheumatologist</td>
<td>14 (16%)</td>
<td>2 (3%)</td>
</tr>
</tbody>
</table>
study was to characterise neuroimmune interactions common variants in the genes of the beta2-adrenergic receptor (beta2AR) and corticotropin releasing hormone (CRH) together with functional stress responses in RA patients and controls.

**Methods:** An allele-specific polymerase chain reaction was used to determine the polymorphisms of the beta2AR at position 16, 27, and 164, as well as the polymorphic sequences in the 5’ flanking region of the human CRH gene in patients with RA (n = 310) and ethnically matched healthy controls (n = 305). In a subgroup of RA patients (n = 100) the autonomic response upon various standardised stressors was performed by utilising the heart rate variability (HRV) test (ProSciCard III, Version 2.2a, Medi-Syst GmbH, Germany) and compared to 45 age and sex matched osteoarthritis patients. To evaluate the impact of CRH promoter polymorphisms on the stress response in a subgroup of RA patients (n=18) an insulin hypoglycaemia test (IHT) was performed studying the dynamics of blood glucose levels, CRH, adrenocorticotropic (ACTH) and cortisol production.

**Results:** There was a highly significant distortion in the distribution of the beta2AR polymorphism at codon 16 between RA patients and controls, contributing to the genetic background of RA. Arginine (Arg) at codon 16 was present in 89.7 % of RA patients compared to 66.2 % controls (OR 4.43, 95 % CI 2.81 to 7.02, p = 0.00001). Stratifying RA patients for the amino acid sequence at position 16 and their autonomic reactivity revealed a statistically significant decrease of parasympathetic activity, in particular for the deep breathing test, in patients with homozygosity for Glycine (Gly) 16 compared to RA patients being heterozygous (Arg16Gly). However, RA patients with homozygosity for Glycine 16 showed a normalisation of the sympathetic reactivity upon mental stress test. On the other hand, polymorphisms of CRH 5’ regulating region are differentially distributed in RA patients and healthy subjects. The CRH promoter polymorphisms exerted a significant influence on the stress response of RA patients undergoing an IHT. The integrated cortisol response to hypoglycaemia expressed as area under the curve was significantly lower in RA patients bearing the A1B1 allele (64154 ± 5768 nmol/l) compared to the A2B2 allele (91273 ± 7298 nmol/l, p=0.016).

**Conclusion:** Polymorphisms of the beta2AR and CRH contribute to the genetic background of RA and is associated with disturbed functional stress reactivity on various levels in these patients. Further studies are warranted to determine the role of genetic factors on stress response in the disease process of RA.

**Disclosure:** O. Malysheva, None; C. G. Baerwald, None.

**1219**

**Periodontal Disease Is Associated with Rheumatoid Arthritis but Its Severity Is Not Correlated with Rheumatoid Arthritis Disease Activity.**

In Ah Choi¹, Jin-Hee Kim², Kyung Hwa Kim², Hye Won Kim¹, Myeong Jae Yoon¹, Bon Seung Ku¹, Hyejin Oh¹, Joo Youn Lee¹, Eun Young Lee¹, Eun Bong Lee¹, Young-Moo Lee⁵ and Young Wook Song⁵. ¹Department of Internal Medicine, School of Medicine, Seoul National University, Seoul, South Korea, ²Department of Periodontology, School of Dentistry, Seoul National University, Seoul, South Korea

**Background/Purpose:** The prevalence of periodontal disease is known to be increased in patients with rheumatoid arthritis (RA) compared to the general population. We investigated whether severity of periodontal disease is associated with RA and correlated with RA disease activity, ACPA status or treatment medication.

**Methods:** We conducted a cross-sectional study comparing 295 RA patients and 88 non-arthritis controls. In RA patients, serum RF, anti-CCP antibody, CRP and ESR were measured. Clinical parameters including tender joint count (TJC), swollen joint count (SJC), DAS28 and presence of erosive status were recorded. Clinical factors were also measured, including periodontal disease (PD) status (PD+PD−), number of teeth (0−15), and general health status. PD status was classified as mild (PD < 5 mm), moderate (PD 5−10 mm) and severe (PD > 10 mm) by the 2004 American Academy of Periodontology Classification.

**Results:** The mean number of teeth (±SD) in 295 RA patients and 88 controls were 25.8 ± 2.9, respectively (p=0.001). Among 290 RA patients, 28 patients (8.8%) had less than 15 teeth and 3 patients had ongoing dental care, both were excluded from the dental exam. Mean PI in 264 RA patients and 88 controls were 0.84 ± 0.49 and 0.70 ± 0.34.
Monday, November 12

activity markers (TJC, SJC, ESR, CRP, DAS28), presence of bone erosion, significant association between severity of periodontitis and RA disease.

E. B. Lee, M. J. Yoon
Mayo Clinic, Rochester, MN

amputation. LE ulcers are associated with double the mortality rate in RA. Ulcers in RA has doubled in the recent years. A significant number require amputation. Presence of LE ulcers was associated with increased mortality (HR 2.03; p=0.002) adjusted for age, sex and calendar year. Risk factors for LE ulcers in RA were: age (HR 1.90 per 10 year increase; p<0.001); current smoking (HR 1.51; p=0.048); diabetes mellitus (HR 1.65; p=0.015); coronary heart disease or heart failure (HR 1.56; p=0.035); presence of rheumatoid nodules (HR 1.64; p=0.010); ESR ≥ 60 mm/hour on three occasions (HR 1.78; p=0.022); venous thromboembolism (HR 2.08; p=0.014); severe extra-articular manifestations (HR 1.67; p=0.048). 79 (46%) of 171 ulcer episodes occurred in patients on corticosteroid therapy.

Conclusion: LE ulcers are common among patients with RA. The cumulative incidence increased by 1% per year, and the incidence of LE ulcers in RA has doubled in the recent years. A significant number require amputation. LE ulcers are associated with double the mortality rate in RA patients. Clinicians should be aware of the significance of LE ulcers in RA for better management of these patients.

Disclosure: A. Jebakumar, None; C. S. Crowson, None; P. D. Udayakumar, None; S. E. Gabriel, None; E. L. Matteson, None.

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Low Muscle Density in Rheumatoid Arthritis and Modified Association with Total Fat Mass, Results of a Pilot Study. Joshua Baker1, Joan Marie Von Feldt2 and Mary Beth Leonard3. 1University of Pennsylvania, Philadelphia, PA, 2Univ of Pennsylvania/Philadelphia VAMC, Philadelphia, PA, 3The Children’s Hospital of Philadelphia, Philadelphia, PA

Background/Purpose: Fatty infiltration of muscle (myositis) results in a decrease in muscle density. Prior studies documented that skeletal muscle attenuation determined by CT was associated with skeletal muscle lipid content on tissue biopsy. Low muscle density is associated with insulin resistance and is independently associated with an increased fracture risk. We evaluated muscle density as measured by peripheral quantitative CT (pQCT) in 28 subjects with rheumatoid arthritis (RA) compared to 464 well-characterized controls.

Methods: RA subjects and healthy controls from the Philadelphia area underwent whole-body Dual X-ray Absorptiometry (DXA) and pQCT of the tibia. The pQCT measure of muscle density (mg/cm²) was used as a composite index of intra and extra-mycocellular fat content as previously described. Edge-detection and threshold techniques were used to separate tissues (fat, muscle, and bone) based on attenuation characteristics. Images were filtered prior to being analyzed using contour mode 3 (~101 mg/cm²) to find skin, and peel mode 2 (40 mg/cm²) to separate adipose and muscle/bone, respectively. Whole body DXA measures of total fat mass were converted to an index to adjust for height (kg/m²). Muscle density was compared between RA and controls after adjusting for age, sex, and race using multivariable linear regression analysis. Linear regression was further utilized to assess for differences in RA and controls after adjustment for differences in total fat mass and to evaluate for modification of the association between fat and muscle density among RA subjects.

Results: Adjusted mean muscle density in RA and controls was 73.3 (2.08) and 74.5 (2.01), respectively (p=0.003). There was significant modification of the effect of fat mass on muscle density in RA [Interaction β: 0.0038 (0.0018–0.0057) p<0.001]. In healthy controls, muscle density was negatively associated with total fat mass index (FMI), while among RA, there was no such association (Figure 1). This interaction suggested that differences in muscle density between RA and controls were most pronounced among subjects with lower fat mass. Use of steroids, use of biologics, disability scores, C-Reactive Protein (CRP) and disease activity (DAS28) were not significantly associated with muscle density in this small sample of RA.

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Figure 1. Association between DXA fat mass index (FMI) and muscle density among Healthy Controls and Rheumatoid Arthritis after adjustment for age, sex, and race.

Conclusion: Muscle density is lower in RA subjects compared to healthy controls of similar age, sex, and race. Differences in muscle density are not dependent on the greater fat mass observed among RA subjects. The interaction observed between RA status and FMI suggests that the mechanism of myositis in RA may be distinct from that of healthy controls.

Disclosure: J. Baker, None; J. M. Von Feldt, American Board of Internal Medicine, 6; M. B. Leonard, None.

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Background/Purpose: to determine the incidence and time trends of malignancy in patients with rheumatoid arthritis (RA) in 1980–2007 compared to individuals without RA from the same population.

Methods: A population based inception cohort of patients with RA who fulfilled 1987 ACR criteria in 1980–2007 and an age and sex matched cohort of non-RA subjects from the same population was assembled and followed until death, migration or 12/31/2008. Incidence rates of overall and site specific malignancy were collected. Cumulative incidence of malignancy adjusted for the competing risk of death was estimated for RA and non-RA subjects and compared using Gray’s test.

Results: The study consisted of 813 RA and non-RA subjects (mean age 55.9 years, 68% female, 60% rheumatoid factor positive). Prior to RA incidence/non-RA index date, 53 RA and 66 non-RA subjects had a malignancy (p=0.22). The prevalence of hematologic malignancy was lower among RA subjects compared with non-RA subjects prior to the incidence/index date, (n=0 vs n=7, p=0.015). Excluding patients with prior malignancies, the remaining RA patients were followed for a mean of 9.1 years (mean 10.3 years for non-RA) during which 109 RA and 94 non-RA subjects developed a malignancy. The cumulative incidence of hematologic malignancy was higher among RA than non-RA subjects (2.0 ± 0.6% vs 0.7% ± 0.3% at 10 years, p=0.009). There was no significant difference in the cumulative incidence of overall malignancy between RA and non-RA subjects (13.0% ± 1.5% vs 9.1% ±1.2% at 10 years, p=0.10). There was no significant difference in the rate of lung or colon cancer in RA subjects relative to non-RA subjects. The cumulative incidence of breast cancer was lower among RA subjects compared to non-RA in the first 10 years after diagnosis of RA (2.9% ± 0.8% vs 1.6% ± 0.7% at 10 years), but this difference did not achieve statistical significance (p=0.63). Individuals diagnosed with RA more recently (1995–2007) were more likely to develop a hematologic malignancy compared with RA subjects diagnosed in earlier years (1980–1994) (hazard ratio [HR]: 2.28; 95% CI 0.95, 5.51). Similar changes were not seen over the same time period among subjects without RA.

Conclusion: Patients diagnosed with RA more recently appear to be at higher risk of developing a malignancy relative to patients diagnosed in earlier years. There was no significant difference in the rate of solid organ malignancies including breast, lung and colon cancer between RA and non-RA subjects in this population. The rate of hematologic malignancy is higher among patients with RA relative to non-RA subjects.

Disclosure: K. Wright, None; C. S. Crowson, None; S. E. Gabriel, None; E. L. Matteson, None.

Incidence of Deep Vein Thrombosis and Pulmonary Embolism in Rheumatoid Arthritis, Christian A. Pineau1, Evelyne Vinet1 and Sasha Bernatsky2. 1McGill University Health Centre, Montreal, QC, Canada.

Background/Purpose: There are few data regarding the frequency of deep vein thromboses (DVTs) and pulmonary emboli (PE’s) in patients with rheumatoid arthritis (RA). To determine the frequency of DVTs and PE’s within RA patients in a population-based sample from Quebec, Canada.

Methods: We conducted a study using Quebec’s provincial administrative health care databases (including physician billing claims and hospitalization records for all eligible Quebec residents (over 7.8 million individuals) from 1996 to 2008. Cohort definition: The definition for RA was based on at least 2 physician billing diagnoses for RA (ICD-9 code 714, ICD-10 code M05), at least 8 weeks apart but within 2 years, OR at least one hospitalization code (primary or secondary) with an RA diagnostic code. Of these subjects, we excluded any with subsequent evidence (based on 2 billing codes or a hospitalization) of a different systemic rheumatic disease (including seronegative arthropathies and connective tissue diseases). We also excluded any patients who had seen a rheumatologist but who did not have the RA diagnosis confirmed on at least one rheumatology visit.

Outcome definitions: Our outcome definition for DVT was: Two or more physician billing diagnoses for ICD-9 code 451 or 453 (ICD10 code 180.2), or at least one hospitalization diagnosis (primary or secondary) indicating one of these codes. Our outcome definition for PE was: Two or more physician billing diagnoses for ICD-9 code 415.1 (ICD-10 code I26) or one or more hospitalization diagnoses (primary or secondary), based on the same ICD codes.

We compared the number of observed events, to the number of events that would be expected, based on recent estimates of thromboembolic events (DVT’s and PE’s) within a general population (which were also based on physician billing and hospitalization administrative data sources). The ratio of observed to expected events provides the standardized incidence ratio, and 95% confidence intervals were generated assuming a Poisson distribution for the observed events.

Results: In total over the period of study, we identified 170,021 Quebec residents who met our RA definition (suggesting a period prevalence of about 2%). The subjects were followed for a total of 1,074,854 patient-years, averaging 6.3 years (standard deviation 3.9) of observation per subject. Within this time, 12278 RA subjects had at least one event (1.18 events per 100 person-years), with 9,846 DVT’s being recorded over the interval (0.94 events per 100 person-years), and 3756 PE’s (0.35 events per 100 person-years).

RA cohort experience

<table>
<thead>
<tr>
<th>Observed events</th>
<th>Expected Events*</th>
<th>Standardized Incidence rate</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any event</td>
<td>12278</td>
<td>9054</td>
<td>1.36</td>
</tr>
<tr>
<td>DVT</td>
<td>9846</td>
<td>7229</td>
<td>1.36</td>
</tr>
<tr>
<td>PE</td>
<td>3756</td>
<td>2996</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Expected rates generated from Boulet et al, ARCH INTERN MED 2010: 170 (19)

Conclusion: Our preliminary work suggests that patients with RA have about a 30% increase in thromboembolic events, compared to published general population rates. Further work is in progress to provide results stratified by age and sex.

Disclosure: C. A. Pineau, None; E. Vinet, None; S. Bernatsky, None.

Rheumatoid Arthritis Disease Activity During Pregnancy Affects the Postnatal Catch-up Growth of the Child, Florentien D.O. de Steenwinkel1, Anita C.S. Hokken-Koelega2, Maria A.J. de Ridder1, Johanna M.W. Hazes1 and Radboud J.E.M. Dollham1. 1Erasmus Medical Center, Rotterdam, Netherlands, 2Erasmus Medical Center- Sophia Children’s Hospital, Rotterdam, Netherlands.

Background/Purpose: Active rheumatoid arthritis (RA) during pregnancy is associated with lower birth weight. Active RA during pregnancy can be treated with prednisone. However, studies have shown that prednisone use during pregnancy reduces gestational age thereby indirectly creates lower birth weight. In general, newborns with a lower birth weight will catch-up in growth after they are born. Literature shows that a fast catch-up growth pattern of the child is associated with cardiovascular risk and metabolic disorders in early adulthood. The purpose of this study: “Is maternal RA and/or prednisone use during pregnancy associated with fast catch-up growth in the first 2 years of the child?”

Methods: Current study is a continuation of a prospective nationwide study on RA during pregnancy. Growth charts were collected from children born from mothers participating in this study. Dependent variable: height standard deviation score (SDS) and weight SDS on different time points. Independent variable: prednisone use and RA disease activity (DAS28) during pregnancy.

Results: 161 growth charts were analyzed; 67 women used prednisone at some point during their pregnancy. The mean DAS28 during pregnancy was significantly higher in the prednisone group, 3.88 (SD: 1.01) than in the group without prednisone 3.02 (SD: 1.03) (p<0.0001). An association was found between elevated DAS28 during pregnancy and fast catch-up growth (>0.50 SDS) of the child within the first half year. An increase of one point DAS28 during pregnancy resulted in a catch-up weight of 0.16 (p=0.03) and a catch-up height of 0.12 (p=0.04) at the age of 3 months. No effect was shown for prednisone use. Conclusion: Our study suggests that elevated RA disease activity during pregnancy is associated with fast catch-up growth. This might have lifelong consequences for the child. Minimizing the disease activity during pregnancy is therefore crucial and should be striven at all times.


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Self Reported Comorbidity Is Common in Early Inflammatory Arthritis and Associated with Poorer Function and Quality of Life and Greater Disease Activity: Results From the Canadian Early Arthritis Cohort. Carol A. Hitchon1, Gilles Boire2, Boulos Harauzi3, Edward Keystone1, Janet E. Pope4, Vivian P. Bykerk1 and Canadian Early Arthritis Cohort (CATCH) Investigators. 1University of Manitoba, Winnipeg, MB, 2CHUS - Sherbrooke University, Sherbrooke, QC, 3Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRUCHM), Montreal, QC, 4University of Toronto, Toronto, ON, 5Univ of Western Ontario, London, ON, 6Hospital for Special Surgery, New York, NY, 7Toronto

Background/Purpose: Chronic comorbid medical conditions may contribute to poor outcomes in rheumatoid arthritis. The extent of comorbidity, in particular cardiovascular disease (CVD), may be related to the burden of inflammation and may influence initial treatment choice. We report the association of baseline comorbidity with clinical disease activity, functional status and quality of life in early inflammatory arthritis (EIA) using data from the Canadian Early Arthritis Cohort (CATCH).

Methods: Subjects (n = 779) with EIA of symptom duration 6–52 weeks, ≥ 2 effusion joints or swollen MCP or PIP, and age ≥ 2 of: RF, + CCP, morning stiffness > 45 minutes, response to NSAIDs, or painful MTP sneeze test report comorbid medical conditions at baseline, quality of life indices (SF12) annually, and functional status (HAQ), pain visual analogue scale, detailed arthritis clinical assessments and arthritis treatment at each visit. Although there is no formal treatment protocol, participating rheumatologists aim for minimal disease activity. The influence of baseline comorbidity on outcomes while controlling for age and disease duration was tested by linear regression.

Results: Comorbidity was reported by 538 subjects (69%; median conditions range 1-8). Patients with vs without comorbidity were older (45 vs 54 years p < 0.0001) and had higher baseline disease activity primarily due to ESR (37 vs 21 p < 0.001) and CRP (14 vs 11 p < 0.02). Associations between CVD and higher DASCRP3v (4.42 vs 4.18 p = 0.03) and worse HAQ (1.13 vs 0.73) vs 0.71 p < 0.001 at baseline were not significant after correcting for age. Baseline SF12 scores (all patients) were below population averages (Physical Composite Score (PCS) 37(11) and Mental Composite Score (MCS) 47(12)). SF12 correlated with the number of comorbidities: PCS (~0.2 p < 0.001), MCS (~0.1 p = 0.05). All domain scores were significantly worse in patients with any comorbidity vs without. Patients with CVD (vs without) (34 (10) vs 38 (11) p < 0.0001) endocrine disease (diabetes, thyroid, dyslipidemia) (35(11) vs 31(11) p = 0.001), GI or renal (stomach, liver, disease, hepatitis or renal) (35(11) vs 38(11) p = 0.03) and respiratory (asthma, bronchitis) (p = 0.005) had worse PCS. Patients with neurologic (migraine, parkinson, seizures) (44(12) vs 47(11) p = 0.03), mental health (depression or other) (39 (11) vs 46 (39) p < 0.0001) and GI or renal (43(12) vs 47(11) p = 0.005) comorbidities were associated with poorer MCS. Patients with any baseline comorbidity had higher DASCRP3v scores (3.15 (8.1) vs 2.94 (9.1) p = 0.004), worse functional status (HAQ 0.67 (0.54) vs 0.47 (0.46) p < 0.0001), and more pain (3.6 (2) vs 3.2 (2.1) p = 0.001), averaged over the first year, than those without baseline comorbidity. Renal or GI disease had worse DASCRP3v (p < 0.0001) over the first year. Baseline cardiovascular disease was not associated with poorer outcomes. The number of comorbid conditions at baseline was inversely associated with one year PCS and MCS.

Conclusion: Patients with comorbid medical conditions have greater disease activity, poorer functional status and lower self reported quality of life over the first year of followup. This observation has implications for treatment of early arthritis.

Disclosure: C. A. Hitchon, None; G. Boire, None; B. Harauzi, None; E. Keystone, Abbott Laboratories Amgen Inc, AstraZeneca Pharmaceuticals LP, Bristol-Myers Squibb, Centocor Inc; F. Hoffmann-LaRoche Inc, Genzyme, Merck, Novartis Pharmaceuticals, Pfizer Pharmaceuticals, UCB, 2, Abbott Laboratories, AstraZeneca Pharma, Biotech, Bristol-Myers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc GeneTech Inc, Incyte, Incyte, Novartis Pharmaceuticals, UCB, Amgen, Janssen Inc; 5; J. E. Pope, None; V. P. Bykerk, Amgen, Pfizer, Roche, BMS, UCB, Janssen Biotech and Abbott, 2.
Results: Table 1 displays the cohort characteristics as a whole and Table 2 displays the comparison of those with UIP and NSIP. There was no significant difference among those with UIP (median 100.3 months) compared to NSIP (median 58.3 months) (p=0.5).

<table>
<thead>
<tr>
<th>Table 1. Baseline Demographics and Pulmonary Function Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at Initial Visit</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>63 (21 to 90)</td>
</tr>
</tbody>
</table>

Table 2. Usual Intertstitial Pneumonia vs Nonspecific Pneumonia

<table>
<thead>
<tr>
<th>Usual Intertstitial Pneumonia</th>
<th>Nonspecific Intertstitial Pneumonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at initial visit</td>
<td>63 (39–84)</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>70%</td>
</tr>
<tr>
<td>Past or current smokers</td>
<td>63%</td>
</tr>
<tr>
<td>RF positivity</td>
<td>100%</td>
</tr>
<tr>
<td>CCP positivity</td>
<td>93%</td>
</tr>
<tr>
<td>%FEV1</td>
<td>59% (30–100%)</td>
</tr>
<tr>
<td>%FVC</td>
<td>62% (30–96%)</td>
</tr>
<tr>
<td>%TLC</td>
<td>76% (53–105%)</td>
</tr>
</tbody>
</table>

Conclusion: In contrast to prior studies that suggest UIP is the most common pattern in RA-ILD, equal numbers of subjects with UIP and NSIP were identified in our large cohort. We also found a significant number of subjects in whom lung disease was either too mild to classify or had fibrotic features both of NSIP and UIP (28% of our cohort). Furthermore, in contrast to prior studies that suggest RA-UIP has worse survival than RA-NSIP, underlying histologic pattern did not impact survival in our cohort. Prospective studies are needed to further understand the impact of histopathology on the natural history of RA-ILD.

Disclosure: J. J. Solomon, None; G. M. Russell, None; J. B. Ketzer, None; A. L. Olson, None; E. R. Fernandez-Perez, None; T. J. Huie, None; J. J. Swigris, None; K. K. Brown, Actelion Pharmaceuticals US, 2, Amgen, 2, Fibrogen, 2, gilead, 2, Genentech and Biogen IDEC Inc., 2, Celgene, 2; A. Fischer, None.

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Rheumatoid Arthritis and Risks of Malignant Lymphoma - Are Risks Increased? Karen Hellegård1, Eva Backlund2, Karin E. Smedby1, Carin Backlin2, Christer Sundström3 and Johan Asling3; 1Unit of Rheumatology, Stockholm, Sweden, 2Unit of Rheumatology, Uppsala, Sweden, 3Clinical Epidemiology Unit, Stockholm, Sweden, 4Department of Medical Sciences, Uppsala, Sweden, 5Department of Genetics and Pathology, Uppsala, Sweden, 6Rheumatology Unit & Clinical Epidemiology Unit, Stockholm, Sweden

Background/Purpose: Patients with established Rheumatoid Arthritis (RA) are at increased risk of malignant lymphomas. We have previously demonstrated a strong association between inflammatory activity and lymphoma risk in a historical RA cohort, but also that the lymphoma risk was increased in patients diagnosed 1997 and followed through 2006. Given the dramatic changes in treatment strategies and goals over the last decade, it may be that lymphoma risks in more recently diagnosed patients have changed. We therefore aimed at assessing lymphoma risks in a more contemporary patient population with respect to year of RA onset and duration of RA disease.

Methods: 10,567 patients with incident RA (ACR criteria, >18 years age, symptom duration ≤13 months) diagnosed 1997 through 2010 were identified from within the national Swedish Rheumatology Register (SRQ) including information on disease characteristics, disease activity, and therapy. Each patient was matched to 5 general population comparators, by gender, age and residence (n=49,825). To identify the lymphomas, all individuals were linked to the nationwide Swedish Cancer Register. Relative risks (RR) of lymphoma were assessed using Cox models. The RA lymphomas were reviewed and reclassified (WHO classification).

Results: Overall, the risk of lymphoma in RA was almost doubled (RR = 1.7 [95% CI 1.2–2.4]), based on 45 lymphomas in RA versus 126 in the general population comparator cohort (person time 58,825 versus 283,903). When stratified by RA disease duration, a statistically significantly increased risk (p-value = 0.04) was noted > 5 years after RA diagnosis. When relative risks were cross-tabulated according to year of RA onset and time since RA diagnosis, we noted that this risk increase was significant only among patients in calendar period 1997–2001. Short-term risks for lymphoma were similar across calendar periods. (see Table).

<table>
<thead>
<tr>
<th>Calendar Period, years of disease in SRQ RR (95% CI) (No. of events)</th>
<th>Time period since RA diagnosis (years) RR (95% CI) (No. of events)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997-2001</td>
<td></td>
</tr>
<tr>
<td>0–c</td>
<td>1.3 (0.5–3.7) (413)</td>
</tr>
<tr>
<td>3–c</td>
<td>1.3 (0.5–3.3) (521)</td>
</tr>
<tr>
<td>6–14</td>
<td>2.7 (1.4–4.9) (527)</td>
</tr>
<tr>
<td>Total</td>
<td>1.9 (1.2–3.1) (481)</td>
</tr>
<tr>
<td>2002-2005</td>
<td></td>
</tr>
<tr>
<td>0–c</td>
<td>1.2 (0.4–3.3) (403)</td>
</tr>
<tr>
<td>3–c</td>
<td>1.7 (0.8–3.8) (717)</td>
</tr>
<tr>
<td>6–14</td>
<td>2.0 (0.6–7.2) (38)</td>
</tr>
<tr>
<td>Total</td>
<td>1.6 (0.8–3.0) (153)</td>
</tr>
<tr>
<td>2006-2010</td>
<td></td>
</tr>
<tr>
<td>0–c</td>
<td>1.8 (0.7–5.3) (629)</td>
</tr>
<tr>
<td>3–c</td>
<td>1.8 (0.9–2.9) (1342)</td>
</tr>
<tr>
<td>6–14</td>
<td>2.8 (1.3–4.7) (1839)</td>
</tr>
<tr>
<td>Total</td>
<td>1.7 (1.2–2.4) (4552)</td>
</tr>
</tbody>
</table>

Note: Other treatments and demographic characteristics were not associated with an independent relation for physical activity with SI (partial R2 = 0.10, P = 0.03). Age, ESR, DAS-28, NSAID, DMARD, or biologic use did not contribute to SI in the aforementioned model.
Conclusion: Overall, the risk increase for malignant lymphomas in RA patients diagnosed 1997–2010 was of a similar magnitude as that reported from historical RA cohorts. Whereas our results suggested a declining point estimates for lymphoma risk in successive calendar periods of RA diagnosis 1997–2010, this observation was confounded by differences in length of follow-up, i.e., that risks increased with RA duration. It will be an important task to monitor future risks over longer follow-up time.

Disclosure: K. Hellgren, None; E. Baecklund, None; K. E. Smedby, None; C. Backlin, None; C. Sundstrom, None; J. Askling, None.

1230

The Role of Sleep Problems in Conditioned Pain Modulation in Rheumatoid Arthritis. Yvonne C. Lee1, Bing Lu2, Robert R. Edwards3, Ayaj Wasan2, Nicholas Nassikas1, Daniel J. Clauw1, Daniel H. Solomon4 and 1University of Michigan, Ann Arbor, MI, 2Brigham and Women’s Hospital, Boston, MA, 3Division of Rheumatology, Brigham & Women’s Hospital, Boston, MA

Background/Purpose: Among rheumatoid arthritis (RA) patients, pain may exist out of proportion to peripheral inflammation. This observation suggests that central nervous system pain amplification mechanisms, such as diminished conditioned pain modulation (CPM), may play a role in enhancing pain perception among some RA patients. We examined CPM, pressure pain threshold and tolerance among RA patients compared to controls.

Methods: Fifty-eight female RA patients and 54 age-matched controls without chronic pain underwent quantitative sensory testing to assess CPM, pressure pain threshold and pressure pain tolerance. We included CPM using a cold water bath, and we assessed pain threshold (when patients first felt pain) and tolerance (when pain was too much to bear) with an algometer. Associations between RA and quantitative sensory testing measures were analyzed using linear regression models. Sleep problems, mental health and inflammation were assessed as mediators of the relationship between RA and quantitative sensory testing measures, according to the Baron and Kenny criteria (J Pers Soc Psychol 1986).

Results: Median CPM levels were 0.5 kg/cm² (interquartile range (IQR) –0.1, 1.6) among RA patients compared to 1.5 kg/cm² (IQR –0.1, 2.5) among controls (P = 0.04). Relative to controls, RA patients had lower pain threshold (P = 0.03) and tolerance (P = 0.004) at the wrists and knees. Spearman’s correlations between clinical pain scores and quantitative sensory testing measures of pain varied from –0.08 for CPM to –0.31 for wrist tolerance. Compared to controls, RA patients had greater problems with sleep, catastrophizing, depression and anxiety (P < 0.0001). Mediation analyses showed significant associations between: 1) RA and CPM (Baron and Kenny criterion #1), 2) RA and sleep problems (Baron and Kenny criterion #2) and 3) sleep problems and CPM, adjusted for RA (Baron and Kenny criterion #3) (Figure 1). Catastrophizing, depression and anxiety did not mediate the association between RA and CPM.

Conclusion: RA patients have impaired CPM relative to pain-free controls. Sleep problems may contribute to low CPM levels. Future studies are needed to determine whether interventions to improve sleep may improve pain in RA.

Disclosure: Y. C. Lee, Forest Laboratories, 2, Merck Pharmaceuticals, 1, Novartis Pharmaceutical Corporation, 1, Elan Corporation, 1; B. Lu, None; R. R. Edwards, None; A. Wasan, None; N. Nassikas, None; D. J. Clauw, Pfizer Inc, Forest Laboratories, Merck, Nuvo, 2, Pfizer, Forest, Lilly, Merck, Nuvo, J and J; D. H. Solomon, Amgen, 2, AbbVie Immunology Pharmaceuticals, 2, Eli Lilly and Company, 2, Pfizer Inc, 9; E. W. Karlson, None.

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Rheumatoid Arthritis Is Associated with Likelihood of Being Overweight in Women. Irum-Mona Idrees1, H. Lester Kirchner2 and Androniki Bili3

1Geisinger Medical Center, Danville, PA, 2Geisinger Health System, Danville, PA

Background/Purpose: Adipose tissue is metabolically active producing adipokines, which, along with locally attracted cytokines, are active participants in inflammation and its regulation. Since RA a systemic inflammatory disease, we postulated that obesity might be a risk factor for developing RA. The objective of this study was to evaluate the association of obesity with risk of incident RA.

Methods: We conducted a case control study using incident RA cases from 2001 to 2011 in a health system using electronic health records. Patients with a primary care physician in the health system with at least 3 documented body mass index (BMI, in kg/m²) measurements were eligible. A 1:5 case:control age, gender, and calendar year match was performed. An index date was created such that for cases it was the date of RA diagnosis and for the controls it was the date of RA diagnosed in the matching case. Current obesity was defined using the most recent prior BMI measurement to the index date. History of obesity was defined using all historical BMI measurements, prior to the index date. Any prior BMI >30 was considered as meeting criteria. This was repeated for current and history of overweight classification (BMI >25). The association between BMI in RA patients and thus the controls was calculated using a conditional logistic regression model adjusting for current smoking status.

Results: 523 patients with incident RA and 2615 age, gender, calendar year matched controls were included in the analysis. The baseline characteristics revealed similar average BMI measurements in the two groups; current and past smoking was more prevalent in the RA group than controls. Of the RA patients, 63% and 41% were positive for RF and ACPA, respectively. The odds ratio (OR) for the association between RA and obesity or overweight overall, and stratified by gender, is shown in Table 1. Subgroup analysis according to RF positivity is shown in Table 2. Similar results were found for ACPA positivity.

Table 1. Odds of obesity or overweight in RA patients according to gender

<table>
<thead>
<tr>
<th>All</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>OR (95% CI)</td>
<td>P-Value</td>
</tr>
<tr>
<td>1.01 (0.99, 1.02)</td>
<td>0.19</td>
<td>1.01 (1.00, 1.03)</td>
</tr>
<tr>
<td>Current Obesity</td>
<td>1.07 (0.88, 1.29)</td>
<td>0.50</td>
</tr>
<tr>
<td>History of Obesity</td>
<td>1.18 (0.98, 1.43)</td>
<td>0.08</td>
</tr>
<tr>
<td>Current</td>
<td>1.31 (1.03, 1.66)</td>
<td>0.03</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.43 (1.09, 1.88)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 2. Odds of RF positivity in RA patients according to gender

<table>
<thead>
<tr>
<th>All</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>OR (95% CI)</td>
<td>P-Value</td>
</tr>
<tr>
<td>1.03 (1.00, 1.05)</td>
<td>0.04</td>
<td>1.00 (0.99, 1.02)</td>
</tr>
<tr>
<td>Current Obesity</td>
<td>1.18 (0.86, 1.62)</td>
<td>0.30</td>
</tr>
<tr>
<td>History of Obesity</td>
<td>1.44 (1.04, 2.01)</td>
<td>0.03</td>
</tr>
<tr>
<td>Currently Overweight</td>
<td>1.68 (1.09, 2.58)</td>
<td>0.02</td>
</tr>
<tr>
<td>History of Overweight</td>
<td>1.72 (1.06, 2.78)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Conclusion: RA is associated with 43% and 31% increase in odds of historical or current overweight status in women. This is consistent with other previously reported data and it is a significant observation that can help shed light in the pathogenesis of RA. Further, the observed association of being currently overweight or historically overweight or obese with specifically

Background/Purpose: Fatigue in rheumatoid arthritis (RA) is related to pain and disability, and several psycho-social factors such as coping strategies. In Chronic Fatigue Syndrome (CFS), increased fatigue is associated with reduced physical activity. Apparently, cognitive behavioral therapy and exercise are the only effective interventions in CFS. It is unclear whether, also in RA, fatigue and physical activity are related. Therefore, the objective of this study was to investigate whether there is an association between objectively measured physical activity and patient assessed fatigue in RA patients.

Methods: Consecutive RA patients of the rheumatology clinic of the Radboud University Nijmegen Medical Centre (N=181) were enrolled. Fatigue severity was measured using the fatigue severity subscale (CIS-fatigue) of the Checklist Individual Strength (CIS20). Physical activity was measured during 12 consecutive days with an ankle-worn actometer and a daily activity score was calculated from the number of accelerations. The group mean of the physical activity score over the 12-day period acted as predefined reference score. All patients with at least 10 daily measurements of activity were included in the analyses. Patients with at least 90% of their daily activity scores below the group mean were classified as perversively passive, while the remaining patients were labeled as active. Linear regression was performed with CIS-fatigue as dependent and physical activity as independent variable with correction for confounders. Fatigue was also analyzed classified as severely fatigued (CIS-fatigue score ≥ 35) and not severely fatigued (CIS-fatigue score < 35).

Results: A total of 167 patients had at least 10 daily measurements of activity and were included in the analysis. Mean activity score (±SD) of all 167 patients was 73±27, and 42 (25%) patients were classified as perversively passive and 125 (75%) patients were classified as active. Active patients showed less fatigue: the mean (±SD) CIS-fatigue was 30.9 (12.5) in active patients and 35.7 (12.8) in perversively passive patients (p=0.028). Similarly, there was a significantly higher percentage of severely fatigued patients in the passive group (60%) compared to the active group (38%), (p=0.017). The relation between activity and fatigue was linear (β=−0.077) and significant (p=0.012), with correction for the confounders age, gender and pain.

Conclusion: In RA, a higher level of physical activity was associated with less fatigue. Active patients had a significantly lower CIS-fatigue score than the perversively passive patients. To study whether this relationship is causal and clinically relevant, an intervention trial aiming at increasing activity may be performed.

Disclosure: I. M. Idrees, None; H. L. Kirchner, None; A. Bill, None.

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Effect of Insoles On the Rheumatoid Foot. Emilia Moreira¹, Anamaria Jones¹, Hilda A. Oliveira¹, Fabio Jennings¹, Artur R.C. Fernandes¹ and Jamil Natour². ¹Universidade Federal de Sao Paulo, Sao Paulo, Brazil, ²Universidade Federal de São Paulo, Sao Paulo, Brazil.

Background/Purpose: Rheumatoid arthritis (RA) is a systemic inflammatory disease characterized by peripheral polyarthritis, which may cause joint destruction and deformities, resulting in reduced function and disability. The joint involvement of the foot occurs in 85–100% of the patients with RA. The use of insoles has been a routine in the treatment of rheumatoid feet, despite the weak evidence of its use in randomized controlled trials. The aim of the present study were to evaluate the effectiveness of the use of insoles for foot pain, function, gait, foot load distribution, quality of life and patient satisfaction regarding the use of the insoles in patients with RA.

Methods: Eligible patients included women classified as RA according to the ACR criteria, aged 18–65 years old with pain in feet between 3 and 8 on a 0–10 cm pain scale (VAS) for walking; functional classes I, II, and III. Of the 208 patients evaluated, 80 met the eligibility criteria and were randomized into experimental (EG) or control groups (CG). The EG group used EVA insoles with medial arch and retrocapital support, and CG group employed flat insoles during the study. Patients were evaluated for pain (VAS) when walking and at rest, function (HAQ), function of the feet (FFI), quality of life (SF-36), 6-minute walk test, satisfaction with the treatment (Likert scale) and dynamics baropodometry (Pro FootWalk, AMcube®, Gargas, France) at baseline, 45 days (T45), 90 days (T90) and 180 days after randomization by a blinded evaluator.

Results: Thirty-nine and 41 patients were randomly divided into EG and CG groups, respectively. The groups were homogeneous at baseline regarding clinical and demographic characteristics. In the comparison between the groups over time, we found better results for the EG with a statistical difference for pain during walking and at rest on the right and left foot (p<0.001), stride length (p=0.001), and satisfaction with the treatment (p=0.039). For other variables, we found no statistically significant difference between groups.

Conclusion: The use of insoles with medial arch and retrocapital support is effective in reducing pain during walking and at rest on both feet, increasing stride length and satisfaction with the use of insoles.

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Barriers, Benefits and Preferences for Exercise in RA Patients: A Cross Sectional Study. Yves Henchoz¹, Pascal Zufferey² and Alexander So³.
¹Université du Québec à Trois-Rivières, Trois-Rivières, QC, ²Lausanne University Hospital, Lausanne, Switzerland.

Background/Purpose: Physical exercise is safe and effective as an adjunctive nonpharmacological treatment modality in the management of rheumatoid arthritis (RA). It is well established that patients with RA are less active compared to healthy controls. The transtheoretical model of health promotion, based on five stages of change, provides a useful framework to determine the distribution of exercise stages of change in a RA cohort, and to examine barriers, benefits and preferences for exercise.

Methods: One hundred and twenty consecutive patients with RA followed at a hospital-based rheumatology practice were invited to participate in the study. Those who accepted to participate filled in a questionnaire to determine their exercise stage of change, their perceived benefits and barriers to exercise, and their preferences for various features of exercise. Disease activity was measured using the disease activity score (DAS28). Other variables included the Health Assessment Questionnaire (HAQ), the short version of the Arthritis Impact Measurement Scales 2 (AIMS2-SF), pain and...
fatigue visual analogue scales (VAS), the number of comorbidities and demographic characteristics. Characteristics of patients in the maintenance and precontemplation stages of change were compared using two-sample t-tests, Wilcoxon rank-sum tests and Chi-square tests.

Results: Eighty-nine (74%) patients were finally included in the analyses. Mean age was 58.4 (SD 11.7) years, mean RA duration was 10.1 (9.8) years and mean DAS28 was 2.8 (1.2). The distribution of exercise stages of change was as follows: precontemplation (n = 30, 34%), contemplation (n = 11, 13%), preparation (n = 5, 6%), action (n = 2, 2%), and maintenance (n = 39, 45%). Compared to patients in the maintenance stage of change, precontemplators were less often at work (P < 0.05), exhibited a higher body mass index (P < 0.01), poorer HAQ (<0.01), higher pain VAS (P < 0.05), poorer scores of physical (P < 0.001), symptom (P < 0.01), affect (P < 0.01) and role (P < 0.01) dimensions of the AIMS2-SF, and reported less exercise benefits (P < 0.05) and more barriers to exercise (P < 0.01). Most participants preferred exercising alone (40%), at home (29%), at a moderate intensity (64%), with advice provided by a rheumatologist (34%) or a specialist in exercise and RA (34%). Walking was by far the preferred type of exercise, in both the summer (86%) and the winter (51%).

Conclusion: This study provides new insight into how RA interferes with exercise participation. Our cohort of patients with RA was essentially distributed across the precontemplation and maintenance exercise stages of change. These subgroups of patients exhibit psychological and functional differences that make their needs in terms of exercise counseling different. Walking appears to be a simple but promising way of promoting physical activity among RA patients.

Disclosure: Y. Henchoz, None; P. Zufferey, None; A. So, None.

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Background/Purpose: Despite improvements in medical management of rheumatoid arthritis (RA) in recent years, arthritis related orthopedic surgery is often needed to relieve pain and improve function. We aimed to identify risk factors for orthopedic surgery in RA, and ascertain if predictors for large joint surgery differ from those for small joint surgery and soft-tissue procedures.

Methods: A population-based inception cohort of patients fulfilling 1987 ACR criteria for RA between 1980–2007 was assembled and followed until death, migration or 12–31–2008. A retrospective medical record review was performed of all orthopedic surgeries since RA incidence, including primary total joint arthroplasty (TJA), large joint surgery (LJS), small joint surgery (SJS) and soft tissue procedures (STP). Demographics, clinical characteristics of RA, extra-articular manifestations and comorbidities were recorded. Risk factors for surgery were examined using Cox models adjusted for age, sex and calendar year.

Results: The study included 813 RA patients (mean age 56 years; 68% female; mean follow-up 9.6 years), 189 of whom underwent ≥1 joint surgeries during follow-up.

Age was associated with a significantly higher risk of TJA (hazard ratio [HR] per 10 years 1.18; p=0.01) and hip/knee surgery (HR 1.3; p=0.001) but lower risk of SJS (HR 0.84; p=0.03). Female sex (HR 1.38; p=0.05) was predictive of a higher risk for any joint surgery. Obesity at incidence was predictive of higher rates of TJA (HR 2.0; p=0.001), LJS (HR 1.8; p=0.001) and hip/knee surgery (HR 2.6; p=0.001), but not SJS (HR 0.8; p=0.4) or STP (HR=1.0; p=0.9). ESR at RA incidence was associated with increased risk for any joint surgery (HR per 10 mm/hr 1.12; p=0.002), TJA (HR=1.2; p=0.001) and LJS (HR=1.15; p=0.001) but not SJS (HR=1.0; p=0.7). Presence of rheumatoid factor (HR 2.0; p=0.001) and radiographic erosions (HR 3.1; p=0.001) predicted a significantly higher risk for any joint surgery.

Large joint swelling was associated with elevated risk of TJA (HR 1.85; p=0.02), LJS (HR 2.1; p=0.001) and STP (HR 2.0; p=0.02) but not SJS. Rheumatoid nodulosis was predictive of SJS (HR 3.3; p=0.001) and STP (HR 3.0; p=0.001) but not LJS (HR=1.3; p=0.2). Severe extra-articular manifestations of RA were marginally associated with a higher risk of SJS (HR 1.8; 95% confidence interval [CI] 0.93–3.6) but not LJS (HR 1.0; p=0.98). Smoking history predicted a marginally higher risk for STP (HR 1.57; 95% CI 0.98–2.5) but not other procedures.

Conclusion: Women with RA are more likely than men to undergo joint surgery. Female sex, increasing age and obesity were predictive of LJS (especially hip and knee TJA) in RA, similar to the general population. Older patients were less likely to undergo SJS. Rheumatoid nodulosis and radiographic erosions are strong predictors especially for SJS and STP but are also associated with increased risk for any joint surgery. These results indicate that need for LJS in patients with RA is similar to the general population, and that SJS is less desirable for older patients despite long standing disease. Aggressive control of disease activity in the early years after RA incidence to lessen development of erosive changes may decrease future need for joint surgery.

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Important Prognostic Factor in Rheumatoid Arthritis Patients with Interstitial Lung Disease Is Not Usual Interstitial Pneumonia Pattern but Interstitial Lung Disease Extent On Chest High-Resolution Computed Tomography. Hwajeong Lee1, Jung-Yoon Cho1, Seong-Kyu Kim1, Sung Hoon Park1, Ji Hun Kim1, Dae Sung Hyun1, Kyung Jae Jung2 and Jisuk Bae3. 1Division of Rheumatology, Department of Internal Medicine, Catholic University of Daegu School of Medicine, Daegu, South Korea, 2Division of Pulmonology, Department of Internal Medicine, Catholic University of Daegu School of Medicine, South Korea, 3Radiology, Catholic University of Daegu School of Medicine, South Korea

Background/Purpose: Interstitial lung disease (ILD) is a common pulmonary manifestation of rheumatoid arthritis (RA), and an important cause of morbidity and mortality in RA patients. We categorized ILD to two groups, as the usual interstitial pneumonia (UIP) pattern and the nonspecific interstitial pneumonia (NSIP) pattern, using chest high-resolution computed tomography (HRCT) scanning. We compared demographic and clinical characteristics of UIP pattern and NSIP pattern in rheumatoid arthritis patients and determined the important prognostic factors that influence the survival of RA-ILD patients.

Methods: We enrolled 51 RA patients (male n=21, female n=30) with ILD underwent HRCT, between January 2002 and December 2011 in Catholic University Hospital of Daegu.

Results: Demographics and the clinical characteristics of the 51 RA-ILD patients showed no significant difference between the UIP pattern and NSIP pattern. Comparing the two groups, there were no differences in age at which RA was diagnosed, age at which ILD was diagnosed, RA duration, ILD duration, proportion of steroid and DMARD medication, laboratory study, pulmonary function test and ILD extent on chest HRCT. But RA-NSIP group was younger than RA-UIP group (62.3±11.7 vs 68.2±8.4).

Of the 51 RA-ILD patients, 21/UIP pattern 16 cases, NSIP pattern 5 cases) patients died. More patients died in UIP pattern, but there were no significant differences in survival time between RA-UIP pattern and RA-NSIP pattern (Log rank p=0.985).

Cox’s regression analysis was performed to find out prognostic factors that affects survival of RA-ILD patients. ILD extent on chest HRCT was strongly associated with mortality (HR=1.044, 95% CI 1.019–1.069). Patients that was diagnosed ILD in older age (HR=1.518, 95% CI 1.109–2.077), high LDH (HR=1.007, 95% CI 1.000–1.014) and high rheumatoid factor (HR=1.004, 95% CI 1.000–1.008), the use of MTX (HR=5.539, 1.323–23.041) were associated with worse survival time. UIP pattern on HRCT, age, sex, smoking history, anti-CCP antibody didn’t have an effect on survival. We divided the extent of the lung disease in to 4 groups; 1–15%, 16–25%, 25–35%, >35% and compared the survival rate. Comparing four groups, there were significant differences in survival estimates (Log-rank p value = 0.00) based on ILD extent of 15%. The median survival time for ILD extent of less than 15% was 89.4 months, ILD extent of excess of 15% was 49 months.

Conclusion: Our case studies reveal that the relationship of the UIP pattern to survival is unclear but the extent of ILD on chest HRCT was found to be significantly associated with poor prognosis of RA-ILD patients.

Disclosure: H. Lee, None; J. Y. Cho, None; S. K. Kim, None; S. H. Park, None; J. H. Kim, None; D. S. Hyun, None; K. J. Jung, None; J. Bae, None.
Baseline Evaluation of Insulin Resistance in Patients with early Non-Treated Rheumatoid Arthritis. Sara Manrique-Arjia1, Maria America Lopez-Lasanta1, Pilar Espino-Lorenzo1, Pedro Valdivielso1, José Rojaa, Inmaculada Ureña1, Francisco Gabriel Jimenez- Niñez2, Carmen M. Romero-Barco1, Veronica Rodriguez-García1, Laura Nieves1, Mari Carmen Ordoñez-Cañizares1, Laura Cano1, Maria Victoria Irigoyen1 and Antonio Fernández-Nebro1. Hospital Carlos Haya. University of Malaga, Malaga, Spain, 1Department of Medicine. University of Malaga, Malaga, Spain

Background/Purpose: High levels of inflammatory cytokines are associated with insulin resistance syndrome in long-standing AR. The aim was to analyze insulin resistance (IR), adipokines, inflammatory cytokines and baseline clinical and laboratory features in patients with early rheumatoid arthritis (ERA) who have not received any treatment for their underlying disease.

Methods: Cross-sectional, case-control, study. Forty-six consecutively patients with ERA (disease duration < 1 year) according to 2010 ACR/EULAR criteria, older than 16 years of age and 45 sex and age-matched controls were included. Patients with Diabetes (2010 ADA Criteria) and in prior or current treatment with DMARDs or corticosteroids were excluded. All participants signed an informed consent. Baseline blood and urine samples were collected; Glucose, lipid profile, RF, anti-CCP, ESR, CRP and other parameters were measured in fresh samples; serum was stored at −80°C for later analysis of insulin, ultrasonarise CRP, IL6, TNFα, resistin, adiponectin y leptin. Insulin resistance was estimated by the Homeostasis model assessment for insulin resistance (HOMA-IR), HOMA β, McCauley and QUICKI index. A cardiovascular risk factors (CVRF) questionnaire and a dietary survey were also completed. Measurement of abdominal and hip circumference was performed. Statistical analysis: T-test or Mann Whitney and Pearson or Spearson’s correlation analysis were performed.

Results: Among 103 subjects twelve were excluded (6 were other types of arthritis, 6 had type 2 diabetes) and finally, 91 subjects were included; 46 had RA (50.5%) and 45 were healthy controls (49.5%). Most of them were women (~70%) and there were not differences in age, sex and BMI, between groups but hypertension was higher in patients than controls (30 vs 13%, p < 0.05). Regarding baseline characteristics of patients with RA, the average time of evolution of RA was 6 months, and more than 70% had positive RF and anti-CCP. Concerning laboratory parameters, CRP and ESR were higher in RA patients than controls (p<0.001). In relation to CVRF and IR, total cholesterol was higher in controls [215 (SD=40.3) mg/dl vs 195(SD=39.5) mg/dl (p<0.005)], and HDL cholesterol lower in RA patients [52(SD=14.8)mg/dl Vs 59 (SD=16.7) mg/dl (p<0.05)], and also levels of cytokines such as IL6, TNFα and Resistin in blood were higher in patients than controls. No statistically significant differences were found in leptin, adiponectin or atherogenic index between cases and controls neither in insulin resistance estimated by HOMA-IR, HOMA β, QUICKI nor McCauley. Bivariate analysis revealed a statistically significant correlation between the different indices of IR and parameters of inflammatory activity (PCR, TNF), leptin and body composition.

Conclusion: Although patients showed higher blood pressure, total cholesterol and resistin levels and lower HDL cholesterol than age, sex and BMI matched controls, we were unable to show differences in leptin, adiponectin and any of the insulin resistance indexes assessed, in spite of the expected high levels of systemic inflammatory molecules, such as TNFα and IL-6 in patients group. Lack of association between AR and IR indexes might be due to the short course of the disease.

Disclosure: S. Manrique-Arjia1, None; M. A. Lopez-Lasanta1, None; P. Espino-Lorenzo1, None; P. Valdivielso1, None; J. Roja1, None; I. Ureña1, None; F. G. Jimenez-Núñez1, None; C. M. Romero-Barco1, None; V. Rodriguez-Garcia1, None; L. Nieves1, None; M. C. Ordoñez-Cañizares1, None; L. Cano1, None; M. V. Irigoyen1, None; A. Fernández-Nebro2, Junta de Andalucia, 2.

Background on Clinical Presentation of Patients with Early Rheumatoid Arthritis. Yun A. Kim1, Jane E. Salmon2, Juan Xiong3, Boulos Haraoui4, Carol A. Hitchon5, Edward Keystone6, Janet Pope7, Diane Tin8, J. Carter Thorne8, Paul A. MacMullan9, Eimear Dunne2, Dermot Kenny2, and Geraldine M. McCarthy1. 1Mater Misericordiae University Hospital, Dublin 7, Ireland, 2RCSI, Dublin 2, Ireland

Background/Purpose: Stress is related to pathogenesis and progression of inflammatory autoimmune disorders. The aim of this study is to evaluate the role of patient (pt) self reported stress within a year of clinical presentation, particularly pt reported outcomes (PROs) in patients (pts) with early rheumatoid arthritis (ERA).

Methods: 951 pts in CATCH (Canadian Early Arthritis Cohort), a prospective multicentre observational cohort, who answered a modified stress & life events questionnaire, were included. Psychological (Psych) stress was defined as death of family member, divorce, separation, family stress and financial stress. Physical stress was defined as motor vehicle accident, surgery, major illness and infection. Differences in baseline characteristics and PROs in pts at 6 months and 1 year reporting exposure or not to stress were compared. Differences were compared using Chi-Square tests for categorical and Wilcoxon rank sum test for continuous variables.

Results: Mean age (SD) was 53.8±14.2. Mean symptom duration (SD) was 6.0 (3.1) months, 83% were Caucasian, 73% female and 18% smokers. Features distinguishing pts with exposure to either stress vs. none are noted in Table 1. More pts reporting psych stress were female, living alone, employed and fatigued (p<0.05). More pts reporting physical stress were female, older, had a higher HAQ score, and more co-morbidities (p<0.05). Symptom duration, AM stiffness, smoking, race, education, income and marital status were not associated with stress. Pain, fatigue and HAQ scores were elevated at 0.6 and 12 months in patients exposed to stress vs. non-exposed though these improved to a similar degree in both groups. (Table2).

Table 1. Patients reporting exposure to psychological or physical stress versus no stress

<table>
<thead>
<tr>
<th>Variables</th>
<th>No stress (n=454)</th>
<th>Psychological stress (n=307)</th>
<th>Physical stress (n=69)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>54.2±15.0</td>
<td>53.0±12.4</td>
<td>58.5±12.8</td>
</tr>
<tr>
<td>Female sex</td>
<td>318 (70.0%)</td>
<td>239 (77.9%)*</td>
<td>39 (56.5%)*</td>
</tr>
<tr>
<td>Living alone, n (%)</td>
<td>51 (11.4%)</td>
<td>54 (17.7%)*</td>
<td>11 (16.2%)</td>
</tr>
<tr>
<td>Employed, n (%)</td>
<td>238 (52.4%)</td>
<td>191 (62.2%)*</td>
<td>32 (46.4%)</td>
</tr>
<tr>
<td>Pain (0–10mm)</td>
<td>5.4±2.8</td>
<td>5.7±2.7</td>
<td>5.5±3.0</td>
</tr>
<tr>
<td>Fatigue (0–10mm)</td>
<td>4.8±3.0</td>
<td>5.6±2.9*</td>
<td>4.9±2.7</td>
</tr>
<tr>
<td>DAAS28 score</td>
<td>5.0±1.5</td>
<td>5.6±1.5</td>
<td>5.2±1.6</td>
</tr>
<tr>
<td>HAQ score</td>
<td>0.96±0.70</td>
<td>1.01±0.66</td>
<td>1.14±0.71*</td>
</tr>
<tr>
<td>Erosions, n (%)</td>
<td>100 (27.4%)</td>
<td>72 (28.0%)</td>
<td>18 (32.1%)</td>
</tr>
<tr>
<td>Co-morbidities, n (%)</td>
<td>384 (86.4%)</td>
<td>268 (87.3%)</td>
<td>66 (95.7%)*</td>
</tr>
</tbody>
</table>

*p-value <0.05; Values are mean ± SD unless indicated

Table 2. Outcomes after 6 months and 1 year in patients exposed to stress versus no stress

<table>
<thead>
<tr>
<th>Variables</th>
<th>6 month stress + 6 month Stress -</th>
<th>1 year stress + 1 year stress -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain (0–10mm)</td>
<td>3.5±2.8*</td>
<td>3.0±2.6</td>
</tr>
<tr>
<td>DAAS28 score</td>
<td>3.3±2.9*</td>
<td>2.9±2.7</td>
</tr>
<tr>
<td>HAQ score</td>
<td>0.6±0.6*</td>
<td>0.5±0.6</td>
</tr>
</tbody>
</table>

*p =<0.05; Values are mean ± SD unless indicated

Disclosure: Y. A. Kim1, None; J. E. Salmon, None; J. Xiong, None; B. Haraoui, None; C. A. Hitchon, None; E. Keystone, None; J. Pope, None; D. Tin, None; J. C. Thorne, None; G. Boire, None; P. P. Bykerk, Junge, Pfizer, Roche, BMS, UCB, Janssen Biotech and Abbott, 2.
We and others have demonstrated that there is increased platelet reactivity in blood from patients with IA. Recent data has shown that platelets amplify inflammation in the joint in IA via the collagen receptor, glycoprotein(GP)VI followed by the production of proinflammatory platelet microparticles. When platelets are activated, the GPVI receptor is shed and detectable in plasma as soluble GPVI (sGPVI). Our hypothesis was that both plasma and synovial fluid (SF) sGPVI would be raised in patients with IA compared to those with osteoarthritis (OA).

Methods: Following ethics approval and informed consent healthy normal donors (n = 20) were compared to 43 consecutively recruited patients (OA, n = 15, IA, n = 28). SF samples were obtained at knee joints when indicated for clinical evaluation and/or joint injection. Plasma and SF samples were centrifuged at 720g and then 2000g to ensure that no platelets or platelet derived microparticles were present in the sample and sGPVI levels were measured by ELISA.

Results: Mean plasma sGPVI was similar in normal controls and patients with OA (30.6 ± 6 ng/ml vs 31.6 ± 6 ng/ml respectively). In contrast, mean plasma sGPVI was 51 ± 14 ng/ml in patients with IA compared to both normal and OA individuals (P<0.005). SF sGPVI was assayed in 14 patients (IA, n = 8, OA, n = 6). Seven patients (IA n = 4, OA, n = 3) had plasma and synovial fluid samples taken simultaneously. SF sGPVI was significantly elevated in patients with IA compared to those with OA. Moreover plasma levels of sGPVI closely correlated with SF levels in these matched samples (rs = 0.95).

Conclusion: Our data shows that sGPVI is easily measured in both plasma and SF. It also suggests the potential value of sGPVI as a marker of both disease activity and platelet reactivity in arthritis. Finally, it further supports an active role of platelets in promoting inflammation locally within the joint.


Disclosure: L. Bell, None; A. M. Madigan, None; P. A. MacMullan, None; E. Dunne, None; D. Kenny, None; G. M. McCarthy, None.

1240

Serum Anti-Müllerian Hormone Can Be Used to Determine Ovarian Reserve in Women with Rheumatoid Arthritis. Jenny Brouwer, Johanna M.W. Hazes, Joop S.E. Laven, Izaija Schapper and Radboud J.E.M. Dolhain. Erasmus Medical Center, Rotterdam, Netherlands

Background/Purpose: Planning of pregnancy is important in women with rheumatoid arthritis (RA). It is preferred to start a pregnancy after adjustment of medication and when disease activity is low. Therefore, it is important to know the ovarian reserve in these women, since a reduced ovarian reserve is associated with subfertility and early menopause. It has been shown in healthy women, that anti-Müllerian hormone (AMH) is a good biomarker for ovarian reserve. Prior to using AMH for this purpose in women with RA, the influence of disease activity and medication use, in particular methotrexate, should be assessed.

Methods: Serum levels of anti-Müllerian hormone were measured in women aged 18 to 42 years with recent onset RA (according to the 2010 ACR/EULAR rheumatoid arthritis classification criteria) at time of diagnosis (before treatment was started) and six months later. The control group existed with RA, the influence of disease activity and medication use, in particular methotrexate, should be assessed.

Results: Serum levels of anti-Müllerian hormone were measured in women aged 18 to 42 years with recent onset RA (according to the 2010 ACR/EULAR rheumatoid arthritis classification criteria) at time of diagnosis (before treatment was started) and six months later. The control group existed with RA, the influence of disease activity and medication use, in particular methotrexate, should be assessed.

Conclusion: In women with recent onset RA, serum AMH levels are not affected by disease activity or short term use of methotrexate. Therefore, serum AMH levels can be used as a marker for ovarian reserve in women with RA. AMH levels are not reduced in women with recent onset RA compared to controls. Further research is needed to study the long term effects of rheumatologic disease and medication use on ovarian reserve in women with RA.

Disclosure: J. Brouwer, None; J. M. W. Hazes, None; J. S. E. Laven, None; I. Schipper, None, R. J. E. M. Dolhain, None.

1241

Glucocorticoid use is associated with increase in HDL in Rheumatoid Arthritis Patients. Lisa L. Schroeder1, Xiaoxin Tang2, Mary Chester Wasko3 and Androniki Bili4. 1Geisinger Health System, Danville, PA, 2Geisinger Center for Health Research, Danville, PA, 3Temple University School of Medicine, Pittsburgh, PA, 4Geisinger Medical Center, Danville, PA

Background/Purpose: Atherogenic lipid profiles are common in active RA, with most common being decreased HDL. Glucocorticoids (GC) use is reported to have variable associations with lipid profiles in RA, and the potential differential effect of GC dose on lipid levels is unknown. We sought to evaluate the association of GC dose with lipid changes in RA.

Methods: Patients with RA diagnosed between 1/1/01–11/30/11, receiving oral or intravenous GC and having lipid levels tested prior to and at least 1 year after treatment with ongoing GC were identified. A cohort of RA patients not on GC was constructed for comparison. GC exposure was calculated as a weighted daily dosage in prednisone equivalents. GC exposure was analyzed as a continuous and as a dichotomous <7.5mg/day (low) vs. ≥7.5mg/day (high) GC dose. Primary outcome was change in HDL in the low vs. high GC groups. Secondary outcomes were changes in LDL, total cholesterol (TC), triglycerides (TG) and TC/HDL in the same fashion. A similar analysis between the patients on GC vs. not on GC was performed. Linear regression models were used to calculate the outcome, adjusting for age, gender, body mass index (BMI), diabetes, HTN, hyperlipidemia, RF, ESR, statin, NSAID, methotrexate (MTX), hydroxychloroquine (HCQ) and TNF-α inhibitor use.

Results: 202 patients on GC and 463 patients not on GC were included. Baseline characteristics are shown in Table 1. The changes in lipid levels according to GC use are shown in Table 2. Any GC and high dose GC use were associated with increased HDL, but no other significant lipid changes,
compared to non-GC users. There were no significant differences in HDL or other lipids between the low vs. high GC groups. Sensitivity analysis, excluding patients on statins, showed similar results.

**Table 1. Baseline patient characteristics**

<table>
<thead>
<tr>
<th></th>
<th>All N=202</th>
<th>Patients on GC</th>
<th>No GC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline patient characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (mean±SD years)</td>
<td>64.7 (11.7)</td>
<td>64.9 (11.7)</td>
<td>64.8 (12.1)</td>
</tr>
<tr>
<td>BMI</td>
<td>30.6 (6.5)</td>
<td>30.4 (6.5)</td>
<td>30.7 (6.6)</td>
</tr>
<tr>
<td>N=166</td>
<td>N=66</td>
<td>N=100</td>
<td></td>
</tr>
<tr>
<td>ESR</td>
<td>35.6 (24.8)</td>
<td>30.8 (22.5)</td>
<td>38.6 (25.9)</td>
</tr>
<tr>
<td>N=134</td>
<td>N=60</td>
<td>N=94</td>
<td></td>
</tr>
<tr>
<td>RF</td>
<td>124 (61.4)</td>
<td>41 (47.1)</td>
<td>83 (72.2)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>88 (43.6)</td>
<td>39 (44.8)</td>
<td>49 (46.2)</td>
</tr>
<tr>
<td>HTN</td>
<td>136 (67.3)</td>
<td>59 (67.8)</td>
<td>77 (67.0)</td>
</tr>
<tr>
<td>Hyperlipidemia*</td>
<td>141 (69.8)</td>
<td>53 (60.9)</td>
<td>88 (76.5)</td>
</tr>
<tr>
<td>HCO use</td>
<td>42 (20.8)</td>
<td>20 (23.0)</td>
<td>22 (19.1)</td>
</tr>
<tr>
<td>NSAID use</td>
<td>96 (47.5)</td>
<td>41 (47.1)</td>
<td>55 (47.8)</td>
</tr>
<tr>
<td>Statin use</td>
<td>74 (36.6)</td>
<td>29 (33.3)</td>
<td>45 (39.1)</td>
</tr>
<tr>
<td>Anti-TNF use</td>
<td>23 (11.4)</td>
<td>10 (11.5)</td>
<td>13 (11.3)</td>
</tr>
<tr>
<td>MTX use</td>
<td>107 (53.0)</td>
<td>49 (56.3)</td>
<td>58 (50.4)</td>
</tr>
</tbody>
</table>

**Table 2. Change in lipids according to GC use [1]**

<table>
<thead>
<tr>
<th></th>
<th>Any GC</th>
<th>GC &lt;7.5</th>
<th>GC ≥7.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline lipids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in TG/HDL</td>
<td>0.39 (0.91)</td>
<td>0.37 (0.94)</td>
<td>0.40 (0.89)</td>
</tr>
<tr>
<td>Lowest post-TG/HDL</td>
<td>106 (131)</td>
<td>151 (184)</td>
<td>167 (130)</td>
</tr>
<tr>
<td>Change in HDL</td>
<td>5.7 (11.6)*</td>
<td>4.7 (12.1)</td>
<td>6.5 (11.3)*</td>
</tr>
<tr>
<td>Highest post-HDL</td>
<td>58.1 (16.6)</td>
<td>60.1 (15.6)</td>
<td>56.5 (17.2)</td>
</tr>
<tr>
<td>Change in LDL</td>
<td>6.4 (32.3)</td>
<td>6.9 (28.5)</td>
<td>6.0 (34.8)</td>
</tr>
<tr>
<td>Lowest post-LDL</td>
<td>96 (33)</td>
<td>103 (30)</td>
<td>97 (34)</td>
</tr>
<tr>
<td>Change in TC</td>
<td>2.4 (36.5)</td>
<td>3.6 (3.9)</td>
<td>1.5 (40.3)</td>
</tr>
<tr>
<td>Lowest post-TC</td>
<td>110 (153)</td>
<td>110 (133)</td>
<td>103 (30)</td>
</tr>
<tr>
<td>Change in LDL/HDL</td>
<td>3.1 (0.7)</td>
<td>3.4 (1.0)</td>
<td>3.1 (1.1)</td>
</tr>
<tr>
<td>Change in TC/HDL</td>
<td>0.39 (0.91)</td>
<td>0.37 (0.94)</td>
<td>0.40 (0.89)</td>
</tr>
</tbody>
</table>

*Statistically significant findings p-value<0.05; GC vs. No GC; change in HDL: p=0.006.

**Conclusion:** In this RA cohort, any GC and high dose GC (median 10.4 mg/day) use were associated with increased HDL, whereas low dose was not. Although our results need to be replicated in other RA cohorts, these findings are reassuring in this patient population at high risk for cardiovascular disease.

**Disclosure:** L. L. Schroeder, None; X. Tang, None; M. C. Wasko, None; A. Bili, None.

**1242**

**Use of Anti-Tumor Necrosis Factor Therapy Is Associated with Reduced Cardiovascular Event Risk in Rheumatoid Arthritis.** Mike Nurmohamed1, Yanjun Bao2, James Signorovitch3, Parvez M. Mulani2 and Daniel E. Furst4, 1Ul University Medical Center & Jan van Breemen Research Institute, Amsterdam, Netherlands, 2Abbott Laboratories, Abbott Park, IL, 3Analysis Group, Inc., Boston, MA, 4David Geffen School of Medicine at UCLA, Los Angeles, CA

**Background/Purpose:** Rheumatoid arthritis (RA) is associated with increased risks for cardiovascular (CV) comorbidities because of an increased prevalence of traditional CV risk factors and the underlying chronic inflammatory process. We assessed the effects of treatment with anti–tumor necrosis factor (anti-TNF) therapy, methotrexate (MTX), or other nonbiologic DMARDs on CV event risk in patients with RA. We examined the differences in peak Error between the control subjects and RA pts. We compared peak Error of RA pts at BL and at 52 wks, and determined the association of peak Error with disease activity and severity measures.

**Results:** The study identified 109,462 patients with 105,920 total patient-years (PYS) of follow-up, including 48,621 PYS of exposure to anti-TNF therapies (31,466 as monotherapy), 35,480 PYS of exposure to MTX (18,325 as monotherapy) and 52,994 PYS of exposure to other nonbiologic DMARDS (9,441 as monotherapy). A total of 1743 patients (1.6%) had a CV event after their index prescription. In the multivariable regression model, each additional 6 months of anti-TNF therapy significantly reduced the risk for any study CV event (hazard ratio [HR]=0.87, 95% confidence interval [CI]=0.80–0.96, P=0.005) and for MI (HR=0.80, CI=0.67–0.95, P=0.013), compared with patients without anti-TNF biologics. The effects of cumulative use of MTX and other nonbiologic DMARDS were not statistically significant. In the subgroup analyses, each additional 6 months of anti-TNF therapy use was significantly associated with a reduction in CV events in patients aged ≥50 years (HR=0.86, CI=0.77–0.96, P=0.007) and in those without prior MTX use (HR=0.85, CI=0.73–0.98, P=0.022). When assessed individually, significant event risk reduction was also observed with MI, unstable angina, and CHF for patients with longer exposure to anti-TNF therapies compared with nonuse of anti-TNF therapies. In the full sample, the model predicted that cumulative use of anti-TNF therapy for 1, 2, or 3 years would reduce CV event risks by 24%, 42%, and 56%, respectively, compared to nonuse of anti-TNF therapies.

**Conclusion:** Use of anti-TNF therapies vs. nonuse was associated with significantly lower risks for CV events (ie, inpatient diagnoses for MI, stroke, unstable angina, or HF) in patients with RA, older patients with RA, and patients without prior exposure to MTX, adjusting for use of MTX and other nonbiologic DMARDS.

**Disclosure:** M. Nurmohamed, Abbott Laboratories, 2, Abbott Laboratories, 5, Abbott Laboratories, 8, Y. Bao, Abbott Laboratories, 3, Abbott Laboratories, 1; J. Signorovitch, Analysis Group, 3; P. M. Mulani, Abbott Laboratories, 3, Abbott Laboratories, 1; D. E. Furst, Abbott Laboratories, 5, Abbott Laboratories, 8, Abbott Laboratories, 9.

**1243**

**Effect of Tocilizumab Treatment On Regional Left Ventricular Function, As Assessed by Cardiac Magnetic Resonance Imaging, in Rheumatoid Arthritis Patients without Cardiac Symptoms.** Hitomi Kobayashi1, Isamu Yokoe2, Hiroshi Sato3 and Yasuyuki Kobayashi4, 1Itabashi Chuo Medical Center, Tokyo, Japan, 2St Marianna Univ Sch of Med, Kawasaki, Japan

**Background/Purpose:** Rheumatoid arthritis (RA) is associated with an increased risk of congestive heart failure, possibly via shared mechanisms of inflammation. This study was undertaken to test the hypothesis that the powerful anti-inflammatory effect of anti-interleukin 6 (tocilizumab: TCZ) therapy might lead to a reduction in left ventricular (LV) dysfunction in patients (pts) with RA. We sought to measure LV regional function by using a cardiac magnetic resonance imaging (CMR) approach in RA pts without cardiac symptoms, and also to evaluate the changes in these measurements at 52 wks of TCZ treatment.

**Methods:** This was an open-label prospective pilot study to directly evaluate the effect of TCZ on LV function in RA pts without a clinical diagnosis of cardiovascular disease. Consecutive RA pts with active disease and healthy control subjects were enrolled. The RA pts each had inadequate clinical response to non-biologic DMARDS or non-TNF directed therapy, and were prescribed TCZ therapy (8 mg/kg IV every 4 wks). All subjects underwent baseline evaluation of LV function, as measured by non-contrast CMR on a 1.5 T scanner. Peak systolic regional radia strain (Err, %) was calculated by feature tracking of cine MRI in the six segments of the mid-slice of LV. After the baseline (BL) CMR, treatment with the prescribed TCZ was initiated and pts were followed for 52 wks. Pts underwent follow-up CMR evaluation at 52 wks of treatment with TCZ. We examined the differences in peak Err between the control subjects and RA pts. We compared peak Err of RA pts at BL and at 52 wks, and determined the association of peak Err with disease activity and severity measures.
Results: All RA pts received TCZ treatment for 52 wks. We compared 11 RA pts (100% female; mean age 52.6 ± 10.4 y) at BL and at 52 wks, with 10 non-RA controls (100% female; mean age 55.7 ± 4.6 y). DAS28-ESR, SDAI, and Swollen Joint Count (SJC) were significantly lower in RA pts at 52 wks than at BL (p < 0.001, p < 0.001, p = 0.003, respectively). Mean peak Err in RA pts at BL was significantly lower than in normal subjects (0.58 ± 0.13 vs. 0.69 ± 0.10; p < 0.04); mean peak Err in RA pts at 52 wks was not significantly different from those of normal subjects (0.65 ± 0.12 vs. 0.69 ± 0.10; p = 0.56) (figure). Mean peak Err tended to be lower at BL than at 52 wks, but not significantly (p = 0.26). Percentage change of mean peak Err in RA pts was significantly associated with percentage change of SJC (r = 0.74, p = 0.009) and DAS28-ESR (r = 0.70, p = 0.017).

Conclusion: Our findings suggested sub-clinical LV regional dysfunction in RA pts without cardiac symptoms. Furthermore, we demonstrated that improvements in LV regional function by TCZ treatment correlated with reduction in measures of systemic inflammation and RA disease activity. This suggests that systemic inflammation contributes to myocardial dysfunction in RA.

Disclosure: H. Kobayashi, None; I. Yokoe, None; H. Sato, None; Y. Kobayashi, None.

1244

Group Cycling in Rheumatoid Arthritis: Positive Effects On Aerobic Capacity and Blood Pressure. Lars Ångström, Kristina Hörnberg and Solveig Wållberg Jonsson. Dept of Rheumatology, Umeå, Sweden

Background/Purpose: Cardiovascular disease (CVD) is increased in rheumatoid arthritis (RA) (1). Strong evidence shows that exercise reduces the CVD risk in the general population (2). In the present study we examined the effect of group cycling on risk factors for CVD in patients with RA.

Methods: 13 subjects (12 women and 1 man, median age 57 years) with RA exercised on stationary bikes at medium to high intensity for 45 min, 3 times a week for 10 weeks. A control group of 10 subjects continued their previous activities. The following measurements were made at baseline, at 10 weeks and at 25 weeks: Aerobic capacity calculated by a sub-maximal ergometer test according to Astrand; Visual analogue scale (VAS) for self-assessment of pain and general health; self-assessments of functional ability, using the health assessment questionnaire (HAQ), and the number of tender and swollen joints (28-joint count). Analyses of erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), lipids (cholesterol, % high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides), insulin and glucose according to routine methods; Body mass index (BMI) and disease activity score (DAS 28) were calculated; Pulse wave analysis (PWA) (Arteriograph™) was used to register augmentation index (AIX), a measure reflecting early endothelial dysfunction shown to predict future cardiovascular events, pulse wave velocity (PWV), a proxy for arterial stiffness, and systolic blood pressure in aorta (SBPao) besides peripheral blood pressure.

Results: In the exercise group there were significant improvements at 10 weeks compared to baseline regarding aerobic capacity (33 vs 26 ml 02/kg X min; p < 0.05), systolic (126 vs 137.8 mm Hg; p < 0.01) and diastolic (73 vs 83.8 mm Hg, p < 0.05) peripheral blood pressure, SBPao (118 vs 137.7 mm Hg; p < 0.01) and tender joint count (p < 0.05). The improvement of the diastolic blood pressure was significantly larger in the exercise group compared to the controls at 10 weeks (7.0 vs +2.6 mm Hg; p < 0.05). Low aerobic capacity at baseline correlated with high disease activity (ESR; r = -0.67, p < 0.01, CRP, r = -0.72, p < 0.01) and low physical function (HAQ; r = -0.72, p < 0.01) at baseline. Swollen joint count at baseline correlated with AIX at 10 weeks (r = -0.64, p < 0.05). Improvements in blood pressure correlated with high physical function (HAQ) at baseline and at 10 weeks and with low disease activity (tender joints, VAS pain, CRP, DAS 28) at 10 weeks.

Conclusion: Regular exercise on stationary bikes on medium to high intensity for 10 weeks increased aerobic capacity in a group of RA-subjects and produced changes of blood pressure to a level that is described to be clinically relevant (3). Subjects also reported fewer tender joints after the exercise period.

Reference

Disclosure: L. Ångström, None; K. Hörnberg, None; S. Wållberg Jonsson, None.

1245

Age-Specific Association Between Disease-Related Measures and Incident Cardiovascular Events and All-Cause Mortality in Early Rheumatoid Arthritis. Sofia J. Akgarov, Maria Leifsson, Johan Frostegård and Ingïld Hafström. 1Karolinska Institutet, Unit of Rheumatology, Department of Medicine Huddinge, Stockholm, Sweden, 2R&D Center, Spenshult Hospital, Oskarström, Sweden, 3Karolinska Institutet, Section of Immunology and chronic disease, Institute of Environmental Medicine, Stockholm, Sweden

Background/Purpose: Increased risk of cardiovascular disease (CVD) and premature mortality in rheumatoid arthritis (RA) has been established, but the impact of inflammatory and disease related factors has been inconsistent across studies.

Here, we determined if occurrence of subsequent CVD and mortality outcomes was influenced by disease related factors at RA onset and the first years of disease, and if the impact of these factors differed between age groups. Further we investigated the role of antibodies against phosphorylcholine (anti-PC), a promising atheroprotective biomarker.

Methods: This is a cohort study derived from the BARFOT inception RA cohort, to which patients were consecutively recruited from 1994 through 1999, disease duration <13 months. Participants with prevalent CVD at study enrollment or aged <20 years were excluded. The outcomes were an incident CVD event (myocardial infarction, cardiac arrest, angina pectoris, peripheral arterial disease, coronary or vascular surgery, stroke and transient ischemic attack) and all-cause mortality, and were tracked through the Swedish Hospital Discharge Registry and the National Cause of Death Registry until December 2010.

Area under the curve (AUC) was calculated for disease measures assessed at inclusion and after 1 and 2 years, and differences (D) between inclusion and 1 year after enrollment. IgM anti-PC was determined by ELISA.

Cox proportional regression models in age groups <65 and ≥65 years at RA onset, adjusted for age, gender, smoking, presence of hypertension, diabetes or hyperlipidemia, and Kaplan Meier analysis were used for statistical tests.

Results: The study population comprised 741 patients with early RA, whose mean age at entry was 55 years (SD 14.7), range 20–93 years, 67.5% of the participants were women, and 60% were RF positive. The median observation was 13 years (range 2–17). During follow-up, 177 patients developed an incident CVD event, and 151 deceased, corresponding rates of observation was 13 years (range 2–17). During follow-up, 177 patients developed an incident CVD event, and 151 deceased, corresponding rates of observation was 13 years (range 2–17). During follow-up, 177 patients developed an incident CVD event, and 151 deceased, corresponding rates of observation was 13 years (range 2–17). During follow-up, 177 patients developed an incident CVD event, and 151 deceased, corresponding rates of observation was 13 years (range 2–17). During follow-up, 177 patients developed an incident CVD event, and 151 deceased, corresponding rates of observation was 13 years (range 2–17).
in the younger patients, while CRP-AUC, ESR-AUC and HAQ-AUC were independently related to risk of death in both age groups.

CVD outcome but not mortality was associated with the levels of anti-PC at baseline, the 10-year CVD event-free survival rates were 66%, 74% and 76% in the first (lowest), second and third anti-PC tertiles, respectively, p = 0.002.

Conclusion: In early RA, age stratification could improve evaluation of risk factors for CVD and mortality. The IgM anti-PC antibodies may perform atheroprotective in RA.

Disclosure: S. Ajejanova, None, M. L. Andersson, None, J. Frostegärd, Frostegärd is named as inventor on patents and patent applications relating to anti-PC, 9; I. Hafström, None.

1246
Cardiovascular Risk Assessment in Rheumatoid Arthritis (RA) Patients Treated by Biologic Response Modifiers. Majed M. Khrashia1, Rana Aslanova2 and Katie Doyle3, 1Memorial University of Newfoundland, St Johns, NF, 2Memorial University of Newfoundland, St John's, NF

Background/Purpose: We aimed to assess the 10-year CV event risk in patients with RA at the baseline and 1 year after the initiation of treatment with biologic DMARDs.

Methods: RA patients receiving biologic therapy were included. Participants were divided into 2 groups aged 21 to 49 years and 50 to 84. The Framingham Risk Score (FRS) was used for the assessment of 10-year CVD risk. The presence of CV risk factors (fasting serum TC, HDL levels, history of HTN, DM and Dyslipidemia, and CV events) were ascertained by a medical records review and throughout a 1 year follow-up. Regression analyses of the relationship between lipids and inflammatory indices (CRP & DAS28) before and after treatment, as well as of biologic modifiers were performed.

Results: The mean (SD) age of 215 patients (73.5% females) was 56.12 (12) years. The age at RA diagnosis was 41.6 (13.3) years with a mean (SD) duration of symptoms at 14.8 (7.7) years. 7 cases with previously documented MI and 3 cases with TIA/Stroke were analysed. All patients had their CV events prior to the initiation of treatment with biologics with predicted 10-year CVD risk more than 30%. Smoking was documented in 19% of patients (61% females) at baseline and 1-year. TJC and SJC were significantly reduced after 12 months of treatment (12.5±8.6 vs. 9.0±7.5; p = 0.001 and 4.3±3.8 vs. 1.9±2.4; p < 0.001, respectively). The means of TC, HDL and the Atherosclerotic Index (AI) at the baseline and 12 months were compared: TC was not significantly increased from 3.1±2.8 to 3.3±2.6 (p = 0.185); HDL increased from 0.7±0.7 to 0.9±0.7 (p = 0.005); and AI was significantly reduced from 4.6±1.7 to 4.0±1.2 (p < 0.001). CRP, ESR and DAS28 levels were significantly reduced from baseline (p = 0.002 vs. 0.001 and p < 0.001, respectively). Patients were grouped by their 10-year CVD risk level: Low Risk (<10%), Moderate Risk (10% to 19%), High Risk (20% and more). The trend analysis of 10-year CVD risk by gender showed that 7% of men in a 12-month period moved from the low/moderate risk to the high risk (38.6% vs. 45.6%; p = 0.001) while 4% of females significantly lowered their risk from the high to the moderate/low (11.4% vs. 7.6%; p<0.001). The analysis of relationship between lipids and inflammatory indices as well as biologics did not show significance at the baseline and 1 year follow-up.

RA Characteristics and lipid levels at baseline and 12-month

RA Characteristics | Baseline, mean (SD) | 1-year F-Up, mean (SD) | P |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Joint Count (TJC)</td>
<td>12.47 (8.550)</td>
<td>8.97 (7.52)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Swollen Joint Count (SJC)</td>
<td>4.33 (3.77)</td>
<td>1.94 (2.43)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>C-Reactive Protein (CRP), mg/l</td>
<td>16.24 (29.73)</td>
<td>9.92 (15.81)</td>
<td>0.002</td>
</tr>
<tr>
<td>ESR, mm/h</td>
<td>30.67 (23.20)</td>
<td>22.86 (20.77)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DAS28 Score</td>
<td>3.95 (13.4)</td>
<td>3.39 (12.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CDAI Score</td>
<td>17.44 (9.90)</td>
<td>13.00 (10.00)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HAQ Score</td>
<td>1.18 (0.73)</td>
<td>1.08 (0.75)</td>
<td>0.007</td>
</tr>
<tr>
<td>Total Cholesterol, mmol/l</td>
<td>3.10 (2.80)</td>
<td>3.30 (2.62)</td>
<td>0.185</td>
</tr>
<tr>
<td>HDL Cholesterol, mmol/l</td>
<td>0.73 (0.70)</td>
<td>0.86 (0.71)</td>
<td>0.005</td>
</tr>
<tr>
<td>Atherogenic Index (TC/HDL)</td>
<td>4.64 (1.68)</td>
<td>3.99 (1.18)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: Our results showed a trend in reducing a 10-year CV event risk over 12-month of treatment with biologic disease modifiers. No serious cardiovascular events were observed during the study period. This improvement was influenced by many factors such as lipid-lowering treatment (30.7% of patients) and proper control of blood pressure and plasma glucose level

(28.4% and 11.6% of patients, respectively). Females appeared to be more successful in reducing the CVD risk. Biologic DMARDs effectively decreased inflammation and possibly played a pivotal role in reducing the risk for CV event in patients with chronic RA.

Disclosure: M. M. Khrashia, Abbott, Roche, Pfizer, Amgen, 2; R. Aslanov, None; K. Doyle, None.

1247
Delay in Diagnosis of Rheumatoid Arthritis Increases the Cardiovascular Risk. Chan-Bum Choi1, Yoon-Kyung Sung2, Soo-Kyung Cho3, Dae-Hyun Yoo4, Shin-Seok Lee5, Joose Lee6, Jinseok Kim7, Hye-Soon Lee8, Tae-Hwan Kim9, Bo Young Yoon10, Wan-Hee Yoo11, Jung-Yoon Cho12, Sang-Heon Lee13, Seung-Choul Shim14, Won-Tae Chung15, Seung-Jae Hong16, Choong Ki Lee17, Eunmi Koh18, Soo-Kyung Cho19, Jeun-Suk Kim20, Hoon-Suk Cha21, Jeeseon Shin22, Sang-Heol Bae23 and Korean Observational Study Network for Arthritis (KORONA)24. 1Hanyang University Hospital for Rheumatic Diseases, 2Clinical Research Center for Rheumatoid Arthritis (CRCRA), Seoul, South Korea, 3Hanyang University Hospital for Rheumatic Diseases, Seoul, South Korea, 4Chonnam National University Medical School, Gwangju, South Korea, 5Ewha Womans University Mokdong Hospital, Seoul, South Korea, 6Jeju National University Hospital, Jeju, South Korea, 7Hanyang University Guri Hospital, Guri, South Korea, 8Inje University Ilsan Paik Hospital, Goyang, South Korea, 9Department of Internal Medicine, Chonbuk National University Medical School and Research Institute of Clinical Medicine, Jeonju, South Korea, 10Catholic university of Daegu School of medicine, Arthritis and autoimmunity research center, Daegu, 11Konkuk University School of Medicine, Seoul, South Korea, 12Eulji University Hospital, Daejeon, South Korea, 13Dong-A University Hospital, Busan, South Korea, 14Kyung Hee University, Seoul, South Korea, 15Yeungnam University, Daegu, South Korea, 16Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea, 17Hanyang University Hospital for Rheumatic Disease, Seoul, South Korea, 18Autoimmunity Research Center, Catholic University of Daegu School of Medicine, Daegu, South Korea, 19Clinical Research Center for Rheumatoid Arthritis (CRCRA), Seoul, South Korea, 20Hanyang University Hospital for Rheumatic Disease, Clinical Research Center for Rheumatoid Arthritis (CRCRA), Seoul, South Korea, 21Seoul
Conclusion: Delay in diagnosis of rheumatoid arthritis can lead to increase in major cardiovascular risk, especially in women.

Disclosure: C. B. Choi, None; Y. K. Sung, None; S. K. Cho, None; D. H. Yoo, None; S. S. Lee, None; J. Lee, None; J. Kim, None; H. S. Lee, None; T. H. Kim, None; B. Y. Youn, None; Y. H. Song, None; J. H. Lee, None; S. C. Shin, None; W. T. Chung, None; S. J. Hong, None; C. K. Lee, None; E. Koh, None; J. B. Jun, None; S. Y. Bang, None; S. K. Kim, None; H. S. Cha, None; J. Shim, None; S. C. Bae, None.

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Background/Purpose: People with rheumatoid arthritis (RA) suffer an excess burden of cardiovascular disease (CVD), yet standard risk assessments designed for the general population do not accurately predict their CVD risk. The purpose of this study was to identify traditional CVD risk factors that have a significantly different impact on CVD development in the presence of RA. Recognition of potentially distinctive contributions of CVD risk factors in RA could inform the development of improved CVD risk assessment tools for patient management.

Methods: A population-based inception cohort of RA subjects aged ≥30 years who fulfilled 1987 ACR criteria for RA between 1-1-1988 and 1-1-2008 was assembled and followed until death, migration, or 12-31-2008. Medical records were reviewed to ascertain the presence of CVD risk factors (age, blood pressure, lipids, smoking, and diabetes mellitus) at RA incidence and to ascertain the development of CVD (myocardial infarction, CVD death, angina, heart failure, stroke and intermittent claudication) during follow-up. The 10-year Framingham risk score (FRS) for CVD was calculated. Cox models were used to examine the effects of CVD risk factors included in the FRS in patients with RA, and whether RA disease characteristics (e.g., rheumatoid factor [RF] positivity, acute phase reactants, extra-articular manifestations) modify the effects of CVD risk factors. Models were adjusted for the FRS and stratified by sex.

Results: The study included 525 patients with RA without prior CVD (mean age: 55 years, 71% women; 68% RF positive). The patients were followed for a mean of 8.4 years, during which 84 developed CVD (47 women, 37 men). The FRS predicted only 45.7 events (23.3 women, 22.4 men). Essentially all of the excess events (37.2 of 38.3) were among the RF-positive patients. Analysis of CVD risk factors revealed a greater effect of age on the risk of developing CVD among RF-positive but not RF-negative patients. Essentially all of the excess events (37.2 of 38.3) were among the RF-positive patients. The results revealed an exponentially increasing effect of age on the risk of developing CVD among RF-positive but not RF-negative patients. Essentially all of the excess events (37.2 of 38.3) were among the RF-positive patients. The results revealed an exponentially increasing effect of age on the risk of developing CVD among RF-positive but not RF-negative patients. Essentially all of the excess events (37.2 of 38.3) were among the RF-positive patients.

Conclusion: The results revealed an exponentially increasing effect of age on CVD risk in patients who have seropositive RA, supporting prior reports of accelerated aging in this disease. In contrast, the impact of age on CVD risk among RF-negative patients was similar to the general population. These findings suggest that the advent of CVD risk scores that better account for accelerated aging and other factors in RF-positive patients could improve CVD risk assessment for persons with RA.

Disclosure: C. S. Crowson, Pfizer Inc, 2; T. M. Therneau, Pfizer Inc, 2; J. M. Davis III, None; Y. L. Yoo, None; J. L. Matteson, Pfizer Inc, 2; S. E. Gabriel, Pfizer Inc, 2; Roche Pharmaceuticals, 5.

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The Impact of Statin Use On Lipid Levels in Statin-naïve Patients with Rheumatoid Arthritis (RA) Vs. Non-RA Subjects: Results From a Population-Based Study. Elena Myasoedova, Cynthia S. Crowson, Abigail B. Green, Eric L. Matteson and Sherine E. Gabriel. Mayo Clinic, Rochester, MN

Background/Purpose: Dyslipidemia in patients with rheumatoid arthritis (RA) is well recognized. The impact of lipid-lowering medications on lipid levels in patients with RA vs non-RA subjects has not been comprehensively studied in large population-based cohorts. We aimed to examine lipid profiles among statin naïve patients with RA and those without RA before and after the initiation of statins.

Methods: Lipid measures were abstracted in a population-based incident cohort of RA patients (1987 ACR criteria first met between 1/1/1988 and 1/1/2008) and in a cohort of non-RA subjects from the same underlying population. Information regarding statin use was gathered in both cohorts. Only patients with no history of statin use who started a statin for dyslipidemia between 1 year prior to RA diagnosis/index date and last follow-up were included. Target lipid levels for both cohorts were defined as follows: total cholesterol (TC) <200 mg/dL, low density lipoprotein cholesterol (LDL) <160 mg/dL, triglycerides <150 mg/dL, high density lipoprotein cholesterol (HDL) ≥50 mg/dL. T-tests and linear regression models were used to compare changes in lipid profiles between the RA and non-RA cohorts.

Results: The study included a cohort of 161 patients with RA (mean age 56.3 years, 57% female, 66% rheumatoid factor positive) and 221 non-RA subjects (mean age 56.0 years, 66% female). Prior to the start of statins, the levels of TC (mean±/standard deviation, 225.3±54.7 mg/dL) and LDL (141.0±53.4 mg/dL) in the RA cohort were significantly lower than in the non-RA cohort (TC: 242.3±45.8 mg/dL, p=0.001, and LDL: 155.2±40.6 mg/dL, p=0.004). The decrease in absolute LDL values after at least 90 days of statin use was less pronounced in the RA vs non-RA cohort ((−33.7±24.2 mg/dL vs −44.7±38.5 mg/dL, respectively, p=0.052); a similar trend was observed for TC (−35.6±46.3 mg/dL vs −43.5±41.4 mg/dL, p=0.08). There were no significant differences in baseline and/or follow-up levels of triglycerides, HDL, and TC/HDL in RA vs non-RA cohorts. During the 90-day follow-up, the percentage change in LDL, but not in other lipids, was significantly smaller (by 9%) in RA than in the non-RA cohort (p=0.039), adjusting for age, sex, smoking, diabetes mellitus, hypertension, and coronary heart disease. However, RA patients with altered lipid levels were as likely to reach lipid targets with statin use as non-RA subjects (all p > 0.05). A total of 89% of RA vs 91% of non-RA subjects met the target levels for LDL after 90 days of statin use (p=0.53). There were no apparent changes in the use of disease-modifying antirheumatic drugs and biologics in RA patients during the study period.

Conclusion: Before statin initiation, patients with RA had significantly lower TC and LDL levels than non-RA subjects. Absolute and relative decreases in LDL values following statin initiation were smaller in RA than in non-RA subjects. Nonetheless, patients with RA were as likely to achieve conventional lipid goals as non-RA subjects suggesting the potential for clinical benefits of statins in RA. More studies are needed to determine the impact of improvement in lipid profile with statin use on cardiovascular risk reduction in RA.

Disclosure: E. Myasoedova, None; C. S. Crowson, Pfizer Inc, 2; A. B. Green, None; E. L. Matteson, Pfizer Inc, 2; S. E. Gabriel, Pfizer Inc, 2; Roche Pharmaceuticals, 5.

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1New York University School of Medicine, New York, NY, 2Mount Sinai School of Medicine, New York, NY, 3NYU School of Medicine, New York, NY, 4NYU School of Medicine, New York, NY

Background/Purpose: Rheumatoid arthritis (RA) has been associated with premature atherosclerosis and increased prevalence of cardiovascular disease. 18-fluoro-deoxyglucose positron emission tomography (18-FDG-PET) is a promising imaging technique that has been used previously to evaluate vascular inflammation. Individuals with coronary artery disease (CAD) have been shown to have increased 18-FDG-PET uptake in previous studies. In this study we compare vascular inflammation in individuals with RA with inflammation versus patients with established CAD without underlying autoimmune disease.

Methods: 27 RA patients (aged 35–64) and 70 CAD patients (aged 41–76) without autoimmune disease were recruited as two separate cohorts and underwent PET scans after injection of 10mCi of FDG to measure vascular inflammation. Metrics of PET uptake were computed.
for the aorta and carotid arteries and compared across the two groups. Multivariate regression models were run to adjust for differences in age, gender and BMI between the groups. P-values < 0.05 were considered significant.

**Results:** The RA cohort had a mean disease duration of 11.3 years and mean DAS28 of 4.6, with 10 (37%) on biologic DMARDs. None of the RA patients had a history of CAD, MI or stroke. The table shows the median - standard deviations of the mean, maximum and MDS FDG-PET uptake (TBR values) in the two groups both without and with adjustments for age gender and BMI. For the carotids, no differences were detected in mean, maximum and MDS TBR values both without and with adjustments for age gender and BMI. For the aortas, differences were detected in mean, maximum and MDS TBR values in both groups without and with adjustments for age gender and BMI. For the carotids, no differences were detected in mean, maximum and MDS TBR values both without and with adjustments for age gender and BMI. For the aortas, differences were detected in mean, maximum and MDS TBR values in both groups without and with adjustments for age gender and BMI. For the carotids, no differences were detected in mean, maximum and MDS TBR values both without and with adjustments for age gender and BMI. For the aortas, differences were detected in mean, maximum and MDS TBR values in both groups without and with adjustments for age gender and BMI.

For the aorta, we found that the mean, maximum and MDS TBR values were significantly higher in RA patients than CAD patients in both unadjusted and adjusted analyses. For the aorta, we found that the mean, maximum and MDS TBR values were significantly higher in RA patients than CAD patients in both unadjusted and adjusted analyses. For the aorta, we found that the mean, maximum and MDS TBR values were significantly higher in RA patients than CAD patients in both unadjusted and adjusted analyses. For the aorta, we found that the mean, maximum and MDS TBR values were significantly higher in RA patients than CAD patients in both unadjusted and adjusted analyses. For the aorta, we found that the mean, maximum and MDS TBR values were significantly higher in RA patients than CAD patients in both unadjusted and adjusted analyses.

**Conclusion:** Our data indicates that RA patients without known CVD have heightened aortic wall inflammation and similar levels of carotid wall inflammation when compared to CAD patients without autoimmune disease. Increased aortic inflammation might be a mechanism for increased risk for atherosclerosis in RA patients.

**Disclosure:** J. D. Greenberg, None; Z. Fayad, None; V. Furer, None; M. Farkouh, None; M. J. Colin, None; P. B. Rosenthal, None; J. Samuels, None; S. Krasnoportsky Samuels, None; S. M. Reddy, None; P. M. Izmirly, None; C. Oh, None; M. Jain, None; V. Mani, None.

### 1251

**Vulnerability Features Are Common in Coronary Plaques of Asymptomatic Patients with Rheumatoid Arthritis Compared to Controls: Associations with Lipid and Oxidative Stress Biomarkers.**

*Paraoxonase 1 (PON1) is a high density lipoprotein (HDL) associated enzyme, which promotes the anti-oxidant and anti-inflammatory properties of HDL. PON1 polymorphisms and enzyme activity have previously been associated with cardiovascular (CV) events in the general population. Since abnormal HDL function has been proposed to contribute to CV risk in patients with rheumatoid arthritis (RA), the current work investigated the relationship of genetic and biochemical determinants of PON1 activity with carotid plaque as a surrogate marker of CV risk in RA patients.*

**Methods:** PON1 activity, PON1 genotype (for the functional polymorphism at position 192), and carotid plaque presence were determined in 168 patients with RA. Fasting blood was collected for lipoprotein analysis, and PON1 activity was measured using paraoxon as the substrate. Genotyping for the PON1 Q192R polymorphism (SNP rs662) was done for all patients as described previously (Blutacharyya et al. JAMA 2008). Lipoprotein cholesterol levels were measured by standard methods and traditional cardiovascular risk factors, medication use, and RA disease characteristics were assessed for all patients.

**Results:** The PON1 genotype demonstrated a significant dose dependent association with PON1 activity (RR192 > QR192 > QQ192) (p < 0.001). Compared to patients with either the PON1 QQ192 or QR192 genotype, patients with the RR192 genotype demonstrated decreased risk of carotid plaque in multivariate analysis controlling for traditional CV risk factors, high-sensitivity C-reactive protein levels, prednisone use, and cholesterol lowering medication use (p < 0.05). Separate multivariate logistic regression analysis controlling for the above factors also revealed a significant association of plasma PON1 activity with carotid plaque in RA patients. Lower plasma PON1 activity was associated with increased risk of carotid plaque (p < 0.05).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>VP (+)</th>
<th>VP (-)</th>
<th>Plaque (-)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA-n patients=150</td>
<td>24</td>
<td>83</td>
<td>43</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Controls-n patients=150</td>
<td>0</td>
<td>68</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>RA-n plaques=303</td>
<td>41</td>
<td>262</td>
<td>n/a</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Controls-n plaques=135</td>
<td>0</td>
<td>135</td>
<td>n/a</td>
<td></td>
</tr>
</tbody>
</table>

**Table.** Comparison of RA Patients versus CAD Patients Target to Background Ratios

<table>
<thead>
<tr>
<th>Target to Background Ratio (TBR)</th>
<th>RA patients (median ± SD)</th>
<th>CAD Patients (median ± SD)</th>
<th>p-value (unadjusted)</th>
<th>p-value (adjusted)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aorta Mean TBR</td>
<td>1.46 ± 0.40</td>
<td>1.25 ± 0.12</td>
<td>0.003</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Aorta Max TBR</td>
<td>2.08 ± 0.57</td>
<td>1.75 ± 0.22</td>
<td>0.014</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Aorta MDS TBR</td>
<td>2.23 ± 0.62</td>
<td>1.87 ± 0.27</td>
<td>0.015</td>
<td>0.0004</td>
</tr>
<tr>
<td>Carotids Mean TBR</td>
<td>1.47 ± 0.19</td>
<td>1.47 ± 0.21</td>
<td>0.261</td>
<td>NS</td>
</tr>
<tr>
<td>Carotids Max TBR</td>
<td>1.69 ± 0.25</td>
<td>1.84 ± 0.30</td>
<td>0.018</td>
<td>NS</td>
</tr>
<tr>
<td>Carotids MDS TBR</td>
<td>1.79 ± 0.25</td>
<td>1.87 ± 0.31</td>
<td>0.005</td>
<td>NS</td>
</tr>
</tbody>
</table>

* Adjusted for age, gender and BMI; bold font indicates significant differences
Conclusion: The current work suggests a relationship between the genetic determinants and activity of PON1 with cardiovascular risk in RA patients as assessed by the presence or absence of carotid plaque. Further CV outcome studies may be warranted to determine if PON1 is a useful biomarker of CV risk in patients with RA.

Disclosure: C. Charles-Schoeman, None; Y. Y. Lee, None; V. K. Ranganath, None; J. D. FitzGerald, None; M. B. Taylor, None; M. A. McMahon, None; D. Elashoff, None; S. T. Reddy, None.

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Kimberly P. Liang, Douglas P. Landsittel, Suresh R. Mulukutla, Steven E. Reis, Marc C. Levesque, Flordeliza S. Villanueva, Hunter C. Champion and Larry W. Moreland, University of Pittsburgh, Pittsburgh, PA

Background/Purpose: Rheumatoid arthritis (RA) is independently associated with a higher risk of cardiovascular disease (CVD). Markers of systemic inflammation, as seen in RA, are associated with plaque vulnerability. Recently, increased vasa vasorum neovascularization has been identified as a common feature of inflammation and plaque vulnerability, and independently predicts future CV events in the non-RA general population. Excess CVD risk in RA may be caused by disease-related factors leading to vulnerable plaque characterized by increased vasa vasorum neovascularization, which is not assessed by traditional imaging modalities. Microbubble contrast-enhanced carotid ultrasound (CU) is a novel imaging technique that has been validated in detecting measures of vulnerable plaque, namely increased adventitial vasa vasorum density (aVVD), in non-RA subjects.

Our objective was to establish feasibility of measuring aVVD in RA patients, to determine whether RA patients have higher aVVD compared to non-RA controls, and whether disease-related RA measures correlate with increased aVVD, using CU.

Methods: We performed a preliminary cross-sectional study of 23 RA cases and 28 non-RA controls; this project is ongoing. All 51 subjects underwent CU with measurement of intima-media thickness (IMT, using maximum of both sides) and the mean common carotid artery adventitial to lumen videointensity ratio (using maximum of both sides) to quantify aVVD. Demographic and CV risk factor data were collected on all subjects, and tested for differences between cases and controls, using the Wilcoxon rank-sum test for continuous data and Fisher’s exact test for categorical data. RA disease activity measures (CDAI and DAS28), cryochemistry sedimentation rate, high sensitivity C-reactive protein (CRP), rheumatoid factor (RF), and anti-cyclical citrullinated peptide (aCCP), were collected systematically on RA subjects. Spearman correlations were assessed between disease activity measures and aVVD and IMT within RA cases.

Results: Demographic and CV risk factors between RA and controls were similar, except for mean age (58.0 years in RA, 66.1 years in controls; p<0.01); systolic blood pressure (138 in RA, 120 in controls; p=0.01); and race (91.3% white in RA, 64.3% white in controls; p=0.02). We successfully measured aVVD, which was higher in RA (mean = 0.634; SD = 0.097) versus controls (mean = 0.595; SD = 0.112), although so far non-significantly (p = 0.112). CRP was also higher, although again non-significantly so far (p = 0.65), in RA (mean = 0.85; SD = 0.28) versus controls (mean = 0.80; SD = 0.18). After adjusting for age and personal history of CVD, results did not qualitatively change. As expected, CRP, RF and CCP were all significantly higher in RA than controls (p<0.001). No correlations between disease activity measures with aVVD and IMT were significant.

Conclusion: Measurement of aVVD to quantify plaque vulnerability in RA patients is feasible utilizing the novel CU technique. In this pilot study, the aVVD was slightly higher in RA than control subjects, though not significantly. Our study is ongoing, with plans for targeted enrollment of larger numbers of subjects and further adjustment for differences in demographics and CV risk factors.

Disclosure: K. P. Liang, None; D. P. Landsittel, None; S. R. Mulukutla, None; S. E. Reis, None; M. C. Levesque, Genentech and Biogen IDEC Inc., 2; UCBB, 5; Crescendo, 5; F. S. Villanueva, None; H. C. Champion, None; L. W. Moreland, None.

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In Treatment-Naive Early RA the Left Ventricular Function Is Correlated to CRP, Doctors Global and Anti-CCP Status. BB Logstrup1, LD Kristensen1, A. Hedemann-Andersen1 and Torkell Ellingsen2.

1Diagnostic Centre Region Hospital Silkeborg Denmark, Silkeborg, Denmark, 2Diagnostic Centre Regional Hospital Silkeborg, 8600 Silkeborg, Denmark

Background/Purpose: The role of inflammation and anti-CCP status in the pathogenesis of cardiovascular disease in RA remains unclear. Previous studies have suggested that both disease activities as well as disease duration are associated with atherosclerosis and a higher mortality rate caused by coronary artery disease.

We wanted to investigate how disease activity and anti-CCP status in treatment-naive early RA impacts the left ventricular (LV) systolic function.

Methods: 41 patients (16 men, median age 60 years (28–81)) with steroid and DMARD-naive early RA. Disease activity was scored by the use of the Danish national DANBIO registry (number of swollen joints (NSJ) (28)), number of tender joints (NTJ (28)), CRP, HAQ. Visual analog scales 1–100 was used to assess pain, fatigue and global assessment by the patient as well as global assessment by doctor and as composite score (DAS28(CRP)).

IGMRF and anti-CCP titers were evaluated by standardized techniques. One experienced senior rheumatologist and one experienced cardiologist performed all the clinical assessments as well as all the transthoracal echocardiography (TTE). We performed an extensively TTE measuring conventional measurements of LV systolic function including the novel technology, global longitudinal strain (GCS) analysis.

Results: Disease activity before treatment at baseline NSJ(28) median 7 range (1–16), NTJ(28) 8 (1–15), CRP 9 mg/l (0–42), HAQ 2.625 (0.5–2.625), pain VAS 54 (7–100), fatigue VAS 48 (2–100), doctor global assessment 55 (28–79), DAS28(CRP) 4.7 (3.3–6.2), pulse 65 (50–87), diastolic blood pressure (BP) 88 mmHg (66–158), systolic BP 147 mmHg (78–158), 18 (43.9%) patients was IgMRF positive and 26(63.4%) was anti-CCP positive.

We found LV systolic function by conventional Ejection Fraction (EF), median 52% (24–74), non-significant correlated to disease activity (CRP: r = 0.19, p = 0.23; baseline NSJ: r = 0.11, p = 0.5; NTJ: r = 0.04, p = 0.81; HAQ: r = 0.27, p = 0.1; pain VAS: r = 0.1, p = 0.53; fatigue VAS: r = 0.1, p = 0.56; doctor global assessment: r = 0.07, p = 0.67 and DAS28: r = 0.03, p = 0.86).

However using a more sensitive measurement of the longitudinal systolic LV function (s’) we found a significant correlation, in means of CRP (r = 0.40; p = 0.015) and doctor global assessment VAS (r = 0.47; p = 0.003), to disease activity; both corrected for relevant confounders (age, gender, pulse and blood pressure). Furthermore using strain analysis of LV function we found a significant difference in global LV GLS values in 11(26.8%) patients with high values of anti-CCP values (values ≥ 340 (GLS: −18.7% (−20.6–14.4)) vs. in 30(73.2%) patients with anti-CCP <340; p = 0.04. For patients with high IgMRF the result was non-significant.

Conclusion: We observed a significant correlation between increasing CRP, doctors global, anti-CCP anti-CCP <340 and increased longitudinal LV systolic function.

Disclosure: B. Logstrup, None; L. Kristensen, None; A. Hedemann-Andersen, None; T. Ellingsen, None.

1255

Vascular Calcification On Hand and Feet X-Rays, VFA Imaging of the Spine, and Cardiovascular Disease in Rheumatoid Arthritis. Auma Mohammadi1, Collette English1, Derek Lohan1, Diane Bergin2, Sarah Mooney1, John Newell2, Martin O’Donnell1, Robert J. Coughlan1 and John J. Carey1.

1Galway University Hospitals, Galway, Ireland, 2National University of Ireland, Galway, Ireland

Background/Purpose: Patients with rheumatoid arthritis (RA) are at increased risk of osteoporosis (OP) and cardiovascular disease (CVD), and have increased cardiovascular mortality compared with the general population. Vascular calcification (VC) is independent predictor of incident CVD and mortality in RA patients. While VC may be present on plain films of the hands and feet, little is known about the significance of this entity in RA patients. We evaluated the prevalence of VC on hands and feet radiographs, the association with VFA-detected abdominal aortic calcification (AAC) and other CVD risk factors, and the prevalence of CVD in RA patients.

Methods: We conducted a cross-sectional study on our RA subjects ≥40 years of age, who met 1987 ACR criteria for RA classification, and had hands and feet radiographs available for analysis. Risk factors and details of CVD were recorded, and DXA and VFA scans were reviewed where available. Study was approved by local I.R.B. Two blinded musculoskeletal radiologists examined all radiographs for the presence of VC as either “present” or “absent”, and VFA scans to detect and quantify the presence of AAC. We controlled the prevalence of VC between RA patients with and without CVD using multivariable logistic regression, and determined if VC on hands and feet radiographs was independently associated with VFA-detected AAC and prevalent CVD.

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Results: 854 RA patients met the inclusion criteria, 603 of whom also had a VFA scan available for analysis: 69% female mean age 59 years and 77% seropositive (Table 1). 230 subjects had ≥1 documented CVD event. CV was observed on radiographs in 94% (11%) and a higher proportion of subjects had prevalent CVD (49% Vs 24%). Of the 603 who had a VFA scan available, 211 (35%) of the subjects had AAC. A greater proportion of those with VC on plain films had AAC on VFA (36% Vs 23%). In multivariable analyses, AAC presence was significantly and independently associated with AAC (OR 1.80; 95% CI 1.55 to 1.98; p < 0.001). Antioxidative activity and total chemical composition of small, dense HDL did not differ between RA patients and controls (p > 0.05). Nonetheless, subgroup analyses revealed that RA patients possessing high levels of inflammation (CRP >10mg/l) showed small, dense HDL with reduced antioxidative activities (up to 23%, p < 0.01). Furthermore, antioxidative activity of HDL was inversely correlated with plasma CRP and SAA levels. HDL3b and 3c were depleted of free cholesterol (FC) in high-inflamed RA patients. This FC depleted HDL particles were less efficient in preventing LDL oxidation.

Table 1. Demographics and Clinical Features of 854 RA Patients According to the Presence of VC on Hand and Feet X-rays

<table>
<thead>
<tr>
<th>Variables</th>
<th>VC positive (n = 94)</th>
<th>VC negative (n = 760)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>59 ± 12.74</td>
<td>56 ± 9.67</td>
<td>0.012</td>
</tr>
<tr>
<td>Women- (%)</td>
<td>65 (69)</td>
<td>525 (69)</td>
<td>0.890</td>
</tr>
<tr>
<td>Smokers- (%)</td>
<td>60 (64)</td>
<td>396 (52)</td>
<td>0.003</td>
</tr>
<tr>
<td>RA duration (years)</td>
<td>15 ± 9</td>
<td>13 ± 6</td>
<td>0.006</td>
</tr>
<tr>
<td>Family history of CVD- (%)</td>
<td>39 (41)</td>
<td>200 (26)</td>
<td>0.003</td>
</tr>
<tr>
<td>Diabetes- (%)</td>
<td>15 (16)</td>
<td>112 (15)</td>
<td>0.540</td>
</tr>
<tr>
<td>Dyslipidemia- (%)</td>
<td>41 (43)</td>
<td>260 (34)</td>
<td>0.003</td>
</tr>
<tr>
<td>Prevalent CVD</td>
<td>46 (49)</td>
<td>184 (24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertension- (%)</td>
<td>45 (48)</td>
<td>167 (22)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Glucose/creatinine-use- (%)</td>
<td>23 (24)</td>
<td>120 (16)</td>
<td>0.017</td>
</tr>
<tr>
<td>RF-positive- (%)</td>
<td>69 (73)</td>
<td>590 (78)</td>
<td>0.021</td>
</tr>
<tr>
<td>Anti-CCP positive- (%)</td>
<td>71 (76)</td>
<td>540 (71)</td>
<td>0.013</td>
</tr>
<tr>
<td>C-reactive protein (mg/l)</td>
<td>5.50 ± 3.52</td>
<td>3.13 ± 1.86</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CRP, mean ± SD</td>
<td>2.98 ± 0.90</td>
<td>1.92 ± 0.86</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SAA, on VFA- (%)</td>
<td>34 (36)</td>
<td>177 (23)</td>
<td>0.034</td>
</tr>
</tbody>
</table>

Conclusion: We found a significant association between VC on hands and feet radiographs and abdominal aortic calcification and CVD in our RA cohort. The presence of VC should alert physicians to the presence of CVD in patients with RA.

Disclosure: A. Mohammad, None; C. English, None; D. Lohan, None; D. Bergin, None; S. Mooney, None; J. Newell, None; M. O’Donnell, None; R. J. Coughlan, None; J. J. Carey, None; S. Mooney, None; J. Newell, None; M. O’Donnell, None; R. J. Coughlan, None; J. J. Carey, None.

1257

Subclinical Atherosclerosis in Hispanic Patients with Rheumatoid Arthritis. Correlation with the Presence of Anti-Oxidized LDL Antibodies and Serum Levels of CD40L

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory disease, associated with an excess of cardiovascular morbidity and mortality due to accelerated atherosclerosis. The appearance of antibodies (Abs) against anti-ox-LDL may be a pathogenic link between inflammation and atherosclerosis. An excessive CD40L/CD40 interaction is thought to play a pathogenic role in RA. The aim of this study was to search for the prevalence of subclinical atherosclerosis in a group of Venezuelan patients with RA and examine its correlation with anti-ox-LDL Abs and serum levels of CD40L.

Methods: Sixty-five RA patients and 26 healthy volunteers participated in the study. The presence and total serum levels of anti-ox-LDL Abs and CD40L were examined by ELISA. The biologically active CD40L was measured by an assay testing induction of nitric oxide production in vitro by RAW mouse 264.7 cells. The prevalence of subclinical atherosclerosis was detected by the measurement of intima-media-thickness (IMT) of the common carotid arteries using a Doppler ultrasound system (Esaote MyLab, 12 Mhz). Subclinical atherosclerosis was defined by an IMT ≥ 0.6 mm. Statistical analysis was performed by Student’s t test and Chi-square and the Exact Fisher’s test for continuous and dichotomous variables, respectively. The study was approved by our hospital Ethics Committee and all patients signed an informed consent.

Results: We compared 65 RA patients (92.3% female; mean age 50.58±8.91) with 26 healthy controls (90.15% female; mean age 43.42±9.62). DMARDS and DMARDS plus biologics were received by 98.46% and 18.46% of patients, respectively. Mean disease duration was 7.32±6.04 years and mean and Disease Activity Score (DAS) 28-ESR was 3.19±1.5. Serum levels of anti-ox-LDL were significantly higher in the RA patients than in healthy controls (34.48±9.83 vs. 24.74±6.4; P = 0.01). Serum levels of total CD40L and biologically active CD40L were also significantly higher in RA patients than in controls (9.13±2.74 vs. 5.38±1.94; P < 0.0001 and 3.81±1.94 vs. 1.6±1.11; P = 0.002).

Patients with RA showed a higher proportion of an IMT ≥ 0.6 mm (P = 0.006). There was no correlation between serum levels of anti-ox-LDL or CD40L with IMT.
Conclusion: To our knowledge this is the first study showing the presence of subclinical atherosclerosis in Hispanic patients with RA. Elevated serum titers of anti-oxLDL Abs and both total and soluble CD40L were features observed in this patient population suggesting their potential utility as biomarkers in our disease. Our preliminary results do not support a role for anti-oxLDL Abs or CD40L in the premature atherosclerosis observed in RA patients.

Disclosure: Y. Fuentes-Silva, None; S. Al Suhi, None; N. Serra-Bonet, None; J. De Sanctis, None; M. A. Rodriguez, None.

1258

Association Between Low Vitamin D Levels and Indicators of Osteoporosis and Atherosclerosis. Barry J. Sheane1, Ruth Dunne2, Ken Scott1, Mary Hall1, Michelle O’Connor2, Martin Healy2, John Feely2, J.B. Walsh2 and Gaye Cunnane2. 1St. James’ Hospital, Dublin, Ireland, 2Trinity College Dublin, Dublin 8, Ireland

Background/Paradigm: Osteoporosis and cardiovascular disease are complications of chronic rheumatoid arthritis (RA). It is not known if these processes share pathogenic mechanisms. Low levels of vitamin D predispose to bone fragility. Recent data suggest that they may also be linked to vascular disease.

Methods: A cross-sectional study of RA patients and age-sex-matched controls was carried out. None had any history of cardiovascular disease or diabetes mellitus. Levels of 25-hydroxy vitamin D were recorded and DXA scans were performed. Evidence of sub-clinical atherosclerosis was obtained with pulse wave analysis (PWA) and carotid intimal-media thickness (CIMT). Serum markers of vascular disease (ICAM1, oxidized LDL, HSP60, IL6), a lipid profile and body mass index (BMI) were measured. Early RA was defined as those with disease duration less than 2 years. Data were analyzed using SPSS 16.0.

Results: 99 people were included in this study (74 RA and 25 controls). Fifty-two (70%) of the RA group and 8 (31%) of the control group were taking calcium/vitamin D supplements (average vitamin D level 400IU/day). Only 12 (13%) had normal vitamin D levels (>80nmol/l). Vitamin D levels were deficient (<25nmol/l) in 21% and insufficient (25-<80nmol/l) in 65%. All patients with early RA were vitamin D deplete (n=18); 33% had insufficient levels and 67% deficient amounts. In contrast, 20% (n=11) of those with established RA had normal vitamin D levels, while 65% had insufficient and 15% deficient levels. Mean vitamin D measurements were 38.5nmol/l in early RA versus 58nmol/l in established RA (p=0.02).

Bone mineral density was similar between RA and controls. In the RA cohort, 29% had evidence of osteoporosis, while 46% had osteopenia and 25% had a normal DXA scan. In those with early RA, osteoporosis was present in 3 (18%) versus 16 (32%) patients with chronic RA (p=0.3). In RA, there was a negative correlation between vitamin D levels and DXA T-scores (p=0.02) and BMI (p=0.007). While RA patients had significantly greater levels of serum markers of vascular disease (IL6, ICAM1, oxidized LDL, HSP60) compared with controls, there was no correlation with vitamin D levels. CIMT measurements correlated negatively with vitamin D (p=0.06). Using multiple linear regression controlling for age, CIMT and DXA T-scores, and calcium/vitamin D supplements, vitamin D levels were negatively correlated with PWV (p=0.04), across the entire study group. Triglyceride levels were inversely related to vitamin D across the study group (cc=-0.3, p<0.001).

Conclusion: Low levels of vitamin D were common in this population, particularly in those with early RA. Vitamin D supplementation at current dosages does not achieve normal vitamin D levels. The association between low vitamin D levels and markers of both osteoporosis and atherosclerosis needs to be further explored. In particular, a lack of sunlight in relation to insufficient exercise exposure may be relevant in exploring this link.

Disclosure: B. J. Sheane, None; R. Dunne, None; K. Scott, None; M. Hall, None; M. O’Connor, None; M. Healy, None; J. Feely, None; J. B. Walsh, None; G. Cunnane, None.

1260


Background/Purpose: Rheumatoid arthritis (RA) is associated with a higher risk of osteoporosis (OP) and cardiovascular disease (CVD). This cross-sectional study was undertaken to identify links between the subclinical evidence of these processes.

Methods: RA patients without known cardiovascular disease or diabetes were included. Measures of osteoporosis risk (DXA, bone turnover markers) and sub-clinical atherosclerosis (pulse wave analysis, carotid intimal-media thickness (CIMT)) were recorded in addition to serum markers of systemic inflammation and lipid profiles. Data were analysed using SPSS 16.0 for Windows.

Results: Seventy four RA patients and 26 controls were included in the analysis. Gender and age were similar between RA and controls and between sub-groups of RA duration. The RA group had significantly higher oxidized LDL titres (p<0.001), interleukin-6 (p<0.001), heat shock protein (HSP) 60 (p=0.008), and soluble ICAM-1 (p=0.016) compared with controls. HDL levels were significantly lower in those with RA for <10 years (p=0.026), while LDL (p=0.014) and HSP60 levels (p=0.024) were higher. Levels of vitamin D (p=0.008), TNFa (0.016) and P1NP, a marker of bone formation (p=0.03), were higher in those with long-standing RA.

In RA, femur T-scores were inversely related to mean CIMT (cc=-0.3, p=0.02), mean common carotid artery IMT (cc=-0.3, p=0.02), aortic augmentation index (AAIxs) (cc=-0.3, p=0.01), CRP (cc=-0.4, p=0.002), oxLDL (cc=-0.3, p=0.01) and anti-CCP antibody titre (cc=-0.25, p=0.046). T-scores for the spine were also negatively correlated with AAlxs (cc=-0.4, p<0.001), anti-CCP antibody (cc=-0.3, p=0.03), and oxLDL (cc=-0.25, p=0.04). For those with osteoporosis, oxLDL was significantly higher compared to those with normal bone density (p=0.016). However, femur T-scores correlated positively with BMI (cc=0.5, p<0.001), waist (cc=0.4, p=0.002) and hip (cc=0.6, p<0.001) circumference, total fat mass (cc=0.4, p=0.01) and trunk fat mass (cc=0.4, p=0.02). T-scores for the spine also correlated with BMI (cc=0.3, p=0.008), waist (cc=0.4, p=0.002) and hip (cc=0.3, p=0.03) circumference.

Conclusion: Disease duration in RA correlated significantly with risk factors for atherosclerosis, independent of age. Furthermore, reduced bone mineral density was associated with evidence of sub-clinical atherosclerosis. These results suggest that early recognition of such complications may help to improve quality of life and longevity in patients with RA.

Disclosure: B. J. Sheane, None; R. Dunne, None; K. Scott, None; M. Hall, None; M. O’Connor, None; M. Healy, None; J. Feely, None; J. B. Walsh, None; G. Cunnane, None.

S538
Background/ Purpose: It has been shown that patients with rheumatoid arthritis (RA) experience cardiovascular (CV) events more often than expected. Increased risks of CV diseases in RA patients cannot be fully explained by conventional CV risk factors. This raises the possibility that the systemic inflammatory burden in RA may bring about its high CV event rate by causing accelerated atherosclerosis. This study was designed to evaluate the extent of subclinical atherosclerosis by measuring intima-media thickness of the carotid arteries (C-IMT) and the presence of plaque among RA patients and controls and to determine whether subclinical atherosclerosis, RA associated features, and other conventional CV risk factors are associated with later development of CV diseases (CVDs) in RA patients.

Methods: C-IMT was measured in 126 RA patients and 85 OA patients as controls who had no experience of CV events. The C-IMT was evaluated at common carotid arteries (CCAs), carotid bifurcation (BF), and internal carotid arteries (ICAs), bilaterally. Mean and maximal (max) IMTs were calculated from three measurements at each site. The following data were obtained for every patient: age, sex, body mass index (BMI), presence of bone erosions, rheumatoid factor, anti-CCP, medications, hypertension, hypercholesterolemia, diabetes mellitus, smoking status, family history of CVDs, ESR and CRP levels. Thereafter, these patients have been followed-up and examined the CV event rate during seven years. The CVD was defined as myocardial infarction, unstable angina, cardiac arrest, or death due to ischemic heart diseases.

Results: Although CV risks were fewer in RA than in OA, the mean and maximal C-IMT did not show a significant difference between two disease groups. We found the higher presence of carotid plaques in RA patients than in OA patients. During follow-up, 21 patients experienced CV events. The incidence of CV events was higher in RA than in OA (15.0% vs. 3.5%, p < 0.004). But, the conventional CV risk factors such as DM, hypertension and hypercholesterolemia were fewer in RA than in OA (10.3%, 27.7%, and 34.1% vs. 28.2%, 55.2%, 57.6%, p < 0.000). More CV events occurred in RA patients who initially showed the presence of subclinical plaques. The duration of CV event-free survival was shorter in RA patients with carotid plaque than those without (10 vs. 31 months, p < 0.051). The RA patients who developed CVD later had more bony erosions, higher positivity for rheumatoid factor or anti-CCP, higher doses of steroid and higher levels of ESR and CRP, than those who did not.

Conclusion: Despite a favorable conventional CV risk profile, RA patients had a significantly higher incidence rate of CVD than OA patients. RA itself was an independent risk factor for CVD. Especially, RA patients with carotid plaque, seropositivity, bony erosion, higher ESR and CRP are at higher risk of CV event.
Diagnosics Inc.). Protein peptide-specific ACPA assays were validated with a panel of sera from RA, OA and healthy individuals.

**Results:** The mean age was 51.2 years, mean DAS28 score 6.7 (range 2.2–6.7), 80% female and 11.36% were on biologic DMARDS. Carotid Max TBR was associated with higher levels of cTn-I (r = 0.566, p = 0.01), indicating an association of carotid wall inflammation with subclinical myocardial injury. Of the 15 inflammatory biomarkers assessed, carotid max TBR values was associated with elevations of sRAGE, VEGF, MMP9, proMMP9 and IL-1β. (Table 1). Similar results were obtained for carotid mean TBR. Strikingly, there was a strong correlation between carotid max TBR and car-Fib Ig (r = 0.72, p = 0.0005). Furthermore, patients with a positive Cit-Fib Ig test (n = 10) had higher levels of carotid wall inflammation (max TBR (p = 0.04), mean TBR (p = 0.03)) than Car-Fib Ig negative pts. No correlation was found between carotid TBR values and levels of IgG CCP3. Neither IgG antibodies nor any of the inflammatory biomarkers correlated with aorta TBR measures. By MRI, we found significant correlations between wall thickness and ACPA IgGs specific for citrullinated fibrinogen, filaggrin, and enolase, as well as plasma hsCRP and pMMPI9 levels (p < 0.05).

**Conclusion:** These FDG-PET studies indicate that a subset of RA patients exhibit inflammatory carotid artery disease. Carotid inflammation was associated with elevations of a distinct profile of innate inflammatory markers and citrullinated self-protein-specific IgG. These data may provide insights into the immunopathogenesis of RA-associated CV disease.

**Disclosure:** C. Gro¨nwall, None; G. Silverman, None; Z. Fayad, None; V. Mani, None; V. Furer, None; M. Farkouh, None; M. Jain, None; C. Oh, None; J. Todd, Singules; S. M. Attur, None; S. B. Abramson, None; J. D. Greenberg, None.

1265

**Vascular Age in Rheumatoid Arthritis Patients.** Jl Rosales-Alexander, César Magro Checa, Juan Salvatierra, Silvia Montes García, Jesús Cantero Hinojosa and Enrique Raya Álvarez, University Hospital San Cecilio, Granada, Spain

**Background/Purpose:** The European League Against Rheumatism (EULAR) recommends cardiovascular risk (CV) assessment using the systematic coronary risk evaluation (SCORE) chart in rheumatoid arthritis (RA) patients. However, the absolute 10 years CV risk is a statistical and epidemiological concept that could be difficult to understand by our patients, resulting in a lack of adherence to treatment. The Framingham heart study (FHS) incorporated the concept of vascular age, as the age of the arteries, a concept more easily understood by all patients. Recently, a calibrated vascular age chart (VAC) according to the SCORE scales was published for European people.

**Objectives:** To assess vascular age (VA) in RA patients without CV risk factors using VA and biomarkers that could help to predict higher vascular age.

**Methods:** We included 101 consecutive RA patients, according to the 1987 ACR classification criteria, without CV risk factors neither previous ischemic events and matched to 98 healthy controls according to sex, age and gender. We recorded demographic data, clinical and laboratory parameters of disease activity like ESR, CRP, tender and swollen joint counts, DAS28, and CV risk factors. We assessed VA using the VAC. Data was analyzed with the statistical software SPSS 15. Descriptive data were shown as percentages and mean±SD. To analyze data, we used simple linear regression test with correlation and the multiple lineal regression analysis. The limit of statistical significance was located in the alpha error of 0.05.

**Results:** In RA patients, the median chronicage (CA) was 53.5 ± 8.28 years. VA was 56.67 ± 9.84 and absolute CV risk was 1.13 ± 11. Of these patients, 20% fulfilled EULAR criteria for higher CV risk (20% had more than 10 years of disease, 9% had extra articular manifestations, 77% were positive RF and 48% had ACPA). In controls, CA was 53.52 ± 8.37, VA was 55.78 ± 9.82 and absolute CV risk was 1.1 ± 1. After applying linear regression test, VA was correlated with CA (beta 1.096, p = 0.000); however, there were not differences in VA between both groups (beta = 0.62, p = 0.232). Of interest, after adjusting for confounding factors, VA seem to be correlated with presence anti-citrullinated peptide antibodies (ACPAs) p < 0.021.

**Conclusion:** In our study we did not find differences between VA in RA patients without CV risk factors in comparison to healthy controls, but we found a well correlation between VA and the CA. Presence of ACPAs seems to predict higher vascular age.

**Disclosure:** J. Rosales-Alexander, None; C. Magro Checa, None; J. Salvatierra, None; S. Montes García, None; J. Cantero Hinojosa, None; E. Raya Álvarez, None.

1265

**Lipoprotein Subclass Particles and Small Vessel Elasticity As A Potential Marker for Early Atherosclerosis in Rheumatoid Arthritis: A Prospective, Controlled Study.** Martha M. Benedic and Elie Germern. University of Minnesota, Minneapolis, MN, “Regions Hospital and University of Minnesota Medical School, St. Paul, MN

**Background/Purpose:** Rheumatoid arthritis (RA) has increased rates of cardiovascular (CV) events. However, standard CV risk factors, such as routine lipid profiles, are not different in RA patients. It is still unclear how to best evaluate CV risk in RA.

Lipoprotein subclass determination differentiates lipoproteins by size and density. Small, dense LDL particles have been associated with an increased risk of CV disease in a number of population studies. Recently, small, dense HDL particles have been shown to be potentially anti-atherogenic. In RA, lipoprotein subclasses have been evaluated in three studies with conflicting results. No studies have prospectively evaluated lipoprotein subclasses in RA. Further, no studies have attempted to correlate these findings with a marker of endothelial function.

In this study, we evaluated lipoprotein subclasses and small arterial elasticity (SAE) in patients with RA over a 12 month period in comparison to healthy controls. SAE is a marker for vascular function and reduction in SAE is predictive of development of atherosclerosis.

**Methods:** Thirty-five seropositive RA and thirty-one control subjects without a history of coronary artery disease, diabetes mellitus, or active statin therapy were recruited. DAS28-CRP was measured as a marker for disease activity. Lipoprotein subchlorides concentrations were measured by nuclear magnetic resonance spectroscopy. SAE was measured from pulse-wave analysis by radial artery tonometry. After 12 months, the RA group underwent repeat DAS28-CRP, lipoprotein subclass determination, and SAE evaluations.

**Results:**

1. There was no significant difference between the RA and control groups in small arterial elasticity.
2. The RA group had significantly lower total LDL and lower small LDL particle concentration as compared to the control group.
3. Average HDL size was significantly larger in the RA group compared to controls.
4. Within the RA group, there was a statistically significant correlation of increased DAS28-CRP with a lesser number of small HDL particles (R = -0.07, p = 0.047). No significant correlations were seen between changes in DAS28-CRP with small LDL particles or HDL size. Changes in small LDL, small HDL particles, HDL size and DAS28-CRP did not correlate with changes in SAE.

**Table:**

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>Spearman (r)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>cTn-I</td>
<td>0.57</td>
<td>0.01</td>
</tr>
<tr>
<td>sRAGE</td>
<td>0.43</td>
<td>0.07</td>
</tr>
<tr>
<td>VEGF</td>
<td>0.59</td>
<td>0.008</td>
</tr>
<tr>
<td>MMP8</td>
<td>0.62</td>
<td>0.004</td>
</tr>
<tr>
<td>pMMP9</td>
<td>0.58</td>
<td>0.008</td>
</tr>
<tr>
<td>IL1β</td>
<td>0.48</td>
<td>0.03</td>
</tr>
<tr>
<td>IgG anti-Cit-Fib</td>
<td>0.72</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

**Conclusion:**

In the RA group, there was lower total LDL and lower small LDL particle concentration as compared to controls. HDL size was significantly larger in the RA group as compared to controls.

**Disclosure:** J. Rosales-Alexander, None; C. Magro Checa, None; J. Salvatierra, None; S. Montes García, None; J. Cantero Hinojosa, None; E. Raya Álvarez, None.
2. Within the RA group, increased disease activity significantly correlated with a reduced number of small HDL particles.

3. Small arterial elasticity did not differentiate RA from controls in assessing potential cardiovascular risk. SAE was not affected by changes in lipoprotein subclasses.

Alterations in LDL subclass populations may not account for the increased cardiovascular risk seen in RA. However, reduction in the potentially anti-atherogenic small HDL particles may be a potential factor.

Disclosure: M. T. Mertens, None; E. Gertner, None.

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Evaluation of Metabolic Syndrome in 97 Patients with Rheumatoid Arthritis. Fernanda G. G Chaker1, Juliana Lucena1, Rogerio Castro Reis1, Fabiola Brasil1, Murilo Melo2, Amanda Callegari2 and Branca Souza3. 1Unidade de Cuidados com a Saude da Santa Casa de Misericordia de Sao Paulo, Sao Paulo, Brazil, 2Unidade de Cuidados com a Saude da Santa Casa de Misericordia de Sao Paulo, Sao Paulo, Brazil

Background/Purpose: Rheumatoid arthritis (RA) is an independent risk factor for cardiovascular disease (CVD), which is the leading cause of death in this group. Thus, the investigation of metabolic syndrome (MS) is critical, as designating a number of other cardiovascular risk factors: abdominal obesity, dyslipidemia, hypertension and hyperglycemia. To evaluate the frequency of MS in patients with RA and their relationship with disease activity and the different therapies used, in particular blocking tumor necrosis factor alpha (anti-TNF).

Methods: We selected 107 consecutive patients diagnosed with RA and included only patients with data necessary for determining the MS according to NCEP-ATPIII. Disease activity was determined using the 28-joint Disease Activity Score (DAS28). Score greater than 3.2 and was considered the cutoff point for disease activity.

Results: The study included 97 patients. 47 (48.5%) were using anti-TNF in combination with methotrexate (MTX). 50 (51.5%) patients were using only synthetic DMARDs: 36 (72%) MTX, 22 (44%), leflunomide, 19 (38%) chloroquine and 8 (16%) sulphasalazine. The overall frequency of MS was 37.1%. There was no significant difference between the prevalence of MS in chloroquine and 8 (16%) sulphasalazine. The overall frequency of MS was only 38% in combination with methotrexate (MTX). 50 (51.5%) patients were using adjuvant therapy in this patient population at high risk for CVD.

Conclusion: Our findings indicate that residual inflammatory burden increases the risk of carotid plaque progression during 2 years of follow up in RA.

Disclosure: C. H. Im, None; N. R. Kim, None; J. W. Kang, None; Y. J. Kim, None; K. H. Kim, None; E. J. Nam, None; V. M. Kang, None.

1268
Lipid Alterations and Measurement of Arterial Stiffness in Rheumatoid Arthritis. Marina Scolinik1, Carla Saucedo1, David A. Navarta2, Leandro Ferreyra Garrot1, Erika Catay1, Maria L. Acosta Felquer1, Eliana Lancioni1, Cristian Quiro2, Federica Varela Guidetti2, Zaida Bedran2, Mirtila Sabelli2, Javier Rosa1, Maria Victoria Garcia1, Patricia M. Imamura1, Patricia Sorvo2, Jose Alfie1, Margarita Morales1, Gabriel Waisman1, Luis J. Catoggio and Enrique Soriano1. 1Rheumatology Section, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 2Central Laboratory, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 3Hypertension Unit, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 4Hospital Italiano de Buenos Aires, Buenos Aires, Argentina

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory disease. Increased arterial stiffness, an independent risk factor for premature coronary artery disease, has been reported in patients with RA. The objectives of this study were to assess inflammatory burden, ESR-AUC during 2 years of follow up (ESR-AUC2), 5 years before baseline enrollment (ESR-AUC5), 140 females, ≥ 40 years old, and summation of these two periods (ESR-AUC7) were calculated.

Results: The study population included 227 females and 52 males RA patients. Mean and maximal common carotid IMT was increased during 2 years of follow up (0.799 ± 0.137 vs. 0.809 ± 0.137 mm; P = 0.010 and 0.918 ± 0.214 vs. 0.936 ± 0.210 mm; P = 0.002, respectively). Frequency and number of carotid plaques were also increased from 34.7% to 46.4% (P = 0.001) and from 0.7 ± 1.3 to 1.0 ± 1.7 (P < 0.001), respectively. Plaque presence at 2 years of follow up was associated with tender joint count (TJC), swollen joint count (SJC), disease activity score (DAS) 28, and ESR level at baseline, after the adjustment with age and gender. ESR-AUC2, ESR-AUC5, and ESR-AUC7 were significantly associated plaque at 2 years (P = 0.035, P = 0.018, and P = 0.025 respectively, after the adjustment with age and gender). After multivariate logistic regression analysis, the factors found to be significantly associated with plaque at 2 years were ESR-AUC5 (P = 0.015) and TJC28 at baseline (P = 0.048). In the second step analysis of 71 patients with newly developed plaque at 2 years (33 patients with no plaque at baseline and 38 patients with increased number of plaques from baseline), the factor significantly associated with plaque progression was ESR-AUC5 (P = 0.038) in multivariate logistic regression analysis.

Conclusion: Our findings indicate that residual inflammatory burden increases the risk of carotid plaque progression during 2 years of follow up in RA.

Disclosure: M. T. Mertens, None; E. Gertner, None; C. H. Im, None; N. R. Kim, None; J. W. Kang, None; Y. J. Kim, None; K. H. Kim, None; E. J. Nam, None; V. M. Kang, None.
Role of Inflammation, Serologic Status and Low Density Lipoprotein in Coronary Heart Disease Among Patients with Rheumatoid Arthritis: Data From the National Veterans Health Administration.

Iris Navarro-Millan1, Shuo Yang2, Scott L. DuVall3, Lang Chen2, John Baddley2, Grant W. Cannon2, Elizabeth S. Delzell1, Jie Zhang3, Monika M. Safford4, Nivedita M. Patkar2, Ted R. Mikuls2, Jasvinder A. Singh2 and Jeffrey Curtis1.

1University of Alabama Birmingham, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL, 3VA Salt Lake City Health Care System and University of Utah School of Medicine, Salt Lake City, UT, 4Salt Lake City VA and University of Utah, Salt Lake City, UT, 5Univ of Alabama-Birmingham, Birmingham, AL, 6Omaha VA and University of Nebraska Medical Center, Omaha, NE.

**Background/Purpose:** Rheumatoid arthritis (RA) increases the risk for coronary heart disease and ischemic events like myocardial infarction (MI). The association between traditional cardiovascular risk factors in this population remains unknown. Objective: To determine the association between myocardial infarction (MI), low density lipoprotein (LDL), seropositive RA and inflammation as determined by C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) among patients with RA.

**Methods:** Retrospective data from the national Veterans Health Administration (VHA) from 1998–2011 was used for this study. Identification of the RA population and incident hospitalized MI was done using a validated algorithm using ICD-9 codes for RA from outpatient rheumatology visits and MI primary diagnosis code on hospitalization. Patients eligible for this analysis included RA patients with no previous MI. Baseline characteristics were determined during the first 12 months of observation in the VHA system, after which follow-up time for this analysis began. Laboratory data was examined in a time-varying fashion and updated on a daily basis and assessed at each event time. Seropositivity was characterized by having either positive rheumatoid factor (RF) or anti-cyclic citrullinated peptide (CCP) antibody. Cox proportional hazard models were used to determine the hazard ratios (HR) between first hospitalized MI and LDL (in quartiles and using ATP III cutoffs); CRP, ESR in quartiles (to avoid assumptions of linearity) and seropositivity using age as the time axis.

**Results:** A total of 38,694 VHA patients with RA were identified. They were 90.3% male; mean ± SD age was 65.3 ± 12.1 years. Mean CRP, ESR and LDL levels at baseline were 10.4 mg/L (± 20.5), 30.1 mm/h (SD ± 24.9) and 100 mg/dL (SD ± 31.7) respectively; 85% of the RA cohort was seropositive. The baseline prevalence of diabetes was 12.5% and hypertension 33.9%.

The number of usable MI events varied according conditional on the availability of laboratory results. The crude rates of MI by each exposure variable are listed (table). A strong relationship was seen with increasing ESR. Trends in MI rates associated with increasing CRP were observed only for the 4th quartile. Higher LDL appeared protective, and patients in the lowest LDL quartile had the highest rates of MI.

**Table.** Myocardial Infarction Incidence rates by ESR, CRP, LDL, High Density Lipoprotein (HDL) and Serologic Status by Quartiles

<table>
<thead>
<tr>
<th>Quartile</th>
<th>MI Events</th>
<th>Person Years</th>
<th>Incidence Rate per 1,000 Person year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt; (11)</td>
<td>80</td>
<td>2406</td>
<td>3.3</td>
</tr>
<tr>
<td>2 (≥ 11 and &lt;23)</td>
<td>87</td>
<td>21131</td>
<td>4.1</td>
</tr>
<tr>
<td>3 (≥ 23 and &lt;42)</td>
<td>133</td>
<td>20247</td>
<td>6.6</td>
</tr>
<tr>
<td>4 (≥ 42)</td>
<td>171</td>
<td>18896</td>
<td>9.0</td>
</tr>
<tr>
<td>CRP (mg/L) Quartile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt; (0.89)</td>
<td>26</td>
<td>4975</td>
<td>5.2</td>
</tr>
<tr>
<td>2 (≥ 0.89 and &lt;3.1)</td>
<td>17</td>
<td>4302</td>
<td>4.0</td>
</tr>
<tr>
<td>3 (≥ 3.1 and &lt;9.5)</td>
<td>20</td>
<td>3941</td>
<td>5.1</td>
</tr>
<tr>
<td>4 (≥ 9.5)</td>
<td>30</td>
<td>3483</td>
<td>8.6</td>
</tr>
<tr>
<td>LDL (mg/dL) Quartile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt; (77.4)</td>
<td>245</td>
<td>31437</td>
<td>7.8</td>
</tr>
<tr>
<td>2 (≥ 77.4 and ≤ 97.2)</td>
<td>184</td>
<td>32797</td>
<td>5.6</td>
</tr>
<tr>
<td>3 (≥ 97.2 and ≤ 121)</td>
<td>143</td>
<td>31965</td>
<td>4.5</td>
</tr>
<tr>
<td>4 (≥ 121)</td>
<td>162</td>
<td>30392</td>
<td>5.3</td>
</tr>
<tr>
<td>HDL (mg/dL) Quartile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt; (34.4)</td>
<td>220</td>
<td>27241</td>
<td>8.1</td>
</tr>
<tr>
<td>2 (≥ 34.4 and ≤ 41.0)</td>
<td>190</td>
<td>30203</td>
<td>6.3</td>
</tr>
<tr>
<td>3 (≥ 41.0 and ≤ 50.4)</td>
<td>180</td>
<td>35294</td>
<td>6.3</td>
</tr>
<tr>
<td>4 (≥ 50.4)</td>
<td>153</td>
<td>34345</td>
<td>4.5</td>
</tr>
<tr>
<td>Serologic status (RF/CCP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seronegative</td>
<td>43</td>
<td>14588</td>
<td>2.9</td>
</tr>
<tr>
<td>Seropositive</td>
<td>443</td>
<td>84193</td>
<td>5.3</td>
</tr>
</tbody>
</table>
After controlling for age, the HR for ESR (comparing the highest to lowest quartile) was 2.4 (p < 0.001), and the HR for CRP (highest to lowest quartile) was 1.6 (p = 0.08). The HR for sepsisive RA was 1.7 (p < 0.001). HR for LDL ≥160 mg/dL compared to LDL < 100 was 1.2 (p = 0.30).

Conclusion: In this U.S., predominantly male RA cohort, ESR and serum positivity were significantly associated with risk for MI and trends suggested CRP was as well. Higher LDL was not associated with a significantly increased risk for MI.

Disclosure: I. Navarro-Millan, None; S. Yang, None; S. L. DuVall, Anodax LLC, 2, Genentech Inc., 2, F. Hoffmann-La Roche Ltd, 2, Amgen Inc, 2, Shire PLC, 2, Mylan Specialty PLC, 2; L. Chen, None; J. Buddley, Merck Pharmaceuticals, 5; G. W. Cannon, None; E. S. Delzel, Amgen, 2, J. Zhang, None; M. M. Safford, None; N. M. Patkar, None; T. R. Mikuls, Amgen; Genentech; 2, J. A. Singh, research and travel grants from Takeda, Savient, Wyeth and Amgen, 2, speaker honoraria from Abbott, Consultant fees from URL pharmaceuticals, Savient, Takeda, Ardea, Allergan and Novartis; 5, J. Curtis, Roche/Genetech, UCBD< Centocor, Corrona, Amgen, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech, UCBD, Centocor, CORRONA, Amgen, Pfizer, BMS, Crescendo, Abbott, 5.

ACR/ARHP Poster Session B
Rheumatoid Arthritis Treatment - Small Molecules, Biologics and Gene Therapy
Monday, November 12, 2012, 9:00 AM–6:00 PM

1271
Two-Year Drug Survival and Treatment Effect of Abatacept and Tocilizumab in the Treatment of Rheumatoid Arthritis in Routine Care. Results From the Nationwide Danish Danbio Registry. HC Leffers1, HC Cannon; 2, L. Chen; None; J. Buddley, Merck Pharmaceuticals, 5; G. W. Cannon, None; E. S. Delzel, Amgen, 2, J. Zhang, None; M. M. Safford, None; N. M. Patkar, None; T. R. Mikuls, Amgen; Genentech, 2, J. A. Singh, research and travel grants from Takeda, Savient, Wyeth and Amgen, 2, speaker honoraria from Abbott, Consultant fees from URL pharmaceuticals, Savient, Takeda, Ardea, Allergan and Novartis, 5; J. Curtis, Roche/Genetech, UCBD< Centocor, Corrona, Amgen, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech, UCBD, Centocor, CORRONA, Amgen, Pfizer, BMS, Crescendo, Abbott, 5.

Background/Purpose: Abatacept and tocilizumab have been shown to be efficacious for the treatment of rheumatoid arthritis (RA), even in patients refractory to tumor necrosis factor inhibitor (TNFi). However, reports on their long term efficacy in clinical practice are scarce. The aim of this study was to describe two-year drug survival and clinical response in RA patients treated with abatacept or tocilizumab in routine care.

Methods: In the DANBIO registry we identified 230 and 447 RA patients treated with abatacept or tocilizumab, respectively. The clinical efficacy was assessed by drug survival and by changes in DAS28 and EULAR response rates after 48 and 96 weeks. No imputation of missing values was done.

Conclusion: The two drugs were made.

Results: Of the patients receiving abatacept and tocilizumab, respectively, 22%/25% (abatacept/tocilizumab) were male, median (interquartile range, IQR) age 55(45–66)/57(46–65) years, disease duration 5(1–13)/5(1–11) years and number of previous biological drugs 2(1–3)/2(1–3), >99%/<99% of patients, had previously received ≥1 TNFi. Rheumatoid factor was positive in 79% and 77% of patients with available data (143/230 and 290/447), respectively.

After 48 and 96 weeks, 54%/66% and 39%/58% of patients treated with abatacept/tocilizumab were still receiving the drug, respectively.

Among patients with available response data, median DAS28 was in the abatacept group 5.2, 3.2 and 2.9 at baseline, week 48 and week 96, respectively, while 5.3, 2.7 and 3.0 in the tocilizumab group.

After 48 and 96 weeks, the remission rates for abatacept/tocilizumab were 29%/49% and 38%/41%, respectively and rates of good-of-moderate EULAR response was 76%/87% and 79%/97% at week 48 and 96. Response rates after correction for proportion of patients still on drug (LUNDEX values)* are presented in figure 1.

Conclusion: In RA patients (>99% TNFi failures) treated with abatacept and tocilizumab, 54%/66% of patients were still receiving the drug after 48 weeks, and 39%-58% after 96 weeks. Due to the non-randomized study design, no direct comparison of the drugs were made. Both drugs significantly decreased the disease activity, and a good-or-moderate EULAR response was seen in the majority (76%–87%) of patients after 48 weeks (87%–97% after 96 weeks). After correction for patients who had withdrawn, response rates were lower. This stresses the importance of transparency in the reporting of observational data.

References

Disclosure: H. Leffers, None; M. Ostergaard, Abbott Immunology Pharmaceuticals, 2, Abbott, Centocor, Merck, Pfizer, Roche, UCB, 5, Abbott, Merck, Mundipharma, Novo, Pfizer, UCB, 8, B. Glintborg, None; N. S. Krog, None; U. Tarp, None; T. Lorenzen, Roche, Pfizer, 6; A. Hansen, MSD, 5; M. S. Hansen, Abbott, Roche, UCB, 5, Abbott, Roche, UCB, 6; L. Dreyer, None; M. S. Jakobsen, None; M. L. Hetland, Roche Pharmaceuticals, 5, MSD, BMS, UCB, Abbott, Pfizer, 8.

1272

Background/Purpose: Certolizumab pegol (CZP), an inhibitor of TNF-alpha, has demonstrated rapid and sustained efficacy in RA patients. Switching from one anti-TNF therapy to another has been investigated in many open-label (OL) uncontrolled studies, but in few controlled trials. This 24-week study (12 weeks double-blind (DB) CZP or placebo followed by 12 weeks OL CZP) examined the effect of treatment with CZP or placebo on measures of disease activity in patients with active RA on stable concomitant DMARD therapy who had discontinued a TNF-alpha inhibitor other than CZP due to a secondary loss of efficacy.

Methods: The initial 12-week phase randomized 37 subjects (2:1 ratio) who were secondary non-responders (primary non-responders were excluded) or intolerant of TNF-alpha inhibitors to either CZP (27 subjects) or placebo (10 subjects) in addition to background MTX or other DMARDs. CZP was administered subcutaneously in approved doses. The pre-specified primary endpoint was the ACR 20 response at Week 12. After the Week 12 visit, all subjects could continue (blinded to initial treatment) with OL CZP for an additional 12 weeks. (NCT01147341).

Results: 37 subjects were randomized; 35 (26 on CZP and 9 on placebo) completing at least 4 weeks of dosing were analyzed for efficacy. Demographic/baseline characteristics (mean) of the 2 treatment groups were similar: age 56 vs 59 years, disease duration 12 vs 14 years, MTX dose 16.4 vs 16.1 mg/week, and DAS-28 CRP 5.48 vs 5.44 (placebo vs active). Efficacy results (initial 12 weeks) are as follows:

<table>
<thead>
<tr>
<th>Efficacy Endpoints</th>
<th>Placebo n/N (%)</th>
<th>CZP n/N (%)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR 20 (primary)</td>
<td>0/9 (0)</td>
<td>16/26 (61.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>CDAL Decrease ≥10</td>
<td>2/9 (22.2)</td>
<td>22/26 (84.6)</td>
<td>0.001</td>
</tr>
<tr>
<td>ACR 50</td>
<td>0/9 (0)</td>
<td>5/26 (19.2)</td>
<td>N.S.</td>
</tr>
<tr>
<td>CDAL LDAS+Remission</td>
<td>0/9 (0)</td>
<td>6/26 (23.1)</td>
<td>N.S.</td>
</tr>
<tr>
<td>EULAR good and moderate</td>
<td>0/9 (0)</td>
<td>17/26 (65.4)</td>
<td>0.001</td>
</tr>
<tr>
<td>DAS28 (CRP)</td>
<td>1.2 Decrease</td>
<td>0/9 (0)</td>
<td>17/26 (65.4)</td>
</tr>
<tr>
<td>CDAL ≥13.9 Decrease</td>
<td>0/9 (0)</td>
<td>17/26 (65.4)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

* two-sided p-value from Fisher's exact test

24-Week Data: 8 of the 9 subjects randomized to placebo (all non-responders) continued into OL: 5/8 (67%) attained ACR 20, 7/8 (87.5%) of these had CDAL improvement ≥13.9 after the switch to CZP. Five of the CZP-treated subjects who were initially ACR 20, but not ACR 50, responders improved to ACR 50 or 70 responses with OL treatment.

In the initial 12 weeks, adverse events occurred in 16/27 (59.3%) CZP subjects and 4/10 (40%) placebo subjects. One serious adverse event of G-I bleeding (considered unrelated to CZP) occurred in the open-label phase.
There were no other serious adverse events, deaths, neoplasms, opportunistic or serious infections.

**Conclusion:** In this controlled study of secondary non-responders to TNF inhibitors, the primary efficacy endpoint (ACR 20) and most secondary endpoints showed significant improvement with CZP compared to placebo. The ACR 20 response rate observed with CZP (60%) is higher than that reported in most previous studies of incomplete TNF responders. With OL, CZP induced for the final 12 weeks, improved efficacy was seen in most subjects who had previously received placebo. In addition, CZP demonstrated good safety and tolerability. This study supports the use of CZP in RA patients who are secondary non-responders to anti-TNF therapies or intolerant to them.

**Disclosure:** M. Schiff, UCB, 2; R. Goldblum, VBL Therapeutics, 5; J. R. Tesser, UCB, 2, UCB, 5.

### Table 1. Baseline characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n = 70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (SD)</td>
<td>58 (10.2)</td>
</tr>
<tr>
<td>Woman, n (%)</td>
<td>57 (81)</td>
</tr>
<tr>
<td>Disease duration, years median [p25-p75]</td>
<td>13 [6 – 18]</td>
</tr>
<tr>
<td>Rheumatoid factor positive, n (%)</td>
<td>61 (87)</td>
</tr>
<tr>
<td>Anti-CCP positive, n (%)</td>
<td>53/65 (76)</td>
</tr>
<tr>
<td>DAS28 at first RTX (SD)</td>
<td>5.1 (0.99)</td>
</tr>
<tr>
<td>Previous DMARDs, n median [p25-p75]</td>
<td>3 [5 – 6]</td>
</tr>
<tr>
<td>Previous biologicals, n median [p25-p75]</td>
<td>2 [2 – 3]</td>
</tr>
<tr>
<td>Concomitant DMARD, n (%)</td>
<td>32 (46)</td>
</tr>
<tr>
<td>Concomitant MTX, n (%)</td>
<td>21 (30)</td>
</tr>
<tr>
<td>Concomitant corticosteroid, n (%)</td>
<td>40 (57)</td>
</tr>
<tr>
<td>Corticosteroid dose, mg (SD)</td>
<td>10 (4.0)</td>
</tr>
<tr>
<td>Concomitant statin, n (%)</td>
<td>7 (10)</td>
</tr>
</tbody>
</table>

The mean interval in days was 301 (SD 95) and 341 (SD 123) days for the first and second rituximab interval. Mean time until loss of response was 252 (SD 93) and 307 (SD 126) days respectively. Limits of agreement between 1st and 2nd infusion intervals were large, −190 and +272 days (figure 1). Of note, the second interval between infusions was longer than the first (40 days (SD 119) p = 0.003).

**Conclusion:** Duration of response after the first rituximab course is not a useful parameter in timing of retreatment, because of the large intra-individual variation in response duration. The second rituximab interval seems to be longer than the first, which could lead to increasing overtreatment when fixed schedule retreatment is used.

**Reference:**


**Disclosure:** N. van Herwaarden, None; A. van der Maas, None; T. L. Jansen, Roche Pharmaceuticals, 5; Roche Pharmaceuticals, 8; E. Dutner, None; A. Hartkamp, None; P. L. C. M. van Riel, Roche Pharmaceuticals, 2, Roche Pharmaceuticals, 5; W. Kievt, None; B. J. F. van den Bent, Roche Pharmaceuticals, 8; A. A. den Broeder, None.

### Figure 1. Difference against mean for RTX interval 1 and 2
were seen with MSS and PI than with MSD, whether the study groups were analyzed separately or together (all treatment, Table 1). Specifically, a moderately strong correlation (r = 0.5) was seen between DAS28 and MSS and PI in the treatment and PBO groups. MSS and PI were strongly correlated (r = 0.9). The ranges of correlations found are similar to previous studies showing joint impairment is moderately correlated with disability (0.42–0.50) as measured by self-report questionnaires (Yazici, J Rheumatol 2004). Responders had a greater relative reduction in MSD than non-responders, especially the MR-prednisone patients (Table 2).

Table 1. Change from Baseline Correlation between MSD, MSS, and PI with Disease Activity Measures

<table>
<thead>
<tr>
<th></th>
<th>All Treatment</th>
<th>MR-Prednisone + DMARD</th>
<th>PBO + DMARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSD</td>
<td>25 (109)</td>
<td>34 (73)</td>
<td></td>
</tr>
<tr>
<td>MSS</td>
<td>50 (191)</td>
<td>49 (79)</td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>60 (216)</td>
<td>50 (99)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: MSD, MSS and PI are correlated with DAS28 and HAQ-DI in placebo and MR-prednisone treated patients on DMARDs, with stronger correlations seen with MSS and PI. Patients meeting ACR20, DAS28 and HAQ-DI response criteria had a significantly greater reduction in MS than non-responders. Morning pain and stiffness severity in addition to duration of morning stiffness are key patient reported outcomes for both treatment response and disease progression in RA patients.

Disclosure: F. Buttgereit, Merck Serono, Horizon Pharma formerly Nitec Pharma, Mundipharma Int. Ltd., 5, Merck Serono, Horizon Pharma (formerly Nitec Pharma), 2; J. R. Kirwan, Horizon Pharma (formerly Nitec Pharma), AstraZeneca, CombinatoRx, GlaxoSmithKline, Merck, and Wyeth; 5. K. G. Saag, Amgen, 2; Eli Lilly and Company, 2; Merck Pharmaceuticals, 2; Novartis Pharmaceutical Corporation, 2; Amgen, 5; Eli Lilly and Company, 5; Merck Pharmaceuticals, 5; Novartis Pharmaceutical Corporation, 5, Horizon Pharma (formerly Nitec Pharma), 5; R. Allen, Merck Serono, Horizon Pharma (formerly Nitec Pharma), 5; Merck Serono, 9; A. Grah, Horizon Pharma (formerly Nitec Pharma), 3; P. Rice, ClinixRx Research, 3; M. Boers, Augurex, Bristol-Myers Squibb, CombinatoRx, GlaxoSmithKline, Medimmune, Horizon Pharma (formerly Nitec Pharma), Mundipharma and Roche, 5; Genentech, Novartis and Sanofi, 9; Schering-Plough, UCB, 9.

1275

Fast Remission Response to Etanercept At Week 4 Predicts Better Long-Term Outcomes in Early and Established Rheumatoid Arthritis Compared to Slower Response At Week 12.

Background/Purpose: Achievement of clinical remission not only early in disease course but also early in treatment course may be critical for functional outcome of patients with rheumatoid arthritis (RA). Patients showing clinical response to certolizumab at week 6 demonstrated greater ACR responses, higher rates of remission, and improved patient-reported outcomes after 1 year compared to patients who had a response at week 12. Response to treatment as early as week 6 predicted continuation of treatment with TNFα blockers in long-term follow-up. Objective of study was to establish rate of patients on etanercept (ETA) achieving clinical remission at week 4 (fast) or week 12 of treatment (slow remission responders). To determine effects of fast versus slow remission response on clinical and radiographic remission, to identify predictors for fast remission response.

Methods: Retrospective case control study was performed on RA patients who started ETA from 2004 to 2010 due to moderate-severe disease activity despite DMARDs. Patients having available control at first and third month were enrolled. Patients achieving DAS28 remission by first month were defined as fast remission responders. Patients reaching DAS28 remission at three months as slow remission responders. Patients not reaching remission within 3 months or not maintaining remission for at least one year were excluded because considered unresponsive. Fast remission responders were compared with slow responders regarding maintenance of clinical remission on ETA in longterm follow-up. Arrest of radiographic progression was determined by Total Sharp Score modified van der Heijde (TSS) on X-rays performed at baseline and after 1 year. Clinical and therapeutic baseline characteristics were compared between fast and slow remission responders. Statistical analysis was performed by Student T-test and Pearson test as appropriate. Multivariate logistic regression was applied to find predictors for fast remission response.

Results: 74 of total 186 RA patients identified reached DAS28 remission within the first treatment month with ETA and were classified as fast remission responders (39.7%). Only 8 of 74 fast remission responders (10.8%) lost disease control by ETA in follow-up (mean 3.5 years) compared with 25% of slow remission responders (28 out of 112, p < 0.05). Considering patients with early RA (disease duration <1 year) difference was even more significant (14.3 vs 67.9, p < 0.05). Radiographic progression (TSS >1) occurred in 5.8% of fast but 16.3% of slow remission responders (p < 0.05). No difference was found for analyzed patients’ baseline characteristics or past and concomitant therapy. None of the baseline characteristics was predictive for fast remission response.

Conclusion: Fast remission response to ETA at week 4 was achieved in 39.7% of RA patients with early and established disease, and determined better outcome by greater maintenance of clinical and radiographic remission compared to slow remission responders at week 12. Fast remission response resulted to be an independent factor for outcome as it could not be predicted by other parameters but only clinically assessed by tight control.

Disclosure: B. Raffinek, None; C. Botios, None; P. Ometto, None; M. Canova, None; L. Bernardi, None; C. Vezzari, None; S. Todesco, None; P. Sfriso, None; L. Punz, None.

1276

Changes in B Cell Populations and Serum Immunoglobulins and Their Relationship to Infections in a One Year, Uncontrolled Open Label Study of Tabalumab. Maria W. Greenwald1, Melissa Veenuhuizen2, Wendy Komocsar3, Rebecca Jones-Taha4, Chin H. Lee and Pierre-Yves Berclaz5. Desert Medical Advances, Palm Desert, CA, 2Eli Lilly & Company, Indianapolis, IN, 3PharmaNet/3, Blue Bell, PA.

Background/Purpose: B cell activating factor (BAFF) is an important mediator of B cell development and proliferation and is constitutively expressed by neutrophils, monocytes, macrophages and dendritic cells. Tabalumab, a monoclonal antibody that neutralizes both membrane-bound and soluble BAFF, has previously been shown to reduce the signs and symptoms of rheumatoid arthritis (RA)^2. In this open label, uncontrolled, extension study, we examined the effect of tabalumab on B cell populations, serum immunoglobulins (g) and the relationship between these parameters and infections.

Methods: One hundred eighty-six patients (pts) who completed one of two 24 week phase 2 trials of tabalumab versus placebo were eligible for this study, and 182 (98%) of those pts enrolled. Pts were methotrexate or TNF blocking agents for at least 6 months prior to treatment and were monitored during a post study follow-up period. N = 66 pts (33%) received 60 mg throughout the study, and 121 pts (66%) escalated to 120 mg and, if necessary, decreased to 60 mg one time at the investigators’ discretion. B cell populations and serum IgGs were compared to their pre-treatment baseline from the initial phase 2 studies. Total B cell counts were monitored during a post study follow-up period.

Results: Sixty pts (33%) received 60 mg throughout the study, and 121 pts (66%) escalated to 120 mg at different times (60/120 mg group). One pt escalated to 120 mg then returned to 60 mg. In all groups, total B cell and mature naïve B cell counts gradually declined over time but were not depleted at week 52 (table). Memory B cells increased to 100% over baseline at week 12 and returned to ~ 60–70% over baseline at week 52. Sixty-six pts had total B cell count > 43 cells/μl and 50% of pts at week 52 or after and the Kaplan-Meier estimate of median time to recovery after the last injection was 40.6 weeks (CI: 39.6–51.3). All of these pts who completed follow up (n=47) recovered by 66 weeks. Among pts whose B cells decreased below
50% of baseline at any time during the treatment period, 37% had infections compared to 53% among pts whose B cells did not. Serum lgs (IgA, IgM, IgG) decreased for all groups at week 52 (table). Eleven pts had treatment-emergent serum lg levels below the lower limit of normal (LLN) during the treatment period with no concurrent infections.

Change from Baseline in B Cell Populations and Serum Immunoglobulins at Week 52:

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean difference from BL (%)</th>
<th>Median difference from BL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>-4.1</td>
<td>-17.8</td>
</tr>
<tr>
<td>Tofacitinib 5 mg BID</td>
<td>-1.8</td>
<td>-10.9</td>
</tr>
<tr>
<td>Tofacitinib 10 mg BID</td>
<td>-3.8</td>
<td>-14.7</td>
</tr>
</tbody>
</table>

† Last observation carried forward method was used to impute missing values at week 52. Small 'y' indicates the number of patients with both baseline and post-baseline assessments

Conclusions: Tabalumab treatment reduced total B cells, mature naïve B cells and serum lgs, while memory B cells were increased. Total B cells were only partially depleted and recovered in all pts during the post treatment follow-up period. There was no indication that reductions in B cells or in serum lgs before the LLN were associated with an increased frequency of infections. Additional studies will help further understand the effect of tabalumab treatment on B cells, serum lgs and adverse events.

Disclosure: M. W. Greenwald, Eli Lilly and Company, 2; M. Veenhuizen, Eli Lilly and Company, 3; E. VandeBerg, Eli Lilly and Company, 1, Eli Lilly and Company, 3; C. A. Connell, and ORAL Scan Investigators, 4.

Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. This 24-month (Mo) Phase 3 study compared efficacy, including inhibition of structural damage, and safety of tofacitinib vs placebo (PBO) in patients (pts) with active RA with inadequate response to methotrexate (MTX). Here we report 24-mo data to assess consistency of efficacy and safety.

Methods: Pts on stable-dose MTX were randomized 4:4:1:1 to one of four sequences (NCT00847613): tofacitinib 5 mg twice daily (BID); 10 mg BID; PBO advanced to 5 mg BID; PBO advanced to 10 mg BID. Pts on PBO advanced to Mo 6 or at Mo 3 if non-responsive (<20% reduction from baseline (BL) in swollen and tender joint counts). In the primary analysis, PBO structure data were imputed through linear extrapolation from the time baseline (BL) in swollen and tender joint counts. In the primary analysis, and safety.

Results: 797 pts were randomized and treated; 535 (67.1%) completed the 24-mo study. Pt treatment sequences were similar for BL characterizations including mTSS and its components. Primary efficacy endpoints and Mo 12 data have been reported previously. Here we report Mo 24 data. Only descriptive statistics are presented for these selected secondary endpoints (Table 1). Efficacy was maintained through Mo 24 as measured by ACR response, DAS28-4(ESR) <2.6, HAQ-DI and mTSS suggesting that pts maintain their response to tofacitinib for at least 2 years. Adverse events (AEs), serious AEs and serious infection events are shown in Table 2. Most AEs were mild or moderate and resolved while continuing tofacitinib treatment. During the 24-mo study, 36 pts (11.2%) on 5 mg BID, 37 pts (11.7%) on 10 mg BID, 8 pts (9.9%) on PBO to 5 mg BID, and 10 pts (12.7%) on PBO to 10 mg withdrew due to AEs related to study drug. There was one opportunistic infection (8 in total over 24 mo) and four deaths (all 5 mg BID; one considered not related: acute myocardial infarction; three considered related by the investigator: cardio-respiratory arrest; cardiac failure; congestive cardiac and renal failure) occurring after Mo 12. The incidence of laboratory abnormalities was similar in all treatment sequences.

Table 1. Selected secondary efficacy endpoints at Mo 12 and Mo 24

<table>
<thead>
<tr>
<th>Group</th>
<th>NRI Observed</th>
<th>NRI Observed</th>
<th>NRI Observed</th>
<th>NRI Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>0.46 (251)</td>
<td>-0.50 (219)</td>
<td>-0.56 (54)</td>
<td>-0.59 (52)</td>
</tr>
<tr>
<td>Tofacitinib 5 mg BID</td>
<td>0.61 (265)</td>
<td>-0.65 (218)</td>
<td>-0.56 (54)</td>
<td>-0.59 (52)</td>
</tr>
<tr>
<td>Placebo</td>
<td>0.53 (67)</td>
<td>-0.56 (54)</td>
<td>-0.56 (54)</td>
<td>-0.59 (52)</td>
</tr>
<tr>
<td>Tofacitinib 10 mg BID</td>
<td>0.48 (63)</td>
<td>-0.59 (52)</td>
<td>-0.59 (52)</td>
<td>-0.59 (52)</td>
</tr>
<tr>
<td>Placebo</td>
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<td>-0.48 (63)</td>
<td>-0.48 (63)</td>
<td>-0.48 (63)</td>
</tr>
<tr>
<td>Tofacitinib 5 mg BID</td>
<td>0.20 (261)</td>
<td>0.23 (216)</td>
<td>0.23 (216)</td>
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</tr>
<tr>
<td>Placebo</td>
<td>0.51 (62)</td>
<td>0.61 (52)</td>
<td>0.61 (52)</td>
<td>0.61 (52)</td>
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<tr>
<td>Tofacitinib 10 mg BID</td>
<td>0.16 (61)</td>
<td>0.37 (49)</td>
<td>0.37 (49)</td>
<td>0.37 (49)</td>
</tr>
</tbody>
</table>

All data are from the full analysis set; mixed-effect, longitudinal model; BID, twice daily; BL, baseline; LEP, imputation using linear extrapolation; N, number of patients in each group; NRI, non-responder imputation (with advancement penalty); Observed, no imputation; NRI, non-responder imputation (with advancement penalty); Observed, no imputation.
Conclusion: RA pts treated with tofacitinib 5 or 10 mg BID on stable background MTX maintained efficacy, including inhibition of structural damage, through 24 mo. No new safety signals emerged.

Reference

Disclosure: D. van der Heijde, Abbott Laboratories; Agena; AstraZeneca; BMS; Centocor: Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanoﬁ-Aventis; Schering-Plough; UCB; Wyeth; S. Imaging Rheumatology. 4. Y. Tanaka, Bristol-Myers Squibb; 5. MSD KJ, Chugai Pharmaceutical Co Ltd; Mitsubishi-Tanabe Pharma Corporation; Astellas Pharma Inc; Abbott Japan Co, Ltd; Eisai Co, Ltd; Janssen Pharmaceutical KK; 2. Mitsubishi- Tanabe Pharma Corporation; 6. Abbott Japan Co, Ltd.; Eisai Co, Ltd; Chugai Pharmaceutical Co, Ltd; Janssen Pharmaceuticals KK; Santen Pharmaceuticals Co Ltd. Tofacitinib is manufactured by Pfizer Inc.

Conclusion: Within the large global tofacitinib development program for RA, TB was rare in regions of low and medium TB incidence and occurred most frequently in pts receiving higher doses of tofacitinib in endemic regions. As with biologic therapy, pts should be screened for TB before tofacitinib treatment using either Quantiferon-TB Gold or tuberculin skin test. Initial data indicate that pts diagnosed with LTBI can be successfully and safely treated with isoniazid while receiving tofacitinib.

References

Disclosure: K. L. Winthrop, Oxford Immunotech; Pfizer Inc, 2; Abbott; Pfizer Inc; UCB; Agena; Cellestis; 5. S. H. Park, None; A. Gul, Pfizer Inc, 5; Pfizer Inc, 8; M. Cardiel, Pfizer Inc, 2; Pfizer Inc, 8; Bristol Myers Squibb; Roche; Agena; La Jolla Pharmaceutical, 9; J. Gomez-Reino, Pfizer Inc, 8; D. Ponce de Leon, Pfizer Inc, 3; R. Riese, Pfizer Inc, 1; Pfizer Inc, 3; R. Chew, Pfizer Inc, 1; Pfizer Inc, 3; T. Kawabata, Pfizer Inc, 1; Pfizer Inc, 3; E. Mortensen, Pfizer Inc, 1; Pfizer Inc, 3; H. Valdez, Pfizer Inc, 1; Pfizer Inc, 3; 1

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First in Human Study with Recombinant Anti-IL-21 Monoclonal Antibody in Healthy Subjects and Patients with Rheumatoid Arthritis.

Stensilag Igenstøen1, Birte K. Skruusnæs2, Adam Steensberg3 and Ulrik Mouritsen2. 1Charité Research Organization GmbH, Berlin, Germany, 2Novo Nordisk A/S, Copenhagen, Denmark

Background/Purpose: Interleukin-21 (IL-21), a cytokine produced by activated T cells (especially Th1 cells) and B cells, has pro-inflamatory and pleiotropic growth and drives mainly activation and differentiation of adaptive immune cells. Both IL-21 and the IL-21 receptor (IL-21R) have been shown to be upregulated in patients with rheumatoid arthritis (RA). NNC0114-0005 is a human recombinant monoclonal immunoglobulin G1 (IgG1) antibody that binds to and neutralizes IL-21. It is currently in development for the treatment of RA. The primary objective of this trial was to assess safety and tolerability of single intravenous (i.v.) and subcutaneous (s.c.) doses of NNC0114-0005 in healthy subjects (HS) and patients with RA.

Methods: A phase 1, randomized, single-center, placebo-controlled, double-blind, single-dose, dose-escalation trial was conducted in male HS (n=44) aged 18–60 and patients with RA (n=20) aged 18–75 on stable methotrexate treatment (7–25 mg/week for ≤4 weeks) with a DAS28-CRP score >3.2. HS were randomized (3:1 active to placebo) to 8 increasing i.v. dose levels (range: 0.0025–25 mg/kg) and 3 s.c. dose levels (0.1, 1 and 4 mg/kg). Patients with RA were randomized (3:1) to 3 i.v. dose levels (0.25, 4 and 25 mg/kg). Key safety parameters included adverse events (AEs), injection-site reactions and detection of neutralizing antibodies against NNC0114-0005. Pharmacokinetic (PK), pharmacodynamic and efficacy parameters were also assessed.

Results: In total, 55 AE cases were reported in 31/64 (48%) subjects: 32 AEs in 16/32 HS on i.v. treatment; 16 AEs in 10/20 RA patients on i.v. treatment; and 7 AEs in 5/12 HS on s.c. treatment. The most commonly reported AEs were headache (22%) and nasopharyngitis (16%). No dose dependency was detected for AEs. One serious AE (eczema) was reported 91 days post-dosing for a patient with RA exposed to 4 mg/kg NNC0114-0005; it was evaluated as unlikely related to the trial product by the investigator. No injection-site reactions or clinically significant antibodies against NNC0114-0005 were detected. No clinically relevant changes in laboratory parameters, vital signs or ECG were observed. Pharmacokinetic dose proportionality of the area under the curve (AUC) was shown after i.v. and s.c. dosing in HS and patients with RA. The mean terminal elimination half-life of NNC0114-0005 was ~3 weeks. Overall, no clinically relevant changes in lymphocyte subsets, B-cell subsets or total IL-21R expression on lymphocyte subsets were observed after NNC0114-0005 treatment. The reduction in DAS28-CRP was numerically favorable (but not statistically significant) for patients with RA treated with 25 mg/kg NNC0114-0005 compared to placebo.

Conclusion: NNC0114-0005 was safe and well tolerated in HS and patients with RA and did not raise any safety concerns during the trial. Linear PK of NNC0114-0005 was demonstrated in HS and patients with RA and the PK properties were similar for both populations. The improvements in DAS28-CRP for patients with RA at the highest dose level may suggest biologic and clinical activity of NNC0114-0005.

Sustained Efficacy Responses and a Consistent Safety Profile with Rituximab Repeat Treatment Over 5 Years in Patients with Rheumatoid Arthritis and an Inadequate Response to Tumour Necrosis Factor Inhibitors. Edward Keystone¹, Stanley B. Cohen, Paul Emery, Joel M. Kremer², Maxime R. Dougados³, James E. Lovelless, Carol Chung, Pamela Wong, Patricia B. Lehanë and Helen Tyrrell⁴, 1Mount Sinai Hospital, Toronto, ON, 2Metropolitan Clinical Research Center, Dallas, TX, 3University of Leeds, Leeds, United Kingdom, 4Albany Medical College, Albany, NY, 5Rene Descartes University, Paris, France, 6St Luke’s Rheumatology, Boise, ID, 7Genentech, Inc., San Francisco, CA, 8Roche Products Limited, Welwyn Garden City, United Kingdom

Background/Purpose: In the REFLEX study conducted in anti-TNF inadequate responder (TNF-IR) patients with RA, a single course of rituximab (RTX) in combination with methotrexate (MTX) significantly improved disease activity at 24 weeks vs placebo (PBO) + MTX. Patients were eligible for continued RTX treatment in an open-label extension (OLE). Efficacy and safety outcomes from REFLEX and its OLE over 5 years are presented.

Methods: This was an observational, post-hoc analysis of REFLEX from baseline to 5 years, open label from the second study treatment. Patients originally randomized to PBO were rescued with RTX as appropriate and safety outcomes from REFLEX and its OLE over 5 years are presented.

Results: Overall, 480 patients received at least one course of RTX. Subsequent RTX courses were given to 317 patients (4.60–6.82) for SIEs. The most frequent SIE was pneumonia, affecting 2% of patients from time of first RTX treatment. Efficacy outcomes 24 weeks after each RTX course were calculated relative to first RTX pre-treatment baseline. No imputations were made for missing data. Safety data included rates of AEs, serious AEs (SAEs), infections, and serious infections (SIEs). ACR response rates (% patients) at 24 weeks after each course

<table>
<thead>
<tr>
<th>Clinical measure</th>
<th>Course 1 (n=400)</th>
<th>Course 2 (n=279)</th>
<th>Course 3 (n=225)</th>
<th>Course 4 (n=161)</th>
<th>Course 5 (n=91)</th>
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<tr>
<td>ACR20</td>
<td>62.0</td>
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<td>41.2</td>
<td>47.6</td>
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<tr>
<td>ACR70</td>
<td>13.0</td>
<td>19.4</td>
<td>26.2</td>
<td>24.2</td>
<td>22.0</td>
</tr>
</tbody>
</table>

The proportion of patients achieving a minimal clinically important difference in HAQ-DI was maintained over 5 courses (66.0–71.1%). Over the 5 years, rates of AEs, SAEs, and infections did not increase and generally remained stable in the RTX-treated population (1768 pt-yrs), with overall rates per 100 pt-yrs (95% CI) of 344.87 (336.32–353.64) for AEs, 22.34 (20.24–24.65) for SAEs, 97.50 (93.01–102.21) for all infections, and 5.60 (4.60–6.82) for SIEs. The most frequent SIE was pneumonia, affecting 2% of RTX patients.

Conclusion: This post-hoc analysis shows that RTX repeat treatment is associated with 24-week clinical efficacy responses, sustained to 5 courses, with a trend towards improved efficacy over time. The safety profile of RTX was comparable with published RTX long-term safety data and with that of other biologics in RA populations. No increased incidence of significant AEs was observed in spite of RTX exposure and peripheral B-cell depletion over other biologics in RA populations. No increased incidence of significant AEs was observed in spite of RTX exposure and peripheral B-cell depletion over other biologics in RA populations. No increased incidence of significant AEs was observed in spite of RTX exposure and peripheral B-cell depletion over other biologics in RA populations.

Disclosure: M. Kitano, None; S. Kitano, None; C. Sato, None; K. Fujita, None; T. Yoshikawa, None; Y. Katashima, None; M. Sekiguchi, None; N. Azuma, None; N. Hashimoto, None; S. Tsuoda, None; K. Matsui, None; H. Sano, None.

IL-6 Signaling Inhibition Improves Abnormal Bone Homeostasis in Active Rheumatoid Arthritis. Masayasu Kitano¹, Sachie Kitano¹, Chieri Sato¹, Kazuyuki Fujita¹, Takahiro Yoshikawa¹, Yuki Katashima¹, Masahiro Sato¹, Naoto Azuma¹, Naohito Hashimoto, Shinjiro Tsuoda¹, Kiyoichi Matsui¹ and Hajime Sano¹. 1Hyogo College of Medicine, Nishinomiya, Japan

Background/Purpose: Tocilizumab (TCZ) is a humanized monoclonal anti-IL-6 receptor antibody. TCZ has demonstrated efficacy in moderate to severe active rheumatoid arthritis (RA) with inadequate clinical response to disease-modifying anti-rheumatic drugs (DMARDs) or TNF inhibitors. Moreover, it is reported that TCZ combined with MTX reduces systemic bone resorption in RA. However, the detailed mechanism about improvement effect by TCZ on abnormal bone homeostasis in RA is poorly understood. In this study, we investigated the effect of TCZ on biomarkers of bone metabolism, soluble receptor activator of NF-kappa B ligand (sRANKL), osteoprotegerin (OPG), Dickkopf-1 (DKK-1), and osteopontin (OPN) in active RA.

Methods: Thirty four patients with active RA (25 females, 9 males; age 51.9±7.9 years; disease duration 12.4±12.6 years; DAS28-ESR 5.6±1.6) were started on treatment with TCZ 8mg/kg intravenously every 4 weeks. All patients were treated with methotrexate, other DMARDs and prednisolone, and patients continued on stable doses of these medications throughout the 12 weeks of treatment with TCZ. We evaluated an effectiveness using DAS28-ESR. We appreciated DAS28-ESR<2.6 as a remission group and DAS28-ESR≥2.6 as a no-remission group, respectively. Additionally, we measured serum biochemical markers such as osteocalcin, type I collagen cross-linked N-telopeptides (NTx), sRANKL, OPG, and DKK-1 and plasma OPN by ELISA at baseline and 12 weeks.

Results: At 12 weeks after the treatment of TCZ, a disease activity reduced significantly from the baseline (DAS28-ESR 5.6±1.6 vs 3.1±1.7; p<0.01). Fifteen patients achieved the remission. In the analysis of bone metabolic markers at 12 weeks, average of serum NTx levels decreased significantly from the baseline (18.9±1.0ml BCE/1 vs 17.6±1ml BCE/1; p=0.05) and osteocalcin levels increased significantly from the baseline (5.78±0.8ml vs 6.68±0.9/ml; p<0.05). In addition, average of serum sRANKL, DKK-1, and plasma OPN levels decreased significantly from the baseline (sRANKL: 0.57±0.8ml vs 0.48±0.0ml; p=0.05; DKK-1: 2860μg/ml vs 2828μg/ml; p<0.01, and OPN: 117.8±0.9μg/ml vs 77.1±0.9μg/ml; p=0.01 respectively), however average of OPG levels did not change significantly from the baseline. TCZ decreased NTx, sRANKL, DKK-1, and OPN levels and increased osteocalcin levels regardless of remission group or no remission group. Moreover, average of OPG levels in remission group increased significantly from the baseline. Therefore, OPG/RANKL ratio tended to increase in remission group compared with no remission group.

Conclusion: These findings suggest that TCZ therapy improves abnormal bone homeostasis in patient with active RA. We consider that this mechanism may result from the regulation of osteoclastic-bone destruction via the control of RANKL-induced-osteoclastogenesis and OPN induced-osteoclast attachment of bone surface and the promotion of osteoblastic-bone formation via the regulation of DKK-1.

Disclosure: M. Kitano, None; S. Kitano, None; C. Sato, None; K. Fujita, None; T. Yoshikawa, None; Y. Katashima, None; M. Sekiguchi, None; N. Azuma, None; N. Hashimoto, None; S. Tsuoda, None; K. Matsui, None; H. Sano, None.

Tofacitinib, an Oral Janus Kinase Inhibitor, in the Treatment of Rheumatoid Arthritis: Open-Label, Long-Term Extension Safety and Efficacy up to 48 Months. Jurgen Wollenhaupt¹, Joel C. Silverfield², Eun Bong Lee³, Susan P. Wood⁴, Koshiba Soma⁵, Lisa Wang⁶, Hiroyuki Nakamura⁷, Yoshihiro Komuro⁸, Chudi I. Nduaka⁹, David Grubens⁴, Birgitta Bendöl⁴, Samuel H. Zwillich⁶, Richard Riese⁴ and John D. Bradley⁴. 1Schoen-Klinik Hamburg-Eilbek Teaching Hospital of the University of Hamburg, Hamburg, Germany, 2Tampa Medical Group, Tampa, FL, 3Seoul National University, Seoul, South Korea, 4Pfizer Inc., Groton, CT, 5Pfizer Japan Inc., Tokyo, Japan, 6Pfizer Inc., Collegeville, PA

Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy in RA. Here we report the safety and tolerability of tofacitinib and the durability of response up to 48 months (mo) in long-term extension (LTE) studies.

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Effects of Tofacitinib On Patient-Reported Outcomes in Patients with Active Rheumatoid Arthritis Receiving Stable-Dose Methotrexate: Results of Two Phase 3 Studies. Gerd R. Burmester1, Désirée van der Heijde, Vibeke Strand, Cristian A. F. Zerbinii, Carol A. Connell, Charles A. Mebus1, Samuel H. Zwillich1, John D. Bradley1, David Gruben1 and Gene Wallenstein1. 1Charité–University Medicine Berlin, Berlin, Germany; 2Leiden University Medical Center, Leiden, Netherlands; 3Stanford University, Palo Alto, CA; 4Centro Paulista de Investigación Clinica, Sao Paulo, Brazil; 5Pfizer Inc., Groton, CT

Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. The efficacy and safety of tofacitinib were evaluated in patients (pts) with active RA in Phase 3 trials. Primary efficacy analyses have previously been described.1 Here we show patient-reported outcomes (PROs) from Phase 3 trials.

Methods: PROs on stable-methotrexate (MTX) from the ORAL Step (NCT0096440; tumor necrosis factor inhibitor-inadequate responder [TNFi-IR] pts) and ORAL Scan (NCT00847613; MTX-IR pts) studies were randomized to tofacitinib 5 mg twice daily (BID), tofacitinib 10 mg BID, or placebo (PBO) advanced to either tofacitinib 5 mg BID or 10 mg BID. All PBO pts in ORAL Step advanced to Month 3. In the ORAL Scan study, non-responder PBO pts (<20% reduction from baseline in swollen/tender joint counts) were advanced to tofacitinib 5 or 10 mg BID at Month 3, and all remaining PBO pts were advanced to tofacitinib at Month 6. Non-responding tofacitinib patients remained on the same treatment and dose. Excepting the Health Assessment Questionnaire-Disability Index, the PROs were secondary endpoints included patient global assessment of disease activity (visual analog scale [VAS]), pain (VAS), health-related quality of life (Medical Outcomes Study Short-Form [36-Item] Health Survey), and fatigue (Functional Assessment of Chronic Illness Therapy-Fatigue).

Results: In total, 1196 pts received treatment (399 in ORAL Step and 797 in ORAL Scan). Within each study, baseline demographic and disease characteristics were generally similar across treatment groups; differences were noted between studies: ORAL Step pts were required to have failed at least one TNFi and had longer RA disease duration and higher disease activity at baseline relative to pts in ORAL Scan. Treatment with tofacitinib 5 and 10 mg BID resulted in significant improvements in all PROs when compared with PBO (Table 1). Improvements with both tofacitinib doses were observed at 3 months and continued through study end. Based on pts reporting improvements ≥ minimally clinically important differences, numbers needed to treat at Mo 3 for tofacitinib 5 and 10 mg BID were 3.7–7.8 and 3.1–10.6, respectively, across various PROs in both studies.

Table 1. PROs at Month 3 (least squares means of change from baseline)

<table>
<thead>
<tr>
<th>PRO</th>
<th>ORAL Step</th>
<th>ORAL Scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBO</td>
<td>Tofacitinib 5 mg BID</td>
<td>Tofacitinib 10 mg BID</td>
</tr>
<tr>
<td>PBO</td>
<td>5 mg BID</td>
<td>Tofacitinib 5 mg BID</td>
</tr>
<tr>
<td>SF-36 PCS</td>
<td>2.03</td>
<td>5.65***</td>
</tr>
<tr>
<td>No. of pts reporting improvements ≥MCID [10]</td>
<td>57</td>
<td>80</td>
</tr>
<tr>
<td>NNT</td>
<td>5.4</td>
<td>5.9</td>
</tr>
<tr>
<td>SF-36 MCS</td>
<td>0.37</td>
<td>3.52</td>
</tr>
<tr>
<td>No. of pts reporting improvements ≥MCID [15]</td>
<td>43</td>
<td>64*</td>
</tr>
<tr>
<td>NNT</td>
<td>5.8</td>
<td>8.0</td>
</tr>
<tr>
<td>FACIT-F</td>
<td>1.11</td>
<td>6.27***</td>
</tr>
<tr>
<td>SF-36 MCS</td>
<td>0.37</td>
<td>3.52</td>
</tr>
<tr>
<td>No. of pts reporting improvements ≥MCID [14]</td>
<td>44</td>
<td>72</td>
</tr>
<tr>
<td>NNT</td>
<td>4.4</td>
<td>10.6</td>
</tr>
</tbody>
</table>

* p < 0.05; *** p < 0.001 versus PBO

Conclusion: In two Phase 3 studies of tofacitinib in combination with MTX, treatment with tofacitinib 5 and 10 mg BID resulted in consistent statistically significant and clinically important improvements in multiple PROs vs PBO.

References

Conclusion: Tofacitinib dosed at 5 or 10 mg BID in pts with RA demonstrated a consistent safety profile and sustained efficacy over 48 mo in open-label LTE studies.

Reference


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Conclusion: Among patients with RA, continuous tofacitinib use did not significantly impair overall responsiveness to pneumococcal and influenza vaccines, although the pneumococcal antigen GMFRs trended higher in patients who discontinued tofacitinib. A study limitation is the absence of a MTX-only control group or group lacking tofacitinib exposure. These data suggest that it is not necessary to discontinue tofacitinib in order to attain meaningful responses to pneumococcal and influenza vaccines.

Disclosure: K. L. Winthrop, Oxford Immunotech; Pfizer, 2, Abbott; Pfizer; UCB; Amgen; Cellectis, 5; A. Racewicz, None; E. B. E. Lee, Pfizer Inc., 5; B. Wilkinson, Pfizer Inc., 1; Pfizer Inc., 3; S. H. Zwillich, Pfizer Inc., 1; Pfizer Inc., 3; K. Soma, Pfizer Inc., 1; S. Wood, Pfizer Inc., 1; S. Kawahata, Pfizer Inc., 1; Pfizer Inc., 3; R. Riese, Pfizer Inc., 1; Pfizer Inc., 3; S. Wood, Pfizer Inc., 1; Pfizer Inc., 3; J. Bradley, Pfizer Inc., 1; Pfizer Inc., 3; C. O. Bingham III, Pfizer Inc., 5.

Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. Clinical guidelines recommend the use of influenza and pneumococcal vaccines in patients with RA; however, the effect of tofacitinib on vaccine immunogenicity is unknown.

Methods: Patients with RA taking tofacitinib 10 mg twice daily (BID) were recruited from an open-label, long-term extension trial (NCT00413699). In this vaccine substudy, participants were randomized into 2 groups and stratified by methotrexate (MTX) use: (1) those who continued tofacitinib 10 mg BID during and after randomization ("continuous"); or (2) those who interrupted tofacitinib use for 1 week prior to and 1 week after vaccination ("withdrawn"). Vaccination baseline serum pneumococcal and influenza antibody titers were measured and all patients were vaccinated with the 2011–2012 influenza vaccine and PNEUMOVAX® 23 (PCV23, Merck & Co., Inc) at 1 week post-randomization; antibody titers were measured at 35 days post-vaccination. The primary endpoint was the proportion of continuous and withdrawn patients who achieved a satisfactory humoral response to (a) pneumococcal vaccine (3-fold increase in antibody concentrations against ≥6 of 12 pneumococcal antigens [serotypes 1, 3, 4, 5, 6B, 7F, 9V, 14, 19A, 19F, 23F, 18C]) and (b) influenza vaccine (≥4-fold increase in antibody titers against at least 2 of 3 influenza antigens). Secondary endpoints included comparison of pre- and post-vaccine hemaglutination titers (HI), and influenza and pneumococcal serotype-specific Geometric Mean Fold Rise (GMFR) between groups.

Results: Of 199 patients enrolled, 183 (continuous, N=92; withdrawn, N=91) completed vaccination and antibody titer evaluations and were included in the analysis. The proportion of patients achieving a satisfactory humoral response to pneumococcal and influenza vaccines was similar between patients who continued tofacitinib and those who were temporarily withdrawn (Table). Post-vaccination pneumococcal antigen GMFRs trended higher in patients withdrawn from tofacitinib, while GMFRs were similar between groups for influenza (Table). Protective humoral HI titers (≥1:40 influenza antibody titer in ≥2 of three antigens) were similar for continuous (75%) and withdrawn patients (82%) at 35 days post-vaccination.

Table. Percentage of satisfactory humoral responders (%) (evaluable population) and pneumococcal and influenza antigen GMFR at 35 days post-vaccination

<table>
<thead>
<tr>
<th>Satisfactory humoral responders, %</th>
<th>Responders n/N (%)</th>
<th>tofacitinib 10 mg BID</th>
<th>Difference between treatment group</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous</td>
<td>2-week withdrawn</td>
<td></td>
<td>95% CI</td>
</tr>
<tr>
<td></td>
<td>PCV23*</td>
<td>Overall</td>
<td>99/102 (77.4)</td>
<td>91/96 (95.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stratified by MTX use at BL</td>
<td>99/101 (98.0)</td>
<td>91/95 (96.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>99/101 (98.0)</td>
<td>91/95 (96.8)</td>
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<tr>
<td></td>
<td></td>
<td>No</td>
<td>99/100 (99.0)</td>
<td>91/90 (98.9)</td>
</tr>
<tr>
<td></td>
<td>Influenza vaccine*</td>
<td>Overall</td>
<td>69/76 (89.6)</td>
<td>61/66 (92.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stratified by MTX use at BL</td>
<td>69/75 (89.3)</td>
<td>61/66 (92.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>69/75 (89.3)</td>
<td>61/66 (92.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>69/71 (97.2)</td>
<td>60/65 (92.3)</td>
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</tbody>
</table>

Pneumococcal and influenza antigen GMFR at 35 days post-vaccination

<table>
<thead>
<tr>
<th>Percentage of satisfactory humoral responders (%)</th>
<th>Continuous</th>
<th>2-week withdrawn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GMFR</td>
<td>95% CI</td>
</tr>
<tr>
<td>Pneumococcal vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>5.87</td>
<td>(4.57, 7.55)</td>
</tr>
<tr>
<td>91</td>
<td>2.34</td>
<td>(1.97, 2.79)</td>
</tr>
<tr>
<td>91</td>
<td>3.32</td>
<td>(2.22, 4.71)</td>
</tr>
<tr>
<td>92</td>
<td>2.02</td>
<td>(1.75, 2.34)</td>
</tr>
<tr>
<td>6B</td>
<td>92</td>
<td>2.32</td>
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<tr>
<td>9V</td>
<td>91</td>
<td>3.17</td>
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<td>9V</td>
<td>92</td>
<td>1.49</td>
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<tr>
<td>9V</td>
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<tr>
<td>7F</td>
<td>92</td>
<td>2.74</td>
</tr>
<tr>
<td>Influenza vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>3.33</td>
<td>(2.57, 4.32)</td>
</tr>
<tr>
<td>H1N1</td>
<td>91</td>
<td>7.94</td>
</tr>
<tr>
<td>H2N2</td>
<td>92</td>
<td>7.80</td>
</tr>
</tbody>
</table>

*A primary endpoint, 35 days post-vaccination; BID, twice daily; BL, baseline; CI, confidence interval; GMFR, Geometric Mean Fold Rise; MTX, methotrexate; PCV23, PNEUMOVAX®; influenza vaccine for 2011-2012.
Conclusion: Combination ETN + MTX was more effective in treating subjects with established moderate-to-severe RA regardless of the DMARD combination (HCQ, Lef, or SSZ) + MTX. Lef + MTX and HCQ + MTX had some greater benefits over SSZ + MTX at 16 weeks.

References


1286


Background/Purpose: To determine if RA patients (pts) who had an inadequate response to etanercept (ETN) or adalimumab (ADA) and developed antibodies (Abs) to ETN or ADA responded clinically in the RESTART Trial after switching without washout to infliximab (IFX) and if the presence of Abs to ETN or ADA correlated with differences in the levels of IFX or Abs to infliximab (ATI) compared to pts who had not developed Abs to ETN or ADA.

Methods: RESTART is a Phase 4, multicenter, open-label, assessor-blinded, active switch study of IFX + MTX (methotrexate) in pts with active RA who had an inadequate response (DAS28 score ≥3.6 and ≥26 SJC and TJC) to ETN or ADA + MTX. EULAR response was evaluated at wk 10 post-induction (1st endpoint). Pts adequately responding by EULAR criteria remained on IFX 3 mg/kg; incremental increases in IFX dose in pts not achieving/maintaining EULAR response occurred at wks 14 and/or 22, with a final efficacy assessment at wk 26. Assays were developed to measure Abs against ADA, ETN, and IFX. Antibodies to anti-TNFs were measured at wks 0, 14 and 26 for ADA and wks 0, 6, 14 and 26 for ETN and IFX. IFX levels were measured at wks 0, 14, 16 and 24.

Results: Among the evaluated patients, 40.3% (50/124) of previously treated patients and 46.8% (37/79) of the previously treated ADA pts of ADA demonstrated measurable Abs before exposure to IFX. No cross-reactivity was observed between anti-ADA Abs and IFX, the data suggest that some pts who developed Abs to ADA cleared IFX more rapidly than those pts who were anti-ADA and did so independent of ATI. Overall, a majority of IFX-treated pts demonstrated a EULAR response by wk 26 regardless of the presence of Abs to ETN, ADA or IFX.

Discussion: C. Pool, Janssen Services, LLC, 3; G. Shankar, Janssen Research and Development, LLC, 3; A. Schantz, Janssen Research and Development, LLC, 3; G. Gunn, Janssen Research and Development, LLC, 3; R. Bolce, Janssen Services, LLC, 3; M. Leirisalo-Repo, Janssen Services, LLC, 3; J. Wang, Janssen Services, LLC, 3; J. A. Gershon, Janssen Services, LLC, 3; R. J. DeHoratius, Janssen Research and Development, LLC, 9; D. Decktor, Janssen Services, LLC, 3.

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Background/Purpose: Double-blind placebo controlled randomized trials have demonstrated the efficacy of 15 different therapies in RA patients with active disease despite methotrexate (MTX). No blinded trials have compared conventional combination therapy to biologicals. Biologicals are roughly 100-fold more expensive than conventional therapy and have a different toxicity profile. We examine the strategy of starting conventional combination therapy followed by switch to a biological only in the subset of non-responders.

Methods: This multinational double-blind non-inferiority trial randomized 353 patients with active disease despite MTX equally to treatment with triple therapy (MTX, sulfasalazine and hydroxychloroquine) or etanercept plus MTX. Treatment continued for 48 weeks, with blinded treatment switch at 24 weeks allowed for patients in both groups if their DAS28 had failed to improve by a clinically significant amount (ΔDAS28 of ≤1.2). The primary endpoint of the trial was DAS28 improvement at week 48 based on the initial randomization. Radiographs were obtained at 0, 24 and 48 weeks and scored by the modified Sharp method (secondary endpoint). Patients were enrolled from 16 VA centers, 12 other US sites and 8 sites in Canada.

Results: Study population baseline: mean age 57 yrs., 54.5% males, DAS28 = 5.8, disease duration 5.2 years and mean initial MTX dose of 19.6 mg week. There was no significant difference between groups at baseline. Both groups improved significantly from 0 to 24 weeks (p<0.001). The percentage of patients who switched therapy at 24 weeks was nearly identical (27.9% for triple therapy group vs. 27.0% for etanercept group). In those patients who switched both groups had significant improvement after the switch (p<0.0001) and the response was not different across therapies (p=0.08). At 48 weeks ΔDAS28 was not different between the groups (−2.1 [triple] and −2.3 [etanercept]). Importantly, in patients in both groups who did respond and continued on their original assignment (73% of the patients in both groups) the response was maintained at 48 weeks. Radiographic progression (week 0 to week 48) was not different between the groups (+0.87 for triple vs. +0.23 for etanercept, p=0.09). Secondary patient-reported outcomes including HAQII and pain were also not different between groups. Toxicities were similar across groups.

Conclusion: The strategy of conventional combination therapy before biological therapy provides benefit, both clinically and radiographically, that are similar to initial use of etanercept. For the first time data support that patients who respond poorly to MTX and a biological (etanercept) have significant improvement with conventional DMARD combinations (triple therapy) and vice versa. At the health system level, the cost-saving potential and ultimately the cost-effectiveness of the
strategy of starting with conventional DMARD combinations and then switching to biologicals in those who do not respond is enormous.

**Funding Sources:** Supported by the Cooperative Studies Program of the Department of Veterans Affairs Office of Research and Development, the CIHR and the NIAMS by interagency agreements. Placebo etanercept donated by Amgen.

**Disclosure:** J. R. O’Dell, None; T. R. Mikuls, Amgen; Genentech; 2. T. Taylor, None; V. Aihwala, None; M. Brophy, None; S. Warren, None; R. Lew, None; C. Pacheco, None; A. H. Anis, None; A. C. Cannella, None; G. A. Bank, None; A. R. Erickson, None; E. Keystone, Abbott Laboratories; Amgen, Inc.; AstraZeneca Pharmaceuticals LP; Bristol-Myers Squibb; Centocor, Inc.; F. Hoffmann-La Roche Inc.; Genzyme; Merck; Novartis Pharmaceuticals; Pfizer Pharmaceuticals; UCB, 2, Abbott Laboratories; AstraZeneca Pharma; Biogen; Bristol-Myers Squibb Company; Centocor, Inc.; F. Hoffmann-La Roche Inc.; Genetech Inc; Merck; Nycomed; Pfizer Pharmaceuticals; UCB, 5, Abbott Laboratories; Bristol-Myers Squibb Company; F. Hoffmann-La Roche, Inc.; Merck; Pfizer Pharmaceuticals; UCB; Amgen; Abbott; Janssen Inc., x;

1289

**A Significant Number of Patients with Chronic Arthritis Received a Reduced Dosage of Biological Drugs: An Observational Study in Clinical Practice.** Jose Inciarte-Mundo1, Maria Victoria Hernández2, Violeta Rosario2, Sonia Cabrera2, Virginia Ruiz-Esquivel2, Maria Eugenia Gomez-Caballero1, Jose A. Gomez-Puerta1, Julio Ramirez2, Juan D. Cañete1 and Raimon Sanmarti1. 1Hospital Clinic of Barcelona, Barcelona, Spain, 2Hospital Clinic of Barcelona, Barcelona, Spain

**Background/Purpose:** Biological agents are used to treat chronic arthritis according to the standard dosages from phase III clinical trials. However, in some patients, a good response to treatment may allow the dosage to be reduced, the timing lengthened, and costs reduced. Our objective was to analyze a strategy of dosage reduction of biological agents in patients with chronic arthritis attended by the rheumatology department of a tertiary hospital.

**Methods:** Cross-sectional study which included all patients attended consecutively between June 2011 and November 2011 by a single clinician, and who had received ≥1 dose of a biological agent in 2011. Data analyzed were: demographic characteristics, diagnosis and disease duration, DMARD therapy, dosage, type and duration of biological agent used; time on reduced dosage and reason for dosage reduction. In rheumatoid arthritis (RA) patients, we also analyzed disease activity (DAS28 score) and serum levels of C-reactive protein (CRP). The reduced dosage was defined as a lower dosage than recommended in the summary of product characteristics and was not based on a structured protocol.

**Results:** We included 170 patients (67% female); mean age: 51.1 ± 14.3 years. Diagnoses were: 56.5% RA, 18.8% unclassified spondyloarthritis, 11.8% psoriatic arthritis (PsA) and 12.9% miscellaneous (MISC), including 9 juvenile idiopathic arthritis, 3 undifferentiated spondyloarthropathy, 3 uveitis, 2 connective tissue disorder and 1 SA-PHO. Mean disease duration was 14.5 ± 8 years, with no differences between diagnoses. Mean duration of current biological therapy was 47.7 ± 35.6 months, with 134 patients receiving TNF blockers and 36 patients receiving non-TNF (abatacept, rituximab and tocilizumab). 53% of patients received concomitant therapy with DMARDs, mainly in the RA group, and 28.2% had received ≥1 biological agent. At the time of analysis, 76 patients (44.7%) were receiving low dosages of biologicals (56% of etanercept patients, 55% adalimumab, 45% tocilizumab, 39% infliximab and 11% abatacept). Of the 76 patients, 51.3% had RA, 23.7% AS, 13.2% PsA and 11.8% MISC. Most commonly used low dosages were 50 mg every 15 days for etanercept, 40 mg every 3 weeks for adalimumab, 5 mg every 9–10 weeks for infliximab and 6 mg every 4 weeks for tocilizumab. The reason for dosage reduction was disease remission in 68 patients (89.5%) and low activity in 8 (10.5%). Mean time of dosage reduction was 17.2 ± 21.1 months. In RA patients, mean DAS28 score and CRP levels were lower in patients with reduced dosage than in patients with standard dosage (2.57 vs 3.47, p = 0.09) and (0.37 vs 1.09, p = 0.007), respectively, and the percentage of remission was higher (76.3% vs 30.7%, p = 0.000). The medical decision at the time of data collection was to maintain low-dosage biological treatment in 63 patients (82.9%) due to low disease activity and/or remission, assessed by clinical judgment and regular scores.

**Conclusion:** Near half our chronic arthritis patients receiving biological therapy were able to reduce the dosage to below that of established clinical guidelines, preserving remission or low disease activity in many cases. This dosage reduction was observed both in RA and spondyloarthropathies, and with different biological drugs.

**Disclosure:** J. Inciarte-Mundo, None; M. V. Hernández, None; V. Rosario, None; S. Cabrera, None; V. Ruiz-Esquivel, None; M. E. Gomez-Caballero, None; J. A. Gomez-Puerta, None; J. Ramirez, None; D. Cañete, None; R. Sanmarti, None.

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**Abatcept Biologic-Free Remission Study in Established Rheumatoid Arthritis Patients, Orion Study.** Tsutomu Takeuchi1, Tsukasa Matsubara2, Shuji Ohta3, Masaya Mukai4, Koichi Amano5, Shigeto Tohma5, Yoshiya Tanaka6, Hisashi Yamamoto6 and Nobuyuki Miyasaka7. 1Keio University School of Medicine, Tokyo, Japan, 2Matsubara Mayflower Hospital, Hyogo, Japan, 3Taga General Hospital, Ibaraki, Japan, 4Sapporo City General Hospital, Sapporo, Japan, 5Department of Rheumatology and Clinical Immunology, Saitama Medical Center, Saitama Medical University, Saitama, Japan, 6Sagamihara National Hospital, Sagamihara City, Japan, 7University of Occupational and Environmental Health, Kitakyushu, Japan, 8Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan, 9Tokyo Medical and Dental University, Tokyo, Japan

**Background/Purpose:** Abatcept (ABA) has comparable efficacy to TNF inhibitors in achieving clinical remission in rheumatoid arthritis (RA) patients. However, although clinical evidence suggests that biologic-free remission is achievable for RA patients treated with TNF inhibitors, no evidence for biologic-free remission is available for ABA. To evaluate the efficacy of ABA in terms of biologic-free remission in RA patients who achieved clinical remission with ABA.

**Methods:** We conducted a multi-center, non-randomized, 12-month, prospective observational study that recruited RA patients who achieved DAS28-CRP < 2.3 at the end of a Japanese phase II/III study. ABA was continued or discontinued based on the patients’ decision. During a 12 month follow-up period, ABA treatment was restarted in patients who experienced disease flare (DAS28-CRP > 2.7 at two consecutive visits) or according to doctors’ decisions. The primary endpoint was the proportion of patients who maintained biologic-free remission 1 year after ABA treatment. DAS28-CRP and Sharp Score (ΔTSS) were compared between the discontinuation and continuation groups.

**Results:** A total of 51 RA patients were enrolled in the study, of which 34 discontinued and 17 continued ABA treatment. The mean age was 57.1 ± 11.3 and 61.4 ± 9.4 years, mean disease duration at entry was 6.6 ± 5.3 and 12.0 ± 10.5 years, and mean duration of ABA treatment was 3.3 ± 0.3 and 3.3 ± 0.3 years for the discontinuation and continuation groups, respectively. Twelve patients (35.3%) in the discontinuation group maintained biologic-free remission for 12 months. Among the other 21 patients in the discontinuation group, 14 patients experienced disease flare, with 9 of them restarted ABA treatment. Seven patients dropped out from the study and one was excluded due to data deficiency, even though the patient discontinued ABA during the entire follow-up period (included in the analysis). The overall remission rate at month 12 for the discontinuation and continuation groups did not significantly differ (p = 0.058, 23.5% and 52.9%, respectively). The least square mean (LS) means for DAS28-CRP at month 12 were 3.1 and 2.1 in the discontinuation and continuation groups, respectively, and the longitudinal profiles of the two groups were significantly different (p = 0.030). ΔTSS of the discontinuation and continuation groups was 0.64 and 0.32, respectively, which did not statistically differ (p = 0.19). The proportion of patients with non-radiological progression (ΔTSS > 0.5) was 52.9% and 70.6%, respectively, and no marked differences in HAQ-DI at month 12 were detected (0.68 and 0.56, respectively; p = 0.46).

**Conclusion:** Biologic-free remission occurred in 35.3% of ABA discontinuation patients, with over 50% of both groups achieving non-radiographic progression. Moreover, functional remission was also maintained among patients in biologic-free remission compared to those in the continuation group. Our findings suggest that ABA may achieve biologic-free remission in RA patients.

### Effects of Tofacitinib On Lipid Profiles and Cholesterol and Lipoprotein Kinetics in Patients with Rheumatoid Arthritis

**Background/Purpose:** Tofacitinib is a novel oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. In RA patients (pts), suppression of total (TC), high-density lipoprotein (HDL), and low-density lipoprotein (LDL) cholesterol levels during inflammation has been described. Tofacitinib has shown significant effects on cholesterol and lipoprotein kinetics in patients with RA compared with healthy controls.

**Methods:** Baseline lipid profiles and cholesterol and lipoprotein kinetics were assessed with a 22-hour infusion of [13C]cholesterol and [13C]leucine. Cholesterol concentrations, HDL and LDL particle size, and biomarkers of HDL dysfunction were assessed.

**Results:** In vivo cholesterol and lipoprotein kinetics were assessed with a 22-hour infusion of [13C]cholesterol and [13C]leucine. The CE fCR and cholesterol levels approached levels of controls with tofacitinib therapy, the HDL-ApoA1 production rate was increased. Additionally, the CE fCR and cholesterol levels approached levels of controls with tofacitinib therapy, the HDL-ApoA1 production rate was increased.

**Conclusion:** This is the first study to assess cholesterol and lipoprotein kinetics in pts with active RA and matched healthy controls. The data suggest that low cholesterol levels in RA pts with active disease may be explained by increases in CE catabolism. Treatment with tofacitinib decreased CE catabolism and normalized cholesterol levels to those of healthy controls while improving markers of HDL function, including increased HDL-ApoA1 production.


### Table: Lipid parameters, cholesterol kinetics, and particle size in RA pts before and after treatment with tofacitinib, and in healthy controls

<table>
<thead>
<tr>
<th>Lipid and lipoprotein concentrations</th>
<th>RA patients</th>
<th>Tofacitinib-treated</th>
<th>Healthy controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (standard deviation)</td>
<td>Baseline</td>
<td>RA patients</td>
<td>Tofacitinib-treated</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>194 (33)†</td>
<td>220 (41)*</td>
<td>162 (20)*</td>
</tr>
<tr>
<td>CE (mg/dL)</td>
<td>106 (20)†</td>
<td>122 (23)*</td>
<td>106 (20)*</td>
</tr>
<tr>
<td>HDL cholesterol (mg/dL)</td>
<td>125 (29)†</td>
<td>143 (39)*</td>
<td>125 (29)*</td>
</tr>
<tr>
<td>LDL cholesterol (mg/dL)</td>
<td>54 (13)†</td>
<td>62 (15)*</td>
<td>54 (13)†</td>
</tr>
<tr>
<td>HDL-ApoA1 (mg/dL)</td>
<td>81 (42)†</td>
<td>93 (42)*</td>
<td>81 (42)*</td>
</tr>
<tr>
<td>ApoA1 (mg/dL)</td>
<td>117 (56)*</td>
<td>135 (58)*</td>
<td>117 (56)*</td>
</tr>
<tr>
<td>HDL dysfunction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE fCR (%/h)</td>
<td>4.23 (0.39)†</td>
<td>2.63 (0.31)*</td>
<td>2.17 (0.36)</td>
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<tr>
<td>CE production rate (mg/kg BW/h)</td>
<td>1.09 (0.24)</td>
<td>1.12 (0.24)</td>
<td>1.11 (0.26)</td>
</tr>
<tr>
<td>LDL-ApoB100 production rate (mg/kg BW/h)</td>
<td>0.49 (0.12)</td>
<td>0.52 (0.12)</td>
<td>0.50 (0.13)</td>
</tr>
<tr>
<td>HDL-ApoA1 FCR (%/h)</td>
<td>1.08 (0.22)</td>
<td>1.11 (0.28)</td>
<td>1.02 (0.22)</td>
</tr>
<tr>
<td>HDL-ApoA1 production rate (mg/kg BW/h)</td>
<td>0.57 (0.11)</td>
<td>0.65 (0.15)*</td>
<td>0.59 (0.19)</td>
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<tr>
<td>LDL dysfunction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL serum amyloid A (mg/L)</td>
<td>35 (63)</td>
<td>18 (35)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Myeloperoxidase (pmol/L)</td>
<td>1092 (1017)†</td>
<td>943 (934)</td>
<td>736 (345)</td>
</tr>
<tr>
<td>LCAT activity (nmol/mL/h)</td>
<td>56 (139)†</td>
<td>642 (134)*</td>
<td>688 (121)</td>
</tr>
<tr>
<td>Particle size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total HDL particles (μm²)</td>
<td>30.7 (4.8)*</td>
<td>35.9 (5.51)*</td>
<td>35.0 (5.92)</td>
</tr>
<tr>
<td>LDL size (nm)</td>
<td>21.0 (0.85)</td>
<td>21.2 (0.87)*</td>
<td>21.4 (0.89)</td>
</tr>
</tbody>
</table>

*Note: all pts had a body mass index <40 kg/m². Apo, apolipoprotein; BW, body weight; CE, cholesterol ester; FCR, fractional catabolic rate; LDL, low-density lipoprotein; LCAT, lecithin cholesterol acyltransferase; LDL, low-density lipoprotein.
to 8 weeks. Safety evaluation performed on days 1 through 28, including AEs, SAEs, and standard laboratory assessments, are used to determine the dose limiting toxicity. Response is assessed after 4 and 8 weeks of treatment according to ACR and DAS28 criteria. The pharmacokinetic profile and formation of human anti-fusion protein antibodies are measured using standard methods.

Results: All three patients enrolled in the first cohort (6 μg/kg weekly of F8-IL10) achieved an ACR 50 response at more than one evaluation time point. In cohort 2 (15 μg/kg weekly of F8-IL10), patient 1005 even resulted in ACR 70 response whereas patient 1004 did not reach ACR20, however a moderate EULAR response was seen and treatment stopped after only 4 weeks. ACR responses are summarized in the attached table. DAS 28 significantly improved in all patients but to a lesser extent in patient 1004. An excellent tolerability of F8-IL10, at the doses used, was observed in all treated patients, as of now no grade ≥2 adverse drug reactions have been reported.

Conclusion: The promising safety data regarding the clinical use of F8-IL10, together with preliminary positive signs of activity may be favored by the targeted delivery of IL10 to the site of inflammation. These results also warrant future developments of the product in randomized clinical trials, which are currently in planning. An update of clinical data will be presented at the ACR meeting.

Disclosure: M. Galeazzi, None; C. Baldi, None; E. Prisco, None; M. Bardelli, None; D. Neri, Philogen, 4; L. Giovannoni, Philogen, 3; E. Selvi, None; R. Caporali, None.

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Background/Purpose: To evaluate the association of fatigue with physical function and disease activity in patients with active RA. Treatment with intravenously administered GLM significantly improved clinical symptoms of fatigue in patients with RA inadequately responsive to MTX.

Method: A 24-week, Phase III, randomized, placebo-controlled study. Adult patients with active RA despite MTX therapy were randomized to placebo+MTX (placebo group) or GLM 2mg/kg plus MTX (GLM group) at week 0, and every 8 weeks thereafter. Patients in placebo group with <10% improvement in tender and swollen joint count from baseline to week 16 entered early escape and received a 2 mg/kg GLM infusion at Weeks 16 and 20. Impact on physical function was assessed using the disability index of the Health Assessment Questionnaire (HAQ). Fatigue was measured using the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) questionnaire, and clinically meaningful improvement in FACIT-Fatigue was defined as ≥ 4 points increase in the scores. Correlation of FACIT-Fatigue with HAQ and disease activity and remission (DAS28 using CRP<2.6) were analyzed using Pearson correlation, or multiple linear and logistic regression models to adjust for other confounding variables (age, CRP, swollen and tender joint counts). Comparisons between groups were performed using ANOVA on van der Waerden normal scores for continuous outcomes or Chi-square test for binary outcomes.

Results: At baseline, mean (SD) FACIT-Fatigue score was 25.5 (10.54), indicating significant fatigue. Significant correlations of FACIT-Fatigue with HAQ r (r=-0.62, p<0.01) and DAS28 score (r=-0.42, p<0.01) were observed at baseline. Compared to the placebo group, GLM-treated patients had significantly greater improvement in FACIT-fatigue at week 12 (5.4 ± 10.3 vs. 2.1 ± 9.0), which was sustained through week 16 (7.5 ± 10.5 vs. 2.2 ± 9.7) and 24 (8.0 ± 10.8 vs. 2.5 ± 10.2) (all p-values<0.001). Compared with the placebo group, a greater proportion of patients in the GLM group achieved clinically meaningful improvement in FACIT-Fatigue score at week 12 (57.5% vs. 42.8%) and at week 24 (65.8% vs. 40.3%) (all p-values<0.001).

Conclusion: RA patients inadequately responsive to MTX experienced severe fatigue. Fatigue was a significant independent predictor of physical function and disease activity in patients with RA. Treatment with intravenously administered GLM significantly improved clinical symptoms of fatigue in patients with RA inadequately responsive to MTX.

Disclosure: R. Westhoven, Janssen Research and Development, LLC, 9; M. Weinblatt, Janssen Research and Development, LLC, 9; C. Han, Johnson & Johnson Pharmaceutical Services, LLC, 3; T. Gathany, Johnson & Johnson Pharmaceutical Services, LLC, 3; L. Kim, Janssen Research & Development, LLC, 3; M. Mack, Janssen Research & Development, LLC, 3; J. Lu, Janssen Research & Development, LLC, 3; D. Baker, Janssen Research & Development, LLC, 3; A. Mendelsohn, Janssen Research & Development, LLC, 3; O. Bingham, Janssen Research & Development, LLC, 9.

1293


Background/Purpose: To determine an optimized dosing regimen for IV golimumab in subjects with active RA using population pharmacokinetic (PK) modeling and simulation.

Methods: Two Phase 3 trials were performed for IV golimumab. In the first trial, IV infusions of 2 mg/kg golimumab every 12 weeks (Q12W) or 4 mg/kg Q12W with concomitant methotrexate (MTX) were investigated in RA subjects. Population PK modeling was conducted using data from this first trial. Simulations were performed to identify an optimized IV regimen that would result in steady-state trough golimumab concentrations similar to the approved subcutaneous (SC) dosing regimen of 50 mg Q4W. Absolute bioavailability of 50% and Ka of 0.658 day^−1 were used for simulating the SC golimumab profile. The dosing regimen for the second trial was then modified to shorten the dosing interval to Q8W.

Results: In the first trial, although there were strong trends towards clinical benefit, the primary endpoint (ACR 50) was marginally missed. It was found that Q12W dosing was inadequate to maintain adequate trough golimumab concentrations at the later part of the dosing interval. Using population PK analysis, a two-compartment IV infusion model with first-order elimination was developed. Parameter estimates for the model were: CL: 0.654 L/day; V1: 4.33 L; V2: 2.82 L and Q: 0.215 L/day. Simulation using ANOVA on van der Waerden normal scores for continuous outcomes showed that IV golimumab 2 mg/kg Q8W + MTX and currently approved SC golimumab 50 mg Q4W + MTX resulted in similar steady-state trough golimumab concentrations. When the IV regimen of 2 mg/kg golimumab at Weeks 0, 4 followed by Q8W was studied in the second trial, the primary efficacy endpoint (ACR 20) was achieved.

Conclusion: Population PK modeling and simulation aided in the determination of an optimized dosing regimen for IV golimumab in subjects with active RA. Both observed data and population PK modeling and simulation corroborate the importance of maintaining adequate steady-state trough concentrations of golimumab for robust clinical efficacy.

A Phase Ib Multiple Ascending Dose Study Evaluating Safety, Pharmacokinetics, and Early Clinical Response of Brodalumab (AMG 827), a Human Anti-Interleukin 17 Receptor (IL-17R) Antibody, in Rheumatoid Arthritis. Melvin A. Churchill1, Luis F. Flores-Suarez2, Daniel J. Wallace3, Kristine Phillips4, Richard W. Martin5, Mario H. Cardiel6, Jeffrey Kaine7, Edgar Bautista8, David H. Salinger9, Erinn Stevens10, Christopher B. Russell11 and David A. Martin12. 1Arthritis Center of Nebraska, Lincoln, NE, 2Instituto Nacional de Enfermedades Respiratorias, Mexico City, Mexico, 3Cedars-Sinai Medical Center, Los Angeles, CA, 4University of Michigan Medical School, Ann Arbor, MI, 5Michigan State University College of Human Medicine, Grand Rapids, MI, 6Hospital, Morelia, Mexico, 7Saint Martha Arthritis Research Center, Sarasota, FL, 8Amgen, Thousand Oaks, CA, 9Amgen, Seattle, WA

Background/Purpose: The cytokine IL-17A is an innate inflammatory cytokine implicated in the pathogenesis of several human autoimmune diseases including rheumatoid arthritis (RA). Brodalumab is a human immunoglobulin G2 (IgG2) monoclonal antibody that binds with high affinity to human IL 17RA and blocks the biological activity of IL 17A, IL-17F, IL-17A/F heterodimers, and IL-23. Increased levels of IL-17A have been detected in the synovial fluid of patients with RA and furthermore, blockade to human IL 17RA and blocks the biological activity of IL 17A, IL-17F, and IL-23. Brodalumab (AMG 827) is a fully human IgG2 monoclonal antibody that binds with high affinity to human IL-17RA and blocks the biological activity of IL-17A, IL-17F, and IL-23. In the current study, we investigated the effectiveness and safety of SC-TCZ in the patients who had received IV-TCZ in the MUSASHI study.

Methods: This study enrolled RA patients who had received TCZ monotherapy for 24 weeks in the MUSASHI study (prior-IV group: 8 mg/kg IV-TCZ every 4 weeks; prior-SC group: 162 mg SC-TCZ every 2 weeks). They received open label SC-TCZ (162 mg every 2 weeks) starting at Week 24 without any concomitant use of synthetic or biologic DMARDs. Disease activity as measured by DAS28-ESR and ACR response rates and safety were assessed.

Results: A total of 319 patients (160 patients in the prior-IV group and 159 patients in the prior-SC group) were enrolled. Baseline demographics were comparable between the prior-IV group and the prior-SC group. body weight (kg, mean ± SD), 54.3 ± 10.1 vs. 53.9 ± 8.8; proportion of patients who previously used TNF-α inhibitors before the MUSASHI study, 23.1% vs. 18.2%. At 12 weeks after starting the extension period (36 weeks after the beginning of the MUSASHI study) 158 patients in the prior-IV group and 157 patients in the prior-SC group were still receiving SC-TCZ. The mean change of DAS28-ESR in the prior-IV group was comparable to that in the prior-SC group. Body weight (kg, mean ± SD), 57.9 ± 10.6 vs. 61.2 ± 10.6; proportion of patients who previously used TNF-α inhibitors before the MUSASHI study, 23.1% vs. 18.2%.

Conclusion: There was no sign of effectiveness being reduced after switching from IV-TCZ to SC-TCZ. Switching of TCZ treatment from IV-TCZ to SC-TCZ was tolerable. These findings are useful for the clinical application of SC-TCZ.


Table. DAS28-ESR over time (mean ± SD)

<table>
<thead>
<tr>
<th>Week</th>
<th>DAS28-ESR</th>
<th>Prior-SC</th>
<th>Prior-IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5.1 ± 0.9</td>
<td>5.2 ± 0.9</td>
<td>5.2 ± 0.9</td>
</tr>
<tr>
<td>12</td>
<td>3.1 ± 1.2</td>
<td>2.7 ± 1.3</td>
<td>2.6 ± 1.4</td>
</tr>
<tr>
<td>24</td>
<td>2.7 ± 1.3</td>
<td>2.6 ± 1.4</td>
<td>2.6 ± 1.2</td>
</tr>
</tbody>
</table>

Conclusion: There was no sign of effectiveness being reduced after switching from IV-TCZ to SC-TCZ. Switching of TCZ treatment from IV-TCZ to SC-TCZ was tolerable. These findings are useful for the clinical application of SC-TCZ.


1296

An Interim Analysis of the Efficacy of Abatacept in Japanese Biologics-Na;-ve Rheumatoid Arthritis Patients (results from ABROAD study): Comparison of CRP and MMP-3 Level After Treatment with Abatacept Versus Anti-TNF Agents. Masahiro Sekiguchi1, Kiyoshi Matsui2, Masayasu Kitano1, Mitsuhiro Ohmura3, Takao Fujii4, Hideko Nakahara5, Keiji Maeda6, Hideo Hashimoto7, Takanori Kuroiwa8, Kenji Miki9, Masanori Funahuchi10, Kazuhiro Hatta11, Kensi Higami12, Shunzo Miyashita13, Ichiro Yoshii14, Teruyuki Nakatani14, Takashi Ikawa15, Takaji Namiuchi16, Ichiro Yoshii17, Teruyuki Nakatani18, Takashi Ikawa19, Takaji Namiuchi20, Kosaku Murakami21, Satoshi Morita22, Yutaka Kawaai23, Nobuo Nishimoto24, Tsuneyo Mimori25 and Hajime Sano26. 1Hyogo College of Medicine, Nishinomiya, Japan, 2Kyoto University, Kyoto, Japan, 3NTT West Osaka Hospital, Osaka, Japan, 4Rinku Hashimoto Rheumatology, Osaka, Japan, 5Yukioi Hospital, Osaka, Japan, 6Amagasaki Central Hospital, Amagasaki, Japan, 7Kyoto University Graduate School of Medicine, Suita, Japan, 8Japan

Background/Design: In the MUSASHI study (i.e., double-blind, parallel-group, Phase III non-inferiority study comparing subcutaneous tocilizumab [SC-TCZ] to intravenous tocilizumab [IV-TCZ] monotherapy), the effectiveness and safety of IV-TCZ monotherapy were proved to be comparable to those of IV-TCZ monotherapy in Japanese patients with rheumatoid arthritis (RA). The aim of the current study was to investigate the effectiveness and safety of SC-TCZ in the patients who had received IV-TCZ in the MUSASHI study.

Methods: This study enrolled RA patients who had received TCZ monotherapy for 24 weeks in the MUSASHI study (prior-IV group: 8 mg/kg IV-TCZ every 4 weeks; prior-SC group: 162 mg SC-TCZ every 2 weeks). They received open label SC-TCZ (162 mg every 2 weeks) starting at Week 24 without any concomitant use of synthetic or biologic DMARDs. Disease activity as measured by DAS28-ESR and ACR response rates and safety were assessed.

Results: A total of 319 patients (160 patients in the prior-IV group and 159 patients in the prior-SC group) were enrolled. Baseline demographics were comparable between the prior-IV group and the prior-SC group. body weight (kg, mean ± SD), 54.3 ± 10.1 vs. 53.9 ± 8.8; proportion of patients who previously used TNF-α inhibitors before the MUSASHI study, 23.1% vs. 18.2%. At 12 weeks after starting the extension period (36 weeks after the beginning of the MUSASHI study) 158 patients in the prior-IV group and 157 patients in the prior-SC group were still receiving SC-TCZ. The mean change of DAS28-ESR in the prior-IV group was comparable to that in the prior-SC group. Body weight (kg, mean ± SD), 57.9 ± 10.6 vs. 61.2 ± 10.6; proportion of patients who previously used TNF-α inhibitors before the MUSASHI study, 23.1% vs. 18.2%.

Conclusion: There was no sign of effectiveness being reduced after switching from IV-TCZ to SC-TCZ. Switching of TCZ treatment from IV-TCZ to SC-TCZ was tolerable. These findings are useful for the clinical application of SC-TCZ.
CD80/86 on antigen presenting cells (APCs) and thereby inhibits the interaction between these molecules and CD28 on T cells. ABA suppresses T cell activation and has been reported to have the therapeutic benefit for patients with rheumatoid arthritis (RA). However, there are limited data to compare the efficacy of ABA and anti-TNF agents. We conducted the ABROAD study (Abatacept Research Outcomes as a first-line biological Agent in the real world) in collaboration with 37 institutions in Japan. In this study, we confirmed the efficacy of ABA and compared CRP and MMP-3 levels after treatment with ABA versus anti-TNF agents in Japanese biological-naïve RA patients.

Methods: We analyzed multicenter 100 biologics-naïve RA patients treated with ABA (ABROAD study) from January 2010 to May 2012. Patients received 500mg of abatacept for patients weighted less than 60kg or 750mg for patients with more than 60kg or without with MTX (mean dosage:6.0±3.7mg/week) for 24 weeks. To evaluate the efficacy of the treatment, we measured SDAI, DAS28-CRP (DAS), CRP and MMP-3 levels at week 0, 4, and 24 after treatment. We also compared CRP and MMP-3 levels after treatment with ABA versus anti-TNF agents using propensity score matching of sex, age and duration of the disease in 48 biologic-naïve RA patients, respectively.

Results: At week 0, 4, and 24 after ABA treatment, the mean SDAI/ DAS score and CRP/MMP-3 levels were SDAI (26.2±14.9;16.6±11.1) at 0.4±9.6), DAS (4.5±1.3;4.3±1.1;2.8±1.2), CRP (2.1±2.2;1.0±1.5;0.8±1.5 mg/dl) and MMP-3 (219.1±202.5;169.7±140.3;141.5±117.0 mg/ml). We observed statistically significant reduction of SDAI/DAS/CRP/MMP-3 levels at week 4 compared to those of the baseline. The proportions of patients who achieved low disease activity or remission at week 24 were 65.7% and 17.2% based on SDAI score, and 49.0% and 39.2% based on DAS, respectively. In the comparison of propensity score matching 96 patients with reported ABA: ABROAD (48 patients treated with ABA at week 24 were 65.7% and 17.2% based on SDAI score, and 49.0% and 39.2% based on DAS, respectively. In the comparison of propensity score matching 96 patients with reported ABA: ABROAD (48 patients treated with ABA: ABROAD study) from January 2010 to May 2012. Patients received 500mg of abatacept for patients with more than 60kg or 750mg for patients with less than 60kg or without MTX (mean dosage:6.0±3.7mg/week) for 24 weeks. To evaluate the efficacy of the treatment, we measured SDAI, DAS28-CRP (DAS), CRP and MMP-3 levels at week 0, 4, and 24 after treatment. We also observed CRP and MMP-3 levels after treatment with ABA versus anti-TNF agents using propensity score matching of sex, age and duration of the disease in 48 biologic-naïve RA patients, respectively.

Conclusion: We observed the efficacy of ABA at week 4 after the treatment of biologic-naive RA patients. We also observed that CRP and MMP-3 levels in ABROAD group were lower than those in ABA group at week 24 after treatment. These results indicate that the ABA could become as a first-line biologic for the treatment of RA patients.

Disclosure: M. Sekiguchi, Bristol-Myers Squibb, 2; K. Matsui, Bristol-Myers Squibb, 2; M. Kitano, Bristol-Myers Squibb, 2; M. Namiki, Bristol-Myers Squibb, 2; K. Ohmura, Bristol-Myers Squibb, 2; T. Fujii, Bristol-Myers Squibb, 2; H. Nakahara, None; K. Maeda, None; H. Hashimoto, None; T. Kurosawa, None; K. Miki, None; M. Panichi, Bristol-Myers Squibb, 2; K. Hatta, None; K. Higami, None; S. Namiuchi, None; I. Yoshii, None; T. Nakatani, None; T. Ikawa, None; T. Matsuura, Bristol-Myers Squibb, 2; R. Kuroiwa, Bristol-Myers Squibb, 2; M. Sekiguchi, Bristol-Myers Squibb, 2; T. Mimori, Bristol-Myers Squibb, 2; H. Sano, Bristol-Myers Squibb, 2.

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Tofacitinib and Adalimumab Achieve Similar Rates of Low Disease Activity in Rheumatoid Arthritis—Lack of Improvement in Disease Activity At 1 Year.

Monday, November 12

Tofacitinib and Adalimumab Achieve Similar Rates of Low Disease Activity in Rheumatoid Arthritis—Lack of Improvement in Disease Activity At 1 Year. Ronald F. van Vollenhoven 1, Srinarong Kunirammathan,2, Brynne Campbell,3, David Gurba,4, Bethan Dennis,5, Charles Fraser,6, Samuel H. Zwillich7 and John Bradley8. 1Karolinska Institute, Stockholm, Sweden, 2Pfizer Inc., Collegeville, PA

Background/Purpose: Tofacitinib is a novel oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. This post-hoc analysis of the Phase 3 active-controlled randomized ORAL standard trial (NCT00853385) determined the relationship between changes in the Disease Activity Score (28 joints, 4 components, ESR; DAS28) during the first 3 months (mo) of treatment with tofacitinib or adalimumab (ADA), and the likelihood of achieving low disease activity (LDA) at Mo 6 or Mo 12 in patients (pts) with RA.

Methods: Pts on background methotrexate (MTX) were randomized 4:4:4:1:1 to one of five sequences: tofacitinib 5 mg twice daily (BID); 10 mg BID; ADA 40 mg sc biweekly (q2w); placebo (PBO) advanced to tofacitinib 5 mg BID; or PBO advanced to 10 mg BID. All pts self-administered injections q2w (ADA or PBO). Pts on PBO advanced to tofacitinib at Mo 6, or at Mo 3 if they did not show ≥20% reduction from baseline (BL) in swollen/tender joint counts.

Results: Overall, 717 pts were treated. Primary results have been reported previously.1 Mean BL DAS28 values across sequences were 6.4–6.6. Tofacitinib 5 and 10 mg BID and ADA all showed statistical superiority to PBO at Mo 3 and Mo 6, and achieved numerically similar responses, including rates of LDA (DAS28 ≤3.2) (Table). In the current analysis of pts with a DAS28 improvement from BL <0.6 by Mo 1, less than 5% receiving tofacitinib 5 mg BID and approximately 10% receiving tofacitinib 10 mg BID achieved LDA at Mo 12. In pts with a DAS28 improvement from BL <0.6 by Mo 3, none achieved LDA at Mo 6 or Mo 12 on either dose of tofacitinib, while approximately 10% (n=2) of ADA pts with DAS28 improvement <0.6 by Mo 3 achieved LDA at Mo 12 (Table).

Conclusion: LDA rates were similar between tofacitinib and ADA. In this post-hoc analysis of the ORAL Standard study, failure to achieve ≥0.6 DAS28 improvement from baseline in DAS28 within the first 3 months of tofacitinib treatment was predictive of a low probability of achieving LDA at 1 year.

Disclosure: R. F. van Vollenhoven, Abbott; BMS; GSK; HGS; MSD, Pfizer, Roche; UCB, 2, Abbott; BMS; GSK; HGS, MSD; Pfizer, Roche; UCB, 5; S. Kunirammathan, Pfizer Inc., 1, Pfizer Inc., 3; B. Dennis, Pfizer Inc., 2; D. Gurba, Pfizer Inc., 2; B. Wilkinson, Pfizer Inc., 1; C. A. Mebus, Pfizer Inc., 1, Pfizer Inc., 3; S. H. Zwillich, Pfizer Inc., 1, Pfizer Inc., 3; J. Bradley, Pfizer Inc., 1, Pfizer Inc., 3.

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Improvement of Treatment Outcome of Rheumatoid Arthritis with Salsalate/Pyridinone by Pharmacogenetic Approach. Shunichi Kumagai1, Yoshiaki Hagiwara2, Yoshihide Ichise1, Sho Sendo1, Nobuhiko Okada1, Jun Saegusa1 and Goh Tuji1. Shinko hospital, Kobe, Japan, “Kobe University Graduate School of Medicine, Kobe, Japan,” Shinko Hospital, Kobe, Japan

Background/Purpose: Salsalate/pyridinone (SASP) is acetylated in liver by N-acetyltransferase2 (NAT2) in the track of metabolism. Previous studies have shown that genotyping of NAT2 is adequate to classify its acetylation activity into fast (FA), intermediate (IA), and slow acetylator (SA). Prediction of SASP efficacy/adverse events (AEs) based on NAT2 genotype has been demonstrated in retrospective studies, but has not been validated by prospective study. Thus, the purpose of this study is to investigate the association of efficacy and NAT2 genotype prospectively.

Methods: NAT2 genotype was determined by typing following SNPs, C341T, G590A, and G857A, using Q-probe method (i-densy; Arkray Inc.). Wilcoxon rank-sum test and Pearson’s chi-square test were used for statistical analysis.

Results: Between Oct 2001 and Apr 2012, 9,905 CORONA patients initiated biologic therapy for RA, of which 40% were previously bio naive. Demographics and disease activity characteristics in the Bio naïve and Bio
experienced patients respectively were as follows: age (years; mean ± SD): 57 ± 14 vs 57 ± 13, females: 76% vs 81%, duration of RA (years; mean ± SD): 8 ± 9 vs 13 ± 10, seropositivity: 75% vs 73%, and CDAI (mean ± SD): 19 ± 14 vs 22 ± 15.

Of the 9,905 patients, 25% received Bio MT and 75% received Bio CMB. Among patients that were previously bio naïve, 19% initiated a biologic as MT whereas MT initiation rates for patients who had received one prior biologic was 29%; two prior biologics, 26%; and three or more prior biologics, 31%. Higher rates of MT initiations were observed with prior Bio experience (unadjusted OR 2.01 [95% CI 1.70, 2.37]). Higher proportion of patients starting their biologic therapy after 2006 received MT as compared to those who started their biologic therapy prior to 2006 but was not statistically significant (unadjusted OR 1.20 [95% CI 0.99, 1.45]).

In the multivariate model (Table 1), Bio experienced patients continued to be significantly more likely to receive MT as compared Bio naïve. Median odds ratio showing the effect of individual physician’s prescribing patterns on initiating bio MT was 2.40 [95% CI 2.08, 2.86].

Table 1. Adjusted Odds ratios for initiating Bio MT versus Bio CMB

<table>
<thead>
<tr>
<th>Prior number of biologics</th>
<th>OR (95% CI) for initiating Bio MT vs Bio CMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (reference)</td>
<td>2.12 (1.76, 2.54)</td>
</tr>
<tr>
<td>1</td>
<td>1.63 (1.30, 2.04)</td>
</tr>
<tr>
<td>≥2</td>
<td>2.20 (1.68, 2.89)</td>
</tr>
<tr>
<td>After 2006 vs. up to 2006</td>
<td>1.03 (0.84, 1.25)</td>
</tr>
<tr>
<td>Effect of physician prescribing patterns</td>
<td>2.40 (2.08, 2.86)</td>
</tr>
</tbody>
</table>

Abbreviations: Bio–biologic, MT–monotherapy, CMB–combination therapy.

Conclusion: Monotherapy remains a common strategy of biologic prescription to treat RA. Prior biologic experience and individual physician’s prescribing patterns were associated with increased likelihood of initiating a biologic as monotherapy warranting further investigation to understand factors influencing decisions to initiate biologic monotherapy.

Disclosure: D. A. Pappas, CORRONA; G. W. Reed, Corrona; K. C. Saunders, Corrona; A. John, Genentech; A. Shewede, Genentech and Biogen IDEC Inc.; J. D. Greenberg, Corrona; J. Xiong, AstraZeneca; K. Kremer, Pfizer; J. M. Kremer, Pfizer; J. Weber, None; Y. Sun, None.

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Rituximab Versus Abatacept in Rheumatoid Arthritis Patients with an Inadequate Response to Prior Biological Therapy: A Retrospective, Single-Center Study. Edward Keystone, Juan Xiong, Deborah Weber and Ye Sun, Mount Sinai Hospital, Toronto, ON

Background/Purpose: Patients with RA who experience an inadequate response to TNF inhibitor (TNFi) therapy (TNF-IR) may be successfully treated using an alternative TNFi or a biologic with a different mode of action such as rituximab (RTX) or abatacept (ABA). The relative effectiveness of these approaches has not been determined in head-to-head trials. Evidence from real-world experience would help to guide treatment decisions for TNF-IR patients.

Methods: This was a retrospective chart review of patients from a single site (Rebecca MacDonald Center) with ACR-defined RA who initiated RTX or ABA after failure of at least one TNFi. The relative effectiveness of RTX and ABA was evaluated by analyzing drug survival distribution. Kaplan-Meier survival curves were compared using the log rank test (p-values <0.05 indicated statistical significance).

Results: The study cohort comprised 61 patients, of whom 37 and 24 were treated with RTX and ABA, respectively. In the RTX group, 10 patients had also received prior therapy with ABA. Demographics and disease characteristics were generally similar in the two groups, although RTX patients had higher disease activity compared with ABA patients (mean CDAI: RTX 32.5 vs ABA 26.9) and had received more prior TNFis (1.8 vs 1.7) and/or ABA (2.1 vs 1.7). After excluding the 10 RTX patients who had received prior ABA, survival rates over time were generally better with RTX vs ABA (table).

Stratification of survival data according to number of prior TNFi failures indicated that RTX (excluding patients with prior ABA) was superior to ABA among patients who had failed 3 TNFis. Survival was also numerically greater with RTX vs ABA in patients who had failed 1 TNFi. Finally, survival was better on both RTX and ABA when compared with that seen in a separate cohort of patients (n=88) who received a second TNFi after first TNFi failure.

Conclusion: These results from real-life practice suggest that in RA patients who have failed one or more TNFi, RTX may have better long-term survival than either ABA or an alternative TNFi. Prior ABA appears to reduce the efficacy of RTX. Further data are needed.

Disclosure: E. Keystone, Abbott, Amgen, AstraZeneca, Bristol-Myers Squibb, Centocor, Roche, Genzyme, Merck, Novartis, Pfizer, UCB, 2, Abbott, AstraZeneca, Biotest, Bristol-Myers Squibb, Centocor, Roche, Genentech, Merck, Nycomed, Pfizer, UCB, 5; J. Xiong, None; D. Weber, None; Y. Sun, None.

1300
Characteristics Associated with Biologic Initiation As Monotherapy Versus Combination Therapy in Patients with Rheumatoid Arthritis (RA) in a US Registry Population. Dimitrios A. Pappas, 1 George W. Reed, 2 Eran E. C. Saunders, 3 Ant John, 3 Ashwani Shewede, 3 Janny Devenport, 8 Jeffrey D. Greenberg, 8 and Joel M. Kremer. 6 1 Columbia University, College of Physicians and Surgeons, New York, NY; 2 University of Massachusetts Medical School, Worcester, MA; 3 CORRONA, Inc., Southborough, MA; 4 Genentech Inc., South San Francisco, CA; 5 NYU Hospital for Joint Diseases, New York, NY; 6 Albany Medical College and The Center for Rheumatology, Albany, NY

Background/Purpose: Approximately one-third of RA patients were prescribed biologic (Bio) monotherapy (MT) i.e. without concomitant disease-modifying anti-rheumatic drugs (DMARD) (Yazici et al., 2008). The purpose of this abstract is to summarize characteristics associated with Bio MT and Bio combination therapy (CMB) initiation in a cohort of previously bio naïve and experienced RA patients in US and evaluate if previous treatments, increased availability of biologics approved for MT after 2006, and individual physician-prescribing patterns influence the decisions to initiate Bio MT and Bio CMB.

Methods: Data were obtained from the Consortium of Rheumatology Researchers of North America (CORRONA) registry, an independent prospective observational cohort with >30,000 RA patients enrolled from over 100 academic and private practices across the US. Odds ratios (OR) (adjusted and unadjusted) for initiating MT in Bio experienced compared to Bio naïve patients were estimated using logistic regression models. A Median OR to account for random effects from variation in individual physician’s prescribing patterns and the effect of the availability of more biologics approved for MT after 2006 were also estimated.
Results: Between Oct 2001 an Apr 2012, 9,905 CORRONA patients initiated biologic therapy for RA, of which 40% were previously bio naïve. Demographics and disease activity characteristics in the Bio naïve and Bio experienced patients respectively were as follows; age (years; mean±SD): 57±14 vs 57±13, females: 76% vs 81%, duration of RA (years; mean±SD): 8±9 vs 13±10, seropositivity: 75% vs 73%, and CDAI (mean±SD): 19±14 vs 22±15.

Of the 9,905 patients, 25% received Bio MT and 75% received Bio CMB. Among patients that were previously bio naïve, 19% initiated a biologic as those who started their biologic therapy prior to 2006 but was not statistically more significant (unadjusted OR 2.01 [95% CI 1.70, 2.37]). Higher proportion of patients starting their biologic therapy after 2006 received MT as compared to those who started their biologic therapy prior to 2006 but was not statistically significant (unadjusted OR 1.20 [95% CI 0.89, 1.45]).

In the multivariate model (Table 1), Bio experienced patients continued to be significantly more likely to receive MT as compared Bio naïve. Median odds ratio showing the effect of individual physician’s prescribing patterns on initiating bio MT was 2.40 [95% CI 2.08, 2.86].

Conclusions: Monotherapy remains a common strategy of biologic prescription to treat RA. Prior biologic experience and individual physician’s prescribing patterns were associated with increased likelihood of initiating a biologic as monotherapy warranting further investigation to understand factors influencing decisions to initiate biologic monotherapy.


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Predictors of Significant Disease Activity Score-28 (Using C-reactive protein) Remission Achieved with Intravenous Golimumab in Patients with Active Rheumatoid Arthritis Despite Methotrexate Therapy: Results of the Phase 3, Multicenter, Double-Blind, Placebo-Controlled Trial. Clifton O. Bingham III1, Michael Weinblatt2, Alan Mendelson3, Lilianne Kim4, Michael Macka,5 Jiandong L6, Daniel Baker and Rene Westhoven7, Johns Hopkins University, Baltimore, MD, 8Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 9Janssen Research & Development, LLC, 3, J. D. Greenberg, Corrona, 4, AstraZeneca, Novartis, Pfizer, 5, J. M. Kremer, Pfizer Inc, 2, Pfizer Inc, 5.

Background/Purpose: To evaluate the efficacy of intravenous (IV) golimumab (GLM) 2mg/kg+ methotrexate (MTX) in patients(pts) with active RA despite MTX in achievement of DAS remission and ACR/EULAR remission.

Methods: Pts (n=592) with active RA (≥6/66 swollen joints, ≥6/68 tender joints, CRP≥1.0mg/dL, RF and/or anti-CCP antibody-positive) despite ≥3months of MTX (15–25mg/wk) participated in this multicenter, randomized, double-blind, placebo(PBO)-controlled phase 3 study. Pts were randomized (2:1) to receive IV GLM 2mg/kg or PBO at wks0&4 and q8wks; all pts continued their stable MTX regimen. Clinical remission was defined by DAS28-ACR remission by using DASAI≤3.3 (post hoc; validated). DAS28-ACR analyses used last-observation-carried-forward.

Results: Statistically significantly higher DAS28-ACR remission rates were observed with GLM+MTX vs. PBO+MTX at Wk14 (15.4% vs. 4.6%, respectively; p<0.001) and Wk24 (17.0% vs. 5.1%, respectively; p<0.001). Similar trends were seen when remission was defined by a SDAI score ≤3.3 (Wk14: 4.8% vs.1.0%, respectively; p<0.05 and Wk24: 7.3% vs. 2.0%, respectively; p<0.01). Moderate (approx.10%-15%) increases in Wk24 DAS28-ACR remission rates were observed among subgroups of pts defined by HAQ score ≤1.625 (24%) vs ≥1.625 (12%), baseline physical Functional Class I (27%) vs Class II and III (17% each), swollen joint count <12 (23%) vs ≥12 (14%), tender joint count <24 (25%) vs ≥24 (11%), and CRP <1.5 mg/dL (29%) vs ≥1.5 mg/dL (15%).

Table. No. (% of pts achieving DAS28-ACR <2.6 at Wk24 by baseline characteristics*

<table>
<thead>
<tr>
<th>No. randomized GLM pts</th>
<th>495</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs): &lt; 65/65</td>
<td>61/336 (18%/59/15)</td>
</tr>
<tr>
<td>Sex: Female/Male</td>
<td>58/326 (18%/12/69/17)</td>
</tr>
<tr>
<td>Body weight (median: 70kg):</td>
<td>34/198 (17%)/36/197 (18%)</td>
</tr>
<tr>
<td>Disease duration (median: 4 yrs): ≤ 4 yrs/ ≤ 4 yrs</td>
<td>35/196 (18%)/35/199 (18%)</td>
</tr>
<tr>
<td>Functional class: I/II/III</td>
<td>9/33 (27%)/48/284 (17%)/13/78 (17%)</td>
</tr>
<tr>
<td>Rheumatoid factor: Negative/Positive</td>
<td>6/30 (20%)/64/365 (18%)</td>
</tr>
<tr>
<td>Anti-CCP: Negative/Positive</td>
<td>6/32 (19%)/64/362 (18%)</td>
</tr>
<tr>
<td>CRP (mg/dL): ≤ 1.5/ &gt; 1.5</td>
<td>20/69 (29%)/30/126 (15%)</td>
</tr>
<tr>
<td>Swollen joint count (median: 12): &lt; 12/ ≥ 12</td>
<td>40/174 (23%)/30/221 (14%)</td>
</tr>
<tr>
<td>Tender joint count (median: 24): &lt; 24/ ≥ 24</td>
<td>48/195 (25%)/22/200 (11%)</td>
</tr>
<tr>
<td>HAQ score (median 1.625): &lt; 1.625/ ≥ 1.625</td>
<td>46/193 (24%)/24/202 (12%)</td>
</tr>
<tr>
<td>Oral corticosteroids at baseline: Yes/No</td>
<td>38/251 (16%)/32/144 (22%)</td>
</tr>
<tr>
<td>DMARDs at baseline: Yes/No</td>
<td>38/206 (18%)/12/69 (17%)</td>
</tr>
<tr>
<td>NSAIDs at baseline: Yes/No</td>
<td>57/323 (18%)/13/78 (18%)</td>
</tr>
<tr>
<td>Methotrexate at baseline (mg/wk):</td>
<td>46/261 (18%)/24/127 (19%)</td>
</tr>
<tr>
<td>* Cutpoints for baseline characteristic subgroups were determined by the median value among patients randomized to GLM+MTX</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: In pts with active RA despite ongoing MTX, IV GLM 2mg/kg+MTX yielded significantly higher DAS28-ACR remission rates and higher ACR/EULAR remission rates vs PBO at Wk14 and Wk24. Achievement of DAS28-ACR remission appeared to be enhanced in pts with lower levels of baseline physical function impairment and lower joint counts. Confirmation of these hypothesis-generating data are required.

Ref


1302

Early Neutropenia Is Associated with Clinical Response in Patients Receiving Tocilizumab in Rheumatoid Arthritis. Marie Kostine1, Thomas Barnette1, Eloide Anjou1, Marlene Joly2, Emilie Rabois3, Baptiste Glace Sr.4, Delphine Nigon5, Thierry Schaeverbeke6 and Christophe Richez7

1Rheumatology, CHU Pellegrin, Bordeaux, France, 2CHU Bordeaux Pellegrin, Bordeaux, France, 3Rheumatology, Limoges University Hospital, Limoges, France, 4Rheumatology, Montpellier University Hospital, Montpellier, France, 5CHU Gabriel Montpied, Clermont-Ferrand, France, 6Rheumatology CHU Gabriel Montpied, Clermont-Ferrand, France, 7CHU Purpan, Toulouse, France, 8Groupe Hospitalier Pellegrin, Bordeaux, France, 9Hoˆpital Pellegrin and Universite´ Victor Segalen Bordeaux, France

Background/Purpose: A reduction in peripheral blood neutrophils count is usually observed with the anti-interleukin (IL) 6 receptor antibody tocilizumab. This often appears few days after first administration, but mechanisms are not completely established. Objective is to evaluate the evolution of neutrophils count under tocilizumab (anti IL-6R) treatment for rheumatoid arthritis affected patients and to correlate this evolution with clinical response.
**Methods:** We performed a multicentric retrospective study including patients with RA treated by tocilizumab +/- DMARDs in 5 University French Centers (Bordeaux, Clermont-Ferrand, Limoges, Montpellier and Toulouse). Neutrophils, inflammatory parameters and DAS28 (ESR) were recorded at baseline, and after one and three months of treatment. The comparisons were performed using Student’s-t test or Mann-Whitney test when appropriate. A statistical significant p-value of 0.05 was selected.

**Results:** Approximately one-fifth (19%) of ADA-+MTX-treated pts in DE019 achieved CDC at 1 year vs 5% of PBO+MTX-treated pts (P < 0.001, Table). The addition of OL ADA-+MTX to PBO+MTX-IR in the Rescue ADA arm of OPTIMA permitted 29% (n=102/348) of early RA pts to achieve CDC following 1 year of treatment, a proportion that was comparable with the proportion of MTX-naïve early RA pts treated with ADA-+MTX in PREMIER achieving CDC at 1 year (32%, n=107/325). Significant differences between treatment groups in DE019 and PREMIER were still apparent when the disease activity component was replaced by DAS28(CRP) remission (<2.6).

**Table.** Attainment of Individual and Composite Criteria for Comprehensive Disease Control (CDC) Following 1 Year of Treatment With ADA + MTX or MTX Alone

<table>
<thead>
<tr>
<th>Study Outcome</th>
<th>DE019</th>
<th>OPTIMA</th>
<th>PREMIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA + MTX (N = 207)</td>
<td>PBO + MTX (N = 200)</td>
<td>Rescue ADA (N = 348)</td>
<td>ADA + MTX (N = 268)</td>
</tr>
<tr>
<td><strong>DAS28(CRP), n (%)</strong></td>
<td><strong>&lt;3.2 (LDA)</strong></td>
<td><strong>&lt;2.6 (remission)</strong></td>
<td><strong>HAQ-DI &lt;0.5, n (%)</strong></td>
</tr>
<tr>
<td>100 (48)</td>
<td>29 (15)**</td>
<td>209 (60)</td>
<td>171 (64)</td>
</tr>
<tr>
<td>56 (27)</td>
<td>12 (6)**</td>
<td>154 (44)</td>
<td>125 (47)</td>
</tr>
<tr>
<td>37 (35)</td>
<td>18 (11)**</td>
<td>136 (39)</td>
<td>157 (59)</td>
</tr>
<tr>
<td>102 (79)</td>
<td>56 (38)**</td>
<td>287 (82)</td>
<td>169 (63)</td>
</tr>
<tr>
<td><strong>CDC, n (%)</strong></td>
<td><strong>remission</strong></td>
<td><strong>remission</strong></td>
<td><strong>remission</strong></td>
</tr>
<tr>
<td>40 (19)</td>
<td>10 (5)**</td>
<td>102 (29)</td>
<td>87 (32)</td>
</tr>
<tr>
<td>28 (14)</td>
<td>5 (3)**</td>
<td>82 (24)</td>
<td>67 (25)</td>
</tr>
</tbody>
</table>

Inclusion criteria following 1 year of treatment with ADA-+MTX combination therapy or MTX monotherapy in DE019, in the Rescue ADA arm of OPTIMA, or in PREMIER.

**Background/ Purpose:** Effective treatment of rheumatoid arthritis (RA) patients (pts) aims to suppress inflammation, preserve physical function, and prevent structural damage, which together represent the hallmarks of comprehensive disease control (CDC). Advances in therapies and application of targeted approaches to disease management have made CDC a realistic treatment goal for many pts. The present analysis evaluated CDC attainment following 1 year of treatment with adalimumab (ADA) + methotrexate (MTX) vs MTX alone in 3 different randomized, controlled trials (RCTs).

**Methods:** Pt data originate from the DE019, OPTIMA, and PREMIER RCTs. DE019 enrolled pts with long-standing RA (mean ± 11 years) and an inadequate response (IR) to MTX, OPTIMA and PREMIER enrolled early RA (mean ± 0.4 and 0.7 years, respectively) and MTX-naïve pts. All studies included a comparison of ADA-+MTX vs placebo (PBO)-+MTX and were of at least 1 year duration. Changes to assigned treatment strategy were not allowed in DE019 or PREMIER but were made on the basis of achieving a stable low disease activity [LDA, DAS28(CRP) <3.2] at target weeks 22 and 26 in OPTIMA; PBO-+MTX-IR could receive open-label (OL) ADA-+MTX for an additional 52 weeks (Rescue ADA arm). CDC was defined for this analysis as the simultaneous achievement of LDA, normal function (HAQ-DI <0.5), and the absence of radiographic progression (ΔmTSS ≤0.5). This post hoc analysis assessed the proportion of pts achieving CDC and the individual criteria following 1 year of treatment with ADA-+MTX combination therapy or MTX monotherapy in DE019, in the Rescue ADA arm of OPTIMA, or in PREMIER.

**Conclusion:** CDC appears to be a realistic treatment goal in RA. Treatment with the combination of ADA-+MTX led to significantly higher rates of CDC following 1 year than treatment with MTX alone, and earlier treatment appeared to increase the likelihood of CDC. A targeted treatment approach aiming at stable LDA at 6 months enabled MTX-IR who received OL ADA-+MTX for an additional 1 year to achieve CDC in a proportion that was comparable with MTX-naïve early RA pts initiated with ADA-+MTX, underscoring the utility of treat-to-target approaches in maximizing long-term outcomes.

**References**


**Disclosure:** E. C. Keystone, Abbott, Amgen, AstraZeneca, BMS, Centocor, Genzyme, Merck, Novartis, Pfizer, Roche, and UCB, 2, Abbott, Amgen, AstraZeneca, Biotez, BMS, Centocor, Genentech, Merck, Novocem, Pfizer, Roche, and UCB, 2, Abbott, Amgen, AstraZeneca, Biotez, BMS, Centocor, Genzyme, Merck, Novartis, Onsiuka, Pfizer, Roche, Sanofi-Avinet, Schering-Plough, Wyeth, 5, Imaging Rheumatology bv. 2, F. Faccin, Abbott Laboratories, 3; H. Kupper, Abbott Laboratories, 1, Abbott Laboratories, 3; A. Kavanaugh, Abbott, Amgen, AstraZeneca, BMS, Celgene, Centecor-Janssen, Pfizer, Roche, and UCB, 2, Abbott, Amgen, Astra-Zeneca, BMS, Celgene, Centoecor-Janssen, Pfizer, Roche, and UCB, 5.
treated with open-label (OL) adalimumab (ADA) as monotherapy following attainment of low disease activity (LDA) with ADA+MTX.

Methods: PREMIER was a 2-year (yr), phase 3, randomized, controlled trial (RCT) in MTX-naïve pts with early RA who were randomized to MTX, ADA, or ADA+MTX.1 Pts completing the RCT were eligible to receive OL ADA for up to an additional 8 yrs (this trial is ongoing); MTX could be added at the discretion of the physician. This post hoc analysis included data from pts treated with ADA+MTX during the RCT who reached at least an LDA state [defined as DAS28(CRP)<3.2] at Yr 2 (ie, the end of the RCT) and received OL ADA as monotherapy up to Yr 5. The percentages of pts remaining in LDA or with normal function (HAQ-DI <0.5) at Yr 5 were summarized using non-responder imputation based on the population entering the OL period and as observed for pts with data available at Yr 5. Mean ΔmTSS and the proportion without radiographic progression (ΔmTSS ≤0.5) from Yrs 2–5 were summarized as observed. Conditional logistic regression analysis based on propensity score matching was used to identify variables significantly associated with MTX use.

Results: Of the 183 ADA+MTX-treated pts who enrolled in the OL extension, 140 (83%) reached an LDA state at Yr 2. Among the LDA responders, 84 (60%) received ADA as monotherapy during the OL period, and 56 (40%) remitted MTX during the OL extension (time to 1st MTX use: mean/median=28/5 weeks). Higher physician’s global assessment appeared to predict MTX use during the OL extension (P<0.01). A total of 60 pts (75%) completed 3 yrs of OL ADA monotherapy. Adverse events were the most frequently cited reason for study discontinuation (n=9); no pt withdrew citing loss of efficacy. The majority of pts retained LDA at Yr 5 with ADA monotherapy (63%; Table); 50% of the 84 pts were in DAS28(CRP) remission and 58% had normal function at Yr 5. Of the pts with Yr 5 data available, 58% were in LDA. Further, OL ADA monotherapy was associated with clinically insignificant radiographic progression for pts completing Yr 5 (mean annual mTSS progression rate from Yrs 2–5 =0.05 units/yr).

Table. Year 5 Outcomes for Year-2 LDA Responders Who Received Up to 3 Years of Treatment With Open-label ADA Monotherapy

<table>
<thead>
<tr>
<th>Assessment Parameter</th>
<th>ADA+MTX Monotherapy</th>
<th>Non-responder imputation</th>
<th>Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAS28(CRP), mean ± SD</td>
<td>N/A</td>
<td>2.3 ± 0.9</td>
<td></td>
</tr>
<tr>
<td>DAS28 (CRP &lt;3.2, % (n/N))</td>
<td>63 (53/84)</td>
<td>88 (53/60)</td>
<td></td>
</tr>
<tr>
<td>HAQ-DI, mean ± SD</td>
<td>N/A</td>
<td>0.3 ± 0.5</td>
<td></td>
</tr>
<tr>
<td>HAQ-DI ≤0.5, % (n/N)</td>
<td>58 (49/84)</td>
<td>78 (49/63)</td>
<td></td>
</tr>
<tr>
<td>ΔmTSS, mean ± SD</td>
<td>N/A</td>
<td>1.5 ± 5.6</td>
<td></td>
</tr>
<tr>
<td>ΔmTSS ≤0.5, % (n/N)</td>
<td>50 (42/84)</td>
<td>72 (42/58)</td>
<td></td>
</tr>
</tbody>
</table>

*Patients with missing data at the Yr 5 assessment were imputed as non-responders.

Conclusion: Following attainment of an LDA state at Yr 2 with ADA+MTX combination therapy, treatment with OL ADA as monotherapy for 3 yrs was sufficient for most pts to retain LDA and have minimal radiographic progression. Thus, MTX withdrawal appears possible for some pts whose disease activity is responsive to ADA monotherapy.

Reference

1Arthritis Rheum 2006;54:26–37.


1305

Three-Year Follow-up of Rituximab in Rheumatoid Arthritis: Results From the Belgian MIRA (MabThera in Rheumatoid Arthritis) Registry, Filip De Keyser1, Patrick Duerz1, Rene Weyand2, Marie-Joelle Kaiser3, and IJ Hoffmann4.

Background: Rituximab is a chimeric monoclonal antibody directed against the CD20 antigen on lymphocytes. The MIRA registry was set up to collect safety, efficacy and (re)treatment practice data for Belgian RA patients treated with rituximab.

Methods: All rheumatologists from Belgium and Luxemburg were invited to participate in the study. Patient demographics were collected at baseline. Follow-up data included disease activity measures, attrition and reasons for discontinuation. Evolution of disease activity is reported here for the subpopulation followed for at least 3 years. Data are presented as mean±standard error (SE) or as percentages. Data analysis was performed with SPSS 20.0 software.

Results: The MIRA registry includes 649 patients (treated by 80 rheumatologists in 52 centers), who started rituximab therapy between November 2006 and October 2011. The study population consisted for 75% of females; 55.3% were RF positive and 33.9% anti-CCP positive. Patients starting rituximab were on average 57.4 ± 0.5 years old with a mean disease duration of 12.8 ± 0.4 years. Patients received on average 2.82 ± 0.07 range (1–9) rituximab treatments, over a median follow up time of 82 weeks (range 0–254 weeks). At database lock, 433 patients (66.72%) were still on rituximab treatment, 182 (28.04%) had stopped, and 34 patients (5.24%) were lost to follow up.

Over the study period, a clear evolution was observed in the baseline characteristics of patients starting rituximab treatment. The number of previously failed anti-TNF drugs used before starting rituximab significantly decreased over time (chi-square P<0.001). In 2006, 50.0% of patients had previously been treated with more than one anti-TNF, whereas in 2011 only 33.4% of patients had received more than one anti-TNF before switching to rituximab. In parallel, the DAS28 values at baseline significantly decreased, from 6.31 ± 0.59 in 2006 to 5.65 ± 0.17 in 2011 (ANOVA, P<0.001).

Evolution of disease activity was analysed in a subset of 191 patients who were followed for at least 3 years. DAS28 showed significant changes over the study period (ANOVA, P<0.001), declining in the first 8 weeks after rituximab treatment, and stabilising afterwards. DAS28 in this subgroup with 3-year follow-up at weeks 0, 8, 52, 104 and 156 respectively were 6.16 ± 0.09, 4.47 ± 0.45, 3.79 ± 0.18, 3.85 ± 0.29 and 3.58 ± 0.42.

Conclusion: Data from the MIRA registry shows that over the last 5 years, less alternative anti-TNF treatments were used in Belgium before switching RA patients to rituximab. Additionally, rituximab treatment tended to be started in patients with lower disease activity. Furthermore, this clinical practice study demonstrates that rituximab treatment results in adequate long-term disease control.

Disclosure: F. De Keyser, Roche Pharmaceuticals, UCB, MSD, AstraZeneca, Pfizer, 5; P. Duerz, BMS - Less than US$2000, 8; R. Westhoven, Janssen Research and Development, LLC, 1; M. J. Kaiser, None; I. Hoffman, None.

1306


Background/Purpose: To identify the proportion of RA and PsA patients that discontinue MTX and the reasons for discontinuation. Evolution of disease activity was analysed in a subset of 191 patients who were followed for at least 3 years. DAS28 showed significant changes over the study period (ANOVA, P<0.001), declining in the first 8 weeks after rituximab treatment, and stabilising afterwards. DAS28 in this subgroup with 3-year follow-up at weeks 0, 8, 52, 104 and 156 respectively were 6.16 ± 0.09, 4.47 ± 0.45, 3.79 ± 0.18, 3.85 ± 0.29 and 3.58 ± 0.42.

Methods: A retrospective review of the Rheumatology departments electronic database was undertaken to identify all patients who had received MTX for RA or PsA. This was followed by review of both the electronic and paper records to identify patients in whom MTX had been discontinued. The objective of our study was to ascertain the proportion of RA and PsA patients that discontinue MTX and the reasons for this.

Results: A retrospective review of the Rheumatology departments electronic database was undertaken to identify all patients who had received MTX for RA or PsA. This was followed by review of both the electronic and paper records to identify patients in whom MTX had been discontinued. The reasons for this were then classified into several categories. Every effort was made to ensure that the correct reasons for drug withdrawal were documented. Discrepancies were discussed with a senior member of the team. Cases with insufficient data were excluded from the final analysis.

Results: 1257 patients on MTX were identified. Of these 762 had RA and 495 had PsA. MTX had been stopped in 260 patients with RA and 71 patients with PsA. In RA patients, the mean dose at the time of discontinuation of MTX was 14.1 mg/week (dose range 5–30 mg, SD 5.6 mg) and in PsA patients 13.6 mg/week (dose range 5–25 mg, SD 5.0 mg) (missing data in 80 and 26 patients respectively). The reasons for discontinuation and differences between the rheumatoid and psoriatic arthritis groups are highlighted in Table 1. In our data suggests that about a third of patients with RA and PsA eventually stop methotrexate, most of whom cite intolerance as a reason. In addition a statistically significant difference between the RA and PsA cohorts was seen, with abnormalities in blood counts (leucocenia and thrombocyto-
Methods: Multicentre (6 sites in CEE), randomized, double-blind, placebo (PLC) controlled, dose escalation, Phase I/II study in patients with active RA on stable MTX therapy. Five treatment groups are tested in the SAD part and primary objectives are safety and tolerability of single ascending doses, MTD and/or biological effective doses (BED). Following SAD completion, an interim PK/PD analysis was performed to confirm the adequacy of the anticipated dosing regimen in MAD. Monthly or bi-monthly doses of ALX-0061 up to 12 and 24 weeks are tested in MAD with roll-over of PLC subjects after 12 weeks interim efficacy analysis to enrich the safety and efficacy population of ALX-0061.

Biological and clinical efficacy is assessed with PK/PD, radiographic (MRI) and clinical scores at 12 weeks and end of study and correlated with pre-clinical modelling and literature data on IL-6R pathway inhibition.

Results: 28 patients with active RA were included in the SAD part and received single injections of 0.3mg/kg (2 pat), 1mg/kg (6 pat), 3mg/kg (6 pat), 6mg/kg (6 pat) and PLC (8 pat). Average age (52y) and BMI (25.6) were balanced between the groups; compared with PLC group, patients in ALX-0061 arm had higher disease activity (ACR Class I/II 85% vs 62.5%; DAS high disease activity 45% vs 12.5%). Safety: ALX-0061 was well tolerated. One subject reported an acute hypersensitivity event, no further SAEs were reported and no DLT occurred. The MTD was not reached. No clear increase in frequency or severity of AEs with increased doses of ALX-0061 observed. PK: Serum ALX-0061 concentrations and corresponding drug exposure increased with escalated dose. PD: CRP, ESR, fibrinogen and serum amyloid A showed rapid and marked decrease with highest effect observed at highest dose levels (3 and 6mg/kg). IL-6 and sIL-6R plasma concentrations increased with dose, representing a marker to monitor the biological effect of ALX-0061 on its target. Clinical efficacy: Following single injection, 16 ALX-0061 subjects (60%) and 4 PLC subjects (37.5%) achieved moderate/good EULAR response at 2 months. 10 ALX-0061 subjects (50%) achieved LDA (6 pat) or DAS28 remission (4 pat), 2 PLC subjects (25%) achieved LDA (1 pat) or DAS28 remission (1 pat). Based on PK/PD modelling, three dose levels were selected for the MAD: 1 mg/kg Q4W, 3 mg/kg Q4W and 6 mg/kg Q8W. 30 patients were treated in MAD part and completion is expected before end of 2012.

Conclusion: Single injections of ALX-0061 were well tolerated at BED. The pre-clinical PK/PD modelling was confirmed and dose-dependent changes of early inflammation biomarkers were consistent with inhibition of the IL-6 pathway. The MAD study part will further assess early effect of ALX-0061 on disease activity with radiographic and clinical disease score evaluations.

Disclosure: S. De Bruyn, Ablynx N.V., 1, Ablynx N.V., 3; B. Gachályi, None; B. Rokjovich, None; S. Bruk, None; P. Sramek, None; M. Korkosz, None; K. Krause, None; P. Schoen, Ablynx N.V., 1, Ablynx N.V., 3; L. Sargentini-Maier, Ablynx N.V., 1, Ablynx N.V., 3; J. D’Artois, Ablynx N.V., 1, Ablynx N.V., 3; K. Verschueren, Ablynx N.V., 1, Ablynx N.V., 3; K. De Swert, Ablynx N.V., 1, Ablynx N.V., 3; G. Arold, None; J. B. Holz, Ablynx N.V., 1, Ablynx N.V., 3, Ablynx N.V., 6.

1308

Opportunistic Infections in Patients with Rheumatoid Arthritis Treated with Rituximab: Data From the Autoimmunity and Rituximab Registry. J. D. Fitzpatrick, None; R. B. Ball, None; T. B. Bacon, None; A. J. Crowe, None; G. M. Doggart, None; T. Bardou, None; R. J. Carson, Sr., Alain G. Cantagrel, Bernard Combé, Maxime Doudagos, Rene-Marc Filip, Bertrand Godeau, Loic Guillot, Xavier X. Le Loet, Eric Hauchalla, Thierry Schaeverbecke, Jean Sibilia, Isabelle Pane, Gabriel Baron, and Xavier Mariette 13. Strasbourg University Hospital, Strasbourg, France; 14. Hotel Dieu, Paris Descartes University, Paris, France; 15. Assistance Publique-Hopitaux de Paris, Hopital Pitie-Salpetriere, Paris, France; 16. Place du Docteur Baylac, Toulouse, France, 17. Hospital Lapeyronie, Montpellier, France, 18. Rheumatology B Department, Paris-Descartes University, Cochin Hospital, Paris, France; 19. Hospital R Salengro CHRU, Lille CEDEX, France, 20. Service de médecine interne, Université Paris Est Creteil, AP-HP, Hôpital Mondor Creteil, France, Creteil, France, 21. Department of Internal Medicine, Renferal Center for Rare Autoimmune and Systemic Diseases, Hôpital Cochin, AP-HP, Université Paris Descartes, Paris, France, 22. CHU de ROUEN, Rouen, France, 23. Department of Internal Medicine, Claude Huriez Hospital, University of Lille, Lille CEDEX, France, 24. Groupe Hospitalier Pellegrin, Bordeaux, France, 25. CHU Hautepierre, Strasbourg, France, 26. Hotel Dieu University Hospital Paris, France, 27. Strasbourg, France, 28. Université Paris-Sud, Le Kremlin Bicêtre, France.

Background/Purpose: Therapy with biological agents may be associated with opportunistic infections (OIs). Data on the occurrence of OIs in patients with RA treated with rituximab (RTX) are limited.

Objective: To describe the spectrum of OIs associated with RTX therapy.

Methods: The Autoimmunity and Rituximab (AIR) registry was set up by the French Society of Rheumatology. Patients are followed up every 6
months during 7 years. Data regarding serious infections are validated by the 2 coordinators of the study using chart copies.

Results: 1975 patients had already had at least 1 follow-up visit. The follow-up was 4937 patient/years on January 14, 13 OIs occurred (0.3 OIs/100 patient years). 23.0% of OIs were due to intra-cellular bacterial (1 tuberculosis, 1 atypical mycobacteriosis, 1 non-typoid salmonellosis), 38.6% were viral (2 severe herpes zoster, 1 varicella, 2 disseminated cytomegalovirus infections), 30.8% were fungal (2 pneumocystosis, 1 echinococcosis, 1 Scedosporium infection) and 7.6% were parasitic (1 disseminated scabies). 1 patient required admission to the intensive care unit and died from herpetic hepatitis.

Conclusion: Even in real life patients, the risk of tuberculosis remains very low in patients treated with RTX in Western Europe. However, some various and serious OIs, especially those with intracellular micro-organisms, may unfrequently develop in patients receiving RTX. This risk requires to be reevaluated with a longer follow-up.

Disclosure: J. E. Gottenberg, None; P. Ravaud, None; T. Bardin, None; P. P. Caouls Br., None; A. G. Cantagrel, None; B. Combe, None; M. Dougdos, None; R. M. Filpo, None; B. Goddeau, None; L. Guillemin, None; X. X. Le Loet, None; E. Hachulla, None; T. Schaeverbeke, None; J. Sibilia, None; I. Pane, None; G. Baron, None; X. Mariette, None.

1309 Predictive Risk Factors of Serious Infections in RA Patients Treated with Abatacept in Real Life: Results in the Orencia and Rheumatoid Arthritis (ORA) Registry.

Background/Purpose: Jacques-Eric Gottenberg1, Philippe Ravaud2, Alain G. Cantagrel1, Bernard Combe3, Rene-Marc Filpo3, Thierry Schaeverbeke4, Eric Foucher5, Philippe Gaubin6, Damien Louquéille7, Stéphane Baran8, Marie-Pascale Lefebvre9, Jean Sibilia10, Xavier Le Loet11, Christian Marcelli12, Marie-Claude Brun13, Isabelle Panet14, Elodie Perrodau15, Gabriel Baron16 and Xavier Mariette17.

Methods: The ORA registry is an independent registry promoted by the French Society of Rheumatology which includes RA patients treated with abatacept. At baseline, 3,297 patients had positive JC antibody and 3,102 patients had a previous record of serious infections. The ORA registry is an independent registry promoted by the French Society of Rheumatology which includes RA patients treated with abatacept. At baseline, 3,297 patients had positive JC antibody and 3,102 patients had a previous record of serious infections.

Results: In ORA registry, severe infections in patients treated with abatacept were slightly more frequent than in clinical trials. This might be related to the fact that a high proportion of patients with comorbidities, who would have been excluded from controlled trials, are treated with ABA in real life. Characteristics of RA (durations, previous treatments including anti-TNF or rituximab, disease activity) were not associated with serious infections. Predictive risk factors of serious infections in patients treated for RA with ABA in common practice included age and previous record of serious infections.

Disclosure: J. E. Gottenberg, None; P. Ravaud, None; A. G. Cantagrel, None; B. Combe, None; R. M. Filpo, None; T. Schaeverbeke, None; E. Houvenagel, None; P. Gaudin, None; D. Louuelle, None; S. Rist, None; M. Dougdos, None; J. Sibilia, None; X. Le Loet, None; C. Marelli, None; T. Bardin, None; I. Pane, None; E. Perrodou, None; G. Baron, None; X. Mariette, None.

1310 Analysis of Anti-JC Polyomavirus T-Cell Immune Response with JC-Feron in Patients with Rheumatoid Arthritis Treated with Rituximab or Anti-TNF.

Raphaële Seror, None; Houriya Chavez, None; Aurélie Mazeret, None; Jerome Sellami, None; Bruno Fauvre, None; Maxime Dougdos, None; Yasmine Taoufi, None and Xavier Mariette, None.

1 Bicêtre university hospital, LE Kremlin-Bicêtre, France, 2 Hopital Bicêtre, Université Paris Sud, AP-HP, France, 3 Hopital Saint-Antoine, Pierre et Marie Curie University Paris 6, AP-HP, 75012, France, 4 AHP-Pitié Salpetrière Hospital/UPMC, Paris, France, 5 Paris-Desertes University, APHP, Cochin Hospital, Paris, France, 6 Université Paris-Sud, LE Kremlin Bicêtre, France

Background/Purpose: Some cases of progressive multifocal leukoencephalopathy (PML) have been described in patients with autoimmune diseases with profound immunosuppression, due to replication of JC polyomavirus within the CNS. Biologics such as natalizumab and efalizumab have been clearly associated with an increased risk of PML. Rare cases of PML have also been described in patients treated with rituximab (RTX), without any idea of the mechanisms which could support this association. Our objectives were to analyze JC viral load and anti-JC T cell response in rheumatoid arthritis (RA) patients treated with RTX or anti-TNF.

Methods: In four French rheumatology departments, RA patients starting a new biological therapy with either RTX or anti-TNF were recruited to participate in this prospective study. All patients were screened at baseline, 3 to 6 months and 12 to 18 months after the beginning of biologic therapy during for JC tests, including JC virus (JCV) and JC virus plasma viral load (quantitative PCR method) and specific IFN-g Elispot for JC (Elispot was performed after overnight activation of T cells with purified JCV). It was planned to include half of patients treated with RTX and half with anti-TNF, and to compare evolution of anti-JCV T cell response and JC viral load between these 2 groups.

Results: Between February 2010 and January 2011, 42 patients were included: 19 received RTX and 23 anti-TNF (etanercept n = 15; adalimumab n = 3; infliximab n = 4; golimumab n = 1). At baseline and during the whole follow-up, all patients had negative PBMC and plasma viral load, 19/42 (45.2%) had positive and stable urine viral load. At baseline, 5 patients had positive JC Elispot, 2 before anti-TNF and 3 before RTX, 2 out of these 5 patients having also positive urine viral load, one in each group. To assess reproducibility of the JC Elispot, at baseline 4 patients had been tested twice a few days apart, results were similar (3 had negative and one had positive results).

38/42 patients had a follow-up visit. The evolution of JCV Elispot is reported in the table. Overall, 9 patients had a positive JCV Elispot once, 5 at baseline, 2 after RTX and 2 after anti-TNF during the follow-up, including 3 who had positive urine viral load, which remained positive during the whole follow-up.

Table. Evolution of JC-feron positive patients
Conclusion: The presence of anti-JCV T cell response has been found positive at least once in 9/42 (21%) of patients with RA treated with anti-TNF or rituximab without any link with the use of one or the other type of biologics. These results suggest that in patients chronically infected with JC virus with long duration RA treated or not with biologics, transient reactivation of JC may occur leading to T-cell response. Our data do not support a link with RTX or anti-TNF use. Long term follow up in larger cohorts of patients is needed to determine if a positive JCV Elispot could be predictive of further central neurological complication of JC virus.

Disclosure: R. Seror, Roche Pharmaceuticals, 5; Pfizer Inc, 5; Roche Pharmaceuticals, 2; H. Chaver, None; A. A. Mazet, None; J. Sellam, Roche Pharmaceuticals, 5; Pfizer Inc, 5; Abbott Laboratoires, 5; Schering-Plough, 5; B. Fauret, Pfizer Inc, 9; Roche Pharmaceuticals, 9; Abbott Immunology Pharmaceuticals, 9; Ucb, 9; Roche Pharmaceuticals, 6; Abbott Immunology Pharmaceuticals, 6; Pfizer Inc, 6; M. Doudagos, Pfizer Inc, 2; Pfizer Inc, 6; Pfizer Inc, 5; Roche Pharmaceuticals, 2, Roche Pharmaceuticals, 6; Abbott Immunology Pharmaceuticals, 2; Abbott Immunology Pharmaceuticals, 6, UCB, 2, Ucb, 6, ucb, 5, Roche Pharmaceuticals, 5; Abbott Immunology Pharmaceuticals, 5; Y. Taouilh, None; X. Mariette, Pfizer Inc, 5, UCB, 5, Roche Pharmaceuticals, 5.

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A Novel Individualized Treatment Approach in Open-Label Extension Study of Ozoralizumab (ATN-103) in Subjects with Rheumatoid Arthritis on a Background of Methotrexate. Roy M. Fleischmann1, Steven De Bruyn2, Christian Duby2, Katrien Verschueren2, Judith Baumeister2, Laura Sargenti-Maier2, Cedric Ververken2 and Josefin-Beate Holz2. 1University of Texas, Dallas, TX, 2Ablynx N.V., Zwijnaarde, Belgium

Background/Purpose: Ozoralizumab (ATN-103), a novel TNFα inhibitor, is a trivalent, bispecific Nanobody® that potently neutralises TNF and binds to human serum albumin to increase its vivo half-life. A single ascending dose (SAD)/multiple ascending dose (MAD) studies in 313 patients (world-wide and Japan) with active RA on stable MTX background evaluated ozoralizumab’s clinical activity and safety during 12 weeks of treatment. The 80mg Q4W dosing regimen significantly improved disease activity measures compared with placebo. Patients completing the MAD trials were allowed to enrol in this 48-week open-label extension (OLE) study to evaluate the long-term safety and tolerability of ATN-103. An innovative dosing concept with individual dose escalation from 10mg to max. 80mg at any time during trial was tested in this OLE.

Methods: Study start was defined as completion of 20-week follow-up visit in the MAD trials. Individualized dosing regimen was introduced with all patients starting on active treatment at 10mg SC monthly. Subsequently, dose escalation to 30mg and 80mg monthly SC was dependent on patient’s CDAI and safety. Primary objective was long-term safety and tolerability of ATN-103. Efficacy measures, as well as PK/PD, were included as exploratory endpoints.

Results: 266/313 pat (85%) enrolled in the OLE. Baseline mean age was 52y, 80% female, DAS 6.11 and CDAI 42. Dropout rate was low with 13% at Wk12 of therapy can predict the likelihood of achieving remission (DAS28<2.6) and extent of radiographic progression after 1 year (yr) (52–56 wks) of CZP treatment in Japanese pts receiving coadministered MTX (JRAPID, NCT00851318), DMRDs other than MTX or CZP monotherapy (Hikari, NCT00850343).

Methods: Both studies included a 24 Wk double blind phase (CZP 400mg Wks 0, 2, 4, then CZP 200mg every other week (Q2W)), followed by open-label treatment for 28 Wks with CZP 200mg Q2W or CZP 400mg every 4 wks (Q4W). The mean change in mTSS and the proportion of pts who achieved remission at 1 yr was assessed according to the level of DAS28 response (ie, DAS28 [ESR] change from baseline [CBF] ≥0.6 and ≥1.2 units) at Wk12. Observation carried forward (LOCF) imputation was used for pts who withdrew.

Results: 82 J-RAPID and 116 HIKARI CZP treated pts were included. J-RAPID and HIKARI pts had a mean baseline DAS28 (ESR) of 6.19 and 6.09, and mean mTSS total of 50.4 and 36.5, respectively. Overall, 77% of J-RAPID pts and 74% of HIKARI pts had a ≥1.2 DAS28 (ESR) response at Wk12. Remission was achieved by 32.9% and 27.6% of the original J-RAPID and HIKARI CZP ITT populations at 1 yr. Pts who did not achieve a DAS28 (ESR) change of ≥1.2 at Wk12, had a <4% chance of achieving remission at Wk52 (Table) and had greater radiographic progression in 1 yr than responders. Failure to achieve remission at 1 yr and the extent of radiographic progression was also dependent on the magnitude of DAS28 (ESR) change at Wk12. Pts with a DAS28 (ESR) response of <0.06 had a lower rate of remission and greater radiographic progression at 1 yr compared to pts with a DAS28 (ESR) response of <1.2 (Table). Similar results were observed in both the J-RAPID and HIKARI populations.

Conclusion: The majority of Japanese pts responded to treatment at CZP at Wk12 in the broad pt population represented by these studies.

Table. Wk 12 response predicts remission rate and mean mTSS total score change after 1 year

<table>
<thead>
<tr>
<th>J-RAPID CZP 200 mg Q2W + MTX (N = 82)</th>
<th>HIKARI CZP 200 mg Q2W (N = 116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in DAS28 (ESR) at Wk12</td>
<td>Change in mTSS total score</td>
</tr>
<tr>
<td>Mean change in DAS28 (ESR) rate (%)</td>
<td>Mean change in mTSS total score</td>
</tr>
<tr>
<td>DAS28 (ESR) response rate n (%)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>&lt;0.6</td>
<td>10</td>
</tr>
<tr>
<td>≥0.6</td>
<td>72</td>
</tr>
<tr>
<td>&lt;1.2</td>
<td>19</td>
</tr>
<tr>
<td>≥1.2</td>
<td>63</td>
</tr>
</tbody>
</table>

Conclusion: The majority of Japanese pts responded to treatment with CZP at Wk12 in the broad pt population represented by these studies.
1313

Methods: The French Society of Rheumatology has set up a nationwide prospective 7-year registry, AIR to investigate the long-term safety and efficacy in real life of RTX.

Results: Among the 2000 patients enrolled, 272 patients (13.6%) treated with RTX had a history of cancer prior to RTX. 33% of them had a history of breast cancer with a median duration of 6 years, 15% of skin cancer (6% melanoma), 14% of lymphoma, 7% a prostate cancer, 6% an uterus cancer, 5% a colorectal cancer, 3% a thyroid cancer and 17% another cancer (kidney, bladder, lung, blood malignancies, brain). The main baseline characteristics of these patients (disease duration 15 years, record of serious or recurrent infections: 35.2%, proportion of patients treated without a concomitant synthetic DMARD: 38.2%) were comparable to those of patients without a history of cancer, except an older age (63 vs 58 years), a higher proportion of patients without anti-TNF prior to RTX (55% vs 83%) and a lower disease activity using the two combined algorithms was 88.9%. Also, in the prediction of remission or low disease activity before treatment with infliximab (IFX) and etanercept (ETN) treatment is currently one of the most important matters in RA treatment. However, there is no method for prediction of remission or low disease activity. Previously, we established and validated SNP algorithms for prediction of remission or non-remission among IFX or ETN-treated RA patients (Matsubara T, et al., The 75th annual meeting of the American College of Rheumatology (ACR). Chicago, IL, USA (2011)). In this study, in order to predict remission or low disease activity with these biologics, we validated a third population sample by using the first and second population algorithms.

Methods: The first population sample included 187 RA patients, the second, 206 patients, and the third, 145 patients, for a total of 538 patients from eleven hospitals in different regions of Japan. Remission criteria and low disease activity were determined by DAS28(CRP) within 24−30 weeks after the initiation of treatment with the biologics. Case-control analyses between 285,548 SNPs and remission or low disease activity was examined by Fisher’s exact test. For each biologic, IFX or ETN, we selected 10 SNPs associated with remission or low disease activity which were common in the analyses of both the first and second population (p < 0.05). We then scored the relationship between each SNP and responsiveness, the estimated total score of 10 SNPs (estimated scoring in each SNP was as follows: homo allele: 1 point, hetero allele: 0 points, and homo allele in the majority of non-remission: −1 point), and then examined relationship between remission, non-remission, and the total score.

Results: In the validation of the third populations sample, accuracy (true positive+true negative)/total) for prediction of IFX remission or low disease activity using the two combined algorithms was 88.9%. Also, in the validation of the third population sample, accuracy of prediction of ETN remission or low disease activity using the two combined algorithms was 76.7%. Therefore, the accuracy of prediction of remission or low disease activity using the two combined algorithms is exponentially better than that of remission or low disease activity algorithms alone.

Conclusion: These highly accurate algorithms using SNP analysis may be useful in the prediction of remission or low disease activity before treatment with IFX or ETN, and in this way can contribute to future tailor-made treatment with biologic agents.

References:

1. van der Heijde D. Ann Rheum Dis 2010;69(suppl 3):505

Disclosure: J. E. Gottenberg, None; M. O. Duzanski, None; T. Bardin, None; P. Cacoub Sr., None; A. Cantagrel, None; R. M. Filo, None; B. Goddeau, None; L. Guillemin, None; E. Hachulla, None; X. Le Loet, None; J. Schaeverbeke, None; J. Sibilia, None; I. Pane, None; P. Ravaud, None; G. Baron, None; X. Mariette, None.

1314
Validation of Algorithms Using Genome-Wide SNP Analysis for Prediction of Remission or Low Disease Activity in Infliximab or Etanercept-Treated RA Patients. Tsukasa Matsubara, Satoru Koyano, Keiko Funahashi, James E. Middleton, Takako Mijura, Kosuke Okuda, Takeshi Nakamura, Akira Sagawa, Takeo Sakurai, Hiroaki Matsumo, Tomomaro Izuamiha, Isuiko Shono, Kou Katayama, Toyomitsu Tsuchida, Mitsuishi Iwashashi, Tomomi Tsuji, and Motohiro Orbe.

Methods: In the prospective 7-year registry, AIR to investigate the long-term safety and efficacy of RTX in patients with a history of cancer included in the AIR (“Autoimmunity and Rituximab”) registry.

Results: Among the 2000 patients enrolled, 272 patients (13.6%) treated with RTX had a history of cancer prior to RTX. 33% of them had a history of breast cancer with a median duration of 6 years, 15% of skin cancer (6% melanoma), 14% of lymphoma, 7% a prostate cancer, 6% an uterus cancer, 5% a colorectal cancer, 3% a thyroid cancer and 17% another cancer (kidney, bladder, lung, blood malignancies, brain). The main baseline characteristics of these patients (disease duration 15 years, record of serious or recurrent infections: 35.2%, proportion of patients treated without a concomitant synthetic DMARD: 38.2%) were comparable to those of patients without a history of cancer, except an older age (63 vs 58 years), a higher proportion of patients without anti-TNF prior to RTX (55% vs 83%) and a lower disease activity using the two combined algorithms was 88.9%. Also, in the prediction of remission or low disease activity before treatment with infliximab (IFX) and etanercept (ETN) treatment is currently one of the most important matters in RA treatment. However, there is no method for prediction of remission or low disease activity. Previously, we established and validated SNP algorithms for prediction of remission or non-remission among IFX or ETN-treated RA patients (Matsubara T, et al., The 75th annual meeting of the American College of Rheumatology (ACR). Chicago, IL, USA (2011)). In this study, in order to predict remission or low disease activity with these biologics, we validated a third population sample by using the first and second population algorithms.

Methods: The first population sample included 187 RA patients, the second, 206 patients, and the third, 145 patients, for a total of 538 patients from eleven hospitals in different regions of Japan. Remission criteria and low disease activity were determined by DAS28(CRP) within 24−30 weeks after the initiation of treatment with the biologics. Case-control analyses between 285,548 SNPs and remission or low disease activity was examined by Fisher’s exact test. For each biologic, IFX or ETN, we selected 10 SNPs associated with remission or low disease activity which were common in the analyses of both the first and second population (p < 0.05). We then scored the relationship between each SNP and responsiveness, the estimated total score of 10 SNPs (estimated scoring in each SNP was as follows: homo allele in the majority of remission: +1 point, hetero allele: 0 points, and homo allele in the majority of non-remission: −1 point), and then examined relationship between remission, non-remission, and the total score.

Results: In the validation of the third populations sample, accuracy (true positive+true negative)/total) for prediction of IFX remission or low disease activity using the two combined algorithms was 88.9%. Also, in the validation of the third population sample, accuracy of prediction of ETN remission or low disease activity using the two combined algorithms was 76.7%. Therefore, the accuracy of prediction of remission or low disease activity using the two combined algorithms is exponentially better than that of remission or low disease activity algorithms alone.

Conclusion: These highly accurate algorithms using SNP analysis may be useful in the prediction of remission or low disease activity before treatment with IFX or ETN, and in this way can contribute to future tailor-made treatment with biologic agents.

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1. van der Heijde D. Ann Rheum Dis 2010;69(suppl 3):505

Disclosure: J. E. Gottenberg, None; M. O. Duzanski, None; T. Bardin, None; P. Cacoub Sr., None; A. Cantagrel, None; R. M. Filo, None; B. Goddeau, None; L. Guillemin, None; E. Hachulla, None; X. Le Loet, None; J. Schaeverbeke, None; J. Sibilia, None; I. Pane, None; P. Ravaud, None; G. Baron, None; X. Mariette, None.
Using RNA gene expression profiling and pathway analysis, significant gene changes associated with the clinical response to tabalumab were identified. We observed changes in genes related to B cell development and maturation which is consistent with tabalumab’s mechanism of action. These data may provide additional potential targets or biomarkers for future studies in RA.

**Table.** Top candidate genes whose gene expression changes were significant following treatment with tabalumab

<table>
<thead>
<tr>
<th>Gene</th>
<th>Raw p-value/Adjusted p-value</th>
<th>Gene</th>
<th>Raw p-value/Adjusted p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-cell leukemia/lymphoma</td>
<td>5.04E-18/</td>
<td>phosphatidic acid phosphatase 2</td>
<td>3.30E-03/</td>
</tr>
<tr>
<td>1A, TCL1A</td>
<td>2.90E-09/</td>
<td>like-glycosyltransferase, LARGE</td>
<td>1.70E-10/</td>
</tr>
<tr>
<td>MACRO domain containing 2, MACRD2</td>
<td>2.00E-04/</td>
<td>HLA-DOB</td>
<td>1.10E-06/</td>
</tr>
<tr>
<td>immuneglobulin heavy constant delta, IgHD</td>
<td>1.60E-01/</td>
<td>immunoglobulin heavy constant mu, IgHM</td>
<td>1.10E-04/</td>
</tr>
<tr>
<td>CD72 molecule, CD72</td>
<td>1.70E-09/</td>
<td>immunoglobulin heavy constant mu, IgHM</td>
<td>1.10E-04/</td>
</tr>
<tr>
<td>chronic lymphocytic leukemia up-regulated 1, CLLU1</td>
<td>2.30E-03/</td>
<td>sodium channel, voltage-gated, type III, alpha subunit, SCN3A</td>
<td>1.10E-08/</td>
</tr>
<tr>
<td>Fc receptor-like A, FCRLA</td>
<td>7.44E-01/</td>
<td>major histocompatibility complex, class II, DO beta, HLADOB</td>
<td>5.80E-04/</td>
</tr>
<tr>
<td>tetraspan 13, TSPAN13</td>
<td>4.08E-07/</td>
<td>CD97a molecule, CD97A</td>
<td>3.20E-07/</td>
</tr>
<tr>
<td>CD19 molecule, CD19</td>
<td>4.08E-07/</td>
<td>family with sequence similarity 129, member C, FAM129C</td>
<td>4.08E-07/</td>
</tr>
<tr>
<td>Fc fragment of IgG, low affinity II receptor for (CD23), FCER2</td>
<td>1.10E-06/</td>
<td>protein kinase c (AMP, dependent, catalytic) inhibitor gamma, PKIG</td>
<td>7.30E-07/</td>
</tr>
</tbody>
</table>

**Conclusion:** Using RNA gene expression profiling and pathway analysis, significant gene changes associated with the clinical response to tabalumab were identified. We observed changes in genes related to B cell development and maturation which is consistent with tabalumab’s mechanism of action. These data may provide additional potential targets or biomarkers for future studies in RA.


**Background/Purpose:** Tabalumab, a monoclonal antibody neutralizing membrane bound and soluble B cell activating factor (BAFF), has been shown to reduce the signs and symptoms of rheumatoid arthritis (RA). To better define tabalumab’s molecular mechanism of action, gene expression profiling of whole blood RNA was performed to characterize individual gene expression signatures and to map the associated pathways involved with BAFF blockade in RA.

**Methods:** Whole blood RNA was obtained from 158 RA subjects with inadequate response to methotrexate enrolled in a phase 2 randomized trial in which patients received subcutaneous placebo, 1, 3, 10, 30, 60 or 120 mg of tabalumab every 4 weeks (wks) over 24 wks. At total of 669 RNA samples were obtained at baseline, wk 1, 4 and 16, and follow up visits at wk 32 and 44. Samples from 30 healthy blood donors controls were analyzed. Affymetrix U133 Plus 2.0 expression arrays were used to measure gene expression. Data were normalized using Robust Multichip Average (RMA) algorithm. Following quality analysis a total of 676 samples were profiled. B cells from peripheral blood were enumerated using flow cytometry. Total serum IgG, A and M, rheumatoid factor (RF) and ACPR were measured using nephelometry. Statistical analyses were performed using a mixed effect model and p-values were adjusted for multiple hypotheses testing using False Discovery Rate (FDR) and Bonferroni techniques. Paired t-tests were used to generate a list of biologically relevant genes whose transcripts exhibited consistent changes in response to tabalumab treatment.

**Results:** The genes demonstrating significant changes with treatment over time are listed in the table. Many of these genes are represented by multiple probe sets. Most were down regulated. Several of these have been previously reported to be associated with RA susceptibility. The use of gene ontology, pathway and literature mining revealed that the most significant changes were related to B cell development and signaling. Changes in CD19 expression were correlated with CD19 enumeration. Additional genes related to B cell development and signaling were associated with changes in CD19 expression. Consistent with these changes, serum immunoglobulins IgM, IgA decreased significantly from baseline and IgG had a numerical decrease over time. There were no statistically significant changes in RF or ACPR levels from baseline.
Conclusion: Use of CZP 400mg Q4W monotherapy has been confirmed to have an acceptable long-term safety profile. Some AEs seem to be lower in the monotherapy subgroup than for all pts, but this requires confirmation as it could be a consequence of selection bias. Long-term CZP monotherapy is associated with similar improvement in disease activity and physical function to a population where the majority of pts received combination therapy. CZP monotherapy pts had a similar retention rate in the OLE to the overall population.

References
2. Choy E et al. Accepted for publication in Rheumatology November 2011

Disclosure: R. M. Fleischmann, UCB, 2; UC, 5; R. van Vollenhoven, UCB, 2; UC, 5; J. Vencovsky, UC, 5; R. Alten, UC, 2; UC, 5; UC, 8; O. Davies, UC, 1; UC, 3; C. Stach, UC, 1; UC, 3; M. de Longueville, UC, 3; B. Van Lumen, UC, 1; UC, 3; E. Choy, UC, 2; UC, 5; UC, 8.

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One-Year Results From the Canadian Methotrexate and Etanercept Outcome Study: A Randomized Trial of Etanercept and Methotrexate Versus Etanercept Alone in Rheumatoid Arthritis. Janet E. Pope1, Boulos Harou12, J. Carter Thorne3, Melanie Poslin-Costello4, Andrew Vieira4 and Edward Keystone5. 1St. Joseph’s Health Care, London, ON, 2Institut de Rhumatologie de Montréal, Montreal, QC, 3Southlake Regional Health Centre, Newmarket, ON, 4Amgen Canada Inc., Mississauga, ON, 5University of Toronto, Toronto, ON

Background/Purpose: Combination therapy with a biologic and methotrexate (MTX) usually yields better outcomes than biologic monotherapy in rheumatoid arthritis (RA).1-3 However, patients may be intolerant to MTX, or prefer fewer medications if doing well. As well, some data suggest monotherapy with etanercept (ETN) may be sufficient.4 The objective of this open label, RA trial was to determine if withdrawing MTX after 6 months of combination ETN+MTX, in MTX inadequate responders, is as effective as continuing ETN+MTX.

Methods: TNF inhibitor naive, RA patients with active disease (≥3 swollen joints, DAS28≥3.2) despite stable MTX therapy (≥15 mg/wk, or 10 mg/wk if intolerant) for ≥12 weeks were enrolled. Combination therapy with ETN (50 mg/wk sc) + MTX was initiated for 6 months, followed by randomization of the patients to either continue with ETN+MTX or switch to ETN monotherapy for an additional 18 months. The primary end point was to show non-inferiority of ETN vs ETN+MTX, based on the change in DAS28-ESR, 6 months after randomization (non-inferiority margin in DAS28-ESR (–0.6)), with pre-specified analyses of subsets by disease activity (DAS28<3.2 vs DAS28≥3.2).

Results: 258 patients with active RA were enrolled (76% female; mean age 54.7±12.5 yrs; DAS28 5.4±1.1; duration of RA 8.9±8.4 yrs). Mean duration of prior MTX treatment was 4.9±4.7 yrs; 48.4% of patients used ≥2 prior DMARDs and 43.8% used sc MTX. From baseline to 6 months, disease activity improved, with a change in mean DAS28 [95% CI] of −1.9 [2.1, −1.7]. At 6 months, 205 patients were randomized with similar baseline characteristics. Of 53 non-randomized patients, 40% discontinued treatment due to disease progression, 26% due to adverse events and 34% for other reasons. From 6 to 12 months, DAS28 was maintained in patients on ETN+MTX and increased slightly in patients on ETN monotherapy, (Table 1). The primary endpoint of non-inferiority was not achieved. However, if a low disease activity (LDA) was achieved (DAS28<3.2) at 6 months, the change in DAS28 from 6 to 12 months was similar for ETN+MTX and ETN (Figure 1). Conversely, for patients on ETN+MTX with DAS28≥3.2 at 6 months disease activity continued to improve from 6 to 12 months, while patients on ETN monotherapy had slightly increased disease activity at 12 months (Figure 1).

Table 1. Change in DAS28 from 6 and 12 months (Intent to Treat–All randomized subjects)

<table>
<thead>
<tr>
<th></th>
<th>MTX Only</th>
<th>MTX + ETN</th>
<th>Non-Inferiority</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change [95% CI]</td>
<td>6 months</td>
<td>12 months</td>
<td>3.2 vs DAS28=3.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean DAS28</td>
<td>4.0 [3.7, 4.3]</td>
<td>3.6 [3.2, 3.8]</td>
<td>−0.4 [−0.7, −0.12]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change [95% CI]</td>
<td>6 months</td>
<td>12 months</td>
<td>DAS28=3.2 vs 6 months</td>
<td>0.5 [0.3, 0.7]</td>
<td>0.04 [0.2, 0.3]</td>
</tr>
</tbody>
</table>

Conclusion: Patients who achieve DAS28<3.2 by 6 months on ETN+MTX have similar disease activity at 12 months, whether they continue or stop MTX. It is possible to discontinue MTX in the subset of patients who reach LDA, while it is preferable to continue MTX in those who do not achieve LDA.

References

Disclosure: J. E. Pope, Amgen, 2; Amgen and Pfizer, 5; B. Harou, Abbott, Amgen, Bristol-Meyers Squibb, Merck, Pfizer, Roche, UCB, 2; Abbott, Amgen, Bristol-Meyers Squibb, Merck, Pfizer, Roche, UCB, 9; Abbott, Amgen, Bristol-Meyers Squibb, Merck, Pfizer, Roche, UCB, 8; J. C. Thorne, Amgen, Pfizer, Abbott, Bristol-Meyers Squibb, Roche, UCB, 2; Merck, 2; Pfizer, Abbott, Bristol-Meyers Squibb, Roche, UCB, 5; Centocor, Inc., 9; M. Poslin-Costello, Amgen, 3; A. Vieira, Amgen, 3; E. Keystone, Abbott Laboratories, Amgen Inc; AstraZeneca Pharmaceuticals LP, Bristol-Myers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc, Genzyme, Merck, Novartis Pharmaceuticals, Pfizer Pharmaceuticals, UCB, 2; Abbott Laboratories, AstraZeneca Pharmaceuticals LP, Biotest, Bristol-Meyers Squibb, Centocor Inc, F. Hoffmann-LaRoche Inc, Genentech Inc, Merck, Nycomed, Pfizer Pharmaceuticals, UCB, 3; Abbott Laboratories, Bristol-Meyers Squibb, F. Hoffmann-LaRoche Inc, Merck, Pfizer Pharmaceuticals, UCB, 8.
Long-Term Benefits of 4-Weekly Certolizumab Pegol Combination and Monotherapy On Household Productivity and Social Participation in Rheumatoid Arthritis: 5 Year Results from an Open Label Extension Study, Vibeke Strand1, Oana Purcaru2, Ronald F. van Vollenhoven3, Ernest Choy4, and Roy Fleischmann5
1University of Texas Southwestern Medical Center, Dallas, TX
2UCB Pharma, Brussels, Belgium, 3Karolinska Institute, Stockholm, Sweden, 4Cardiff University School of Medicine, Cardiff, United Kingdom, 5University of Texas Southwestern Medical Center, Dallas, TX

Background/Purpose: Certolizumab pegol (CZP) monotherapy administered every 4 weeks (Q4W) for rheumatoid arthritis (RA) has been shown to be associated with rapid and sustainable improvements in productivity up to 2 years. The current analysis evaluates the long-term impact on household productivity and social participation of CZP 400mg Q4W combination and monotherapy over 5 years.

Methods: In this open-label extension (OLE) (NCT00160693) patients (pts) originally enrolled in FAST4WARD (NCT00544154) received CZP 400 mg Q4W for 24 weeks (wks). Pts who completed or withdrew on/after Wk12 in either study were eligible and were permitted to take DMARDs in OLE. Household productivity and social participation were assessed through the RA-specific Work Productivity Survey (WPS-RA); results are reported up to Wk268 (5.2yrs). The analyzed population consisted of (1) Wk 24 CZP completers from FAST4WARD or (2) CZP completers from FAST4WARD who entered OLE (all pts group) and (2) CZP completers from FAST4WARD who entered OLE and did not receive MTX or another DMARD at any point (monotherapy subgroup).

Results: From the CZP groups of the FAST4WARD (N=111) and 014 (N=124) feeder studies, 75 and 96 pts, respectively, completed the studies and entered the OLE. 48 pts who completed FAST4WARD and entered the OLE remained on monotherapy throughout their time in the OLE, and of these 26 remained in OLE at Wk268. In both populations analyzed, a rapid reduction in the number of days missed of household work per month was seen from feeder study baseline (BL, 7.4 and 11.1 mean days respectively) over 24wks of the feeder studies to OLE entry (3.5 and 4.1 mean days respectively) and continued to decline over time, up to Week 268 (1.2 and 1.4 mean days respectively; Table). A similar decrease was reported in the number of household days with reduced productivity per month, and in the rate of RA interference with household productivity per month (Table). Increased participation in family/social/leisure activities was reported in both populations, with a decrease in the number of days missed per month from feeder study baseline (4.4 and 6.2 mean days, respectively), to entry to OLE, at a mean of 1.3 and 1.1 days respectively for the 2 groups; these improvements continued over the 5 years to 0.4 and 0.2 days on average in the 2 populations respectively.

Conclusion: CZP treatment, in combination with MTX/DMARDs or as monotherapy, improved household productivity and increased participation in social/family/leisure activities, as shown by the decrease in the number of household work or social/family/leisure days missed or the number of days with reduced productivity per month. These improvements were maintained up to 5 years with open-label CZP following 24 wks double-blind CZP therapy.

Disclosure: V. Strand, UCB; 6. O. Purcaru, UCB; 3. R. F. van Vollenhoven, UCB, 2, UCB; 5. E. Choy, UCB; 2, UCB; 5. R. Fleischmann, UCB; 2, UCB; 5.

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Certolizumab Pegol Plus Methotrexate Is Similarly Effective in Active Rheumatoid Arthritis Secondary Non-Responders to Anti-TNF Inhibitors: Post-Hoc Analysis of a Phase IIIb Trial, Daniel Furst1, Saeed A. Shaikh2, Maria W. Greenwald3, Michael H. Schiff4, Barbara Bennett5, Owen Davies5, Fabienne Staelens6, Will Koestec7 and Philippe Bertinie8
1University of California at Los Angeles, Los Angeles, CA, 2McMaster University, St Catharines, ON, 3Desert Medical Advances, Palm Desert, CA, 4University of Colorado, Denver, CO, 5B/Bennett Consulting, LLC, Marietta, GA, 6UCB Pharma, Brussels, Belgium, 7UCB Pharma, Rtp, NC, 8Daytopyren Hospital, Limoges, France

Background/Purpose: Certolizumab pegol (CZP) has demonstrated efficacy in patients (pts) with prior TNF inhibitor exposure.1 In the Doseflex trial two maintenance dosing regimens of CZP were comparable at maintaining response and significantly better than placebo (PBO).1 Data from pts with and without prior TNF inhibitor exposure are presented.

Methods: Doseflex was a 36 Wk Phase IIIb, open-label run-in and double-blind (DB) PBO-controlled randomized study in pts with active RA on stable dose MTX (NCT00588040). Secondary TNF inhibitor non-responders were included. All pts received 400 mg CZP at wks 0, 2, and 4 and 200 mg CZP every 2 wks (Q2W) to Wk16 + MTX. ACR20 responders were randomized 1:1:1:1:1 at Wk18 to MTX plus 200 mg CZP, 400 mg CZP every 4 wks (Q4W) or PBO (CZP withdrawn) for 16 Wks. Primary end-point was ACR20 at Wk34; ACR responses and CDAI/SDAI/DAS28(ESR) remission were assessed using NRI for missing data imputation.

Results: Of 333 pts entering the run-in 91.9% were from the US and 53.5% had prior TNF inhibitor use. Mean DAS28(ESR), SDAI and CDAI at baseline were 6.4, 40.8 and 38.4. At Wk16, responder rates for pts with and without prior TNF inhibitor exposure were: ACR20 60.7% vs. 61.9%; ACR50 34.8% vs. 41.3%; ACR70 14.0% vs. 18.7%. Of pts randomized at Wk18, 42.0%, 61.4% and 55.7% had prior TNF inhibitor use in PBO, CZP 200 mg and CZP 400mg groups. Baseline characteristics were similar for randomized pts with and without prior TNF inhibitor exposure. At Wk34, ACR20/50/70 response rates were comparable between 200mg and 400mg groups (61.7/10.0/30.0% and 65.2/5.2/23.7%) and significantly higher than CZP→PBO (44.9/30.4/15.9%, p<0.05 for all). ACR20 at Wk34 in pts with vs. without prior TNF exposure was 37.9% vs. 50.0% with PBO; 74.4% vs. 55.6% with CZP 200 mg Q2W and 61.5% vs. 70.0% with CZP 400 mg Q4W. ACR50/70 and remission rates were similar in CZP pts and with prior TNF inhibitor exposure receiving both dosages; however, with PBO they were considerably lower for pts with prior TNF inhibitor exposure vs. without (Figure). CZP was well tolerated (adverse event (AE) rates in DB phase: 62.3% vs 62.9% vs 60.9%; serious AE rates: 0% vs 7.1% vs 2.9% in the PBO, CZP 200mg and 400mg groups). The most common SAEs were infections and infestations (4.3% in the CZP 200mg groups; 0 in the other groups).

Conclusion: In RA pts with active disease and incomplete response to MTX, CZP 200mg Q2W and CZP 400mg Q4W showed comparable efficacy in maintaining clinical response to Wk34 following a 16 Wk run-in. CZP demonstrated similar efficacy in RA pts with or without prior exposure to TNF inhibitors over 54 Wks. When CZP was withdrawn at Wk16 in ACR20 responders (pts randomized to PBO), there appeared to be a greater maintenance of response in pts who had prior TNF inhibitor exposure.

References

Disclosure: D. Furst, UCB, 2, UCB, 5, B. Bennett, UCB; 5, O. Davies, UCB, 1, UCB, 3; F. Staelens, UCB Pharma, 3; W. Koets, UCB Pharma, 3; P. Bertin, UCB Pharma, 5.
Sarilumab, a Subcutaneously-Administered, Fully-Human Monoclonal Antibody Inhibitor of the IL-6 Receptor: Effects On Hemoglobin Levels in a Clinical Trial for the Treatment of Moderate-to-Severe Rheumatoid Arthritis. Mark C. Genovese1, R. Radin4, Jennifer Hamilton5 and Tom W. Huizinga6. 1Stanford University, Leiden, Netherlands against the alpha subunit of the IL-6 receptor (IL-6R such as IL-6. Sarilumab, the first fully human monoclonal antibody directed impact on patient function, is driven in part by proinflammatory cytokines articular manifestation of rheumatoid arthritis (RA), which has a substantial of sarilumab on hemoglobin (Hb) levels.

RA receiving methotrexate (MTX). The current analysis evaluated the effects in a Clinical Trial for the Treatment of Moderate-to-Severe Rheumatoid Arthritis. Results: 306 patients were randomized. Baseline characteristics were similar across all groups: mean age 52.2±12.3 years; 79% female; mean disease duration 7.8±8.1 years; RF + 79.7%; mean hs-CRP 2.8±3.0 mg/dL. Week 0 Hb data were available for 295 patients: mean baseline Hb 12.6 mg/dL; 25.4% of patients had low Hb, defined as <12.5 mg/dL. Increase in Hb levels was observed as early as Week 2 in all sarilumab groups, with significant increases vs. placebo (P<0.0002) at Week 12 (Figure). The effect was greatest with the 150 mg qw dose, followed by 200 mg q2w. All placebo patients who had low baseline Hb (n=17) still had low Hb at Week 12: 65.5% of the sarilumab patients low at baseline (n=58) had normalized Hb (n=38) at Week 12. Mean hs-CRP levels were ≤0.8 mg/dL by Week 12 in all treatment groups except placebo (2.6 mg/dL) and sarilumab 100 mg qw (1.8 mg/dL); reductions in hs-CRP at Week 12 were also significant relative to placebo (P<0.0001), except for 100 mg q2w (P=0.0661). The most common treatment emergent adverse events (AEs) reported in the sarilumab arms were infections (non-serious) 12–26%, neutropenia 0–20%, and ALT increase 0–6%. Eight patients (3 receiving sarilumab 100 mg q2w, 3 receiving 100 mg q2w, and 2 receiving placebo) experienced at least 1 treatment emergent serious AE (SAE); of these, 6 led to permanent treatment discontinuation, including 1 death in the sarilumab 100 mg q2w group (acute respiratory distress syndrome, cerebrovascular accident). There were no infection-related SAEs in patients with grade 3 or 4 neutropenia.

Conclusion: Sarilumab treatment for RA over 12 weeks resulted in significant improvements in hemoglobin relative to placebo.

Disclosure: M. C. Genovese, Eli Lilly and Company, 2; Eli Lilly and Company, 5; Sanofi-Aventis Pharmaceutical, 2; Sanofi-Aventis Pharmaceutical, 5; R. M. Fleischmann, Pfizer Inc., Roche, Abbott, Amgen, UCB, Genentech, BMS, Lilly, Sanofi, Lexicon, MSD, Novartis, BiogenIDC, Astellas, Astra-Zeneca, Jansen, 2, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi, Lexicon, Novartis, Astellas, Astra-Zeneca, Jansen, HGS, S. M. Jasson, Sanofi-Aventis Pharmaceutical, 1; Sanofi-Aventis Pharmaceutical, 3; A. R. Radin, Regeneron, 1; Regeneron, 3; J. Hamilton, Regeneron, 1; Jansen, 2; T. W. J. Huizinga, Meck, UCB, Bristol Myers Squibb, Biotest AG, Pfizer, Novartis, Roche, Sanofi, Abbott, Crescendo Bioscience, Nycomed, Axis Shield. 5.

C-Type Lectin Domain Family 4, Member C Gene Expression Level Helps Predict Future Clinical Response to Tabalumab Blockade of B Cell Activating Factor in Rheumatoid Arthritis. Ernst R. Dow1, Poulabi Banerjee2, Michelle A. Penny3, Eric P. Nantz4, Sergey Stepantsians, Anne Ho5, Wendy J. Komocsar6, Pierre-Yves Berclaz7 and Robert W. Hoffman1.

1Eli Lilly and Company, Indianapolis, IN, 2Covance Genomics Laboratory LLC, Seattle, WA

Background/Purpose: Patients with rheumatoid arthritis (RA) exhibit substantial variability in both the magnitude and duration of their clinical response to treatment. Despite considerable research, no biomarker has reproducibly been shown to predict likelihood of clinical response to biologic therapy. There remains significant unmet medical need to identify patients who will have a meaningful response to treatment prior to drug exposure. We have recently shown the efficacy of tabalumab (previously known as LY2127399), a monoclonal antibody neutralizing membrane bound and soluble B cell activating factor (BAFF) in RA1. We have now used gene expression profiling of whole blood mRNA, obtained prior to drug exposure, to identify a predictive gene expression pattern that could potentially identify patients that are highly likely to respond to treatment with tabalumab.

Methods: Whole blood mRNA was obtained at baseline from 158 RA subjects with an inadequate response to methotrexate enrolled in a phase 2 randomized trial in which patients received placebo, 1, 3, 10, 30, 60 or 120 mg of tabalumab every 4 weeks for 24 weeks. Clinical results of BAFF blockade in RA of this study have recently been reported1. In addition to the RA subjects (152 samples passed quality control), samples from 30 healthy blood donor controls were analyzed using Affymetrix U133 Plus 2.0 expression arrays to determine gene expression, and data were compared after normalization using Robust Multichip Average (RMA) algorithm2. C-Type Lectin Domain Family 4, Member C (CLEC4C) qPCR was performed in validated assays at Covance Genomics Seattle using primers and probes obtained from ABI. Statistical analyses were performed using Messina3, two sample t-test or regression modeling.

Results: There was a bimodal distribution of CLEC4C mRNA in whole blood from RA patients and controls at baseline. The mean level of CLEC4C gene expression measured by Affymetrix was lower in patients than in controls. Mean expression after normalization for patients (n=152) is 5.79 with a range of 3.18 to 9.69. Mean expression for control healthy blood donors (n=30) is 6.88, range is 4.36 to 9.02. Among patients, those with higher levels of CLEC4C gene expression were more likely to respond to tabalumab (as measured by ACR-N). Messina analysis3 at baseline identified both CLEC4C probe sets as having the largest margin when comparing responder and non-responder group outcome at week 16 using ACR-N/DAAS28. A two sample t-test on the same data was significant (p<0.0007). These expression findings from selected Affymetrix probe sets were validated using qPCR; for CLEC4C the change in threshold cycle versus ACR-N was statically significant after correction for multiple comparisons using False Discovery Rate (FDR) and Bonferroni techniques (FDR p=0.013, Bonferroni p=0.013).

Conclusion: The subgroup of RA patients with higher levels of CLEC4C mRNA expression at baseline were significantly more likely to respond to treatment with tabalumab. Independent replication of these hypothesis generating findings is now in progress in a large phase 3 clinical trial of tabalumab.

References

Background/Purpose: ASP015K is an oral Janus kinase (JAK) inhibitor with selectivity for JAK1/3 in development for treatment of rheumatoid arthritis (RA) and other autoimmune diseases. Methotrexate (MTX) is the most common non-biologic DMARD therapy and recommended as first-line therapy in RA treatment guidelines. In humans, MTX is primarily excreted unchanged into urine. Transport-mediated renal tubular secretion of MTX is thought to be a major mechanism of PK interaction with other drugs. In vitro experiments were performed to evaluate the effects of ASP015K on renal transporters. A clinical drug-drug interaction study was also conducted to evaluate the effect of ASP015K on renal tolerability of coadministration in RA patients.

Methods: In vitro experiments were conducted to assess the inhibitory potency of ASP015K on human multidrug resistance-associated protein 2/4 (MRP2/4) and organic anion transporter 1/3 (OAT1/3). A phase 1, open-label, single-sequence study was conducted to confirm the in vivo effect of ASP015K on the PK of MTX, a substrate of MRP2/4 and OAT3, in 14 healthy volunteers following single oral doses of ASP015K 100 mg BID and an oral dose of MTX 20 mg. Additionally, 28 days were enrolled. Subjects received their usual prescribed dose of MTX on day 1. They then received ASP015K 100 mg BID for 6.5 days (day 3 through the morning of day 9), and a second prescribed dose of MTX in combination with ASP015K on day 8. Serial blood samples were collected for MTX concentration assay after dosing on day 1 (MTX alone) and 8 (MTX+ASP), and for ASP015K concentration assay 24 h after dosing on any 7 (ASP alone) and 8 (MTX+ASP). Predose concentrations (C0) of ASP015K were measured on days 3, 4, 5, 6, 7 and 8. Urinary excretion of MTX was also assessed.

Results: ASP015K demonstrated no in vitro inhibitory effect on MRP2/4 or OAT1 (IC50 > 100 μM); it inhibited OAT3 with an IC50 of 5 μM. Fourteen subjects completed the phase 1 study for PK evaluation. Results showed that MTX exposure was not affected by coadministration of ASP015K. AUC0–ss, ratio (MTX+ASP/MTX alone) was 103% [90% confidence interval (CI) 93, 113]; Cmax ratio was 92% [90% CI 83, 103]. Analysis of C0 showed that a 50% increase in ASP015K levels reached steady state on day 5. ASP015K AUC0–ss, was not affected by coadministration of MTX with a ratio (MTX+ASP/MTX alone) of 98% [90% CI, 91, 106]. ASP015K Cmax, decreased by 8% with a ratio (MTX+ASP/MAX alone) of 92% [90% CI, 87, 98], which was considered not to be clinically significant. The unbound C0 of ASP015K at 100 mg BID was estimated to be <1/10th of the IC50 for OAT3 in vitro suggesting that ASP015K would not affect MTX PK. ASP015K was well tolerated when coadministered with MTX. One subject experienced an SAE (urinary tract infection) before discontinuing from the study.

Conclusion: Coadministration of ASP015K and MTX was well tolerated in this short-term study exhibiting no clinically significant effect on the PK profile of either drug. Efficacy and safety of ASP015K/MTX combination therapy is being assessed in ongoing phase 2 trials in RA patients.


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Effects of Dose Elevation of Tocilizumab in Combination with Nonbiologic Disease-Modifying Antirheumatic Drugs: Sub-Analysis of a 24-Week Study in a United States Population. M. E. Weinblatt1, Herbert S. B. Baraf2, Ara H. Dikranian3, Andrew M. Anisfeld4, Jenny Devenport4 and Sheldon Cooper5, 1Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 2Arthritis & Rheumatism Associates, Wheaton, MD, 3San Diego Arthritis Medical Clinic, San Diego, CA, 4Genentech, South San Francisco, CA, 5Univ Vermont College of Med, Burlington, VT

Background/Purpose: In the US, the recommended starting dose of Tocilizumab (TCZ) is 4 mg/kg (q4w) with an increase to 8 mg/kg (q4w) based on clinical response. However, analyses of responses experienced by patients increasing TCZ dose from 4 mg/kg to 8 mg/kg have been limited by a uniform escape escalation criterion used across phase III trials: patients randomized to 4 mg/kg who did not experience a ≥20% improvement in DAS at Week 16 increased the dose to 8 mg/kg. This sub-analysis of the ACTSTAR study evaluated the response of patients following an increase in TCZ dose after or at Week 8 based on joint counts or investigator discretion, respectively. Safety and efficacy outcomes of the full study were reported previously.

Methods: ACT-STAR was a phase 3b, 24-wk, open-label, multicenter US study that evaluated adults with active RA who had an inadequate clinical response or safety/tolerability issues with prior DMARD therapy. This sub-analysis examined patients initiating TCZ 4 mg/kg who continued their current synthetic DMARD. Per study protocol, patients who did not achieve ≥20% improvement in DAS at Week 8 were to increase TCZ dose to 8 mg/kg. After Week 8, the protocol allowed TCZ dose escalation to 8 mg/kg per physician discretion. Study visits occurred at BL and 4 weeks after each infusion.

Results: Of the 363 patients randomized to receive TCZ 4 mg/kg, 68 increased to 8 mg/kg after Week 8, 142 patients increased to 8 mg/kg at Week 16 (with 52 patients randomizing only 4 mg/kg (1 patient was not dosed)). Among patients who increased dose after Week 8, ACR20 response at Week 24 was achieved by 58.8% of patients, ACR50 by 36.8% of patients and ACR70 11.8% of patients. Mean DAS28 decreased from 5.76 at BL to 4.45, 2.80 and 3.77 at Weeks 8, 16 and 24, respectively. ACR core components improved initially and continued to improve following dose escalation (Table). Of these patients who escalated at Week 8, which was enriched for non-responders due to study design, ACR20, 50 and 70 responses were achieved in 30.3%, 12.0% and 3.5% of patients at Week 24. Mean DAS28 decreased from 5.69 at BL to 5.39 at Week 8 (prior to protocol defined dose escalation) and to 4.32 and 4.17 at Weeks 16 and 24 (after dose escalation), respectively. Similar improvements across ACR core components were observed (Table). The most common serious adverse events pre- and post-dose increase were serious infections (SI); 1/42 (0.7%) patient experienced SI prior to dose increase, 0 patients escalated after Week 8 experienced SIs and 3/42 (2.1%) patients experienced SI post Week 8 dose increase. Eight patients withdrew from the study due to adverse events; 2 patients who escalated after Week 8 and 6 patients who increased at Week 8.

Table. Results showed that MTX exposure was not affected by coadministration of ASP015K. AUC0–ss, ratio (MTX+ASP/MAX alone) of 98% [90% CI, 91, 106]. ASP015K Cmax, decreased by 8% with a ratio (MTX+ASP/MAX alone) of 92% [90% CI, 87, 98], which was considered not to be clinically significant. The unbound C0 of ASP015K at 100 mg BID was estimated to be <1/10th of the IC50 for OAT3 in vitro suggesting that ASP015K would not affect MTX PK. ASP015K was well tolerated when coadministered with MTX. One subject experienced an SAE (urinary tract infection) before discontinuing from the study.

Conclusion: Coadministration of ASP015K and MTX was well tolerated in this short-term study exhibiting no clinically significant effect on the PK profile of either drug. Efficacy and safety of ASP015K/MTX combination therapy is being assessed in ongoing phase 2 trials in RA patients.

Disclosure: M. E. Weinblatt, Amgen, Abbott, Merck, Astra Zeneca, Centlar, UCB, Pfizer, Roche/Genentech, 5; H. S. B. Baraf, Abbott, Janssen, Sanofi, Pfizer, BMS, Genentech, 2, Abbott Laboratories, 8; A. H. Dikranian, Genentech, UCB, Abbott, BMS, 8; A. M. Anisfeld, Genentech and BioGen IDEC Inc., 3; J. Devenport, Genentech and BioGen IDEC Inc., 3, Genentech/Roche, 1; S. Cooper, IL-6, IL-21 in RA, 2, various, 5.
Golimumab, A Human Anti-TNF Monoclonal Antibody, Administered Subcutaneously Every Four Weeks As Monotherapy in Patients with Active Rheumatoid Arthritis Despite Disease Modifying Antirheumatic Drug Therapy: Week 104 Results of Clinical, Radiographic and Safety Assessments.

Methods: GO-MONO is a multicenter, randomized, double-blind, placebo (PBO)-controlled study in pts with active RA despite treatment with DMARDs. Pts were randomized to SC PBO, GLM 50 mg, or GLM 100 mg q4wks as monotherapy. At wk16, pts in the PBO group (grp) crossed over to GLM 50 mg after wk 16. Missing clinical response data were not imputed. For vdh-S score, endpoint was the proportion of pts achieving ACR20 at wk14. Secondary endpoint was proportion of pts with no progression changes in TSS greater than the smallest detectable change (SDC) were also reported as incidence per 100-patient-years.

Results: Long-term efficacy and safety data are shown in the Table. Clinical remission was defined as DAS28(ESR) < 2.6 and HAQ remission was defined as HAQ < 0.5 maintained from wk52 and wk104. Proportion of pts with no progression in TSS greater than the smallest detectable change (SDC) were also maintained from wk52 and wk104. Proportion of pts with no progression (change in TSS≤0) were slightly decrease from wk52 to wk104 in both of GLM 50 mg and 100 mg. Safety finding are also summarized in the Table. Two deaths were reported, one in GLM 50 mg (brain stem haemorrhage) and one in 100 mg (pancreatic carcinoma). Incidences of SAEs and AEs leading to discontinuation in GLM 50 mg were higher than 100 mg. There were no cases of tuberculosis or lymphoma reported.

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<td>n (%)</td>
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<td>22/72 (30.6)</td>
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</table>

Safety results from all treatment period

| Avg duration of follow-up (wks) | 15 | 97.1 | 110.9 |

Incidence per 100 patient-years (95%CI)

| Wk 52 | 0.00 (0.00, 9.88) | 0.28 (0.01, 1.55) | 0.46 (0.01, 2.56) |
| Deaths | 6.63 (0.80, 23.94) | 14.47 (10.74, 19.08) | 7.92 (4.61, 12.68) |
| SAEs | 9.85 (2.05, 29.09) | 7.83 (5.20, 11.32) | 5.07 (2.53, 9.07) |
| Patients with AEs leading to discontinuation | 3.30 (0.08, 18.38) | 3.09 (1.54, 5.53) | 3.75 (1.62, 7.39) |

Conclusion: Treatment with GLM 50 mg and 100 mg monotherapy sustained the efficacy of signs/symptoms during 104wks. Inhibition of structural damage in GLM 100 mg was relatively greater than GLM 50mg, however the progression went on slowly during 104wks in both of the GLM groups. The GLM safety profile was similar to other anti-TNF agents.


Prevention of Joint Destruction in Patients with High Disease Activity or High C-Reactive Protein. Yoshiya Tanaka1, Masayoshi Harigai1, Tsutomu Takeuchi2, Hisashi Yamanaka3, Naoki Ishiguro4, Kazuhiko Yamamoto5, Yutaka Ishii5, Daniel Baker6, Nobuyuki Miyasaka7 and Takao Koike6.

Background/Purpose: In Japan, 2 doses (50mg and 100mg) of golimumab (GLM) were approved for the treatment of rheumatoid arthritis (RA) patients (pts), used with methotrexate (MTX), based on the results from GO-FORTH study. However, differences in joint destruction between the GLM 100 mg and 50mg groups remain unclear. In a sub analysis of the GO-FORTH study, we assessed the difference of suppression on joint destruction between the GLM 50mg and 100mg groups.

Methods: GO-FORTH is a multicenter, randomized, double-blind, placebo (PBO)-controlled study in pts with active RA despite MTX. Pts were randomized to SC PBO, GLM50 mg, or GLM100 mg q4wks. All pts received MTX 6–8 mg orally/wk. Pts who did not enter EE continued initial therapy until wk16, pts in the PBO group (grp) crossed over to GLM50 mg after wk 16. Missing clinical response data were not imputed. For vdh-S score, endpoint was the proportion of pts achieving ACR20 at wk14. Secondary endpoint was proportion of pts with no progression changes in TSS greater than the smallest detectable change (SDC) were also reported as incidence per 100-patient-years.

Results: Long-term efficacy and safety data are shown in the Table. Clinical remission was defined as DAS28(ESR) < 2.6 and HAQ remission was defined as HAQ < 0.5 maintained from wk52 and wk104. Median changes from baseline to wk52 were 1.0 in PBO and GLM 50mg, and 0 in GLM100 mg. Median changes from baseline to wk104 in PBO, GLM 50 and 100 mg were 1.5, 1.25 and 1.0, respectively. The proportions of pts with changes in TSS greater than the smallest detectable change (SDC) were also maintained from wk52 and wk104. Proportion of pts with no progression (change in TSS≤0) were slightly decrease from wk52 to wk104 in both of GLM 50 mg and 100 mg. Safety finding are also summarized in the Table. Two deaths were reported, one in GLM 50 mg (brain stem haemorrhage) and one in 100 mg (pancreatic carcinoma). Incidences of SAEs and AEs leading to discontinuation in GLM 50 mg were higher than 100 mg. There were no cases of tuberculosis or lymphoma reported.
Background/ Purpose: The Health Assessment Questionnaire (HAQ) is a patient-centred, validated measure of physical function. It is predictive for disability, morbidity and mortality. The efficacy of various biologic agents for improving HAQ in patients with Rheumatoid Arthritis (RA) has been demonstrated in numerous trials. However, head-to-head comparisons of biologic agents are scarce. The objective of this study was to determine the comparative efficacy of biologic agents for improving HAQ in patients with established RA who failed Disease Modifying Anti-Tumour Necrosis Factor (DMARDs) or anti-Tumour Necrosis Factor (TNF) agents and patients with early RA (ERA).

Methods: We performed random effects meta-analyses (Mantel-Haenszel method) of randomized, placebo-controlled trials. Inclusion criteria were: age >15 years, clinically utilized biologic agents, HAQ score at baseline and 6 or 12 months. We searched PubMed, EMBASE and the Cochrane Library. Outcome was the mean difference in change in HAQ for biologic agents compared to controls (ΔHAQtest−ΔHAQcontrol). Indirect comparisons of the different biologic drugs compared to the control group were conducted using the Q-test based on analysis of variance. Meta-regression was performed using the method of moments.

Results: 31 trials were included: 23 with DMARD-failures; 5 with anti-TNF-failures and 6 ERA. The following biologics were represented: abatacept, adalimumab, certolizumab, etanercept, golimumab, infliximab, rituximab and tocilizumab. In established RA patients with DMARD-failures: ΔHAQtest−ΔHAQcontrol = −0.28; 95% CI: −0.324, −0.237 (F = 64%); abatacept and infliximab were less effective compared to the other anti-TNF agents and tocilizumab (p < 0.01). In anti-TNF-failures: ΔHAQtest−ΔHAQcontrol was −0.254; 95% CI: −0.46, −0.049 (F = 92%); golimumab was not effective compared to control and abatacept was superior to tocilizumab (p = 0.0184); rituximab was equivalent to abatacept and tocilizumab. Heterogeneity was predominately due to differences in the efficacy of the different biologic agents. In ERA trials: ΔHAQtest−ΔHAQcontrol = −0.231; 95% CI: −0.323, −0.14 (F = 90%); adalimumab, etanercept, infliximab and rituximab were equally effective. Using meta-regression, baseline HAQ did not significantly affect HAQ improvement.

Conclusion: Biologic agents were efficacious at lowering HAQ in established RA and ERA by at least the minimally clinically important difference of 0.22. However, infliximab and abatacept were less effective in DMARD-failures. The role of anti-TNF agents in anti-TNF failures and of biologics in DMARD-naive patients remains unclear.

Disclosure: L. J. Barra, None; A. Ha, None; L. Sun, None; C. Fonseca, None; J. Pope, None.

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Comparison of Four Different Intensive Treatment Strategies in Patients with Early Rheumatoid Arthritis in Korea. Mi-II Kang, Yoon Kang, Hee-Jin Park, Hyun-Sun Lee, Sang-Won Lee, Yong-Beom Park and Soo-Kon Lee. Department of Internal Medicine, Yonsei University College of Medicine, Seoul, South Korea

Background/ Purpose: The previous studies reported that intensive treatment-strategies, including biological agents and glucocorticoids, can improve the severity of early rheumatoid arthritis. However, there was no report on their efficacy in Korean patients with early rheumatoid arthritis. Hence, in this study, we investigated the clinical efficacy of intensive treatments in patients with early rheumatoid arthritis in Korea.

Methods: A total of 135 patients with rheumatoid arthritis (RA), who had not received disease modifying anti-rheumatic drugs (DMARDs) and who had presented with joint symptoms within 1 year, were prospectively enrolled. Clinical outcome measurements and laboratory tests were performed monthly during one-year study period for adjusting treatment in order to achieve remission (Disease Activity Score in 28 joints, DAS28 (ESR) <2.6). All patients were randomly distributed to four treatment groups. Treatment groups were as followings: group 1 = a step-up regimen starting with initial methotrexate (MTX) monotherapy and subsequent addition of sulfasalazine (SSZ) and hydrosorcolournoquin (HCO); group 2 = initial triple therapy (MTX/SSZ/HCO); group 3 = initial high dose prednisolone with rapid-tapering schedule, combined with MTX; group 4 = initial tumor necrosis factor (TNF)-α blockades combined with MTX. At 12 months, functional ability (Health Assessment Questionnaire (HAQ)), mean differences in the DAS28 (ESR) and proportion of patients meeting the American College of Rheumatology criteria for 50% improvement (ACR50) and DAS28 (ESR) remission were evaluated. Radiological progression was assessed by the modified Sharp scores after 12 months.

Disclosure: None.
The percentages of low MTX-PG1–7 concentration (Hb) were 7.7% in the DAS (RBC) lysates of 91 patients receiving long-term oral ExLD-MTX were respectively investigated. After 12 months of the treatment, the rates of dosage: 6.68 treatment.

In this report, we used in the rest of world. As a result, we have very unique experience of and escalation. The higher starting dosage and faster increasing schedule (RA), it is considered to be essential for the therapeutic effect to achieve the clinical utility of MTX polyglutamates (PGs) measurements as a significance, the total concentrations of MTX-PG1–7 (nmoles/1g of Hb) whereas the rate of MTX-PG6–7 was reported to be less than 1% after MTX-PG after ExLD-MTX treatment revealed distinct distribution of and maintained during the long-term follow-up of patients with early rheumatoid arthritis.

Disclosure: M. I. Kang, None; Y. Kang, None; H. J. Park, None; H. S. Lee, None; S. W. Lee, None; Y. B. Park, None; S. K. Lee, None.

The Higher and Faster Increasing Schedule of Methotrexate May Not Be the Best: The Accumulation of Intracellular Longer Chain Methotrexate Polyglutamates Was Facilitated by the Extra-Long-Dose Methotrexate Treatment. Yoshinobu Koyama1, Kazunori Hase2, Daisuke Hidaka2, Shuji Nagano3, Toshiyuki Ota4 and Ayumi Uchino5. 1Okayama Red Cross General Hospital, Okayama, Japan, 2Iizuka Hospital, Iizuka, Japan

Background/Purpose: Although data are conflicting with regard to the clinical utility of MTX polyglutamates (PGs) measurements as a predictor of the efficacy or toxicity in the treatment of rheumatoid arthritis (RA), it is considered to be essential for the therapeutic effect to achieve necessary concentrations of intracellular MTX-PGs. However, there is no universally accepted method of the optimal schedule for dose initiation and escalation. The higher starting dosage and faster increasing schedule is considered to be beneficial so far. In Japan, the officially approved dosage of MTX for RA treatment had been fixed up to 8mg/wk from 1996 to 2011, whereas the maximum doses of 20 to 30mg/wk were commonly used in the rest of world. As a result, we have very unique experience of extra-low-dose MTX (ExLD-MTX) treatment for RA. In this report, we evaluate the efficacy of ExLD-MTX treatment for RA, and we also investigate the concentrations of intracellular MTX-PGs after ExLD-MTX treatment.

Methods: RA cases treated with ExLD-MTX (n=133) were retrospectively investigated. After 12 months of the treatment, the rates of achieving remission criteria and of withdrawing from the initial treatment were calculated. Next, the concentrations of MTXGlul–7 in red blood cell (RBC) lysates of 91 patients receiving long-term oral ExLD-MTX were quantitated with using HPLC method.

Results: After 12 months of ExLD-MTX treatment (mean MTX dosage: 6.68±1.72 mg/wk), 72.2% of cases were still maintained with the same treatment. The remission criteria for DAS28 (<2.6) were achieved 31.4% of patients, which is comparable to those of MTX monotherapy arm (mean MTX dosage: 16.9mg/wk) in PREMIER study. The rates of withdrawal because of adverse events and of insufficient efficacy were 2.2% and 25.6% in ExLD-MTX group, while 7.4% and 17.9% in MTX monotherapy arm in PREMIER study. The analysis of intracellular MTX-PG after ExLD-MTX treatment revealed distinct distribution of MTX-PG subtypes, i.e., 88.2±19.5% of MTX-PG was MTX-PG6–7, whereas the rate of MTX-PG6–7 was reported to be less than 1% after conventional MTX treatments. Although it did not reach statistical significance, the total concentrations of MTX-PG1–7 (nmol/1g of Hb) after ExLD-MTX treatment were 8.3±3.8 (range: 3.3–15.4) in the DAS<2.6 group and 6.55±4.25 (range: 1.7–17.6) in the DAS≥3.2 group. The percentages of low MTX-PG1–7 concentration (<5.0 nmol/1g of Hb) were 7.7% in the DAS<2.6 group versus 44.8% in the DAS≥3.2 group.

Conclusion: Although the higher starting dosage and faster increasing schedule for MTX has been considered to be better, we found that the efficacy of ExLD-MTX treatment is comparable to conventional MTX treatments. Since MTX exposure was known to induce up-regulation of folyopolyglutamate hydrolase, which removes glutamic acid from MTX-PG, the ExLD-MTX treatment could be favorable for accumulation of the longer-chain MTX-PG. Although it seems to be beneficial to escalate the MTX dosage for some patients with active disease (DAS3>3.2) after ExLD-MTX treatment, a majority of them may have already sufficient MTX-PG concentration to predict its maximal efficacy. Our findings prompt a re-evaluation of the conventional methods for dose initiation and escalation of MTX.

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Differential Effect of 4 and 8 Mg/Kg Tocilizumab in Combination with Methotrexate On Serum Biomarkers of Cartilage, Connective Tissue and Bone Turnover. Anne C. Bay-Jensen1, Inger Byrjalsen2, Andrew Kenwright3, Thierry Sornasse4, Claus Christiansen5 and Morten Asser Karsdal1. 1Nordic Bioscience A/S, Herlev, Denmark, 2Nordic Bioscience, Herlev, Denmark, 3Roche, Welwyn Garden City, United Kingdom, 4Genentech, South San Francisco, 5CCBR, Ballerup, Denmark

Background/Purpose: Rheumatoid arthritis (RA) is a chronic autoimmune disease characterized by poly-articular inflammation, cartilage loss, synovial inflammation, subchondral bone erosion, and joint space narrowing. In this analysis, we investigated the effect of tocilizumab (TCZ; anti-IL-6R mAb) in combination with methotrexate (MTX) on serum biomarkers of bone, cartilage, and synovium turn over in patients with moderate to severe RA enrolled in the LITHE study.

Methods: The LITHE study (Roche WA17823) was a 2-year phase III, 3-arm randomized (1:1:1), double-blind, placebo-controlled, parallel group study of TCZ in moderate to severely active RA with inadequate response to MTX. 1196 patients were randomized to receive stable doses of MTX (10–25 mg/wk) plus placebo, TCZ at 4 mg/kg (TCZ4), or TCZ at 8 mg/kg (TCZ8) every 4 weeks for 52 weeks. Patients who experienced less than 20% improvement in both swollen (SJC) and tender joint counts (TJC) at week 16 were given escape therapy. Serum samples were collected at baseline and week 2, 4, 16, 24, and 52. Following biomarkers were measured: C2M (cartilage degradation), C3M (synovial inflammation), MMP3, total CRP, CRPMP (MMP-degraded CRP), VICM (Citrullinated and MMP degraded Vimentin), ICTP (MMP destroyed type I collagen), osteocalcin (bone formation) and CTX-I (Bone resorption). Analysis of dose- and time-dependent effect of TCZ on the release of biomarkers compared to placebo both including and excluding the escape patients was done by two-way ANOVA.

Results: In the TCZ8 group, the cartilage degradation marker C2M was rapidly reduced as compared to placebo (week 2: −12% and remained low through weeks 4, 16, 24, and 52 (−13 to −16%, p<0.001). A similar pattern was observed for C3M, VICM, and CRPMP, which were reduced by 51%, 57%, and 28%, respectively. In contrast, MMP3 levels were strongly reduced in both TCZ4 and TCZ8 groups. The circulating level of total CRP was completely inhibited by TCZ8, but only inhibited by 50% in the TCZ4 group. Osteocalcin and CTX-I were both increased in response to TCZ8, but only osteocalcin was increased in response to TCZ4. No change in ICTP was observed. There was a significant difference (p<0.001) in the biomarker profiles between escape patients, non-responders and responders.

Conclusion: TCZ8 strongly inhibited serum markers of cartilage degradation, synovial inflammation, and inflammation mediated tissue turnover suggesting that TCZ actively suppresses key pathobiological processes at the site of inflammation in RA patients. TCZ8, on the other hand, had limited effect on the release of the markers. This might indicate that TCZ8 had a more beneficial effect on the joint health as compared to TCZ4. Furthermore, the difference in the biomarkers profiles of responders and non-responders were markedly different indicating that predictive profiles for responders and non-responders may exist.

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High Body Mass Index Is Associated with Decreased Response to Initial Combination Therapy in Recent Onset RA Patients, Marionne van den Broek,1, L. Heimans,2 S. le Cessie,1 B. Siegertink,1, H.K. Ronday2, K.H. Han,3 P.J.S. Kerstens,3 T.W.J. Huizinga2, W.F. Lems1 and C.F. Allaart.4

Leiden University Medical Center, Leiden, Netherlands,2 Haga Hospital, The Hague, Netherlands,1 MCRZ hospital, Rotterdam, Netherlands,4 Jan van Bremen Research Institute | Reade, Amsterdam, Netherland,3 VU University medical center, Amsterdam, Netherlands

Background/Purpose: A diminished response to combination treatment with a fixed dose of TNF-blocker infliximab (IFX) has been reported in patients with established RA and a high BMI. The association between BMI and response to therapy might also exist for other treatment regimens through inflammation and/or pain.

The association between high body mass index (BMI) and treatment response was assessed in a treat to target cohort with recent onset RA patients.

Methods: All patients from the BeSt study (n=508), in which patients were randomized to initial monotherapy or combination therapy with prednisone or infliximab (IFX) were included in the analyses. Response (DAS28<2.4) to disease activity steered treatment (first dose and after 1 year) was compared between patients with a BMI <25 and ≥25, using Poisson regression analyses. Several components of disease activity and functional ability during the first year were compared using linear mixed models. Joint damage progression in year 1 and over 8 years of treatment was compared using radiographs scored with the Sharp/van der Heijde Score.

Results: High BMI was independently associated with decreased treatment response to initial therapy, RR: 1.20 (95% C.I. 1.05–1.37). After stratification for initial treatment group, the effect was found for combination therapy with prednisone: RR 1.55 (1.06–2.28) and for combination therapy with IFX, RR 1.42 (0.98–2.06). The RRs for failure after one year in these groups were 1.46 (0.75–2.83) and 2.20 (0.99–4.92) respectively. A similar association was found for response to delayed combination therapy with IFX, after adjustment for selection bias related to previous failure on DMARDs. In the first year of treatment, patients with a high BMI had higher disease activity and worse functional ability, with more tender joints and a higher VAS global health, but not more swollen joints and similar systemic inflammation. Patients with high BMI did not have more damage progression over time (figure 1).

Conclusion: High BMI was independently associated with decreased response to initial combination therapy with prednisone and to initial and delayed treatment with infliximab. During DAS28<2.4 targeted treatment, patients with a high BMI experienced more pain, but not more swelling or systemic inflammation. Joint damage progression over 8 years was similar for patients with high and normal BMI.

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Once Daily High Dose Regimens of GLPG0634 in Healthy Volunteers Are Safe and Provide Continuous Inhibition of JAK1 but Not JAK2. Florence Namour1, René Galien1, Lien Gheylen2, Frédéric Vanhoutte1, Béatrice Vaysseire1, Ansgreet Van der Aa2, Bart Smet2 and Gerben van ’t Klooster1.1 Galapagos SASU, Romainville, France, 2SGS Clinical Pharmacology Unit, Antwerp, Belgium, 3Galapagos NV, Mechelen, Belgium

Background/Purpose: GLPG0634 is an orally-available, selective inhibitor of Janus kinase 1 (JAK1) with an IC50 of 0.6 μM and a 30-fold selectivity over JAK2 in human whole blood. Non-selective JAK inhibitors have shown long-term efficacy in treating rheumatoid arthritis (RA). However, doses and thereby efficacy are limited by JAK2-driven side effects. Selective inhibition of JAK1 may result in a cleaner safety profile while maintaining clinical efficacy. Based on its pharmacokinetic (PK) half life, both once-daily (QD) and twice-daily (BID) dosing regimens have been explored. In patients with active RA on methotrexate, 4 weeks daily dosing of 200 mg GLPG0634 has shown highly encouraging efficacy and safety.

Objectives: Evaluate the safety, PK, IAK pharmacodynamics (PD) and -selectivity of GLPG0634 at high dose QD regimens in healthy volunteers.

Methods: In a single-center Phase I study, 3 panels of 8 male healthy volunteers (2 on placebo) received QD dosing of 200 mg, 300 mg and 450 mg GLPG0634 for 10 days. Safety was monitored continuously and followed until 7 days after the last dose. Day profiles for PK and PD were evaluated on Days 1 and 10. GLPG0634 plasma concentrations were assessed by LC-MS/ MS. Inhibition of JAK1 was measured by ex vivo IL-6 induced STAT1 phosphorylation (pSTAT1) in CD4+ cells, and JAK2 by GM-CSF induced pSTAT5 in CD3+ cells.

Results: GLPG0634 was safe and well-tolerated for 200 mg, 300 mg and 450 mg QD, following 10 days of dosing. Treatment-emergent adverse events over all dose groups were typical Phase 1 findings (mild and transient headache and abdominal discomfort), with a comparable incidence in GLPG0634- and placebo- treated subjects. There were no relevant findings regarding hematology (including reticulocytes), biochemistry (including LDL cholesterol, ALT/AST or creatinine) or other safety parameters (ECG and vital signs, including blood pressure). A maximal tolerated dose was not reached.

Steady state PK was dose proportional up to 450 mg QD, with an apparent mean half-life of 8 hours. The PK was similar in RA patients and healthy volunteers. There was no accumulation to steady state with low trough levels relative to GLPG0634’s IC50. Still, JAK1 signaling remained suppressed up to 24 hours from drug intake, whereas JAK2 signaling was not influenced up to the high dose of 450 mg QD.

Conclusion: At high doses, exceeding those showing high level efficacy in a 4-week RA patient study, GLPG0634 was well tolerated and safe in healthy volunteers. No safety signals were found with GLPG0634; typical findings reported within 2 weeks of dosing of non-selective JAK inhibitors were not observed. Up to 450 mg QD, GLPG0634 was highly selective for inhibition of JAK1 over JAK2. The data suggest the PD half life to be longer than that for PK.

Ongoing studies in RA patients will determine the efficacy of low doses of GLPG0634 (30 mg QD) and the safety of high doses (300 mg QD).

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The Incidence of Exacerbation of Pre-Existing Interstitial Lung Disease (ILD) Is Higher in TNF Blockers Than in Non-TNF Blockers in RA. Tamao Nakashita1, Shinji Motojima2, Inari Kubota1,2,3

1Kameda Medical Center, Kamogawa City, Japan, 2Kameda Medical Center, Kamogawa city, Japan

Background/Purpose: Exacerbation of interstitial lung disease (ILD) is a problem when biologics are administrated in patients with RA, and is a problem when biologics are administrated in patients with RA. In Japan there are 6 biologics available for the treatment of RA, 4 of which are TNF blockers and 2 are non-TNF blockers. Here we compared the incidence of exacerbation of pre-existing ILD in patients administrated with TNF blockers and non-TNF blockers.
Methods: Subjects were 58 patients with RA, with the mean age of 66. As a part of workup before administration of biologics, chest CT scan was done. After administration of biologics, chest X-ray film (CXR) was taken at least every 3 months. When newly developed shadows were found on CXR or when patients complained of respiratory symptoms for more than 2 weeks, chest CT scan was done again. The severity of ILD was graded into 3, grades 1 to grade 3, according to the extent of ILD on chest CT. The biologics administered were infliximab (IFX) for 8, etanercept (ETN) for 36, adalimumab (ADA) for 2, tocilizumab (TCZ) for 9 and abatacept (ABT), respectively. The duration of observation was 12 months, except when the biologics were withdrawn because of exacerbation of ILD.

Results: The ILD of 30, 22 and 6 patients were graded into grade 1, 2 and 3, respectively. The ILD exacerbated in 14 subjects (24.1 %), the duration from the introduction of biologics to the exacerbation was from 1 to 12 months with the median of 7 months. The biologies used at the exacerbation of ILD were IFX in 5, ETN in 8, ADA in 1, TCZ in 0 and ABT in 0, respectively. The incidence of ILD exacerbation with TNF blockers and non-TNF blockers were 30.4 % (14/46) and 0 % (0/12), respectively, and there was a significant difference between them (p = 0.024). There were no differences between the subjects with ILD exacerbation and those without it in age, gender, RF titer, the ILD grade, KL-6 concentration, and the dose of prednisolone and MTX. The KL-6 concentration increased significantly when ILD exacerbated (p < 0.05). The biologies were withdrawn in 11 of 14 subjects with ILD exacerbation, and 2 subjects with ILD grade 2 and 3 died due to respiratory failure.

Conclusion: The exacerbation rate was high in patients with pre-existing ILD when TNF blockers were administered.

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The Predictive Value of CD64 Counts for Infectious Disease in Patients Treated with Tocilizumab On the Infectious Disease Risk Management Cohort (ACT14U-study).

Atsushi Ihata1, Hiroiyo Hagiyama2, Shouhei Nagaoka3, Junichi Obata4, Kiyomitsu Miyachi5, Hidehiro Yamada6, Shunsei Ohno7, Hirohata7, Norihiko Koido8, Masaomi Yamasaki9, Kenichi Miyagi10, Shigeru S574

Methods: Forty-nine RA patients with were enrolled from 4 universities and affiliated clinics (Table). They were required to comply with IDRM policy during observation period. CD64 and PCT were measured at week 0, 4, 8 and the occurrence of infectious disease. Primary endpoint was occurrence frequency of SI (OFSI) and rate of increase in CD64 and PCT. Secondary endpoint was admission due to infection, the dose of concomitant medicines, CDAI and persistence rate of TCZ.

Table

<table>
<thead>
<tr>
<th>Case</th>
<th>Baseline characteristics of RA subjects at cohort entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>Male/Female</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>57±2.1</td>
</tr>
<tr>
<td>Weight</td>
<td>8.0±1.4 (6.0)</td>
</tr>
<tr>
<td>Steinblocker’s Stage (1/2/3/4)</td>
<td>18.835/4.22/0.922</td>
</tr>
<tr>
<td>Steinblocker’s Class (1/2/3/4)</td>
<td>22.9/65.2/5.4/6.0</td>
</tr>
<tr>
<td>Smoking</td>
<td>14.3%</td>
</tr>
<tr>
<td>Steroid use</td>
<td>≥0.6</td>
</tr>
<tr>
<td>Methotrexate use</td>
<td>≥0.5</td>
</tr>
</tbody>
</table>

Results: CD64 was 1477.3±199 and 1456.1±96.7 before and after TCZ administration, respectively. There was no significant difference of CD64 and PCT at baseline between patients with infectious disease and without infectious disease (1104.8±228.3 vs. 1501.4±191.5). Although the increase of CD64 was found in patients with infectious disease at week 8 compared with patients having no infectious disease, there were no significant difference between two groups (2091.7±934.9 vs. 1405.2±157.9). CRP was not as sensitive as CD64, which increased more than 2,000 when infection was complicated in some, but not all cases.

Neither pneumonia nor cellulitis occurred in 17 events of infection and 3 events of SI. CDAI was changed from 61.1±3.7 to 18.3±4.4 (Figure). The dose of CS was reduced by 41.8%. Persistence rate of TCZ was 69.4% at 48 weeks (Figure).

Conclusion: The present study showed that CD64 more sensitively moved than CRP at the complication with infection, suggesting that CD64 was a promising surrogate marker to detect infectious events in patients treated with TCZ. In spite of higher frequency of concomitant lung disease, the incidence of respiratory infection and OFSI were lower in our study than PMS, indicating that IDRM could contribute to reduction of OFSI especially in respiratory infection.

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Intra-Articular Etanercept Treatment in Inflammatory Arthritis: A Randomized Double-Blind Placebo-Controlled Trial.

Jeroen V. J. A. Smeets1, Danielle M. Gerlag1, Koen Vos1, Gertjan Wolbink2, R. Landewe1 and K. Miyagi1, None; d. Kishimoto, None; R. Watanabe, None; T. Uehara, None; T. Tan, None; M. Kiyama, None; R. Yoshimi, None; A. Ueda, None; M. Takeno, None; Y. Ishigatubo, None.

Background/Purpose: The use of intra-articular (IA) corticosteroid injections has been widely accepted as a therapy to control local inflammation. Studies on the use of IA TNF inhibitors revealed conflicting results. Case-reports suggested long-term efficacy of single or repeated injections in inflammatory arthritides. Randomized controlled trials comparing the use of IA TNF inhibitors to IA corticosteroids, showed either inferior or comparable efficacy. It is unknown if IA TNF blockade is more effective than placebo treatment. The objective of this trial was to investigate efficacy and safety of a single IA etanercept injection in comparison to placebo.

Methods: Patients with rheumatoid arthritis (RA) (revised 1987 ACR criteria) or psoriatic arthritis (PsA) (CASPAR classification criteria) and arthritis of knee, ankle, wrist, elbow or MPC joint despite a stable dose of methotrexate and/or prednisone were included. Patients were randomized to receive an IA injection of etanercept (25 mg) or placebo (0.9% NaCl) in a 2:1 ratio. Target joint improvement was determined by a composite change equations was used with age, gender, disease duration, CRP at baseline and TJC at baseline as covariates, and an exchangeable working correlation structure was chosen. Safety and general disease activity parameters were evaluated weekly up to week 6, as well as systemic CRP level, ESR and etanercept levels.

Results: Thirty-two patients (RA=12; PsA=20) were included, 22 received etanercept and 9 placebo. At baseline both groups were comparable. Treatment with etanercept resulted in a prompt and statistically significant improvement of the CCI (p<0.001) in comparison with placebo, as well as in...
Disclosure: C. J. Aalbers, None; D. M. Gerlag, None; K. Vos, None; G. Wolbink, Pfizer Inc, 2, Pfizer Inc, 8, Amgen, 8; R. Landewe, Abbott Immunology Pharmaceuticals, Amgen, Centocor, BMS, Johnson-Johnson, Merck, Pfizer, Roche, 5; P. P. Tak, Employee of GlaxoSmithKline, 3.

Background/Purpose: Tocilizumab (TCZ), as monotherapy and in combination with methotrexate (MTX), has been shown to be efficacious for rheumatoid arthritis patients with insufficient response to MTX or other disease-modifying antirheumatic drugs. These observations were extended to patients with early rheumatoid arthritis (ERA) or refractory to tumor necrosis factor inhibitors. This study was designed to compare the rate of remission induction and the cardiorespiratory endurable response (CRE) in early RA patients treated with TCZ or MTX.

Methods: Eligible patients had disease duration ≤2 years, were MTX-naïve, and had active RA (DAS28 ≥3.2). Thirty (23 women and 7 men) RA patients were randomized to receive either TCZ 8 mg/kg every month or MTX 20 mg weekly for 6 months. After this first period, all patients were treated with MTX for an additional 6 months period. Baseline demographics did not differ between groups: mean age Δ+/- SD (56.9 Δ+/- 10.4) vs (49.4 Δ+/- 14.0), mean disease duration (0.49 Δ+/- 1.3) vs (0.99 Δ+/- 2.3), mean DAS 28-CRP (4.7 Δ+/- 1.3) vs (4.4 Δ+/- 1.0), mean HAQ (1.4 Δ+/- 0.7) vs (0.9 Δ+/- 0.6). ACR and EULAR core set values were evaluated monthly by an independent joint assessor. Differences were statistically tested using Mann-Whitney or Wilcoxon rank tests.

Results: 13 and 17 ERA patients were included in the MTX and TCZ arm, DAS 28CRP promptly improved with a between group statistically significant difference observed at month 3 and 6. At week 24, respectively 76.5% (13/17), 75% (12/16) of patients in the TCZ group achieved DAS28CRP remission (<2.6) and SDAI remission (<3.3) vs 41.7% (5/12), 50% (6/12) in the MTX group. Interestingly, a SJC of 0 was achieved at 6, 9 and 12 month in a significantly greater proportion of patients in the TCZ group (88%) compared to the MTX group (36%) (p<0.012). According to the new ACR/EULAR Boolean definition, remission was achieved in 31.3% (5/16) of TCZ patients and 0% (0/13) of MTX patients (p<0.048). The proportion of patients achieving ACR20 scores within the non-REM (0-10) was not significantly greater in the TCZ group (70.5% [12/17]) than in the MTX group (33.3% [4/12]). For the submaximal CRE test, 13 patients were excluded from the analysis because they were unable to perform the 3rd stage. The work capacity during the active treatment was not statistically improved at 6 months (W65%/kg: 1.86 Δ+/- 0.85 vs 1.57 Δ+/- 0.60 watts/kg for the MTX group and 1.55 Δ+/- 0.60 vs 1.57 Δ+/- 0.49 for the TCZ group). Serious AEs were reported by only one patient in the TCZ group who developed an episode of diverticulitis at 24 weeks.

Conclusion: These results demonstrate that remission is a realistic therapeutic goal when TCZ monotherapy is administered early in the RA disease process. In this population of naïve DMARDs ERA patients, TCZ was superior to MTX alone in producing prolonged clinical remission. We failed to demonstrate that early RA patients intensively treated with TCZ or MTX could restore their CRE despite a large clinical response.

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Changes in the Levels of Anti-Cyclic Citrullinated Protein Antibody and Immunoglobulins in Rheumatoid Arthritis Patients After Administration of Tocilizumab. Masao Sato, Masao Takemura, Ryuki Shinohe, Tsuneo Watanabe and Katsuji Shinizu. Gifu University, Gifu, Japan

Background/Purpose: The recently established scoring system of American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) early arthritis diagnosis criteria have assigned scores of 0, 1, and 2, respectively, for negative, positive (low titer), and positive (high titer) results of anti-cyclic citrullinated protein (anti-CCP) antibody tests. Thus, high anti-CCP antibody titer is unfavorable in the pathological condition of rheumatoid arthritis (RA). We investigated the changes of anti-CCP antibody and immunoglobulin titers after treatment using tocilizumab (TCZ), which is the biological product of an interleukin (IL)-6 inhibitor agent.

Methods: Subjects were 40 RA patients (6 men, 34 women). The patient backgrounds were as follows: age, 25–76 years; mean age, 58.1 ± 11.8 years; mean disease duration, 8.8 ± 8.4 years (range, 1–45 years). TCZ 8 mg/kg was intravenously administered every 4 weeks and was continued for 52 weeks. Evaluations were performed at 3 time points: at the start of the treatment, after 12 weeks, and after 52 weeks. The methods of evaluations were as follows: after calculation of the patient’s disease activity score (DAS28), quantitative determination of serum C-reactive protein (CRP) and immunoglobulin levels was performed by TIA. Anti-CCP antibody was measured using CL-JACK with a designated reagent and an anti-CCP test kit. IL-6 was evaluated using CLEIA. In addition, lymphocyte phenotypes were analyzed for CD3/CD19, CD4/CD25, and CD8/CD11 levels with the corresponding antibodies by using a flow cytometer.

Results: Of the 40 RA patients, 34 patients showed effective improvement in the DAS28; further, although effective, 6 patients showed insufficient DAS28. All CRP values of effective cases after the 12-week evaluation were much less than the cut-off value (0.02 μg/ml). Comparison of the immunoglobulin levels at the start of the treatment and after 52 weeks of treatment were respectively as follows: IgG, 1550.1 ± 518.9 mg/ml and 1162.2 ± 431.9 mg/ml, p < 0.0006; IgA, 287.9 ± 112.2 mg/ml and 234.7 ± 89.9 mg/ml, p < 0.002; IgM, 119.9 ± 68.0 mg/ml and 111.9 ± 59.1 mg/ml, not significant (NS). A significant decrease was observed in IgG and IgA levels. No changes were observed in the CD3 (682.1 ± 11.7% and 652.2 ± 11.2% [NS]), CD19 (12.5 ± 8.1) and 14.3 ± 8.7% [NS]), and number of lymphocytes. The results at the beginning and after 52 weeks of treatment for anti-CCP antibody were 207.0 ± 281.2 U/ml and 253.6 ± 336.4 U/ml (NS) and IL-6, 22.7 ± 35.6 pg/ml and 31.8 ± 40.1 pg/ml (NS). No statistically significant differences were observed.

Conclusion: It can be confirmed from our study results that administration of TCZ decreases immunoglobulin levels in all patients. This result is understood clearly by blocking the differentiation-inducing effect from B-cell lymphocytes to plasma cells, which originally is an action of IL-6. Despite the decrease in general parameters. When analysed over time, this beneficial effect was transient and only statistically significant at week 1 and 2 after IA injection (Figure 1). Joint tenderness remained decreased up to week 6 (p < 0.01). Maximum serum etanercept levels measured after 1 week were 1.39 ± 0.46 μg/ml. Levels were comparable between CCI ‘good’- and ‘non-responders’. Mild transient adverse events were reported for 7 (32%) patients treated with etanercept and 2 (25%) with placebo (p=0.55). No serious adverse events were reported.

Figure 1. Effect over time of treatment on the composite change index (CCI). The CCI is calculated relative to the baseline visit. Etanercept has a significant effect on the CCI at 1 and 2 weeks after intra-articular injection. *p < 0.05; **p < 0.01.

Conclusion: A single IA etanercept injection is feasible and safe and results in transient improvement of disease activity in the target joint as well as general parameters. This treatment can benefit patients who do not respond to or do not tolerate IA corticosteroids. Due to the high costs associated with anti-TNF treatment, IA corticosteroids remain the preferred treatment option.
possibility that a decrease in the levels of anti-CCP antibodies can be misinterpreted, no such observations were noted. A suppressive action on B-cell differentiation is assumed because of the changes in lymphocytes (CD19+) in the patient blood samples. However, TCZ is considered to have no suppressive action on anti-CCP antibody production at the local inflammation sites in RA patients.

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Background/ Purpose: Sarilumab, a fully human monoclonal antibody targeting interleukin-6 receptor alpha (IL-6Rα), is being evaluated for the treatment of rheumatoid arthritis (RA) based on the role of IL-6 in RA pathogenesis. This study aims to characterize the pharmacokinetic (PK) profile of single subcutaneous (SC) doses of sarilumab, and determine its relationship to markers of pharmacodynamic (PD) effects in patients (pts) with RA.

Methods: In this phase 1 parallel group study, pts with active RA (N=32) on background methotrexate (MTX) received a single SC dose of 50, 100, or 200 mg sarilumab or placebo (PBO). Blood samples were drawn at baseline and post-treatment days 1, 4, 8, 12, 15, 22, 29, 36, and 43. The serum obtained was analyzed for concentrations of functional sarilumab, defined as antibody with 0 or 1 of the 2 binding sites occupied by soluble IL-6Rα, using a validated enzyme-linked immunosorbent assay (ELISA). Pharmacokinetic parameters were determined using non-compartmental methods. The PK markers IL-6, high sensitivity C-reactive protein (hsCRP), and serum amyloid A (SAA) were assessed in parallel. Safety and tolerability were evaluated based on incidence of adverse events (AEs) and clinical/laboratory assessments.

Results: All pts were white and female; age ranged from 45.5–55.4 years and RA duration from 7.9–10.3 years. PK is characterized as non-linear with target-mediated elimination. An initial absorption phase, followed by a saturating beta phase and a terminal target-mediated elimination phase were observed. Patients in the higher dose groups had higher concentrations of functional sarilumab, and these concentrations were detectable for a longer period (Table). A greater than dose-proportional increase in the area under the concentration-time profile (AUC) and maximum serum concentration (Cmax) was observed. The beta phase was well defined in the 200 mg dose group. While no meaningful changes over time were observed in hsCRP, SAA, or IL-6 with PBO, changes in the sarilumab groups reflected both the dose and PK profile. Reductions in hsCRP and SAA and increases in IL-6 were greater of longer duration at higher doses, and were statistically significant compared to placebo. The largest % changes were seen in the 200 mg group: hsCRP –91.7%, SAA –92.5%, and IL-6 +647%. The most commonly reported treatment-related AEs in the combined sarilumab groups were neutropenia, increased alanine aminotransferase, and increased aspartate aminotransferase, which were transient and not associated with clinical sequelae. One pt receiving sarilumab 50 mg had a serious AE of RA flare requiring hospitalization.

Conclusion: Sarilumab has a nonlinear PK profile with parallel linear and target-mediated elimination. PD effects were dose-dependent, consistent with the PK profile, and showed substantial reductions in acute phase reactants relative to placebo.

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Anti-Tumor Necrosis Factor Therapy Reduces Serum Levels of Chemerin in Rheumatoid Arthritis: A New Mechanism by which Anti-Tumor Necrosis Factor Might Reduce Inflammation. M.M. Herenius1, A.S.F. Oliveira1, C.A. Wijbrands1, D. Gerlag1, Paul P. Tak2 and Maria C. Lebre1. 1Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands, 2Academic Medical Center, University of Amsterdam and GlaxoSmithKline, Amsterdam, Netherlands

Background/ Purpose: Chemerin is a specific chemotaxtractant for macrophages and dendritic cells (DC). In addition, it can rapidly stimulate macrophage adhesion to extracellular matrix proteins and adhesion molecules and is able to activate fibroblast-like synoviocytes (FLS), suggesting a role in the pathogenesis of rheumatoid arthritis (RA). Chemerin is also an adipokine that has been related to the inflammatory state of endothelial cells and as such could be involved in the changes in endothelial cells in RA and perhaps increased cardiovascular morbidity. We investigated whether anti-TNF treatment affects chimeric levels.

Methods: 49 patients with active RA (disease activity score evaluated in 28 joints (DAS28) ≥3.2) were started on adalimumab therapy. Blood was drawn from patients while fasting at baseline and 16 weeks after treatment. Chemerin serum levels were measured by ELISA and related to disease activity, mediators of inflammation and known risk factors for cardiovascular disease.

Results: Adalimumab therapy significantly reduced chemerin serum levels, which was correlated with the reduction in DAS28 (r=0.37, p=0.009), ESR (r=0.55 p<0.001), CRP (r=0.40, p=0.005). In addition, the decrease in chemerin serum levels after anti-TNF treatment was associated with the decrease in serum levels of IL-6 (r=0.39, p=0.033) and macrophage migration inhibitory factor (MIF) (r=0.31, p=0.049). Baseline chemerin serum levels were not related to traditional risk factors for atherosclerosis, except perhaps for smoking (p=0.07). 

Conclusion: The present study suggests that anti-TNF therapy may exert its beneficial effects on synovial inflammation and cardiovascular morbidity in part via an effect on chemerin levels.

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A Pilot Study Investigating the Tolerability and Pharmacodynamic Effect of Single Intravenous/Subcutaneous Doses of Olokizumab, an Anti-Tumor Necrosis Factor Antibody, in Patients with Rheumatoid Arthritis. Roy Fleischmann1, Alan J. Kivitz2, Frank Wagner3, Jeffrey A. Feinstein4, Uwe Fuhr5, Jürgen Rech6, Jagdev Sidhu7, Philip L. Hill8, Ruth Oliver9 and Kosmas Kretsos9. 1University of Texas Southwestern Medical Center, Dallas, TX, 2Altoona Center for Clinical Research, Duncansville, PA, 3Charité Research Org GmbH, Berlin, Germany, 4San Antonio, TX, 5Hospital of the University of Cologne (AöR), Köln, Germany, 6University of Erlangen-Nuremberg, Erlangen, Germany, 7CSL Limited, Parkville, Australia, 8UCB Celltech, Slough, United Kingdom, 9UCB, Slough, United Kingdom

Background/ Purpose: Olokizumab is a novel IL-6 inhibitor that selectively blocks the final assembly of the IL-6 signaling complex (gp80+gp130+IL-6). We report the safety, PK, and PD results from a pilot single-dose study in patients with rheumatoid arthritis (RA).

Methods: This was a randomized, double-blind, placebo-controlled study of RA patients who: were diagnosed by the 1987 ACR criteria; had >6 months’ disease duration; were treated with metotrexate 5–25 mg/week for at least 3 months prior to screening; had an elevated baseline high-sensitivity C-reactive protein (CRP, median 3.37, range 0.6–27.2 mg/L) with a reason- able spread that allowed robust characterization of the PD effect. At baseline, the mean DAS28 (CRP) was 3.07 (okolizumab) and 2.87 (placebo). Patients were randomized (3:1) to a single dose of okolizumab, either iv (0.1 or 1.0 mg/kg) or sc (1.0 or 3.0 mg/kg), or placebo. Primary objectives of the study

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included evaluating the PK/PD relationship between olokizumab and CRP, and the safety and tolerability of olokizumab over 12 weeks post dose. Results: Of 40 randomized patients, 38 completed the 12-week follow-up. Dose-dependent and sustained suppression of plasma CRP followed all doses of olokizumab until the end of the study (except for the 0.1 mg/kg iv group). IL-6 levels were markedly reduced after olokizumab exposure, remaining suppressed for the duration of the study. Commonly reported AEs in olokizumab recipients included headache, infection, decreased white blood cells (WBC), and abnormal liver function tests (LFT), with no dose relationship to severity, grade, or frequency of reported events. Laboratory abnormalities included: reductions in WBC and elevated LFT, cholesterol, and triglycerides. Two serious AEs were reported: 1 for placebo (grade 2 Bowen’s disease) and 1 for olokizumab 1.0 mg/kg sc (worsening of RA). Two patients withdrew: 1 placebo (worsening of RA) and 1 olokizumab 1.0 mg/kg sc (protocol deviation). Dose-related reductions in complement C3 and C4 were seen. The terminal elimination t1/2 of olokizumab in plasma was consistent regardless of route of administration or dose, with an overall median of 31 days. For the 1.0 and 3.0 mg/kg sc dose groups, the mean Cmax was 6.29 and 19.1 μg/mL, achieved within a median tmax of 13 and 7 days, respectively. Bioavailability determined from PK/PD modeling, pooling data from the first-in-human study and this study, was 76%. Non-compartmental analysis, based solely on data from this study, yielded a bioavailability of 66%.

Conclusion: In RA patients, single doses of ≤3 mg/kg sc olokizumab demonstrated prolonged suppression of CRP, a marker of inflammation, although CRP in the 0.1 mg/kg iv group showed some recovery after 28 days; all doses were well tolerated. These results provided the rationale for a further study to investigate the clinical efficacy of olokizumab in RA.

Reference:

Disclosure: R. Fleischmann, Genentech Inc, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicon, MSD, Novartis, Biogen Idec, Astellas, Astra-Zeneca, Jansen, 5, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicon, Novartis, Astellas, Astra-Zeneca, Jansen, HGS, 2; A. J. Kivitz, Genentech Inc and Biogen Idec Inc., 5, Bristol-Myers Squibb, 8, Takeda, 8, Forest Laboratories, 8, Pfizer Inc, 8; F. Wagner, None; J. A. Feinstein, None; U. Fuhr, None; J. Rech, None; J. Sidhu, None; P. L. Hill, Employed by UCB, 3; R. Oliver, Employed by UCB, 3; K. Kretos, Employed by UCB, 3.

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Effects of Subcutaneous Abatacept or Adalimumab On Remission and Associated Changes in Physical Function and Radiographic Outcomes: One Year Results From the Ample (Abatacept Versus Adalimumab Comparison in Biologic-NAIVE RA Subjects with Background Methotrexate) Trial. Roy Fleischmann1, Michael H. Schiff2, Michael E. Weinblatt3, Michael A. Malandrino4, Elena M. Masarotti4 and Yusuf Yazici5.

1University of Texas Southwestern Medical Center, Dallas, TX; 2University of Colorado, Denver, CO; 3Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA; 4Bristol-Myers Squibb, Princeton, NJ; 5Brigham and Women’s Hospital, Harvard Medical School, Boston, MA; 6New York University, New York, NY

Background/Purpose: Advancements in the understanding of Rheumatoid Arthritis (RA) have led to the development of novel therapeutics and treatment guidelines that target remission as an achievable goal in RA. Further, this has created a debate on the definition and dimensions of remission in RA. We report here, the impact of treatment with subcutaneous abatacept (ABA) or adalimumab (ADA) on remission in the AMPLE (Abatacept Versus Adalimumab Comparison in Biologic Naive RA Subjects with Background Methotrexate) study, the first head-to-head trial in RA patients with inadequate response to methotrexate (MTX). AMPLE provides a novel opportunity to compare biologic agents with different mechanisms of action and their ability to achieve remission defined by multiple criteria.

Methods: AMPLE is an ongoing, phase IIIb, randomized, investigator-blinded study of 24 months duration with a 12 month primary efficacy endpoint. Biologic-naïve RA patients with an inadequate response to MTX were randomized to 125 mg ABA weekly or 40 mg ADA bi-weekly, in combination with a stable dose of MTX. The proportions of patients achieving remission defined as DAS28-CRP <2.6, SDAI =3.3, CDAI ≤2.8, RAPID3 <1, and Boolean score ≤1 were assessed. Patient function (assessed with the health assessment questionnaire disability index [HAQ-DI] - responders defined as reduction ≥ 0.3) and radiographic non-progression (defined as change in modified total Sharp score of ≤ 0.5 or ≤ 2.8, change in erosion or joint space narrowing score of ≤ 0.5) were then analyzed in patients achieving remission at 1 year.

Results: The baseline clinical characteristics of ABA (n = 318) and ADA (n = 328) treatment groups were balanced, as was clinical, functional and radiographic efficacy and safety at 1 year with minor differences. The proportions of patients meeting each of the remission criteria at 1 year were generally equal for both groups, but significantly more patients achieved DAS28-CRP remission compared to CDAI, SDAI or RAPID3 remission, and the smallest proportion achieved Boolean remission (Table). Across all assessed remission criteria, 76–85% of patients in both treatment arms were HAQ responders at year 1. Furthermore, 63–100% of patients were radiographic non-progressors depending on the remission criteria employed; however, similar radiographic outcomes were seen in both treatment arms.

Remission Criteria | SC Abatacept | Adalimumab
--- | --- | ---
DAS28-CRP ≤ 2.6, n/n (%) | 119/275 (43.3%) | 112/267 (41.9%)
RAPID3 = 0–1.0 | 74/272 (27.2%) | 66/263 (25.1%)
CDAI ≤ 2.8 | 65/277 (23.5%) | 64/267 (24.0%)
SDAI ≤ 3.3 | 64/275 (23.3%) | 66/266 (24.8%)
Boolean | 6/275 (2.2%) | 15/267 (5.6%)

Conclusion: Patients treated with SC abatacept or adalimumab in the AMPLE trial achieved comparable rates of remission as assessed across multiple criteria. Similar improvements in physical function and radiographic outcomes were observed in patients that achieved remission. Data reported here further highlight the difference in remission rates depending on the measure used and help illustrate the relationship between remission and functional and radiographic outcomes independent of choice of effective treatment in RA.

Disclosure: R. Fleischmann, Genentech Inc, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicon, MSD, Novartis, Biogen Idec, Astellas, Astra-Zeneca, Jansen, 2; R. Fleischmann, Genentech Inc, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicon, Novartis, Astellas, Astra-Zeneca, Jansen, HGS, 5; M. H. Schiff, Bristol-Myers Squibb, 5, Abbott Laboratories, 8; M. E. Weinblatt, Bristol-Myers Squibb, Abbott, 2; Bristol-Myers Squibb, Abbott, 5; M. A. Malandrino, Bristol-Myers Squibb, 3; Bristol-Myers Squibb, 1; E. M. Masarotti, Bristol-Myers Squibb, 2, UCB, 5; Y. Yazici, Bristol-Myers Squibb, Genentech, Celgene, Janssen, 2, Bristol-Myers Squibb, Abbott, Genentech, UCB, Pfizer, Merck, 5, Bristol-Myers Squibb, Abbott, 8.

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1Hospital Universitario Sierraallana, Torrelavega, Spain; 2Hospital Sierraallana, Torrelavega, Spain, 3Hospital Universitario Marqués de Valdecilla, IFIMAV, Santander, Spain, 4Hospital Universitario Marqués de Valdecilla. IFIMAV, Santander, Spain, 5Fundación 12 de Octubre, Madrid, Spain, 6Hospital Universitario Marqués de Valdecilla, Santander, Spain

Background/Purpose: RA patients portend a greater risk of cardiovascular complications than general population. Although most probably diverse mechanisms are implicated, quantity and quality changes in the lipoproteins appear to have an important role.
Methods: RA patients in stable treatment with anti-TNF therapy at least during the last six months and a matched (by age, gender and rheumatoid factor status) with stable doses of standard DMARDS (most of them using methotrexate) were clinically evaluated using DAS28, as activity marker and MHAQ to assess disability. In addition, a complete standard lipid profile, a comprehensive lipoprotein assessment was carried out including: Lipoprotein, and apolipoprotein A1 (ApoA1) and B (ApoB) levels (total and lipoprotein specific), levels of paroxonase 1 (PON1), HDL, LDL, VLDL and total cholesterol, triglycerides and phospholipids levels as well as number of molecules of these lipids (mc, mt and mf respectively) in each lipoprotein, total mass (M) and number of particles (np) of the before mentioned lipoproteins, levels of PCSK9 receptor. Results of both subsets of patients were performed with standard statistical tests.

Results: Sixty-seven RA patients on anti-TNF and 63 matched RA patients on DMARD, mean age (58.7±12.3 and 61.2±1.1 years), gender distribution (81% females in both cases), disease duration (140±165 and 143±276 months) and RF status (64% in both cases) were comparable. Patients on DMARD were more active (DAS28 4.42±1.35 vs 3.57±1.27 and hsCRP 9.4±15.2 vs 3.8±5.8 mg/l respectively. Main findings in the lipoprotein analysis are shown in table 1.

Disclosure: J. Calvo-Alen, None; J. Villa, None; V. M. Martinez-Taboada, None; J. L. Peña-Sagredo, None; M. Agudo, None; A. C. García, None; J. Gomez-Gerique, None.

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Changes in Patient Reported Outcomes in Response to Subcutaneous Abatacept or Adalimumab in Rheumatoid Arthritis: Results From the Ample (Abatacept Versus Adalimumab Comparison in Biologic Naive RA Subjects with Background Methotrexate) Trial. Roy Fleischmann1, Michael E. Weinblatt2, Michael H. Schiff3, Dinesh Khanna4, Daniel Furst5 and Michael A. Maldonado6. 1University of Texas Southwestern Medical Center, Dallas, TX, 2Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 3University of Colorado, Denver, CO, 4University of Michigan, Ann Arbor, MI, 5University of California at Los Angeles, Los Angeles, CA, 6Bristol-Myers Squibb, Princeton, NJ

Background/Purpose: Rheumatoid arthritis (RA) is associated with pain, fatigue, disability and functional loss, which can significantly impact a patient’s health-related quality of life (HRQoL). Patient-Reported Outcomes (PROs) are critical since patients and caregivers do not always perceive treatment effects equally. To highlight the patient’s perspective, we report multiple PROs from the first head-to-head study, AMPLEx (Abatacept Versus Adalimumab Comparison in Biologic Naive RA Subjects with Background Methotrexate) comparing subcutaneous abatacept (ABA) and adalimumab (ADA) on background methotrexate (MTX).

Methods: AMPLEx is an ongoing, phase IIIb, randomized, investigator-blinded study of 24 months duration with a 12 month efficacy primary endpoint. Biologic-naive patients with active RA and inadequate response to MTX were randomized to either 125 mg ABA weekly or 40 mg ADA bi-weekly in combination with MTX. PROs assessed were patient pain, patient global assessment (PGA), and fatigue, all assessed by 100mm visual analog scale (VAS), and a higher score indicating worse outcome (Minimal Clinically Important Difference [MCID]: reduction ≥10mm). Physical function was evaluated with the health assessment questionnaire disability index (HAQ-DI; MCID reduction ≥0.3). HRQoL was assessed using the SF-36 (including Physical and Mental Component Summary subscores [PCS and MCS]; MCID: improvement ≥5).

Results: A total of 646 patients were randomized and treated with ABA (n=318) or ADA (n=328) on background MTX. Patient characteristics were balanced. A similar proportion of patients achieved a HAQ-DI response from baseline to year 1 (60.4% patients in the ADA arm vs. 57.0% patients in the ADA arm). Improvements in patient pain (mean% ± SE) were 46.5 ± 4.2% vs. 35.6 ± 4.1% at 6 months, and 53 ± 6.1% vs. 39.2 ± 6.0% at 1 year for ABA and ADA, respectively. Improvements in PGa were 40.2 ± 7.3% vs. 27.6 ± 7.2% and 46.1 ± 3.5% vs. 41.2 ± 3.4% for ABA and ADA at 6 months and 1 year. Fatigue decreased from baseline by −22.4 ± 1.5% vs. −19.9 ± 1.5% at 6 months, and −23.2 ± 1.5% vs. −21.4 ± 1.5% at 1 year for ABA and ADA respectively. Improvements in all domains of the SF-36 including PCS and MCS observed at 6 months were maintained at 1 year (Figure). For RAPID3, the ABA and ADA-treated groups demonstrated improvements (mean ± SE) of −2.7 ± 0.1 vs. −2.5 ± 0.1 at 6 months and −2.9 ± 0.1 vs. −2.7 ± 0.1 at 1 year.

Figure 1. Mean Change from Baseline to Year 1 in Short From-36 Scores

Conclusion: In this first head-to-head comparison, subcutaneous abatacept demonstrated significant improvements with similar kinetics of response in patient-reported outcomes and HRQoL measures over 1 year which were comparable to adalimumab.

Disclosure: R. Fleischmann, Genentech Inc, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicon, MSD, Novartis, Biogenidec, Astellas, Astra-Zeneca, Jansen, 2Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicon, Novartis, Astellas, Astra-Zeneca, Jansen, HGS; 5, M. E. Weinblatt, Bristol-Myers Squibb, Abbott, 2, Bristol-Myers Squibb; Abbott, 5, M.H. Schiff, Bristol-Myers Squibb, 5, Abbott Laboratories, 8, D. Khanna, Bristol-Myers Squibb, 2, Bristol-Myers Squibb, 5, D. Furst, Abbott, Actelion, Amgen, BMS, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 2, Abbott, Actelion, Amgen, BMS, Biogenidec, Centocor, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 5, Abbott, Actelion, UCB (CME ONLY); 8, M. A. Maldonado, Bristol-Myers Squibb, 3, Bristol-Myers Squibb, 1.

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EARLY Improvements in the Lower Limbs Enthesis by Ultrasound Predicting Later Favorable Responses in TNF Inhibitors-Treated Pa

Patients with Spondyloarthropathies: Clinical Aspects and Treatment

Monday, November 12, 2012, 9:00 AM–6:00 PM

Background/ Purpose: Lower limbs enthesis by ultrasound (US) detects inflammatory activity in patients with spondyloarthritides (SpA) and is a diagnostic tool of early SpA. The present objective was to follow SpA patients starting anti-TNF inhibitors with US and clinical assessments to
explore whether any variable in baseline or early stage could predict later favorable responses.

Methods: This study is prospective and US reader and clinical physician blinded study. Patients with SpA starting anti-TNF inhibitors were consecutively included and examined at baseline and, after 1 and 12 weeks with standardized bilateral ultrasound of six entheses (Madrid sonography enthesis index (MASEI)). In addition, the patients were assessed clinically with ASDAS, assessor global VAS (study nurse), ESR and CRP. Patients with ASDAS clinical important improvement at the 12 weeks examination was defined as responders. The results of US score (MASEI), clinical and laboratory assessments at baseline and after 1 week were explored by Mann-Whitney tests to examine for associations with the responders.

Results: A total of 45 patients were included (mean (SD) age 60.3 (25.2) years, disease duration 14.2 (6) years, and 35% women, with 73% using infliximab and 27% adalimumab). A total of 69% of the patients were defined as ASDAS responders, and they had significantly lower US score (MASEI) (p<0.03), assessor global VAS (study nurse) (p=0.02), and CRP (p=0.02) at the 12 weeks examination. Baseline US score (MASEI), ASDAS, assessor global VAS, ESR or CRP did not separate between responders and non-responders. At 1 week examination the only variable differing between responders and non-responders was the US score (MASEI), with a significant reduction in US score (MASEI) in the responders versus non-responders 12.6 (5.4) versus 2.3 (3.3) (p=0.03).

Conclusion: US enthesis images at 1 week after TNF inhibitors in patients with SpA are useful to identify later good responders.

References

Disclosure: K. Kume, None; K. Amano, None; K. Amano, None; H. Ohta, None; N. Kuwaba, None.

1344
Diagnostic Value of High Sensitivity C Reactive Protein for Early Axial Spondyloarthritis: Results From the Devenir Des Spondylarthopathies Indifférencées Recentes Cohort, Victoria Navarro-Compán1, Désirée van der Heijde1, Bernard Combe2, Claudine Cosson3 and Floris van Gaalen1.

1Leiden University Medical Center, Leiden, Netherland, 2Hopital Lapeyronie, Montpellier, France, 3Hoˆpital Bicêtre, Assistance Publique Hoˆpitaux de Paris, Paris, France

Background/Purpose: The average delay in spondyloarthritis (SpA) diagnosis after symptom onset is one of the longest among the inflammatory rheumatic diseases. Elevated C-reactive protein (CRP) has been incorporated as one of the features for ASAS axial SpA criteria and in the Berlin diagnostic algorithm. However, CRP levels are elevated in only a minority of early SpA patients which limits its potential diagnostic value. More sensitive tests called high-sensitivity CRP (hsCRP) have been developed and can detect lower concentrations of CRP compared with traditional CRP. The aim of this study was to assess if hsCRP measurement contributes to early axial SpA diagnosis compared with traditional CRP measurement.

Methods: Baseline data from 648 patients with inflammatory back pain (IBP) duration >3 months but <3 years from DESIR cohort was used. Design and inclusion criteria have previously been reported (1). Levels of CRP and hsCRP were measured in serum at baseline. The cut-off values selected to define positive hsCRP and CRP were ≥2 mg/l and ≥5 mg/l, respectively.

Results: Based on the ASAS axial SpA criteria, 444 (69%) patients were classified as SpA and 203 (31%) patients as no SpA. Patients’ characteristics and lab results are shown in table 1. Serum levels of CRP and hsCRP were higher in SpA versus no SpA. In the subgroup of patients with a negative CRP, mean serum levels of hsCRP were also higher in SpA patients compared with no SpA patients (1.7 mg/l vs 1.5 mg/l, p=0.03). Moreover, after dichotomizing hsCRP, more patients within the SpA group had a positive hsCRP versus the no SpA group, although this difference was not statistically significant (p=0.06) (table 2).

Finally, we investigated how many extra patients from the no SpA group (n=203) would be classified as SpA substituting the traditional CRP by hsCRP in the clinical arm (HLA-B27 arm) of the ASAS axial SpA criteria. Only 4 (2%) extra patients had 2 axial SpA features instead of only 1 feature (IBP) substituting hsCRP by CRP (195 vs 191 patients), but none of them was HLA-B27 positive. Consequently, none of the no SpA patients met ASAS criteria applying this modification.

Conclusion: In patients with a normal CRP, hsCRP is increased in axial SpA patients compared with patients without SpA. However, hsCRP measurement in patients with IBP may not add any extra value for early axial SpA diagnose compared with CRP measured by traditional method.


Disclosure: V. Navarro-Compán, None; D. van der Heijde, None; B. Combe, None; C. Cosson, None; F. van Gaalen, None.

1345
Validation of the Health Assessment Questionnaire for Spondyloarthritides in Patients with Non-Radiographic Axial Spondyloarthritides, Dennis Revicki1, Wen-Hung Chen1, Ying Jin1, Sumati Rao2, Philip Mease3 and Mary Cifaldi3.1 United Biosource Corporation, Bethesda, MD, 2ABBott Laboratories, Abbott Park, IL, 3Swedish Rheumatology Research Group, Seattle, WA

Background/Purpose: To evaluate the psychometric properties of the Health Assessment Questionnaire for Spondyloarthritis (HAQ-S) in patients with non-radiographic axial spondyloarthritis (nr-axSpA).

Methods: Data from 185 nr-axSpA patients receiving the human anti-TNF monoclonal antibody adalimumab (ABILITY-1-trial) were analyzed. Internal consistency and test-retest reliability were evaluated using Cronbach’s alpha and intraclass correlation coefficient (ICC), respectively. Convergent validity was assessed by correlating HAQ-S with Bath Ankylosing Spondylitis Functional Index (BASFI), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), EQ-5D™, Patient and Clinical Global Assessment of Disease Activity Visual Analog Scales (PGA-VAS and CGA-VAS), and Patient’s Global Assessment of Pain (PAIN-VAS). Known-groups validity and ability to detect changes were assessed based on Patient Acceptable Symptom State Questionnaire (PASS) and PGA-VAS using analysis of variance. PASS, PGA-VAS, and CGA-VAS were used as anchors to determine the minimally important difference (MID).

Results: The HAQ-S Global and Activity scores demonstrated internal consistency, with good Cronbach’s alpha (0.95 and 0.78, respectively), but Cronbach’s alpha was lower for Driving score (0.63). The HAQ-S Global, Activity, Driving, and Stiffness scores all demonstrated test-retest reliability, with good ICCs (0.90, 0.82, 0.71, and 0.87, respectively). The HAQ-S Global, Activity, and Stiffness scores demonstrated good convergent validity, as indicated by the moderate to high correlations with BASFI, BASDAI, EQ-5D™, PGA-VAS, and PAIN-VAS at baseline (0.51–0.76) and week 12 (0.53–0.89). Correlations between the HAQ-S Driving score and the criterion measures were lower (0.24–0.46 at baseline; 0.41–0.63 at week 12). For known-groups validity, mean HAQ-S Global, Activity, Driving, and Stiffness scores were lower (0.24–0.46 at baseline; 0.41–0.63 at week 12). For unknown-groups validity, mean HAQ-S Global, Activity, Driving, and Stiffness scores were lower (0.24–0.46 at baseline; 0.41–0.63 at week 12).

Table 1. Characteristics of patients

<table>
<thead>
<tr>
<th></th>
<th>n=444 (69%)</th>
<th>n=203 (31%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>32.4 ± 8.6</td>
<td>34.8 ± 8.3</td>
<td>0.001</td>
</tr>
<tr>
<td>Male</td>
<td>223 (50%)</td>
<td>76 (37%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Caucasian</td>
<td>400 (90%)</td>
<td>159 (88%)</td>
<td>0.5</td>
</tr>
<tr>
<td>Back pain duration</td>
<td>1.0 ± 0.9</td>
<td>0.9 ± 0.4</td>
<td>0.03</td>
</tr>
<tr>
<td>HLA-B27 positive</td>
<td>368 (83%)</td>
<td>8 (4%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sacroiliitis on MRI</td>
<td>106 (52%)</td>
<td>0 (0%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sacroiliitis on X-Ray</td>
<td>107 (24%)</td>
<td>0 (0%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>3.9 (1–6.9)</td>
<td>2.6 (1–5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>hsCRP (mg/L)</td>
<td>2.8 (1–8.1)</td>
<td>1.6 (0–3.6)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Table 2. Serum levels of hs-CRP in patients with normal CRP values (<5 mg/L)

<table>
<thead>
<tr>
<th></th>
<th>SpA (n=260)</th>
<th>No SpA (n=152)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hsCRP (mg/L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>174 (66.9%)</td>
<td>110 (72.4%)</td>
</tr>
<tr>
<td>2–&lt;3</td>
<td>41 (15.8%)</td>
<td>30 (19.7%)</td>
</tr>
<tr>
<td>3–&lt;4</td>
<td>34 (13.1%)</td>
<td>11 (7.2%)</td>
</tr>
<tr>
<td>4–&lt;5</td>
<td>7 (2.7%)</td>
<td>0</td>
</tr>
<tr>
<td>≥ 5</td>
<td>4 (1.5%)</td>
<td>1 (0.7%)</td>
</tr>
</tbody>
</table>

Finally, we investigated how many extra patients from the no SpA group (n=203) would be classified as SpA substituting the traditional CRP by hsCRP in the clinical arm (HLA-B27 arm) of the ASAS axial SpA criteria. Only 4 (2%) extra patients had 2 axial SpA features instead of only 1 feature (IBP) substituting hsCRP by CRP (195 vs 191 patients), but none of them was HLA-B27 positive. Consequently, none of the no SpA patients met ASAS criteria applying this modification.

Conclusion: In patients with a normal CRP, hsCRP is increased in axial SpA patients compared with patients without SpA. However, hsCRP measurement in patients with IBP may not add any extra value for early axial SpA diagnose compared with CRP measured by traditional method.

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scores at week 12 were significantly different for patients with different PASS responses (P<0.001). The HAQ-S Global, Activity, and Stiffness scores were significantly different for patients with PGA-VAS scores below and above the sample median at baseline and at week 12 (P<0.001). The HAQ-S Global, Activity, Driving, and Stiffness scores demonstrated significantly larger changes for responders (PASS=“Yes”) at week 12 than for non-responders (PASS=“No”), and for responders (PGA-VAS decreased ≥30% at week 12) than for non-responders (PGA-VAS decreased <30% or increased), indicating the ability to detect changes in clinical status. Using anchor-based methods (based on PASS, PGA-VAS, and CVA-VAS), MIDs ranged from −0.17 to −0.42 for HAQ-S Global score, −0.09 to −0.57 for HAQ-S Activity score, 0.10 to −0.29 for HAQ-S Driving score, and −8.8 to −32.7 for HAQ-S Stiffness score. The MID for the HAQ-S Global score should be 0.26 calculated as the average of the MIDs based on PGA-VAS and CVA-VAS anchors.

Conclusion: This study of the HAQ-S indicated that Global, Activity, and Stiffness scores were reliable and valid measures of functional ability in patients with nr-axSpA. The HAQ-S scores also demonstrated ability to detect change in clinical status.

Disclosure: D. Revicki; Abbott Laboratories, 2; W. H. Chen; Abbott Laboratories, 2; Y. Jin; Abbott Laboratories, 2; S. Rao; Abbott Laboratories, 1; Abbott Laboratories, 3; P. Mease; Abbott Laboratories, 5; Abbott Laboratories, 2; Abbott Laboratories, 8; M. Cifaldi; Abbott Laboratories, 1; Abbott Laboratories, 3.

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Background/Purpose: Patients with psoriasis and PsA can have fatigue, enthesitis, dactylitis, skin and nails. Where available, rheumatoid factor (RF) was assessed. Treatment for PsA included anti-TNF agents (22% of patients), disease-modifying anti-rheumatic drugs (36%), and non-steroidal anti-inflammatory drugs (82%). Sensitivity and specificities for the three questionnaires are shown in the table below. A positive non-PsA diagnosis was made in 54 subjects: 40 of these had degenerative tendonopathy or osteoarthritis.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>AUC</th>
<th>P value</th>
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<tbody>
<tr>
<td>PASE</td>
<td>74.5</td>
<td>38.5</td>
<td>0.594</td>
<td>0.052</td>
</tr>
<tr>
<td>PEST</td>
<td>76.6</td>
<td>37.2</td>
<td>0.610</td>
<td>0.023</td>
</tr>
<tr>
<td>TOPAS</td>
<td>76.6</td>
<td>29.7</td>
<td>0.554</td>
<td>0.267</td>
</tr>
</tbody>
</table>

Conclusion: Both the PEST and TOPAS questionnaires performed slightly better than the PASE questionnaire at identifying PsA but discriminate capacity overall was best for the PEST questionnaire. As patients scoring negative for the questionnaires were not examined these results are likely to overestimate the sensitivity and underestimate the specificity. Nevertheless, these screening tools do identify many cases of musculoskeletal disease other than PsA.

Disclosure: L. C. Coates, None; T. Aslam, None; A. D. Burden, None; E. Burden-Teh, None; A. R. Capron, None; R. Cerio, None; C. Chattopadhyay, None; H. Chinoy, None; M. J. D. Goodfield, None; A. D. Goodfield, None; A. Kay, Pfizer Inc; S. Abbott Immunology Pharmaceuticals, 8, Roche Pharmaceuticals, 6; W. B. Kirkham, Roche Pharmaceuticals, UCB Pharma, 2; Abbott Laboratories, Bristol-Myers Squibb, Chugai, Pfizer Inc, Roche Pharmaceuticals, UCB Pharma, 5; C. G. Lovell, None; H. Marzo-Ortega, None; N. McHugh, None; R. Murphy, None; C. Pitzalis, None; N. Reynolds, None; H. H. Smith, None; E. Stewart, None; R. B. Warren, None; H. E. Wilson, Pfizer Inc, 8, Abbott Immunology Pharmaceuticals, 9, Roche Pharmaceuticals, 9; P. S. Hellwell, None.

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Anti-TNF Treatment Discontinuation in Psoriatic Arthritis: Is it Possible After Achieving Minimal Disease Activity? Amir Haddad, Arane Thavaneswaran, Vinod Chandran and Dafna D. Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Remission in Psoriatic Arthritis, defined as a period of at least 3 consecutive visits with no actively inflamed joints, occurs in about 17 percent of patients with PsA. Achieving a state of Minimal Disease Activity (MDA) can lead to reduction in joint damage progression. In clinical practice, we face a dilemma in terms of future management when a patient achieves MDA while being on anti-TNF therapy. The aim of this study was to identify and describe PsA patients who discontinued or reduced the dose of anti-TNF agent and continued to remain in a state of MDA.

Methods: Patients were identified from a large single centre psoriatic arthritis cohort. We included patients who achieved MDA (according to slightly modified criteria proposed by Coates et al) and discontinued their anti-TNF treatment or reduced the dose and continued to remain in MDA. No predetermined protocol was used for dose reduction and in most cases it was left to patient preference. MDA was defined when fulfilling at least 5 of the 7 following outcome measures: tender joint count ≤1; swollen joint count ≤1; psoriasis activity and severity index (PSAT) ≤0.5 or body surface area ≤3; patient pain numerical rating scale (NRS) score of ≤2; patient global disease activity numerical rating scale (NRS) score of ≤2; Health Assessment Questionnaire (HAQ) score ≤0.5; and tender entheseal points ≤1. Baseline demographic and clinical characteristics at the first visit and before commencing anti-TNF therapy were collected including sex, age at diagnosis of psoriasis and PsA, disease manifestation (peripheral joint involvement, axial disease, the presence of enthesitis, dactylitis and tenosynovitis), previous disease-modifying anti-rheumatic drug use, the number of active and damaged joints, patient global assessment, C-reactive protein (CRP), ESR as well as the health assessment questionnaire (HAQ) and SF 36 PCS. Descriptive analyses were conducted.

Results: Of the 307 patients treated with anti-TNF agents in our cohort, 17 patients were identified who were able to reduce the dose of anti-TNF agents with a total of 22 observation periods and continued to be in MDA for a median period of 23.7 ± 16.6 months. 15 patients were on etanercept and 2 on adalimumab. Most patients were not treated concurrently with DMARDs at the time they reduced/stopped the dose of anti-TNF agent. 8 patients reduced their dose and did not flare for a mean duration of 38.7 ± 16.3
months, while 9 patients flared after a mean duration of 13.2 ± 12 months. Patients stopped the medications for the following reasons: 11 patients were in remission, 3 patients due to infection, 2 cases due to patient preference and one case due to non improvement in skin disease.

Conclusion: In this study, we identified a group of patients who have stopped or reduced the dose of anti-TNF medications after being in remission. Eight patients have reduced the dose with no evidence of disease exacerbation. The data support the need for randomized controlled trials to better define the duration of anti-TNF therapy in psoriatic arthritis.

Disclosure: A. Haddad, None; A. Thavaneswaran, None; V. Chandran, None; D. D. Gladman, None.

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Diffuse Idiopathic Skeletal Hyperostosis (DISH) in Psoriatic Arthritis.

Amir Haddad1, Arane Thavaneswaran1, Sergio M.A. Toloza1, Vinod Chandran1 and Dafna D. Gladman1. 1Toronto Western Hospital and University of Toronto, Toronto, ON; 2Hospital San Juan Bautista, Catamarca, Argentina

Background/Purpose: Spondylitis in Psoriatic Arthritis (PsA) sometimes resembles DISH because of the presence of juxta-vertebral calcification that resemble syndesmophytes. Distinguishing spondylitis from DISH has therapeutic and prognostic implications. The purpose of this study was to determine the prevalence of DISH in PsA patients and to identify features associated with its occurrence.

Methods: PsA patients were recruited from a single centre prospective observational cohort initiated on 1978. All patients fulfilled the CASPAR criteria and were assessed every 6–12 months according to a standard protocol which included a detailed history, physical examination and laboratory evaluation. Radiographs of peripheral joints and spine were obtained every 2 years. DISH was defined as flowing bony bridges in at least 4 contiguous thoracic vertebrae irrespective of the presence of radiographic sacroilitis on the last radiographic assessment. Each PsA patient with DISH was matched by sex to 3 PsA patients without DISH recruited to the clinic within a year. Demographics and disease characteristics were compared in both groups including age, disease duration, BMI, comorbidities (myocardial infarction, angina, diabetes, hypertenstion), uric acid levels, ESR and CRP. The radiographic features that were assessed included the presence of sacroilitis, syndesmophytes at cervical, thoracic and lumbar spine, and calcaneal spurs. Descriptive analyses and comparisons were conducted using McNemar test, Fisher’s exact test and Chi-squared test for categorical variables and paired t-test for continuous variables. Logistic regression analyses using univariate and multivariate models with stepwise regression were conducted.

Results: Of 938 PsA patients, DISH was observed in 78 patients with a prevalence of 8.3%. Patients with DISH were older (62.9 vs 49.3, P<0.0001), had a longer disease duration (15.1 vs 12.8 years, P<0.003), a higher BMI (32.9 vs 28.7, P<0.0001), had more diabetes (28% vs 9.8%, P<0.0001), hypertension (50% vs 24.9%, P<0.0001) and higher uric acid levels (16% vs 7%, P=0.02). The modified Steinbrocker score was also higher in patients with DISH (32.0 ± 39.8 vs. 19.5 ± 31.4, P=0.0001). The presence of inflammatory back pain, HLA-B27 allele and a previous history of psoriasis were similar in both groups. The differences in ESR and CRP were not statistically significant. However, patients with DISH had more syndesmophytes (38.5% vs 18.7%, P<0.0001) and calcaneal spurs (83.3% vs 60.9%, P<0.0001). Patients with DISH and syndesmophytes had more sacroilitis (65% vs 38%, P=0.02) than patients with no syndesmophytes. Older age, higher BMI and the presence of radiographic damage to peripheral joints were associated with DISH in the multivariate analysis with an odds ratio of 1.13 95%CI(1.07–1.19), 1.19 95%CI(1.09–1.29) and 5.22 95%CI(1.35–20.13) respectively.

Conclusion: DISH was associated with known DISH related factors including older age and high BMI, as well as the presence of radiographic damage to peripheral joints. The diagnosis of DISH is possible in the presence of psoriatic spondylitis. The presence of sacroilitis was similar but syndesmophytes were higher in patients with DISH.

Disclosure: A. Haddad, None; A. Thavaneswaran, None; S. M. A. Toloza, None; V. Chandran, None; D. D. Gladman, None.

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Kerry Wright, Cynthia S. Crowson, Clement J. Michet and Eric L. Matteson. Mayo Clinic, Rochester, MN

Background/Purpose: To determine trends in the incidence and clinical presentation of ankylosing spondylitis (AS) among residents of a geographically defined area first diagnosed 1980–2009 and to describe survival among these patients.

Methods: A population-based inception cohort of patients with AS was assembled by reviewing all medical records of residents of a geographical area with any diagnosis consistent with AS. We identified residents aged 18 years or older first diagnosed between January 1, 1980 and December 31, 2009. Cases were included if they fulfilled the modified New York criteria for AS or the ASAS criteria for axial spondyloarthritis and the date at which the criteria was fulfilled was considered the date of diagnosis. Incidence rates were estimated and were age- and sex-adjusted to the 2000 US white population. All identified cases were followed until death, migration or December 31, 2011. Cases with psoriasis, inflammatory bowel disease (IBD) and reactive arthritis were identified. Survival was estimated using the Kaplan-Meier method and compared to expected survival for persons of the same age, sex and calendar year estimated using US population life tables.

Results: 95 patients were newly diagnosed with AS between 1980–2009 (25 women and 72 men) based on ASAS criteria for axial spondyloarthritis. 92 (97%) patients met modified New York criteria. The overall age and sex-adjusted incidence for AS was 3.9 per 100,000 population (95% CI 3.1, 4.6). The age- and sex-adjusted incidence in men was more than three times that of women: 6.0 (95% CI 4.6, 7.4) vs 1.8 (95% CI (1.0, 2.5) per 100,000 population. The mean age at diagnosis was 35 years (min: 18 max: 69). Patients diagnosed in the 1990s (mean 39 years) were older than those diagnosed in the 1980s (mean 32 years) or the 2000s (mean 34 years). The median interval between symptom onset and diagnosis was 4.0 years (min: 0 max: 36 years) with no significant difference over the study period (p = 0.539). The incidence of AS was highest in the 25–34 age group at 8.0 per 100,000. Of 75 patients tested for HLA-B27 antigen, 65 (87%) were positive. Inflammatory back pain was the most common presenting manifestation and was seen in 92% of patients. Twenty nine patients (32%) had peripheral arthritis at diagnosis which was more common in patients diagnosed in the 1990s (50%) compared to the 1980s (36%) or the 2000s (20%; p = 0.034). Ten patients (11%) also had psoriasis and 10 (11%) had IBD. Uveitis was the most common extra-articular manifestation, seen in 31 patients (33%) with no significant change over the study period (p = 0.22). Uveitis occurred more often in women (50% vs 25%; p = 0.005). There were 3 deaths during a median follow up duration of 8.5 yrs. (total 998 person-years). This was consistent with the 4.4 expected deaths (standardized mortality ratio: 0.68; 95% CI 0.14, 2.00).

Conclusion: AS occurs in about 4 persons per 100,000 per year. Patients diagnosed in the 1990s had more peripheral arthritis and were slightly older at diagnosis than patients in any other decade. Clinical features, extra-articular manifestations and interval from symptom onset to diagnosis have remained constant in this population over the study period.

Disclosure: K. Wright, None; C. S. Crowson, None; C. J. Michet, None; E. L. Matteson, None.

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Inflammatory Biomarkers in Psoriatic Arthritis.

Ibrahim AliHomood, Arane Thavaneswaran, D. D. Gladman and Vinod Chandran. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Psoriatic arthritis (PsA) is an inflammatory arthritis that may progress rapidly and result in joint damage and disability. The aim of this study was to establish the frequency of raised inflammatory markers (ESR and CRP) in PsA and to investigate their association with disease activity and progression.

Methods: At the PsA Clinic patients are followed prospectively and are evaluated according to a standard protocol which includes a detailed clinical history, physical examination, laboratory and radiological assessments every 6–12 months. ESR levels are recorded as normal or raised (15 mm/hour for male patients, 20 mm/hour for female patients) as well as CRP as normal or raised (0–3). X-rays are done every two years. Patients followed between 2006 and 2011 were included.

ESR and CRP were measured at baseline in all patients included in this study, and correlated with other disease features at baseline. Pearson correlation coefficient was used for correlations between the continuous variables. We also constructed univariate and multivariate models based on information at baseline to detect the variables that associate with disease activity and severity. The covariates were age at onset of PsA, sex, duration of PsA, use of biologics, infection and BMI.

Results: A total of 253 patients with PsA (107 male and 146 female with mean duration of PsA 5.2±7.6 years) were included. ESR level ranged from 0 to 121 mm/hr at baseline. Mean ESR was 18.3±21.2 (median 11) and was...
elevated in 28.1%. CRP level ranged from 3 to 132 mg/l. Mean CRP was 14.3 ± 20.7 (median 5) mg/l and was elevated in 54.9%.

Correlation between ESR and CRP with the variables

<table>
<thead>
<tr>
<th>ESR Variable</th>
<th>Univariate analysis p-value</th>
<th>CRP Multivariate linear regression p-value</th>
<th>Univariate analysis p-value</th>
<th>CRP Multivariate linear regression p-value</th>
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</thead>
<tbody>
<tr>
<td>Active joints</td>
<td>0.02</td>
<td>0.06</td>
<td>0.67</td>
<td>0.67</td>
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<tr>
<td>Damage joints</td>
<td>0.01</td>
<td>0.07</td>
<td>0.32</td>
<td>0.03</td>
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<td>BASDAI</td>
<td>0.0004</td>
<td>&lt;0.0001</td>
<td>0.13</td>
<td>&lt;0.0001</td>
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<tr>
<td>PASI</td>
<td>0.05</td>
<td>0.28</td>
<td>0.30</td>
<td>0.30</td>
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<tr>
<td>Radiological damage</td>
<td>0.12</td>
<td>0.68</td>
<td>0.16</td>
<td>0.16</td>
</tr>
</tbody>
</table>

The association between ESR and CRP and different variables

Conclusion: Increased ESR was observed in 28.1% of PsA and was correlated with active and damaged joint count and PASI. Increased CRP was observed in 54.9% of PsA and was correlated with PASI. Inflammatory markers are associated with disease activity and progression.

Disclosure: I. AlHomood, None; A. Thavaneswaran, None; D. D. Gladman, None; V. Chandran, None.

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Ultrasoundographic Enthesal Abnormalities Among Patients with Psoriatic Arthritis, Psoriasis Alone and Healthy Individuals and Their Correlation with Disease-Related Variables. Lihi Eder1, Jai Jayakar2, Arane Thavaneswaran3, Amir Haddad4, Daniel Pereira3, Sutharshini Shanmugara3, Toronto Western Hospital and University of Toronto, Ontario, London, ON, 4University Health Network, Toronto, ON

Background/Purpose: Enthesitis is an important manifestation of psoriatic arthritis (PsA). We aimed to compare the frequency of ultrasonographic (US) enthesal abnormalities between patients with PsA, psoriasis without arthritis (PsC) and healthy controls and to assess the correlation between disease-related variables and the extent of US enthesitis.

Methods: PsA and PsC patients who were part of two large prospective cohorts were recruited. PsC patients were assessed by a rheumatologist to exclude inflammatory arthritis. Healthy controls were recruited from hospital personnel.

Ultrasound examinations were performed using a MyLab 70 XVG device equipped with 6–18 MHz linear transducer and Doppler frequency of 7.1–14.3 MHz. The following enthesal insertion sites were examined: patella (at insertions of the quadriceps and patellar tendons), tibial tuberosity, Achilles tendon and plantar fascia insertions to the calcaneus and triceps tendon insertion to the olecranon. Two scoring systems for US enthesitis (MAdrid Sonographic Enthesitis Index (MASEI) and Glasgow Enthesitis Scoring System (GUESS)) were used to generate scores that reflect the severity of enthesal abnormalities in each patient.

Analysis of variance was used to compare GUESS and MASEI scores across the groups. Chi square test was used to compare the frequencies of enthesal abnormalities between the groups. The correlation between disease-related variables and enthesitis scores was assessed by Pearson correlation coefficients (r).

Results: A total of 59 PsA patients, 79 PsC patients and 60 healthy controls were assessed. The frequency of US enthesal abnormalities was high with 98.3% of PsA patients, 97.5% of PsC patients and 86.7% of healthy controls having at least one abnormality. However, the extent of US abnormalities showed a trend with the highest score found in PsA patients followed by PsC patients and lowest in the controls (GUESS 8.9 ± 4.6, 5.6 ± 3.5 and 4.4 ± 3.9, respectively <0.001, MASEI 18.5 ± 13, 9.9 ± 7.4 and 7.7 ± 9.2, respectively <0.001). GUESS and MASEI correlated significantly with age (p<0.001 for each score) and Body Mass Index (p<0.001 for each score) and after adjusting for these variables the difference in enthesitis scores across the groups were not significant. The frequency of individuals who had tendon hypoechochogenicity (p<0.001) and thickening (p<0.001), bony erosions (p<0.001) and positive Doppler signal (p=0.04) at the entheses was highest in PsA patients compared to both PsC and healthy control.

Conclusion: The prevalence of US enthesal abnormalities is high even among healthy individuals. However, their severity is highest in PsA patients followed by PsC and is lowest in healthy controls. Such abnormalities are associated with age, obesity, CRP and in PsA with the severity of radiographic axial damage.

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1352

Adalimumab Significantly Reduces Recurrence Rate of Anterior Uveitis in Patients with Ankylosing Spondylitis. J. Christiaan van Denderen1, Ingrid M. Visman1, M. T. Nurmohamed2, Maria S.A. Suttorp-Schulten1 and Irene E. van der Horst-Bruinsma3, Jan van Breemen Research Institute/Reade, Amsterdam, Netherlands, VU University Medical Center/Jan van Breemen Research Institute, Amsterdam, Netherlands, Onze Lieve Vrouwe Gasthuis, Amsterdam, Netherlands, VU University Medical Centre, Department of Rheumatology, Amsterdam, Netherlands

Background/Purpose: A high percentage (30–40%) of patients with Ankylosing Spondylitis (AS) suffer from acute anterior uveitis (AAU) attacks. Local treatment with corticosteroids is a beneficial treatment, but not always sufficient. The objective of this study is to examine whether the use of adalimumab decreases the frequency of attacks of AAU in patients with AS, who receive this treatment for their spinal disease activity.

Methods: Consecutive AS patients, who were treated for at least 12 weeks with 40 mg of adalimumab every other week, were enrolled. The number of attacks of AAU in the year before start and during adalimumab treatment was assessed by ophthalmological controls at baseline and yearly thereafter. Follow-up ended at January First, 2012, or upon discontinuation of adalimumab treatment for any reason.

Results: In total 77 patients were enrolled of whom 67 (87%) were seen by the ophthalmologist at baseline and 44 (57%) during follow-up. The other data were retrieved from protocol visits to the research physician. Out of these 77 patients:

51 (66%) did not have attacks of uveitis in the year before (and during) treatment.
16 (21%) had uveitis before, but not during treatment,
10 (13%) had attacks of uveitis before and during treatment
No one developed uveitis for the first time during adalimumab treatment.

Figure 1 Uveitis before and after start adalimumab

In total 26 patients (34%) suffered from recurrent flares of uveitis in the year before start of adalimumab treatment, with a median of 2.0 uveitis

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attacks per year (IQR: 1.0–3.5). The median follow-up period of all patients was 1.74 years (IQR: 0.80–2.57). During follow-up only 10 patients (13%) had attacks of uveitis with a median of 0.56 uveitis attacks per year (IQR: 0.30–0.75). This constitutes a 62% drop in the number of patients with uveitis attacks. The number of patients with uveitis as well as the number of attacks/year dropped significantly (p<0.0001), compared with the year before adalimumab. Even the patient with a very high number of attacks of AAU (12 attacks/year) was completely free of uveitis attacks after start of adalimumab, during his entire 4 years of follow-up.

**Conclusion:** A significant and substantial reduction of recurrence rate of flares of anterior uveitis during adalimumab treatment was found, even in patients with a high recurrence rate of attacks. The majority (87%) of patients remained completely free of uveitis attacks for the entire follow-up period.

**Disclosure:** J. C. van Denderen, None; I. M. Visman, None; M. T. Nurmosahmed, MBS, MSD, Roche, Abbott, Pfizer and UCB, 5; MBS, MSD, Roche, Abbott, Pfizer and UCB, 8; M. S. A. Suttorp-Schulten, None; I. E. van der Horst-Bruinsma, None.

### 1353

**Improvement in Physical Function, Health-Related Quality of Life, and Work Productivity with Adalimumab Treatment in Nonradiographic Axial SpA: Wk-52 Results From Ability-1.**

**Background/Purpose:** To evaluate long-term effects of adalimumab (ADA) treatment on patient reported outcomes (PROs) in nonradiographic axial spondyloarthritis (nr-axSpA).

**Methods:** Ability-1 is an ongoing Phase III, multicenter, randomized, controlled trial of ADA vs. placebo (PBO) in patients with nr-axSpA (fulfilling ASAS axial SpA criteria but not modified New York criteria for AS). Following the 12-wk double-blind phase, all patients were switched to open-label (OL) ADA (referred to as ADA/ADA and PBO/ADA groups) for 144 wks. This post hoc analysis evaluated physical function, health-related quality of life (HRQOL), and work productivity until Wk 52. Physical function was assessed using the disability index of the Health Assessment Questionnaire for Spondyloarthropathies (HAQ-S) and HRQOL using the Short Form 36 Health Survey (SF-36) Physical Component Summary (PCS) score. Productivity was assessed using the overall work impairment domain of the Work Productivity and Activity Impairment Questionnaire. Changes from baseline to Wk 12 were compared between groups using ANCOVA with adjustment for baseline scores and with treatment as a factor. Analyses were conducted on the intent-to-treat (ITT) population excluding 7 subjects from a noncompliant site and the OL population (patients who had at least 1 dose of OL ADA).

**Results:** After 12 wks of therapy in the double-blind period, the ADA group experienced statistically significant improvements in HAQ-S (p<0.001) and SF-36 PCS (p<0.001) compared with PBO. A total of 179 patients entered the OL period (87/91 and 92/94 from the original ADA and PBO arms, respectively) and 150/151/81 patients completed the HAQ-S, SF-36 PCS, and work productivity questionnaires, respectively, at Wk 52 (Table). At Wk 52, approximately 62% of the patients met the minimum important difference (MID) for HAQ-S of 0.26 and 77% met the MID for SF-36 PCS of 3.0. Nearly 65% of the patients also met the MID for work productivity of 7% at Wk 52. PBO patients who switched to OL ADA experienced improvements in HRQOL and work productivity levels comparable to patients who received ADA through Wk 52. By Wk 52, patients in both groups achieved SF-36 scores (42.8 and 44.1 for the PBO/ADA and ADA/ADA groups, respectively) that approached the US general population norm of 50.

**Change From Baseline Through Wk 52 in Physical Function, HRQOL, and Work Productivity in Patients With nr-axSpA.**

**Conclusion:** Patients who remained on ADA therapy for 52 wks had sustained improvement in PRO and productivity. Likewise, patients who received PBO and switched to ADA in the OL period showed improvement in physical function, HRQOL, and work productivity that was maintained through Wk 52.

**Disclosure:** D. van der Heijde, Abbott Laboratories, Amgen, Aventis, Bristol Myers Squibb, Centocor, Pfizer, Roche, Schering Plough, UCB, Wyeth; S. P. Mease, Abbott Laboratories, 5; A. L. Pangan, Abbott Laboratories, 3; Abbott Laboratories, 1; S. Rao, Abbott Laboratories, 1; Abbott Laboratories, 3; N. Chen, Abbott Laboratories, 3, Abbott Laboratories, 1; M. A. Cifaldi, Abbott Laboratories, 3, Abbott Laboratories, 1.

### 1354

**The Prevalence of Psoriatic Arthritis Based On Rheumatologists’ Clinical Assessment Before and After Laboratory and Radiographic Tests in Psoriasis Patients in European/North American Dermatology Clinics.**

Dafna D. Gladman1, Philip J. Mease2, Rafay J. Faraway3, Eustratios Banisias4, Andrew S. Koening5, Robert Northington6, Joanne Fuiman5 and Daniel Alvarez7. 1Toronto Western Research Institute, University of Toronto, University Health Network, Toronto, ON, 2Swedish Medical Center, Seattle, WA, 3McMaster University, Kitchener, ON, 4Pfizer Inc., Collegeville, PA

**Background/Purpose:** Psoriatic arthritis (PsA) is a chronic inflammatory disease with a heterogeneous presentation that is associated with impaired quality of life, joint damage, and limited ability to work.1–3 Diagnosis of PsA is often challenging and may require close collaboration between dermatologists and rheumatologists. Reliance on laboratory and/or radiographic tests to diagnose PsA varies among rheumatologists. The PREPARE trial (NCT01477874) was conducted to estimate PsA prevalence as determined by rheumatologists’ evaluation of psoriasis patients presenting to dermatologists’ offices. The objective of the secondary analysis presented here was to estimate the prevalence of PsA in psoriasis patients based on clinical assessment by rheumatologists using medical history and physical examination before and after review of supplemental laboratory and radiographic tests.

**Methods:** Unselected, consecutive psoriasis patients, ≥18 years of age, were initially assessed for plaque psoriasis by dermatologists at 34 dermatology centers in 7 European and US locations. After psoriasis was confirmed, patients were evaluated for PsA by rheumatologists based on medical history and physical examination alone. Rheumatologists reassessed their diagnoses after receiving laboratory test results (eg, C-reactive protein, erythrocyte sedimentation rate, or rheumatoid factor). In a patient subgroup undergoing radiographic evaluation of hands and feet, rheumatologists conducted a 2nd reassessment after x-rays were provided.

**Results:** In 949 psoriasis patients who were subsequently evaluated with the inclusion of laboratory tests, 281 (29.6%) were initially diagnosed with PsA based on medical history and physical examination alone (table). In comparison, 285 (30.0%) received clinical PsA diagnoses from rheumatologists based on medical history, physical examination, and laboratory results. In 183 psoriasis patients in the radiographic subgroup, 74 (40.4%) received a PsA diagnosis based on medical history, physical examination, laboratory results, whereas 71 (38.8%) received this diagnosis based on medical history, physical examination, laboratory results, and radiographic findings.

**Table.** PsA prevalence based on different clinical assessment approaches in the PREPARE study

<table>
<thead>
<tr>
<th>Clinical Assessments</th>
<th>Prevalence n (%) (95% CI)</th>
<th>Change in PsA Diagnosis n (%)</th>
<th>Negative to Positive</th>
<th>Positive to Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Patients (N = 949)</td>
<td>281 (29.6%) (26.7, 32.6)</td>
<td>285 (30.0%) (27.1, 33.1)</td>
<td>8 (0.8)*</td>
<td>4 (0.4)*</td>
</tr>
<tr>
<td>Medical history + physical examination</td>
<td>281 (29.6%) (26.7, 32.6)</td>
<td>285 (30.0%) (27.1, 33.1)</td>
<td>8 (0.8)*</td>
<td>4 (0.4)*</td>
</tr>
<tr>
<td>Patients in Radiographic Subgroup (n = 183)</td>
<td>74 (40.4%) (33.3, 47.7)</td>
<td>71 (38.8%) (31.7, 46.3)</td>
<td>2 (1.1)*</td>
<td>5 (2.7)*</td>
</tr>
</tbody>
</table>

*Number (%) of patients whose diagnosis changed when radiographic results were added to the clinical assessment based on medical history, physical examination, and laboratory results.

### References

1. Suttorp-Schulten M.S., A.S. Suttorp-Schulten, None; I. E. van der Horst-Bruinsma, None.

2. van Denderen J.C., None; I. M. Vismans...
Conclusion: In this large, multinational prevalence study, approximately one-third of psoriasis patients had PsA based on rheumatologists' clinical assessment. This analysis confirms the ability of rheumatologists to diagnosis PsA based on medical history and physical examination alone. However, laboratory and radiographic results may assist in excluding and/or confirming the diagnosis in some patients.

References

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1355

Hand Bone Loss Is Arrested in Early Psoriatic Arthritis But Not in Rheumatoid Arthritis Following Anti-Rheumatic Treatment Assessed by Digital X-ray Radiogrammetry (DXR).

Background/Purpose: Periarticular bone loss is an early feature of both psoriatic arthritis (PsA) and rheumatoid arthritis (RA). Digital X-ray radiogrammetry (DXR) is a sensitive method for quantifying changes in periarticular bone mineral density (DXR-BMD) in the early phase of the disease. Only a few studies have examined the effect of anti-rheumatic drugs on hand bone loss as measured by DXR in RA and even less in PsA. To our knowledge there is no prospective study designed for capturing differences in hand bone loss as measured by DXR in RA and even less in PsA. To our knowledge there is no prospective study designed for capturing differences in hand bone loss as measured by DXR in RA and even less in PsA. To our knowledge there is no prospective study designed for capturing differences in hand bone loss as measured by DXR in RA and even less in PsA. To our knowledge there is no prospective study designed for capturing differences in hand bone loss as measured by DXR in RA and even less in PsA.

The aim of this study was to (1) investigate DXR-BMD changes in early PsA and RA patients prior to and 3 and 12 months after introducing an anti-rheumatic drug; and (2) to explore associations between disease-related variables and DXR-BMD.

Methods: Recent-onset (<12 months), treatment naive PsA and RA patients with active disease were recruited. Hand BMD was assessed by DXR calculated from digitized radiographs (Sectra, Sweden) measuring the cortical thickness of the 2nd, 3rd and 4th metacarpal bones. Mean DXR-BMD (mg/cm2) values and changes from baseline in DXR-BMD (mg/cm2/month) were calculated and compared between the two groups at baseline, 3 and 12 months. Clinical parameters were correlated with DXR-BMD including ESR, CRP, TJC, SJC, DAS28-CRP4v and HAQ.

Results: 64 patients (31 PsA, 33 RA) were included with median age 43 years (18–71). 96.6% of the patients were commenced on a DMARD therapy (93.2% methotrexate) at baseline; 18.6% of the patients (12.1% of RA; 19% of PsA) were also started on a TNF inhibitor.

Mean DXR-BMD was significantly higher in PsA at 12 months compared to RA at 3 months (p=0.0137). In contrast mean DXR-BMD was lower in RA at both 3 and 12 months compared to baseline (p=0.0347 and p=0.0302) and at 12 months compared to 3 months (p=0.0159). Highly elevated bone loss (>2.5 mg/cm2/month) was only present in the RA cohort (6%). Changes from baseline and 3 months to 12 months were significantly less marked in PsA compared to RA (p=0.0084 and p=0.004). Similarly, comparing treatment responders only, changes from baseline to 12 months were less marked in the PsA responder group (p=0.2020). Disease activity scores were lower in PsA than in RA at all time points reaching significance at baseline and 3 months. ESR, CRP, TJC, SJC, DAS28-CRP4v and HAQ improved significantly in both diseases during the study. Mean DXR-BMD correlated with ESR at 3 months in PsA (r = –0.59; p = 0.013) and with CRP at baseline in RA (r = –0.448; p = 0.025). Similarly, significant inverse correlations were found between mean DXR-BMD and ESR and CRP at baseline in the entire group.

Conclusion: Hand bone loss is arrested by 12 months of intervention of appropriate DMARD therapy in PsA but not in RA. Higher disease activity is associated with accelerated cortical bone loss in both diseases. Changes in DXR-BMD were less marked in PsA supporting the hypothesis of different pathogenetic mechanisms being involved in hand bone resorption/formation balance in PsA.

Disclosure: A. Szentpetery, Abbott Laboratories Ireland, 2; M. Haroon, None; P. Gallagher, None; M. Cooney, None; E. J. Heffernan, None; O. M. FitzGerald, Abbott Laboratories Ireland, Bristol-Myers Squibb, 2, Abbott Laboratories Ireland, UCB, 5, Abbott Laboratories Ireland, 8.

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Gender Differences Among Spondylitis Associated with Psoriasis, Inflammatory Bowel Disease and Primary Ankylosing Spondylitis.

Margarita Landi1, Herman Maldonado-Fico2, Jose A. Maldonado-Cocco3, Gustavo Citera2, Pablo Arturi4, Percival Sampaio-Barros5, Diana Flores6, Ruben Burgos-Vargas7, Helena Santos8, Jose Chavez-Corrales9, Daniel Pallero9, Miguel A. Gutierrez10, Elsa Vieira-Sousa11, Fernando Pimentel-Santos11, Sergio O. Paina12, Alberto Berman Sr.13, Janitizia Vazquez-Mellado14, Eduard Collantes-Estевez15 and On behalf of RESPONSE Group16. 1Instituto de Rehabilitacion Psicofisica and Fundacion Reumatologia Argentina, Buenos Aires, Argentina, 2Instituto de Rehabilitacion Psicofisica, Buenos Aires, Argentina, 3University of Sao Paulo School of Medicine, Sao Paulo, Brazil, 4Hospital Universitario “Dr. Jose Eleuterio Gonzalez”, Monterrey, Mexico, 5Hospital General de Mexico, Mexico DF, Mexico, 6Instituto Portugues de Reumatologia, Lisboa, Portugal, 7Hospital Nacional E. Rebagli-ESSALUD, Lima, Peru, 8Instituto Nacional de Reumatologia, Montevideo, Uruguay, 9Pontificia Universidad Catolica de Chile, Santiago, Chile, 10Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisboa, Portugal, 11Centro Hospitalar de Lisboa Oriental, Hospital Egas Moniz, Lisboa, Portugal, 12Hospital Jose Maria Cullen, Santa Fe SFE S3000BFP, Argentina, 13Hospital Padilla, Tucuman, Argentina, 14Hospital General de Mexico, Mexico city, Mexico, 15IMIBIC-Reina Sofia Hospital, Cordoba 14012, Spain, 16Buenos Aires

Background/Purpose: Differences regarding gender in primary Ankylosing Spondylitis are well known. However, there is less evidence regarding Spondylitis Associated with Psoriasis and that associated with Inflammatory Bowel Disease. To compare clinical manifestations, disease activity, functional capacity, spinal mobility and radiological findings among women and men from a multicenter, multidisciplinary cohort, of Ibero-American patients with Spondyloarthritis.

Methods: This observational cross-section study included 2044 consecutive spondyloarthritis (SpA) patients (ESSG criteria). Demographic, clinical, disease activity, functional ability, quality of life, work status and radiologic data were evaluated and collected by RESPONDIA members from different Ibero-American countries between June and December 2006. For this analysis patients were selected only if they met modified New York criteria for AS. Data was transmitted on-line and stored in the Spanish Spa Registry (REGISONPE) website. Categorical data were compared by X2 or Fisher’s exact tests and continuous variables by ANOVA with post-hoc tests.

Results: Out of 2044 patients, 1264 met New York criteria; 73% were male (mean age 43 years, SD=15.8) and 27% were female (mean age 45.8 years, SD=12.6). 1072 had primary Ankylosing Spondylitis (AS), 147 Spondylitis Associated to Psoriasis (PsSp) and 45 Spondylitis associated to Inflammatory Bowel Disease (IBDSp). Overall, male patients were significantly younger, had longer diagnostic delay, lower disease activity (BASDAI), less swollen joints, worse spinal mobility (BASMI), better quality of life although worse totale BASRI. Frequency of dactylitis and enthesitis was significantly more common among women. Analysing only AS, there was marked male predominance (76.2%). Male patients were also significantly younger, had lower disease activity, worse BASMI, better quality of life and less frequency of dactylitis, yet worse total BASRI. When reading only BASRI in the spine, it still was significantly higher in male patients (mean 7.3 vs 5.8 p=0.000). However, among patients with PsSp male predominance was lower (57.8%), had significantly worse total BASRI and spinal BASRI and worse spinal mobility (BASMI). Among the 45 patients with IBDSp there was a slight female predominance (51.1%) and only differed in less lateral lumbar flexion in males (p=0.015). Regarding work disability in the total population, men had higher permanent work disability (13.2 vs 6.9 p<0.05). These differences were maintained when subdividing patients according to primary AS but were no differences in PsSp. There were no patient with IBDSp and permanent work disability.
Psoriatic Arthritis and Biologic Therapy: Treatment Response, Drug Survival and Outcome After Switching.

Dinny Wallis1, Deepak Jadon2, William Tillot3, Nicola Waldron2, Charlotte Cavill3, Neil McHugh2 and Enrique R. Soriano4. 1Rheumatology Section, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 2Royal National Hospital for Rheumatic Diseases NHS Foundation Trust, Bath, United Kingdom, 3Royal National Hospital for Rheumatic Diseases, Bath, United Kingdom, 4Bath Institute for Rheumatic Disease, Bath, United Kingdom

Background/Purpose: Data on longer term efficacy and tolerance of biologic therapies in psoriatic arthritis (PsA) are emerging. Persistence with the first TNF inhibitor (TNFi) at one year is estimated at 70–87%. Data on the benefit of switching between TNFis are limited but persistence with a second agent at one year is reported as 74–81%. We aimed to investigate the treatment response, drug survival and outcome with the first and subsequent biologic agents in patients with PsA.

Methods: Data were collected from a prospective single-centre cohort of PsA patients who started a biologic agent between 1st Jan 2003–1st Sept 2010.

Results: Seventy-one patients switched to a second biologic agent of whom 96% had polyarticular disease. The median follow-up was 36 months, median age at start of biologic 47y and median disease duration 10y. The most frequently prescribed first biologic agent was etanercept (58%) followed by adalimumab (35%) and infliximab (7%).

Thirty-six percent started a biologic agent as monotherapy, 49% started in combination with one DMARD and 13% with two DMARDs. Ninety-six percent fulfilled the Psoriatic Arthritis Response Criteria (PsARC) where a combination with one DMARD and 13% with two DMARDs. Ninety-six percent fulfilled the Psoriatic Arthritis Response Criteria (PsARC) where

Assessment of Skin Index).

Conclusion: Persistence with the first biologic was 92% at 6 months, 87% at 12 months, 74% at 24 months and 70% at 36 months. Six patients (8.4%) stopped due to secondary inefficacy (after 12 weeks) and 16 (23%) stopped due to adverse event.

Nineteen patients switched to a second biologic agent (6 due to secondary inefficacy and 13 due to an adverse event). Persistence was 67% at 6 months and 61% at 12 months. One patient stopped due to primary inefficacy, 2 due to secondary inefficacy and 7 had an adverse event. Of the 6 patients who had switched to a second agent because of secondary inefficacy, one continued on the second agent, one switched again because of primary inefficacy, 2 switched again because of secondary inefficacy and 2 switched again because of an adverse event. Of the 13 patients who switched to a second agent because of an adverse event, 9 continued on the second agent, one stopped biologic therapy and 3 switched again because of an adverse event. One patient was pending switch to a third biologic at the time of analysis.

Eight patients switched to a third biologic. Six continued on the third agent (median follow up after switching 26 months). Two switched to a 4th agent (ustekinumab) because of secondary inefficacy and remained on the 4th agent at 4 and 11 months follow up respectively.

Median percentage improvements with the first biologic at 12 and 24 months respectively were 79% and 100% in swollen joint count, 77% and 83% in tender joint count, 50% and 56% in Health Assessment Questionnaire, 67% and 61% in Psoriasis Area and Severity Index, 89% and 100% in Dermatology Life Quality Index and 100% and 100% in the Bath Nail Score.

Conclusion: Persistence with the first biologic agent in this cohort was 87% at 12 months, 74% at 24 months and 70% at 36 months. The response to the first biologic agent was sustained at 24 months across joint, skin, nail and quality of life measures. Persistence with the second biologic agent was 53% at 12 months. Patients who switched to a second biologic agent because of adverse event were more likely to continue with the second agent than those who switched because of secondary inefficacy.

Disclosure: D. Wallis, None; D. Jadon, None; W. Tillot, None; N. Waldron, None; C. Cavill, None; N. McHugh, None; E. Korendowych, None.
Background/Purpose: There is a debate whether axial psoriatic arthritis (axPsA) is an ankylosing spondylitis with psoriasis, however due to the fact that PsA has characteristic clinical features, this concept is debatable. On the other hand HLA-B27 is a key component of the clinical arm of the new ASAS criteria for axial SpA. Objective: to determine the prevalence of HLA-B27 in PsA and to analyze its prevalence according to the clinical forms.

Methods: Cross-sectional prevalence study of HLA-B27. HLA-B27 was determined in the following populations: a) healthy controls (HC) (n = 308) and AS (n = 106) (1), b) cutaneous psoriasis (n = 113), c) PsA (n = 172). axPsA was defined according to our previous definition (2.3). HLA-B27 was determined with a commercial kit: Invitrogen®, Allset Gold B27 Low and High Res SSP. For each group of patients, HLA-B27 prevalence was determined, together with its 95% confidence interval. Using data from the Galician population as reference, prevalence ratio and odds ratio values were estimated from a logistic regression model. Comparisons among groups were performed by using the Mann-Whitney U, chi-squared and Fisher’s exact tests.

Results: The prevalence of HLA-B27 was: HC 9.4%, AS 94.3% (p<0.001), cutaneous psoriasis 9.7% (p=0.921), PsA whole group 14.5% (p=0.099), peripheral PsA 8.2% (p=0.708), axPsA (mixed/”pure”) (n=68) 23.5% (p=0.002), axPsA “mixed” (n=61) 18% (p=0.052), axPsA (pure) (n=7) 71.4% (p<0.001). HLA-B27+ PsA patients had a diagnosis of the disease at an earlier age, 39.2±14.14 vs 45.3±13.52 years (p=0.036). Comparing axPsA (mixed/”pure”) HLA-B27+ (n=52) vs HLA-B27+ (n=16) there were no significant differences in the following: epidemiological, clinical, morphological, inflammatory, functional and structural damage assessed by BASRI. The only exception was the occiput to wall distance (1.1 cm vs 4.7 cm; p=0.036).

Conclusion: The prevalence of HLA-B27 in PsA is similar to the general population. HLA-B27+ seemed to determine the age of presentation of PsA. There seems to be two populations with spinal involvement in axPsA, HLA-B27+/−, being the most prevalent the HLA-B27+− group. These data question the hypothesis that axPsA is a primary AS and question the reliability of HLA-B27 for classifying axPsA patients using the new ASAS criteria for axial SpA.

Disclosure: J. L. Fernandez-Sueiro, None; J. Pinto, None; S. Pertega-Diaz, None; E. Gonzalez, None; F. J. Blanco, None.

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Disclosure: J. L. Fernandez-Sueiro, None; J. Pinto, None; S. Pertega-Diaz, None; E. Gonzalez, None; I. Rego-Perez, None; F. J. de Toro-Santos, None; F. J. Blanco, None.

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Disease Burden Is Comparable in Patients with Non-Radiographic Axial Spondyloarthritis and Ankylosing Spondylitis. Joachim Sieper Male1, Desirae van der Heijde2, Dirk Elewaut3, Aileen L. Pangan4 and Jaclyn K. Anderson5. 1Charité Universitätsmedizin Berlin, Berlin, Germany, 2Leiden University Medical Center, Leiden, Netherlands, 3Ghent University Hospital, Ghent, Belgium, 4Abbott Laboratories, Abbott Park, IL

Background/Purpose: Chronic back pain and functional impairment are disease characteristics common to all patients (pts) with axial spondyloarthritits (SpA), regardless of the presence of radiographic sacroiliitis in ankylosing spondylitis (AS) or its absence in non-radiographic axial SpA (nr-axSpA). This analysis compares baseline disease characteristics of pts with nr-axSpA and AS in registries and randomized clinical trials (RCT) with adalimumab (ADA).

Methods: Registry data in this analysis include the German SpA Inception Cohort (GESPCIC)1 that compared pts with AS by modified New York criteria (divided into >5 yrs and ≤5 yrs) and nr-axSpA (<5 yrs) meeting modified ESSG criteria and a prospective cohort of TNF-naive SpA pts meeting ASAS criteria for axial SpA.2 ADA RCT data were derived from the ATLAS study3 in AS pts, and the ABILITY-14 and Haibel5 studies in nr-axSpA pts. Pts in RCTs were selected based on a pre-specified level of disease activity and inadequate response to non-steroidal anti-inflammatory drugs.

Disclosure: J. L. Fernandez-Sueiro, None; J. Pinto, None; S. Pertega-Diaz, None; E. Gonzalez, None; I. Rego-Perez, None; F. J. de Toro-Santos, None; F. J. Blanco, None.

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Disclosure: J. L. Fernandez-Sueiro, None; J. Pinto, None; S. Pertega-Diaz, None; E. Gonzalez, None; I. Rego-Perez, None; F. J. de Toro-Santos, None; F. J. Blanco, None.

1360

Spinal Involvement in Axial Psoriatic Arthritis Is Not Determined by the Presence of HLA-B27. Is the HLA-B27 Arm of the Axial SpA Criteria Reliable for Classifying Axial Psoriatic Arthritis? Jose Luis Fernandez-Sueiro1, JA Pinto1, S. Pertega-Diaz1, E. Gonzalez1, Ignacio Rego-Perez2, Francisco J. de Toro-Santos3 and Francisco J. Blanco1. 1Complejo Hospitalario Universitario La Coruña, La Coruña, Spain; 2INIBIC-Hospital Universitario A Coruña, A Coruña, Spain; 3Complejo Hospitalario Universitario Juntìa Canalejo, Universidad de la Coruña, La Coruña, Spain; 4INIBIC-Hospital Universitario A Coruña, A Coruña, Spain

Background/Purpose: Is the HLA-B27 Arm of the Axial Spa Criteria Reliable for Classifying Axial Psoriatic Arthritis? Jose Luis Fernandez-Sueiro1, JA Pinto1, S. Pertega-Diaz1, E. Gonzalez1, Ignacio Rego-Perez2, Francisco J. de Toro-Santos3 and Francisco J. Blanco1. 1Complejo Hospitalario Universitario La Coruña, La Coruña, Spain; 2INIBIC-Hospital Universitario A Coruña, A Coruña, Spain; 3Complejo Hospitalario Universitario Juntìa Canalejo, Universidad de la Coruña, La Coruña, Spain; 4INIBIC-Hospital Universitario A Coruña, A Coruña, Spain

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Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.

Disclosure: None; J. Marín, None; M. Scolnik, None; M. V. García, None; S. Ruta, None; M. Sabelli, None; Z. Bedran, None; J. Rosa, None; I. J. Catoggio, Pfizer Inc, 5; E. R. Soriano, Janssen Pharmaceutica Product, L.P.; Pfizer, 8.
Results: Mean age was similar in nr-axSpA and AS pts, ranging from 36–42 yrs (table). A higher proportion of AS pts had elevated CRP as compared to nr-axSpA pts and gender differences were observed, with nr-axSpA pts being predominantly female and AS pts primarily male. Symptomatic pts with nr-axSpA and AS often went undiagnosed for years. Similar levels of disease activity as measured by the BASDAI, pain scores, and pt and physician global assessments of disease activity were seen between nr-axSpA and AS pts in registries and RCTs, with levels of disease activity generally higher in RCT pts due to minimum levels of baseline disease activity required for study eligibility.

Table. nr-axSpA and AS baseline disease characteristics

<table>
<thead>
<tr>
<th>Registry</th>
<th>GESPIC</th>
<th>Pharmacia</th>
<th>Kielland</th>
<th>ATLAS</th>
<th>RCTs Ability-1</th>
<th>Hadel</th>
<th>N=236</th>
<th>N=211</th>
<th>N=226</th>
<th>N=35</th>
<th>N=185</th>
<th>N=35</th>
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<th>N=46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs</td>
<td>35.6</td>
<td>36.1</td>
<td>36.1</td>
<td>41.2</td>
<td>39.1</td>
<td>42.2</td>
<td>38.0</td>
<td>37.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, %</td>
<td>36.0</td>
<td>34.5</td>
<td>37.1</td>
<td>23.2</td>
<td>68.2</td>
<td>25.1</td>
<td>54.6</td>
<td>54.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLA-B27, %</td>
<td>88.2</td>
<td>73.1</td>
<td>74.7</td>
<td>89.1</td>
<td>86.4</td>
<td>78.7</td>
<td>75.1</td>
<td>67.4</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Symptom duration, yrs</td>
<td>5.2</td>
<td>3.0</td>
<td>2.6</td>
<td>12.8</td>
<td>9.4</td>
<td>-10.1</td>
<td>7.5</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Symptom duration since diagnosis, yrs</td>
<td>2.8</td>
<td>1.7</td>
<td>1.7</td>
<td>7.5</td>
<td>5.0</td>
<td>10.6</td>
<td>2.9</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>BASDAI 0–10</td>
<td>4.0</td>
<td>4.0</td>
<td>3.9</td>
<td>4.2</td>
<td>3.6</td>
<td>6.3</td>
<td>6.5</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Abnormal CRP, %</td>
<td>51.9</td>
<td>49.6</td>
<td>29.8</td>
<td>69.1</td>
<td>29.5</td>
<td>29.5</td>
<td>35.7</td>
<td>37.8</td>
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<td></td>
</tr>
<tr>
<td>Total pain, VAS 0–10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.5</td>
<td>6.9</td>
<td>6.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGA of disease activity, VAS 0–10</td>
<td>5.0</td>
<td>4.8</td>
<td>4.8</td>
<td>4.7</td>
<td>4.0</td>
<td>-</td>
<td>6.8</td>
<td>7.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGA of disease activity, VAS 0–10</td>
<td>4.5</td>
<td>4.4</td>
<td>3.6</td>
<td>3.5</td>
<td>2.7</td>
<td>5.7</td>
<td>5.7</td>
<td>5.9</td>
<td></td>
<td></td>
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</tbody>
</table>

Values are the mean unless otherwise indicated. AS, ankylosing spondylitis; BASDAI, Bath AS Disease Activity Index; CRP, C-reactive protein; nr-axSpA, non-radiographic axial spondyloarthritis; PGA, physician global assessment; RCT, randomized clinical trial; VAS, visual analog scale.

Conclusion: Registry and clinical trial data demonstrate that both nr-axSpA and AS patients have comparable burden of disease. These findings suggest that all patients with axial spondyloarthritis can present with similar disease activity of the disease and the severity of the depressive syndrome. Our study confirms a good concordance between the BASDAI and the ASDAS. Thresholds of BASDAI and ASDAS are proposed for PASS and flare in SpA.

Disclosure: M. Godfrin-Valnet, None; C. Prati, None; M. Puyraudeau, None; E. Toussirot, None; H. Letho-Gyselinck, None; D. Wendling, None.

1362 Evaluation of Spondyloarthritis activity by the Patients and the Physicians: ASDAS, Basrai, PASS and Flare. Marie Godfrin-Valnet1, Clément Prati2, Marie Puyraudeau3, Eric Toussirot4, Helene Letho-Gyselinck5 and Daniel Wendling6, 1CHU, Besançon, France, 2CHU J Minjoz, Besancon, France, 3CIC Biotherpy 506 and Rheumatology and EA 4266 Pathogens and Inflammation, Besancon, France, 4Minjoz University Hospital, Besançon, France

Background/Purpose: Objectives: to define thresholds of the ASDAS corresponding to the PASS (Patient Acceptable Symptomatic State) and to the thresholds of activity of the disease through what the patients feel. Correlate these levels of activity to the presence of a depressive syndrome and determine a threshold ASDAS and BASDAI corresponding to a flare in spondyloarthritis (SpA).

Methods: A prospective study of SpA patients (ASAS criteria) from February 2011 until February 2012. Various scores (BASDAI, ASDAS, BASFI) as well as the evaluation of the PASS and the depressive syndrome were measured. Determination of ASDAS thresholds corresponding to the PASS, to the various thresholds of activity according to the patients, and to flare was performed using ROC curves. The Kappa coefficient was calculated to estimate the correlation between the physician’s and the patient’s evaluation of the flare.

Results: 200 SpA patients, mean age 44.4 ± 12.5 years (duration 12.9 ± 10.5 years) were included. The average scores were respectively 4.1 ± 2.2 for the BASDAI and of 2.4 ± 1.0 for the ASDAS-CRP and of 3.3 ± 2.7 for the BASFI. 58.9 % of the patients were considered in PASS. The PASS corresponded to a BASDAI ≤ 4.1 and to an ASDAS-CRP ≤ 2.3. Concerning the impairment of the disease by the patients: a weakly active disease corresponded to a BASDAI < 3.8 and to an ASDAS-CRP ≤ 2.3, and a strongly active disease in a BASDAI > 5.2 and an ASDAS-CRP > 3.1. When the disease was considered as strongly active, 64.5 % of patients had a score of severe depressive syndrome on Beck’s scale. A flare was considered by 36.9 % of the patients versus 28.3 % of the physicians. The threshold BASDAI “flare” was ≥ 5.2 and the threshold ASDAS-CRP “flare” was ≥ 2.3. The concordance between the evaluation of the flare according to the physician and the patient was good (Kappa: 0.61).

Conclusion: Our results report a significant link between the level of activity of the disease and the severity of the depressive syndrome. Our study confirms a good concordance between the BASDAI and the ASDAS. Thresholds of BASDAI and ASDAS are proposed for PASS and flare in SpA.

Disclosure: M. Godfrin-Valnet, None; C. Prati, None; M. Puyraudeau, None; E. Toussirot, None; H. Letho-Gyselinck, None; D. Wendling, None.

1363 Validation of the Self-Administered Comorbidity Questionnaire in Patients with Ankylosing Spondylitis. Carmen Stolvik1, A.M. Van Tubergen2, Sofia Ramiro3, Ivtje Essers4, Marc Blaauw5, Desree van der Heijde6, Robert B. M. Landewe7, Filip Van den Bosch8, Maxime Dougdas9 and Annelies Boonen1, 1Maastricht University Medical Center, Maastricht, Netherlands, 2Academic Medical Center, University of Amsterdam, The Netherlands and Hospital Garcia de Orta, Almada, Portugal, 3Leiden University Medical Center, Leiden, Netherlands, 4Academic Medical Center/University of Amsterdam & Atrium Medical Center, Amsterdam, Netherlands, 5Ghent University Hospital, Ghent, Belgium, 6Paris-Descartes University, APHP, Cochin Hospital, Paris, France

Background/Purpose: Comorbidities can importantly influence the results of clinical studies on functional outcomes as they may act as confounders or effect modifiers. The generic self-administered comorbidity questionnaire (SCQ) is a frequently used instrument to assess common comorbidities which might impact functioning but has never been validated for use in ankylosing spondylitis (AS). Objective was to measure the agreement between SCQ-responses and medical records diagnosis, and to assess construct- and concurrent validity of the SCQ in patients with AS.

Methods: The SCQ (range 0–45) asks about the presence, treatment and functional limitations of 12 common comorbidities and three additional non-specified medical problems. The SCQ, demographics and indices of disease activity (Bath AS Disease Activity Index [BASDAI]; AS Disease Activity Score- C-reactive protein), physical function (Bath AS Functional Index) and health-related quality of life (HR-QoL; Short form-36 [SF-36], Ankylosing Spondylitis Quality of Life [ASQoL]), EuroQol-VAS), were administered to 98 patients with AS who were followed in the Outcome in Ankylosing Spondylitis International Study (OASIS). The agreement between the SCQ-items and comorbidities retrieved from medical records was calculated by two independent extractors. Concurrent validity was assessed by the correlation with two other comorbidity indices: the Charlson index, a record-based comorbidity index which predicts mortality, and the Michaud/Wolfe index, which predicts functional outcomes. Construct validity was assessed by testing the hypothesis that a valid comorbidity index should correlate with age, function and overall HRQoL. An adapted version of the SCQ (adapted-SCQ) was created and validated after removing items on rheumatic diseases (osteoarthritis, back pain, chronic rheumatic disease) because they were conceptually overlapping with the index disease.

Results: The median SCQ-score was 5 (range 0–19) and the median adapted-SCQ-score was 2 (range 0–13). Frequently reported non-rheumatic comorbidities were hypertension (27.6%), inflammatory bowel disease (10.2%) and depression (9.2%). Agreement between self-report and medical records was moderate to perfect for all diseases included in the SCQ (kappa 0.47–1.00), except for stomach disease, depression, and osteoarthritis (kappa
The correlations of the SCQ with the Michaud/Wolfe index and the Charlson index were 0.39 and 0.24 respectively, and of the adapted-SCQ with both indices 0.53 and 0.36 respectively. The SCQ correlated weakly with age (r=0.24) and disease activity (BASDAI r=0.27), and moderately with function (r=0.43) and HRQoL (SF-36 physical r=0.45; ASQoL r=0.43). The adapted SCQ correlated weakly with age (r=0.28), and moderately with function (r=0.41) and HRQoL (SF-36 physical r=0.41, ASQoL r=0.32), but not with measures of disease activity.

Conclusion: The SCQ can be used to measure comorbidities which have impact on functional outcomes in AS, but the rheumatic items showed low agreement. Exclusion of these items improved construct and concurrent validity.

Disclosure: C. Stolwijk, None; A. M. Van Tubergen, None; S. Ramiro, None; L. Essers, None; M. Blaauw, None; D. van der Heijde, None; R. B. M. Landewe, None; F. Van den Bosch, None; M. Dougados, None; A. Boonen, None.

1364

Development, Sensibility and Reliability of a New Case-Finding Questionnaire, the Toronto Axial Spondyloarthritis Questionnaire in Inflammatory Bowel Disease, Khalid A. Alnaqbil1, Zahi Touma1, Laura A. Passalent1, Sindhu R. Johnson1, George A. Tomlinson1, Adele Carty2 and R. D. Inman1, 1Toronto Western Hospital, Toronto, ON, 2Toronto General Hospital, Toronto, ON

Background/Purpose: Inflammatory bowel disease (IBD) encompasses Crohn’s disease, ulcerative colitis, and indeterminate colitis. Articular involvement (peripheral arthritis and axial spondyloarthritis (axSpA)) is the most common extra-intestinal manifestation. There is an unacceptable delay in diagnosis of axSpA by 8–11 years. Our aim was to develop a sensible and reliable questionnaire that identifies undetected axSpA among IBD patients and facilitates timely referral to rheumatologists.

Methods: Literature review facilitated identification of 3 domains: 1) IBD, 2) inflammatory back symptoms, and 3) extra-axial features. Items of the Toronto Axial Spondyloarthritis Questionnaire (TASQ) were evaluated for sensibility among SpA team, 2 general rheumatologists, and axSpA patients. Sensibility assessment was related to purpose and framework (clinical function, clinical justification, clinical applicability), face validity, comprehensibility (oligovariability, transparency), replicability, content validity, and feasibility. For the test-retest reliability study, the final version of TASQ was mailed to 77 patients with established IBD and axSpA, who were followed at the Spondylitis clinic. Patients were instructed to complete the questionnaire on 2 occasions 1–2 weeks apart. Calculated sample size was 23 for reliability. Kappa statistics were calculated for the binary response options of each item.

Results: Item modification and reduction led to drafting version 4 of TASQ consisting of 16 items on a one-page double-sided document with a diagram of the back. Of the 77 patients, 34 responded to the TASQ. Responders and non-responders did not differ in terms of age, sex, level of education, types of IBD, BASDAI, BASFI, ESR and CRP levels. Kappa agreement coefficient ranged from 0.81 to 1.00 indicating almost perfect agreement. Absolute agreement of all items ranged from 91 to 100%.

Table 1.

<table>
<thead>
<tr>
<th>Sensibility assessment</th>
<th>Pre-pilot testing n=9 (%)</th>
<th>Post-pilot testing n=9 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical function</td>
<td>9 (100)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Comprehensibility</td>
<td>7 (88)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Olivo availability</td>
<td>7 (89)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Transparency</td>
<td>9 (100)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Appropriate nature of response options</td>
<td>9 (100)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Weighting each item</td>
<td>0 (0)</td>
<td>8 (89)</td>
</tr>
<tr>
<td>Replicability</td>
<td>7 (88)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Face validity</td>
<td>6 (67)</td>
<td>9 (100)</td>
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<tr>
<td>Important omissions</td>
<td>2 (22)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Inappropriate inclusions</td>
<td>3 (33)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Feasibility</td>
<td>Time to completion, medium (range)</td>
<td>4 (3 5) minutes</td>
</tr>
<tr>
<td>Acceptability</td>
<td>8 (89)</td>
<td>9 (100)</td>
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<tr>
<td>Reliability</td>
<td>4 (44)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Clarity of 1 questions</td>
<td>7 (88)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Flow of questions</td>
<td>72.2% (74.7%)</td>
<td>72.2% (74.7%)</td>
</tr>
<tr>
<td>Flesch Kainard grade level*</td>
<td>5.6</td>
<td>5.3</td>
</tr>
<tr>
<td>Absence of typographical errors</td>
<td>8 (89)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Usefulness of illustration(s)</td>
<td>5 (56)</td>
<td>9 (100)</td>
</tr>
</tbody>
</table>

Conclusion: TASQ is a newly developed, sensible and reliable questionnaire to be administered to patients with IBD who have ever had chronic back pain or stiffness that lasted ≥ 3 months. TASQ should facilitate identification and referral of IBD patients to rheumatologists and should avoid delay in diagnosis of axSpA.

Disclosure: K. A. Alnaqbil, None; Z. Touma, None; L. A. Passalent, None; S. R. Johnson, None; G. A. Tomlinson, None; A. Carty, None; R. D. Inman, None.

1365

Double-Blind, Placebo-Controlled, 28-Week Trial of Efficacy and Safety of Infliximab Plus Naproxen Vs Naproxen Alone: Results From the INFliximab As First Line Therapy in Patients with Early, Active Axial Spondyloarthritis Trial, Part I. Joachim Sieper1, Jan Lenaerts, Jürgen Hofmann-Wellenhof1, Valdim Mazurov, L. Myasoutova, Sung-Hwan Park, Yeong W. Song, Ruiji Yao, Denesh Chikara and Nathan Vastasegger. 1Charité, University Medicine Berlin, Berlin, Germany, 2Reuma-institut, Hasselt, Belgium, 3Schön-Klinik, Hamburg, Germany, 4St. Petersburg Medical Academy, St. Petersburg, Russia, 5Kazan State Medical University, Kazan, Russia, 6Catholic University of Korea, Seoul, South Korea, 7Seoul National University, Seoul, South Korea, 8Merck Sharp and Dohme, Kenilworth, NJ, 9Merck Sharp and Dohme, Brussels, Belgium

Background/Purpose: Efficacy of anti-tumor necrosis factor (TNF) therapy in patients with axial spondyloarthritis (SpA) has been tested only in patients who are refractory to NSAIDs.

Objectives: To determine whether combination infliximab (IFX) + NSAID therapy is superior to NSAID monotherapy for achieving better clinical outcomes in patients with early, active axial SpA who were naïve to NSAIDs or had a submaximal dose of NSAIDs.

Methods: The INFAST trial was a double-blind, randomized controlled trial of IFX in biologic-naïve patients 18–48 years of age with early, active axial SpA (ASAS criteria, disease duration ≤ 5 years with chronic back pain and active inflammatory lesions of the sacroiliac [SI] joints on MRI). Patients naïve to NSAIDs or treated with a submaximal dose of NSAIDs were randomized (2:1) to receive 28 weeks of treatment with either IV IFX 2 mg/kg (weeks 0, 2, 6, 12, 18, and 24) + naproxen (NPX) 1500 mg/d or IV placebo (PBO) + NPX 1000 mg/d. The primary endpoint was the percentage of subjects meeting ASAS partial remission criteria at week 28. Treatment group differences were analyzed using Fisher exact tests or analysis of covariance.

Results: 106 patients were randomized to IFX+NPX and 52 to PBO+NPX. At baseline, mean BASDAI scores (100 mm VAS) were 64.4 (SD=15.37) mm and 63.0 (SD=15.43) mm and HLA-B27-positive statuses were 82.1% and 90.4% in the IFX+NPX and PBO+NPX groups, respectively. The primary endpoint, ASAS partial remission at week 28, was achieved by more patients treated with IFX+NPX (61.9%) than PBO+NPX (35.3%), P=0.0021. Partial remission rates increased steadily through weeks 2, 6, 16, and 28 in both the IFX+NPX group (28.6%, 41%, 51.4%, and 61.9%) and the PBO+NPX group (11.8%, 15.7%, 25.5%, 35.3%), with greater partial remission in the IFX+NPX group at each visit (all P<0.05).

Improvements in BASDAI, BASFI, and CRP were considered and were significantly greater in the IFX+NPX group than the PBO+NPX group (Table 1). The observed CRP decrease was greater in the IFX+NPX group

Table 2. Sensibility assessment

<table>
<thead>
<tr>
<th>Stage I n=4 (%)</th>
<th>Stage II n=9 (%)</th>
<th>Stage III n=6 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensibility</td>
<td>Transparency</td>
<td>Approprate response opens for each item</td>
</tr>
<tr>
<td>Replicability</td>
<td>Face validity</td>
<td>Clarity of all questions</td>
</tr>
<tr>
<td>Feasibility</td>
<td>Acceptability</td>
<td>Flow of questions</td>
</tr>
<tr>
<td>Transparency</td>
<td>Readability</td>
<td>Absence of typographical errors</td>
</tr>
<tr>
<td>Clarity of all questions</td>
<td>Appropriate fent size</td>
<td>2 (22)</td>
</tr>
<tr>
<td>Usefullness of picture(s)</td>
<td>Replicability</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Actions following each stage</td>
<td>Removal of 4 items</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Modifications of 4 items</td>
<td>Removal of 2 items</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Minor modifications of few items</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
than the PBO+NPX group, but did not reach statistical significance. A greater number of patients in the IFX+NPX group (51.4%) than the PBO+NPX group (19.6%), \( P=0.0001 \), achieved inactive disease, defined as ASDAS-CRP ≤1.3.

Table 1. Change in Efficacy Outcomes from Baseline to Week 28 by Treatment Group

<table>
<thead>
<tr>
<th>Outcome</th>
<th>IFX+NPX (N=105)</th>
<th>PBO+NPX (N=51)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline, mean</td>
<td>Week 28, mean</td>
</tr>
<tr>
<td></td>
<td>(100 mm VAS)</td>
<td>(SD)</td>
</tr>
<tr>
<td>BASDAI</td>
<td>64.4</td>
<td>18.0</td>
</tr>
<tr>
<td>ASAS</td>
<td>3.8</td>
<td>1.4</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>23.0</td>
<td>7.1</td>
</tr>
<tr>
<td>CRP (mg/dL)</td>
<td>0.17</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Serious adverse events were reported in 5 (4.8%) patients in the IFX+NPX group (possibly related to study medication in 3 [2.9%] patients) and 3 (5.8%) patients in the PBO+NPX group (possibly related in 2 [3.8%] patients). No deaths occurred.

Conclusion: Patients with early, active axial SpA who were treated with IFX+NPX had greater rates of ASAS partial remission and were more likely to have lower or inactive disease (as measured by BASDAI and ASAS) than those treated with PBO+NPX. Patients who were treated with PBO+NPX had good response but still had moderately active disease. The safety profile was consistent with that of other anti-TNF biologics.

Disclosure: J. Sieper, Merck, Abbott, Pfizer, 2; Merck, Abbott, Pfizer, UCB, Roche, Lilly, 5; Merck, Abbott, Pfizer, 8; J. Lenaerts, Abbott, BMS, MSD, Pfizer, Roche, Astra Zeneca, 5; J. Wollenhaupt, MSD, 5, MSD, 8; V. Mazurov, None; L. Myasoutova, None; S. H. Park, None; Y. W. Song, None; R. Yao, Merck Pharmaceuticals, 3; D. Chikara, Merck Pharmaceuticals, 5; N. Vassergaard, Merck Pharmaceuticals, 3.

1366

Golimumab Administered Subcutaneously Every 4 Weeks in Chinese Patients with Active Ankylosing Spondylitis: Week 24 Safety and Efficacy Results From a Randomized, Placebo - Controlled Study.

Chunde Bao1, Feng Huang2, Muhammad Asim Khan3, Kaiyin Fei4, Zhong Wu5 and Elizabeth C. Hsia6. 1Shanghai Renji Hospital, Shanghai, China; 2Chinese PLA General Hospital, Beijing, China; 3Case Western Reserve University Hospital Cleveland, OH; 4Janssen Research & Development, LLC, Spring House, PA; 5Janssen Research & Development, LLC/CU of Penn, Spring House/Phil, PA

Background/Purpose: This multicenter, randomized, placebo (PBO)-controlled study was conducted to evaluate the efficacy and safety of golimumab (GLM) in Chinese patients with active ankylosing spondylitis (AS).

Methods: Patients ≥18yrs of age with a diagnosis of active AS for ≥3 months prior to screening and symptoms of active disease (Bath Ankylosing Spondylitis Disease Activity Index [BASDAI] ≥4, and a visual analogue scale [VAS] for total back pain ≥4, each on a scale of 0 to 10cm) were eligible to be enrolled for study screening. Patients with prior exposure to biologic anti-tumor necrosis factor alpha (TNF) agents and patients with complete ankylosis of the spine were not permitted to be included in the study. The age at onset was ranged between 16 and 68 years old (y.o.) (average: 48.3), and the age at diagnosis from 16 to 74 y.o. (average: 53.8).

The primary efficacy endpoint was the proportion of patients with ≥20% improvement in BASDAI and ASAS remission criteria. A significant difference in change from baseline in the primary back pain and morning stiffness measures) began receiving GLM 50 mg injections in a blinded fashion at wk16 and q4wks thereafter through wk48; all other patients still receiving placebo injections began receiving GLM 50 mg SC injection at wk24 and q4wks thereafter through wk48; all patients randomized to GLM continued receiving GLM 50 mg SC at wk24 and q4wks through wk48 regardless of the status of early escape. The primary efficacy endpoint was the proportion of patients with ≥20% improvement in BASDAI and ASAS remission criteria at wk14.

Results: 213 patients were randomized to treatment; baseline demographics were comparable between groups with median age of 29yrs, median weight of 62.0kg, and 83.1% male. The primary endpoint and major secondary endpoints were achieved (Table). Adverse events through 24 wks were reported in 38.9% of GLM-treated and 34.3% of PBO-treated patients. Serious adverse events were reported in 0.9% (1 ovarian epithelial cancer) and 0.0% of GLM and PBO-treated patients, respectively. Infections were reported in 22.2% and 19.0% of GLM and PBO-treated patients, respectively (primarily upper respiratory tract infections). No serious infections, TB or opportunistic infections, or deaths were reported. Antibodies to GLM were not detected in GLM-treated patients through wk24.

Table.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Placebo</th>
<th>Golimumab 50 mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients randomized</td>
<td>105</td>
<td>108</td>
</tr>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASDAI</td>
<td>6.65</td>
<td>6.58</td>
</tr>
<tr>
<td>ASAS</td>
<td>4.82</td>
<td>5.26</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>13.19–6.87</td>
<td>3.04–6.80</td>
</tr>
<tr>
<td>CRP (mg/dL)</td>
<td>3.57</td>
<td>3.89</td>
</tr>
<tr>
<td>Week 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASAS 20</td>
<td>26 (24.8%)</td>
<td>53 (49.1%) *</td>
</tr>
<tr>
<td>ASAS, change from baseline</td>
<td>0.18</td>
<td>−0.80</td>
</tr>
<tr>
<td>ASAS 50</td>
<td>15 (14.3%)</td>
<td>49 (45.4%) *</td>
</tr>
<tr>
<td>BASDAI 30</td>
<td>3.2%</td>
<td>20 (18.5%)</td>
</tr>
<tr>
<td>BASDAI 50</td>
<td>64 (62.6%)</td>
<td>33 (31.3%) *</td>
</tr>
<tr>
<td>Values are number of responders (%) or median (interquartile range) change from baseline</td>
<td>p&lt;0.001, **p&lt;0.001; ASAS partial remission =&lt;2 (VAS 0–10) in each of 4 ASAS domains</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: GLM significantly improved, as compared to the placebo group, signs and symptoms and physical function in Chinese patients with active AS. GLM was well tolerated through 24wks of treatment.

Disclosure: C. Bao, Janssen Research and Development, LLC, 9; F. Huang, Janssen Research and Development, LLC, 9; M. A. Khan, Janssen Research and Development, LLC, 9; K. Fei, Janssen Research and Development, LLC, 3; Z. Wu, Janssen Research and Development, LLC, 3; F. C. Hsia, Janssen Research and Development, LLC, 3.

1367

Clinical Features and Treatment Results of Japanese Patients with SAPHO (Synovitis-Acne-Pustulosis-Hyperostosis-Osteitis) Syndrome.

Hiroki Yabe1, Takashi Kuroiwa2, Aya Nomaka1, Tomomi Tsutsumi2, Tadashi Sakurai3, Masato Moriguchi4, Hisaji Oshima2, Chihiro Tera5, Jichi Medical University Saitama Medical Center, Saitama City, Japan, 6Tokyo Medical Ctr, Tokyo, Japan, 7Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan

Background/Purpose: SAPHO syndrome is a disorder characterized by purulent skin lesions and osteoarticular lesions, which was proposed by Chamot et al. in 1987. Clinical studies based on the diagnostic criteria of SAPHO syndrome are mainly reported from Europe, and still limited in East-Asia.

Methods: We investigated the clinical features and treatment results in 31 Japanese patients with SAPHO syndrome (male 10, female 21) diagnosed and treated between 2003 and 2011. HLA-A and -B typing was performed in 30 patients, and their allele frequencies were compared with those in the healthy Japanese patients with SAPHO syndrome (male 10, female 21) diagnosed and treated between 2003 and 2011. HLA-A and -B typing was performed in 30 patients, and their allele frequencies were compared with those in the healthy Japanese controls, using Fisher’s exact test.

Results: The age at onset was ranged between 16 and 68 years old (y.o.) (average: 48.3), and the age at diagnosis from 16 to 74 y.o. (average: 53.8). The average follow-up period was 42 months. Sternocostoclavicular hyperostosis was the main manifestation and recognized in 29 cases (94%). As other manifestations, recurrent oral ulceration was seen in 6 cases (19%), and inflammatory bowel disease in 2 cases. Most patients had intermittent attacks of pain, therefore oral NSAIDs were used in all cases and oral prednisolone (PSL) in 14 cases (45%). The oral NSAIDs and/or PSL were effective for temporary pain relief. DMARDs (SSZ and/or MTX) were used in 14 cases (45%) with recurrent chronic pain. Pain relief more than 50% was seen in only 4 cases (29%) out of DMARDs users. In two refractory cases with severe spondylitis, adalimumab (ADA) was tried. Both cases showed improved pain-relief and ADA was effective during at least one
year. HLA tests revealed that the allele frequencies of HLA-B27 and HLA-B51 were respectively 9% and 12%, which were similar with those in healthy Japanese controls. On the other hand, the frequency of HLA-B61 was 27% and significantly higher than that (12%) in healthy Japanese patients with SAPHO syndrome. This study revealed that HLA-B61 was significantly increased in Japanese patients with SAPHO syndrome.

Disclosure: H. Yabe, None; T. Kuroiwa, None; A. Nonaka, None; T. Tsuchiya, None; T. Sakurai, None; M. Moriguchi, None; H. Oshima, None; K. Ochi, None; C. Terai, None.

1368
Psoriatic Arthritis in South Asians- Comparison with Caucasians of European Descent. Vinod Chandran, Arane Thavaneswaran and Dafna D. Gladman Gladman, Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: The prevalence of psoriatic arthritis (PsA) varies substantially world-wide and is highest among Caucasians of European descent. Studies from India suggest that patients with PsA have a milder disease. Comparing disease phenotype across ethnicities can provide insight into mechanisms underlying disease severity. We aimed to determine whether demographic and disease characteristics differed in PsA patients of South Asian ethnicity compared to those of European ethnicity.

Methods: The study was conducted at a PsA clinic in a North American city with a diverse ethnic composition. Patients are assessed every 6–12 months according to a standard protocol. Prospectively collected data were retrieved from the clinic database. The distribution of ethnicities within the cohort was determined. The demographic and disease characteristics of those with South Asian ethnicity were compared to those of European ethnicity using chi-squared tests and unpaired t-test. Subsequently, each patient of South Asian ethnicity was matched by gender, age, duration of PsA and year of entry to clinic, to 3 patients of European ethnicity and the disease characteristics compared using McNemar and paired t-tests.

Results: The distribution of the 1184 patients in the cohort were as follows: European 1037 (88%), South Asian 59 (5%), Chinese 26 (2.2%), Black 12 (1%), Filipino 12 (1%), Hispanic 7 (0.6%), South-east Asian 4 (0.3%), Korean 2 (0.2%), Aboriginal 1 (0.1%) and other/mixed 24 (2%). Overall patients of South Asian descent had shorter duration of psoriasis, lower family history of psoriasis, lower family history of PsA, lower prevalence of obesity, lower exposure to biologic agents and NSAIDs as well as lower prevalence of nail psoriasis and severe radiographic damage (defined as grade 4 damage according to the Steinbrocker method) compared to patients of European descent. The summary of results of the matched analyses comparing patients of South Asian descent to those of European descent is presented in Table 1. Patients of South Asian descent had lower tender joint counts, less number of joints with severe damage, lower frequency of treatment with biologics, lower frequency of HLA*B27 and worse SF-36 MCS scores, compared to matched patients of European descent. Although they had lower prevalence of obesity, the prevalence of diabetes and hyperlipidemia was higher.

Table 1. Summary of the results of the matched-pair analyses between subjects of South Asian ethnicity and those of European ethnicity

<table>
<thead>
<tr>
<th>Variable</th>
<th>South Asian (N=116)</th>
<th>Caucasian (N=548)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active joint count</td>
<td>12.3 (12.8)</td>
<td>10.5 (8.0)</td>
<td>0.10</td>
</tr>
<tr>
<td>Tender joint count</td>
<td>10.2 (11.7)</td>
<td>7.5 (6.1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Damaged joint count</td>
<td>4.3 (4.2)</td>
<td>6.0 (6.6)</td>
<td>0.06</td>
</tr>
<tr>
<td>No. of joints with grade 3 damage</td>
<td>9 (18.4%)</td>
<td>40 (27.2%)</td>
<td>0.09</td>
</tr>
<tr>
<td>No. of joints with grade 4 damage</td>
<td>1 (2.0%)</td>
<td>17 (11.6%)</td>
<td>0.003</td>
</tr>
<tr>
<td>HAQ</td>
<td>0.73 (0.75)</td>
<td>0.58 (0.59)</td>
<td>0.10</td>
</tr>
<tr>
<td>SF-36 MCS</td>
<td>43.9 (12.1)</td>
<td>46.4 (12.3)</td>
<td>0.03</td>
</tr>
<tr>
<td>Obesity</td>
<td>5 (17.9%)</td>
<td>34 (34.7%)</td>
<td>0.09</td>
</tr>
<tr>
<td>Diabetes</td>
<td>5 (11.1%)</td>
<td>7 (5.9%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>4 (9.3%)</td>
<td>3 (2.8%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Biologics ever</td>
<td>8 (20.0%)</td>
<td>45 (40.9%)</td>
<td>0.0006</td>
</tr>
<tr>
<td>DMARDs ever</td>
<td>32 (72.7%)</td>
<td>78 (59.1%)</td>
<td>0.08</td>
</tr>
<tr>
<td>HLA*B27</td>
<td>3 (8.6%)</td>
<td>23 (20.0%)</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Conclusion: Although PsA patients of South Asian descent report higher HAQ scores, and have more tender joints, radiographic joint damage appears to be less severe and they are less likely to be treated with biologic agents than patients of European descent. Although less likely to be obese, they have higher prevalence of diabetes and hyperlipidemia. Ethnic differences in disease manifestations may have an impact on long-term outcomes of patients with PsA.

Disclosure: V. Chandran, None; A. Thavaneswaran, None; D. D. G. Gladman, None.

1369
Severe Joint Damage in Psoriatic Arthritis: Mutilans and Ankylosis. Amir Haddad, Arane Thavaneswaran, Dafna D. Gladman Gladman and Vinod Chandran, Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Patients with Psoriatic arthritis (PsA) who develop severe joint damage have higher mortality risk. The most severe form of PsA is termed arthritis mutilans and is associated with severe erosions, osteolysis and pencil-in-cup change. Ankylosis is also a feature of severe PsA. The modified Steinbrocker method of scoring radiographic damage to peripheral joints in PsA recognizes grade 4 damage as severe damage, but does not explicitly distinguish between severe erosions, pencil-in-cup change, subluxation and ankylosis. We aimed to describe the prevalence and disease association of these features of severe joint damage in a cohort of patients with early PsA.

Methods: Patients presenting to a large PsA clinic with PsA duration of <5 years were identified. Patients are evaluated every 6–12 months and plain radiographs are obtained every 2 years. Radiographs are reviewed according to the modified Steinbrocker method by consensus of at least 2 rheumatologists. For this study radiographs were scored as 4 were retrieved and rescored to indicate disorganization (4.0), subluxation (4.1), pencil-in-cup (4.2) and ankylosis (4.0). Subsequently, the clinical characteristics at first visit of patients who developed at least 1 joint with severe joint damage were compared to those without such damage.

Results: 664 patients who were enrolled within 5 years of diagnosis were the subjects of this study. 116/664 (17.5%) were observed to have at least one joint with 4.0, 4.1, 4.2 or 4.3 of the 42 scored. The demographic and disease characteristics at first visit of the patients who were observed to develop such damage compared to those who did not are reported in table 1. Patients with severe joint damage were older at diagnosis of psoriasis and had longer PsA duration, but shorter psoriasis duration. They had higher active and damaged joint counts and ESR. There was a trend towards higher prevalence of female sex, axial disease and HLA-B*27 in those with severe damage. Of the 116 patients observed to develop severe damage, 34 (29%), 63 (54%), 36 (31%), 58 (50%) patients were observed to have ‘4.0’, ‘4.1’, ‘4.2’ and ‘4.3’, respectively at baseline or during follow-up. The mean (sd) number of joints with ‘4.0’, ‘4.1’, ‘4.2’ and ‘4.3’ were 0.3 (0.7), 1.1 (2.1), 0.6 (2.0) and 0.7 (1.4), respectively. Only 15 (13%) patients were observed to have ankylosis without lysis. These patients had lower modified Steinbrocker score [mean, (sd) 31 (18) vs. 53 (43) p=0.001] compared to those with subluxation or pencil-in-cup change.

Table 1. Demographics and Disease Characteristics at baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients with severe joint damage N=116</th>
<th>Patients without severe joint damage N=548</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (Males)</td>
<td>58 (50.0%)</td>
<td>322 (58.8%)</td>
<td>0.08</td>
</tr>
<tr>
<td>Age</td>
<td>43.8 (13.9)</td>
<td>41.7 (12.9)</td>
<td>0.11</td>
</tr>
<tr>
<td>Age at diagnosis of Psoriasis</td>
<td>33.9 (15.5)</td>
<td>29.0 (14.6)</td>
<td>0.002</td>
</tr>
<tr>
<td>Age at diagnosis of PsA</td>
<td>41.4 (14.1)</td>
<td>39.8 (13.0)</td>
<td>0.27</td>
</tr>
<tr>
<td>Duration of Psoriasis</td>
<td>9.9 (10.1)</td>
<td>12.7 (11.6)</td>
<td>0.02</td>
</tr>
<tr>
<td>Duration of PsA</td>
<td>2.3 (1.5)</td>
<td>1.9 (1.7)</td>
<td>0.02</td>
</tr>
<tr>
<td>ESR</td>
<td>30.2 (20.5)</td>
<td>20.9 (19.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>PASI score</td>
<td>6.3 (9.1)</td>
<td>5.9 (8.4)</td>
<td>0.76</td>
</tr>
<tr>
<td>Active joint count</td>
<td>12.9 (10.5)</td>
<td>9.4 (8.7)</td>
<td>0.001</td>
</tr>
<tr>
<td>Swollen joint count</td>
<td>5.7 (5.7)</td>
<td>4.7 (5.1)</td>
<td>0.09</td>
</tr>
<tr>
<td>Damage joint count</td>
<td>5.8 (5.2)</td>
<td>3.1 (4.0)</td>
<td>0.0086</td>
</tr>
<tr>
<td>Axial disease</td>
<td>41 (35.3%)</td>
<td>148 (27.0%)</td>
<td>0.07</td>
</tr>
<tr>
<td>HLA B*27</td>
<td>21 (22.6%)</td>
<td>59 (14.0%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Follow-up time (radiographic visits)</td>
<td>11.6 (9.3)</td>
<td>5.3 (7.4)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Conclusion: Patients with PsA who develop severe joint damage have higher disease activity at presentation. The most common form of severe joint...
damage observed is subluxation. Only 13% have exclusive ankylosis. Further phenotypic characteristic of radiographic damage in PsA will facilitate genetic and mechanistic studies.

Disclosure: A. Haddad, None; A. Thavaneswaran, None; D. D. G. Gladman, None; V. Chandra, None.

1370

Clinical and Ultrasonographic Features of Nail Disease in Psoriasis and Psoriatic Arthritis. Amir Haddad, Arane Thavaneswaran, Vinod Chandran and Dafna D. Gladman Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: The purpose of this study was to investigate the association between clinical and ultrasonographic features of psoriatic nail disease and to identify specific nail features associated with psoriatic arthritis (PsA)

Methods: Patients with PsA and Psoriasis without arthritis (PsC) were recruited from prospective cohorts in a single centre. Healthy volunteers were also recruited. Subjects with co-existing OA or history of nail trauma were excluded. A detailed nail assessment according to the modified Nail Psoriasis Severity Index (mNAPSI) for the presence of onycholysis, nail pitting, nail plate crumbling, leukonychia, splinter hemorrhages, nail bed hyperkeratosis and red spots in the lunula was completed for each participant. All participants underwent an ultrasound evaluation of the nail apparatus at each finger with detailed recording of loss of definition of the ventral or dorsal plates, thickness of the nail bed or matrix and the presence of increased vascularity in the nail bed or matrix using a 10-MHz linear array transducer. Doppler signal was standardized with a pulse repetition frequency of 400 Hz, a gain of 20 dB and a low wall filter. Descriptive analyses and comparisons were conducted using Kruskal Wallis for continuous variables and Fisher’s exact test for categorical variables. Logistic regression analyses using GEE model was used to compare between the groups due to repeated observations for each patient.

Results: 10 patients were recruited into each group and the results are reported in the following tables:

Table 1. Demographic Characteristics (n=30) between Controls, PsC and PsA

| Frequency (%) or Mean (sd) | Controls (n=10) | PsC (n=10) | PsA (n=10) | p-value
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (Males)</td>
<td>3 (30.0%)</td>
<td>9 (90.0%)</td>
<td>7 (77.8%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Age</td>
<td>29.0 (4.4)</td>
<td>46.0 (16.1)</td>
<td>54.7 (12.6)</td>
<td>0.0006</td>
</tr>
<tr>
<td>Age at diagnosis of Psoriasis</td>
<td>33.0 (21.9)</td>
<td>33.0 (13.8)</td>
<td>33.4 (13.8)</td>
<td>0.60</td>
</tr>
<tr>
<td>Duration of Psoriasis</td>
<td>13.0 (13.9)</td>
<td>21.1 (11.7)</td>
<td>21.8 (6.5)</td>
<td>0.10</td>
</tr>
<tr>
<td>mNAPSI score</td>
<td>0</td>
<td>6.2 (5.8)</td>
<td>3.8 (6.6)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 2. Summary & Comparison of Fingers Affected by Nail Feature for the three groups

<table>
<thead>
<tr>
<th>Nail Feature</th>
<th>Controls</th>
<th>PsC</th>
<th>PsA</th>
<th>p-value*</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of definition of the ventral plate</td>
<td>0/100</td>
<td>24/100</td>
<td>29/100</td>
<td>&lt;0.0001</td>
<td>0.42</td>
</tr>
<tr>
<td>Hyperechoic focal involvement of the ventral plate</td>
<td>0/100</td>
<td>19/100</td>
<td>21/100</td>
<td>&lt;0.0001</td>
<td>0.21</td>
</tr>
<tr>
<td>Thickening of both the and dorsal and ventral plates</td>
<td>0/100</td>
<td>8/100</td>
<td>2/100</td>
<td>0.005</td>
<td>0.052</td>
</tr>
<tr>
<td>Nail bed thickness (mm)</td>
<td>14.1 (1.2)</td>
<td>16.0 (2.9)</td>
<td>15.9 (3.0)</td>
<td>&lt;0.0001</td>
<td>0.81</td>
</tr>
<tr>
<td>Nail matrix thickness (mm)</td>
<td>15.8 (0.92)</td>
<td>17.5 (2.9)</td>
<td>18.8 (3.0)</td>
<td>&lt;0.0001</td>
<td>0.002</td>
</tr>
<tr>
<td>Nail bed vascularity</td>
<td>2/100</td>
<td>14/100</td>
<td>18/100</td>
<td>0.001</td>
<td>0.44</td>
</tr>
<tr>
<td>Nail matrix vascularity</td>
<td>16/100</td>
<td>30/100</td>
<td>34/100</td>
<td>0.01</td>
<td>0.54</td>
</tr>
<tr>
<td>Onycholysis and oil drop dyschromia (Some vs. none)</td>
<td>0/100</td>
<td>13/100</td>
<td>5/100</td>
<td>0.005</td>
<td>0.048</td>
</tr>
<tr>
<td>Pitting Some vs. none</td>
<td>0/100</td>
<td>28/100</td>
<td>20/100</td>
<td>&lt;0.0001</td>
<td>0.19</td>
</tr>
<tr>
<td>Nail bed crumbling (Some vs. none)</td>
<td>0/100</td>
<td>8/100</td>
<td>0/100</td>
<td>0.0003</td>
<td>0.004</td>
</tr>
<tr>
<td>Leukonychia</td>
<td>0/100</td>
<td>3/100</td>
<td>2/100</td>
<td>0.24</td>
<td>0.65</td>
</tr>
<tr>
<td>Splinter hemorrhage</td>
<td>0/100</td>
<td>1/100</td>
<td>0/100</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Nail bed hyperkeratosis</td>
<td>0/100</td>
<td>0/100</td>
<td>0/100</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Red spots in the lunula</td>
<td>0/100</td>
<td>0/100</td>
<td>1/100</td>
<td>0.37</td>
<td>0.32</td>
</tr>
</tbody>
</table>

P-value* is between the 3 groups, p-value** is between the PsC and PsA.

None of the nail’s sonographic or clinical covariates were found to statistically different in between PsA and PsC groups after adjusting for repeated measurements.

Conclusion: This proof of concept study shows that ultrasounds can be used as a tool for assessment of psoriatic nail disease. Patients with psoriatic disease had increased nail bed and matrix thickness as well as vascularity compared to healthy controls. However, whether these microanatomical nail structures could be predictors for evolution of psoriatic arthritis is yet to be determined.

Disclosure: A. Haddad, None; A. Thavaneswaran, None; V. Chandra, Abbott Canada; D. D. G. Gladman, Abbott Canada, 5.
Conclusion: Among patients with PsA followed for at least 10 years 12% never develop E.

Presence of actively inflamed and damaged joints at baseline increases the odds of development of E. A longer duration of psoriasis at baseline has a protective effect of development of E.

Disclosure: Z. Touma, None; A. Thavaneswaran, None; V. Chandran, None; D. D. Gladman, None.

1372

Increased Participation in Daily Activities After 24 Weeks of Certolizumab Pegol Treatment of Axial Spondyloarthritis Patients, Including Patients with Ankylosing Spondylitis: Results of a Phase 3 Double-Blind Randomized Placebo-Controlled Study. Désirée van der Heijde1, Jurgen Braun2, Martin Rudwaleit3, Oana Purcaru4 and Arthur Kavanaugh5. 1Leiden University Medical Center, Leiden, Netherlands, 2Rheumazentrum Ruhrgebiet, Herne, Germany, 3Endokrinologikum Berlin, Berlin, Germany, 4UCB Pharma, Braine, Belgium, 5UCSD School of Medicine, La Jolla, CA

Background/Purpose: Axial spondyloarthritis (axSpA) includes both ankylosing spondylitis (AS) and non-radiographic axial SpA (nr-axSpA). AS significantly affects patients’ (pts) work productivity. The impact of the entire spectrum of axSpA on work productivity is still poorly researched. RAPID-axSpA (NCT01087762) is the first report of the effect of certolizumab pegol (CZP), a PEGylated Fe-free anti-TNF, on paid and household productivity. WPS was administered every 4 wks. WPS responses (last observation carried forward imputation) were compared between treatment arms using a non-parametric bootstrap-t method.

Results: 325 pts were randomized. 63.2%, 69.4%, and 74.8% of pts in the PBO, CZP 200mg Q2W, and CZP 400mg Q4W treatment groups were employed at study BL, 11%-13% of pts were unable to work due to axSpA; 4%-9% were students; 3%-8% were retired. Treatment groups were comparable at BL in terms of workplace and household productivity. At BL, the burden of axSpA on absenteeism, presenteeism, household productivity and social activities was high (Table). Compared to PBO, pts employed in both CZP groups reported reduced absenteeism, presenteeism, and axSpA interference. WPS responses (last observation carried forward imputation) were compared between treatment arms using a non-parametric bootstrap-t method.

Table. Work and household productivity in RAPID-axSpA study (FAS population, LOCF data)

<table>
<thead>
<tr>
<th>WPS</th>
<th>PBO</th>
<th>CZP 200mg Q2W</th>
<th>CZP 400mg Q4W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity at workplace</td>
<td>67</td>
<td>77</td>
<td>80</td>
</tr>
<tr>
<td>BL</td>
<td></td>
<td>68</td>
<td>78</td>
</tr>
<tr>
<td>Wk4</td>
<td>66</td>
<td>80</td>
<td>81</td>
</tr>
<tr>
<td>Wk24</td>
<td>2.4</td>
<td>2.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Work days missed due to arthritis per month</td>
<td>4.3</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Wk4</td>
<td>2.0</td>
<td>1.1</td>
<td>0.6*</td>
</tr>
<tr>
<td>Wk24</td>
<td>5.3</td>
<td>5.6</td>
<td>4.7</td>
</tr>
<tr>
<td>Days with work productivity reduced by ≥50% due to arthritis per month</td>
<td>3.2</td>
<td>2.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Wk4</td>
<td>4.4</td>
<td>2.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Wk24</td>
<td>4.8</td>
<td>4.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Rate of arthritis interference with work productivity per month</td>
<td>3.9</td>
<td>3.1</td>
<td>3.1*</td>
</tr>
<tr>
<td>Wk3.9</td>
<td>3.5</td>
<td>2.2*</td>
<td>2.0*</td>
</tr>
</tbody>
</table>

*Based only on employed pts; Does not include work days missed counted in the previous question;

Conclusion: CZP improved workplace productivity in pts with axSpA by reducing absenteeism, presenteeism, and axSpA interference with work. CZP also improved household productivity and increased participation in social and daily activities.

References

Disclosure: D. van der Heijde, UCB Pharma, 5; UCB Pharma, 2; UCB Pharma, 8; J. Braun, UCB Pharma, 5; UCB Pharma, 2; UCB Pharma, 8; M. Rudaweleit, UCB Pharma, 5; O. Purcaru, UCB Pharma, 3; A. Kavanaugh, UCB Pharma, 5; A. Kavanaugh, UCB Pharma, 2.

1373

Influence of Early Onset On the Clinical Characteristics and Prognosis of Ankylosing Spondylitis. Maria Aparicio1, Jesús Rodríguez-Moreno1, Paula Estrada1, Irene Martín-Esteve1, Laura López-Vives1, Vicenç Torrente2, Jordi Anton3, Joan Miquel Nolla1 and Xavier Juanola1. 1Hospital Universitari de Bellvitge, Barcelona, Spain, 2Hospital Sant Joan de Déu, Barcelona, Spain, 3Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

Background/Purpose: To determine the influence of early onset (<16 years) on the clinical characteristics and prognosis of ankylosing spondylitis (AS).

Methods: We revised patients diagnosed with AS according to the New York criteria included in our database. Age at symptom onset was taken from the patient’s clinical history. Other data recorded were current age, time of evolution, gender, form of onset, form of evolution, HLA B27, BASRI (cervical, lumbar column, sacroiliacs and hips), metrology (Schober test, modified Schober test, thoracic expansion and occupi-wall distance), VSG and PCR (last measurements), uveitis development, surgery of the locomotive apparatus and treatment provided with special attention to the need for biological drugs in order to establish prognosis.

To ensure that the differences were not solely related to the time of evolution of the disease, we created a Control Group (CG) comprising, two randomly paired patients for each patient with early onset (EO), with an age of onset between 20 and 30 years and a time of evolution of the disease (± 5 years) similar to those with EO. The results were analyzed by means of the SPSS 15.0 statistical package. The differences between EO and CG were studied by means of χ² and ANOVA or Fisher’s test depending on the characteristics of the variables.

Results: We revisited 324 patients with EA; 35 (10.8%) had an age of onset ≤16 years. The chart shows the main characteristics of the patients from both groups. Significant differences in the development of uveitis and HLA B27 positivity were observed, as well as a tendency towards greater hip involvement and indication for hip prosthesis in the EO group.
Depression and Anxiety in Psoriatic Disease: Prevalence and Associated Factors

Emily McDonough, Arane Thavaneswaran, Adele Carty, Sutharshan Shanmugarajah, Remse Ayesar, Lili Edser, Vinod Chandran, Cheryl Rosen, and Daifai Gladman.

University of Toronto, Ontario, ON, Toronto Western Hospital and University of Toronto, Toronto, ON, 2Carmel Medical Center, Haifa, Israel, 3Toronto Western Hospital, University of Toronto, Toronto, ON.

Background/Purpose: Psoriatic arthritis (PsA) affects approximately 30% of patients with psoriasis and has the potential to cause severe joint damage. Research into the prevalence of depression and anxiety in PsA patients, and the contribution of joint disease to mental health in psoriatic disease, is limited. The objectives were: 1) To determine the prevalence of depression and anxiety in PsA patients and identify associated demographic and disease-related factors. 2) To determine if there is a difference between patients with PsA and those with psoriasis without PsA (PsC).

Methods: Consecutive patients attending PsA and PsC clinics were assessed for depression and anxiety using the Hospital Anxiety and Depression Scale (HADS). Patients with PsA satisfied CASPAR criteria and those with PsC had dermatologist confirmed psoriasis and PsA excluded by a rheumatologist. Patients underwent a clinical assessment according to a standard protocol and completed questionnaires assessing their happiness with life, quality of life, and their expectations of future treatments. The t-tests, ANOVA, univariate, and multivariate models were used to compare depression and anxiety prevalence between patient cohorts and determine factors associated with depression and anxiety.

Results: A total of 306 PsA and 135 PsC patients were assessed. The mean age of PsA and PsC patients was 53.8 and 52.4 years respectively. There were significantly more men in the PsA group (61.4% vs. 48% for PsC) and they were more likely to be unemployed (40% vs. 29.1%). The prevalence of both anxiety and depression was higher in PsA patients (36.6% and 22.2% respectively) compared to PsC (24.4% and 9.6%) (p = 0.012, 0.002). Factors associated with a higher likelihood of depression and/or anxiety included unemployment, female gender, and higher active joint count. Patient reported factors such as disability, pain, and fatigue were highly correlated with an increased likelihood of both depression and anxiety (p < 0.0001). In the univariate analyses, the protective factors for depression included having only PsC, drinking socially, and being employed. Factors associated with a higher odds ratio (OR) for depression included current smoking, a higher pain rating, higher patient reported physical disability, and a higher level of fatigue. In the multivariate reduced model, employment was protective for depression (OR 0.36) and a 1 unit increase on the fatigue severity scale (FSS) was associated with depression (OR 1.5).

Conclusion: The rate of depression and anxiety is significantly higher in PsA patients than in PsC patients. The factors most closely associated with higher rates of depression and anxiety are those in which patients express the negative effects PsA has on their quality of life, such as ratings of pain, disability and fatigue. The major limitation of this study is that it is not able to determine causation. Nonetheless, these results indicate the importance of addressing patients’ perceptions of their own health and functioning, as well as objective measures of disease severity, when treating depression and anxiety in psoriatic disease. A deeper understanding of these factors is important for planning and evaluating future treatments.

Disclosure: E. McDonough, None; A. Thavaneswaran, None; A. Carty, None; S. Shanmugarajah, None; R. Ayers, None; L. Edser, None; V. Chandran, None; C. Rosen, None; D. Gladman, None.

Depression and Anxiety in Psoriatic Disease: Prevalence and Associated Factors

Emily McDonough, Arane Thavaneswaran, Adele Carty, Sutharshan Shanmugarajah, Remse Ayesar, Lili Edser, Vinod Chandran, Cheryl Rosen, and Daifai Gladman.

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Disclosure: E. McDonough, None; A. Thavaneswaran, None; A. Carty, None; S. Shanmugarajah, None; R. Ayers, None; L. Edser, None; V. Chandran, None; C. Rosen, None; D. Gladman, None.

Development of a Health Index for Patients with Ankylosing Spondylitis - First Steps of a Global Initiative Based On the ICF Guided by ASAS

Uta Küttel, Desirée van der Heijde, Annies Boonen, Alarcos Ciezà, Gerold Stucki, Muhammad Asim Khan, Walter P. Maksymowycz, Helena Marzo-Ortega, John D. Reveille, Cristina Bostan, and Paraplegic Research Unit, Nottwil, Switzerland

Background/Purpose: To develop a measure to assess the overall impact of AS on health based on the International Classification of Functioning, Disability and Health (ICF), a model to systematically classify and describe functioning, disability and health in human beings, has been used by the Assessments of SpondyloArthritis international Society (ASAS) as a basis to define a core set of items that are important and relevant for patients with AS. However, no ICF-based patient-reported outcome measure has been developed for AS patients. The objective is To develop a measure to assess the overall impact of AS on health based on the ICF Core Set for ankylosing spondylitis (add the ref) which can be
Methods: Development is being performed in five phases. I development of an item pool using categories of the ICF Core Set for AS as the domain structure; II item exploration based on Rasch analyses for the items fitting the bio-medical categories and correlation analyses for the contextual factors; III - agreement on item reduction; IV validation of the draft version; V agreement on a final version.

Results: Phase 1: The item pool contained 251 items in 44 categories. It was formed from various instruments (identified through literature search) which focus on symptoms and functioning in patients with AS. Phase 2: An international cross sectional study with 1915 AS patients (mean age 51.2 ± 3.6, 53% male, BASDAI 5.5 ± 2.4) was conducted in 4 continents. In 82 items of the functioning part a unidimensional scale, fit to the Rasch model and absence of Differential Item Function could be confirmed. 32 items of the environmental factors part showed a significant correlation between person score and ICF category (correlation coefficient between 0.04 - 0.45). Phase 3: Based on results of the analyses in step 2, an expert committee selected 50 functioning items and 16 environmental factor items using predefined selection criteria (cognitive properties, ease of wording, covering whole range of ability). Phase IV: The draft version are being tested in various anatomical sites for a mean disease duration of 12.4 (SD 5.2) years in studies on comorbidities in relation to outcome in AS is recommended. (IBD) and osteoporosis increased with longer disease duration. Osteoporosis was diagnosed in 10.9% (10.4–11.4) at the femoral neck and 29.2% (28.2–30.1) at both vertebral fractures.

Table 1. Phases of development for the ASAS Health Index

<table>
<thead>
<tr>
<th>Phase</th>
<th>Objectives</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Preparatory</td>
<td>Development of a pool of items representing the categories of the ICF Core Set</td>
<td>Linkage of various assessment tools for functioning and health to ICF categories</td>
</tr>
<tr>
<td>II 1st postal patient survey</td>
<td>Item reduction</td>
<td>Factor Analysis, Rasch Analysis, Spearman rank correlation coefficient</td>
</tr>
<tr>
<td>IV Expert consultation survey</td>
<td>Agreement on item reduction and further item reduction</td>
<td>Nominal Consensus Process Testing psychometric properties Rasch Analysis</td>
</tr>
<tr>
<td>V Consensus Meeting</td>
<td>Agreement on a final version</td>
<td>Nominal Consensus Process</td>
</tr>
</tbody>
</table>

Discussion: C. Stolwijk, None; A. M. Van Tubergen, None; J. D. Castillo-Ortiz, None; A. Boonen, None.

1378 Validity of Ankylosing Spondylitis Disease Activity Score (ASDAS) in Patients with Early Spondyloarthritis. Cruz Fernández-Espartero1, Eugenio De Miguel2, Milena Gobbo1, Carmen Martínez1, Miguel A. Descalzo3, Esteban Lora Sr.1, and Esperanza De Miguel2, Hospital Universitario de Móstoles, Madrid, Spain, 1Hospital Universitario La Paz, Madrid, Spain, 2Spanish Society of Rheumatology, Madrid, Spain, 3Sociedad Española de Reumatología, Madrid, Spain, 5Research Unit. Sociedad Española de Reumatología, Madrid, Spain, 6Madrid

Background/Purpose: Recently, a Working Group of the SpondyloArthritis International Society (ASAS) has proposed a composite disease activity score, the Ankylosing Spondylitis Disease Activity Score (ASDAS), for patients with ankylosing spondylitis (AS), for improved and feasible measures of disease activity and treatment response in patients with spondyloarthritis (SpA).

Methods: Patients with early SpA were selected from ESPeranza database. The individual correlation of the ASDAS and Bath Ankylosing Spondylitis Activity Disease Index (BASDAI) with disease activity in early SpA.

Objectives: To evaluate the validity of the Ankylosing Spondylitis Disease Activity Score (ASDAS) as clinical tool for measurement of disease activity in early spondyloarthritis (SpA) in comparison with conventional clinical measures of disease activity. To assess the discriminative ability and correlation of the ASDAS and Bath Ankylosing Spondylitis Activity Disease Index (BASDAI) with disease activity in early SpA.

Validity of Ankylosing Spondylitis Disease Activity Score (ASDAS) in Patients with Early Spondyloarthritis. Cruz Fernández-Espartero1, Eugenio De Miguel2, Milena Gobbo1, Carmen Martínez1, Miguel A. Descalzo3, Esteban Lora Sr.1, and Esperanza De Miguel2, Hospital Universitario de Móstoles, Madrid, Spain, 1Hospital Universitario La Paz, Madrid, Spain, 2Spanish Society of Rheumatology, Madrid, Spain, 3Sociedad Española de Reumatología, Madrid, Spain, 5Research Unit. Sociedad Española de Reumatología, Madrid, Spain, 6Madrid

Results: Out of 7817 studies initially retrieved, 188 met the inclusion criteria. Additionally, 13 studies were found by hand search. The prevalence of IBD and osteoporosis and vertebral fractures could be calculated in respectively 337 (40141 patients), 53 (25695 patients), 66 (30410 patients), 24 (2786 patients), and 17 articles (2285 patients). The overall (weighted) mean age was 43.9 (SD 6.9) years, mean disease duration 16.7 (SD 6.2) years and 63.7% were men. The prevalence of uveitis was 30.3% (95% CI 30.2–30.4) for a mean disease duration of 16.4 (SD 6.4) years but increased with longer disease duration (from 19.4% for a disease duration of <10 years to 36.5% for a duration of >20 years). Prevalence of uveitis was also higher for studies using self-report compared to medical records (39.2% vs. 27.4%, p<0.001). Weighted prevalence of psoriasis was 11.3% (95% CI 11.2–11.4) for a mean disease duration of 18.0 (SD 6.3) years and prevalence of IBD was 7.2% (95% CI 7.1–7.2) for a mean disease duration of 17.8 (SD 6.4) years, without a clear relation to disease duration for both comorbidities. Prevalence of osteoporosis was 20.5% (19.4–21.6) in the lumbar spine, 10.9% (10.4–11.4) at the femoral neck and 29.2% (28.2–30.1) at both vertebral fractures.

Disclosure: C. Stolwijk, None; A. M. Van Tubergen, None; J. D. Castillo-Ortiz, None; A. Boonen, None.
ASDAS and BASDAI scores show good and moderate discriminative ability with different constructs of disease activity.

**Conclusion:** ASDAS is a disease activity index valid in early SpA. ASDAS and BASDAI scores show good and moderate discriminative ability and correlation with different constructs of disease activity. In early SpA, ASDAS showed a slight superiority to BASDAI in its ability to discriminate between high and low disease activity states.

**Disclosure:** C. Fernández-Espartero, None; E. De Miguel, None; M. Gobbo, None; C. Martínez, None; M. A. Descalzo, None; E. Loza Sr., None;

1379

**Ultrasoundographic Is More Sensitive Than Traditional Clinical Evaluation in the Detection of Hands and Wrists Synovitis and Digital Soft Tissue Involvement in Early Psoriatic Arthritis.** Francesca Bandinelli1, Valentina Denaro1, Francesca Prignano2, Diletta Bonciani2, Ledio Collaku3, and Marco Mattucci-Cerinic1.


**Background/Purpose:** Background: Clinical measures are widely used in established psoriatic arthritis (PsA) but in early phase of disease, often fail to identify the joint and tendons involvement. Purpose: To investigate the ultrasonography (US) abnormalities in hands and wrists of early PsA patients and to compare them with clinical evaluation

**Methods:** We performed a retrospective study on 112 early PsA patients (onset of inflammatory symptoms lower than one year) in the period 2008–2010, diagnosed with CASPAR criteria (1).

Data were carried out by the analysis of medical records of all patients, completed of demographic data, historical information, clinical (swollen joints and dactylitis count) and MyLab70 Xview (linear probe 15 MHz and PFR 1 MHz) and US (Power doppler [PD] positive synovitis, erosions, tenosynovitis and PD in soft tissue around flexor finger tendons) hands and wrists assessment.

**Results:** Out of 224 wrists and 1120 MCP, 1120 PIP and 1120 DIP totally observed, synovitis was more frequently found on wrist (50/224; 22.3%) and US resulted more sensitive than clinical evaluation (swollen joints: in wrists 50/224 (22.3%) vs 42/224 (18.7%), in MCP 28/1220 (2.5%) vs 11/1220 (1%), in IPP 24/1120 (2.1%) vs 15/1120 (1.3%), in IPD 3/1120 (0.3%) vs 1/1120 (0.09%). Also erosions were present only in MCP (mostly II and III MCP) in 10/120 joints (0.9%). At US, PD signal in soft tissue around tendons (68/1120, 6.1%) was more frequent than tenosynovitis of flexors (29/1120, 2.6%) and were both found also in patients without clinical dactylitis (55/68 PD [80.8%] of soft tissue and 18/29 [62%] of tenosynovitis).

**Conclusion:** US showed more frequently synovitis of wrists but also erosions and PD signals in soft tissue are present in early phase of PsA. In all cases, US seemed more sensitive than clinical evaluation for synovitis and dactylitis.

**Reference**


**Disclosure:** F. Bandinelli, None; V. Denaro, None; F. Prignano, None; D. Bonciani, None; L. Collaku, None; M. Mattucci-Cerinic, None.

1380

**A Spondyloarthritis Research Consortium of Canada Score Cut-off ≥3 As Best Match for the Assessment of Spondyloarthritis International Society Definition of a Positive MRI of the Sacroiliac Joints.** Rosaline van den Berg1, Manouk de Hooge2, Victoria Navarro-Compañ3, Monique Reijnierse1, Floris van Gaalen1, Tom Huizinga4, Desiree van der Heijde5.

1. Leiden University Medical Center, Leiden, Netherlands

**Background/Purpose:** The definition of a ‘positive’ or ‘negative’ MRI of the sacroiliac joints (MRI-SIJ) according to ASAS is recommended for use in daily practice. However, in several clinical trials the Spondyloarthritis Research Consortium of Canada (SPARCC)-score is used. It would be useful to know which SPARCC-score is the best cut-off value as surrogate for the ASAS definition. Therefore, we investigated which SPARCC cut-off value best matches the ASAS definition for a positive MRI-SIJ.

**Methods:** All MRI-SIJs of two time points of patients included in the SPondyloArthritis Caught Early (SPACE)-cohort in the Leiden University Medical Center (LUMC) were scored independently by 3 readers. The readers, blinded to the time sequence, scored the MRI-SIJs according to the ASAS definition (ASAS-pos) and the SPARCC-score. An MRI-SIJ was marked ASAS-pos if ≥2 readers scored positive. In this analysis, mean SPARCC-scores of the readers that also scored ASAS-pos for that particular case were used. Cross-tabs were used to analyse agreement between several SPARCC-score cut-off values (≥1, ≥2, ≥3 and ≥4) and ASAS-pos, which served as external standard in this comparison.

**Results:** All available MRI-SIJs were used (n=238 in total; n=148 baseline MRI-SIJs; n=90 follow-up MRI-SIJs). The results of the different tested SPARCC cut-off values are presented in the table. A SPARCC cut-off value ≥1 resulted in 39 (16.4%) false-positive classifications and a cut-off value ≥2 resulted in 11 (4.6%) and both cut-off values had no false-negative classifications compared to ASAS-pos. A SPARCC cut-off value ≥3 resulted in 1 (0.4%) false-positive classification and 4 (1.7%) false-negative classifications, and a SPARCC cut-off value ≥4 resulted in 9 (3.8%) false-negative and 1 (0.4%) false-positive classifications. We found very similar results if baseline MRI-SIJs and follow-up MRI-SIJs were analysed separately.

**Conclusion:** SPARCC cut-off values of ≥2, ≥3 or ≥4 have all high percentages of correctly classified patients (95.4%, 97.9% and 95.8%, respectively). A SPARCC cut-off value ≥3 shows the most balanced misclassification and the highest agreement with the ASAS definition for a positive MRI-SIJ.

**References**


**Disclosure:** R. van den Berg, None; M. de Hooge, None; V. Navarro-Compán, None; M. Reijnierse, None; F. van Gaalen, None; T. Huizinga, None; D. van der Heijde, None.

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1. St. Joseph’s Hospital, London, ON, 2. Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON, 3. Toronto Western Hospital and University of Toronto, Toronto, ON, 4. Memorial University, St. Johns, NF, 5. University of Alberta, Edmonton, AB, 6. Toronto Western Research Institute, University of Toronto, University Health Network, Toronto, ON.

**Background/Purpose:** Clinical subsets of spondyloarthritis (SpA), such as ankylosing spondylitis (AS) and psoriatic arthritis (PsA), can be associated with significant impact on work performance and attendance. Prior to becoming completely work disabled, patients’ functional abilities do not match their work demands. This period of time is one of work instability (WI). The aim of this study was to determine the characteristics of WI in a large population of patients with SpA.

**Methods:** Patients were recruited from two large, well established cohorts of AS and PsA. WI was evaluated using a validated questionnaire, the AS-WIS, in which higher scores denote more WI, which may be stratified into low, medium and high risk of future job loss. Standard protocols were completed at the time of completion of the AS-WIS which included a detailed history, physical examination, physician-reported outcome measures and patient-reported outcome measures.
Results: 414 patients responded (222 PsA, 160 AS, 18 undifferentiated SpA [uSpA], 12 non-radiographic SpA [nr-axSpA] and 2 reactive arthritis [ReA]). Mean age was 47.2 (SD 14.4), 66.9% male. Mean duration of PsA was 17.4 years; AS was 11.9 years. Mean WIS scores were low in AS (8.0, SD 6.1), PsA (6.7, SD 6.0), ReA (7.5, SD 9.2) and uSpA (8.0, SD 6.9). However, those with nr-axSpA had significantly greater WIS scores than the other groups, placing them in the moderate risk category (mean 12.6, SD 6.6). Higher WIS scores were significantly correlated with female gender, lower education, lung disease, gastrointestinal (GI) disease, diabetes, peripheral joint involvement, NSAID use, tender joint count, fibromyalgia tendon point count (FMTP), MD global assessment of disease activity, EQ5D, Dermatology Life Quality Index, pain, stiffness, Health Assessment Questionnaire, Fatigue Severity Score, Bath AS-Global, Bath AS Disease Activity Index, Bath AS Functional Index, AS Quality of Life, Functional Assessment of Chronic Illness Therapy, SF-Physical Component Scale, SF-Mental Component Scale, and patient global assessment of disease activity. Linear regression revealed that sex, lower education level, history of GI disease, diabetes, NSAID use and FMTP were significantly associated with higher WIS scores. Multinomial logistic regression was carried out on WIS risk level (low, medium or high) with low risk as the reference category. Medium WIS risk scores were significantly associated with education level, history of GI disease, diabetes, NSAID use and FMTP. High WIS risk scores were significantly associated with education level and history of GI disease.

Conclusion: WIS was significantly higher in those with nr-axSpA than other types of SpA, suggesting that these patients have a greater mismatch between their functional abilities and job demands. Education level, history of GI disease, NSAID use and higher FMTP were associated with higher levels of WIS. The highest risk of WIS was associated with education level and history of GI disease.

Disclosure: S. Rohojar, None; R. D. Inman, None; R. Ayeast, None; P. Rahman, Janssen Research and Development, LLC; W. P. Maksymowych, None; D. D. Gladman, None.

1382
A Comparison of Three Methods of Measuring Intermalleolar Distance in Patients with Ankylosing Spondylitis.
Buse Ozata1, Burak Uyar2, Dilek Solmaz2, Ismail Sari2, Servet Akar2 and Nurullah Akkoc3, 1Dokuz Eylul University School of Medicine, Izmir, Turkey, 2Dokuz Eylul University School of Medicine, Izmir, 3Dokuz Eylul University School of Medicine, Izmir, Turkey

Background/Purpose: Involvement of the hips are relatively common in AS and associated with a higher degrees of disability and worse prognosis. The measurements of spinal mobility could be used for predicting clinical involvement and monitoring disease severity. In this regard, intermalleolar (IMD) distance (0 cm suggests hip disease in AS. There are two recommended methods of measuring IMD. First, distance between the two medial malleoli is measured, with the patient lying in a supine position with the hips fully abducted. Second, the patient stands and separates the legs as far as possible and the distance between the medial malleoli is measured. Alternatively, some physicians measure IMD in sitting position, while keeping knees and the legs straight in contact with the resting surface, patient is then asked to take legs as far apart as possible, and the distance between the medial malleoli is measured. Today, it is not known whether these three methods are in agreement with each other. In this study, we evaluated the agreement of IMD measurement methods performed during standing, sitting and supine positions.

Methods: In total of 61 consecutive AS patients (44.1±12.3 years; 35 male, and 26 female), were included in the study. Each patient was examined independently by two observers. Bootstrapping of the methods and reliability of observers were evaluated by means of the single measures intraclass correlation coefficient (ICC) values. For the analysis of intra- and interobserver variability, ten randomly chosen patients were reexamined by the observers on two different occasions (2 weeks apart). An ICC value of > 0.75 indicated good agreement.

Results: The three measurement methods of IMD showed good agreement between each other (Table 1). The ICCs obtained by each observer were as follows: 1- measurements performed by the observer 1: 0.81 (95% CI= 0.73–0.88), and 2- measurements performed by observer 2: 0.81 (95%CI= 0.72–0.87). Both intra- and interobserver reliability of the observers also showed good agreement (Table 1).

Table 1. Comparison of agreement between three methods of IMD measurements and intra- and inter-observer reliability of the examiners.

<table>
<thead>
<tr>
<th>Observer</th>
<th>Comparison of agreement between three methods of IMD measurements</th>
<th>Observer 1</th>
<th>Observer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supine</td>
<td>Standing</td>
<td>Sitting</td>
</tr>
<tr>
<td>Observer 1</td>
<td>0.98 (0.91–0.99)</td>
<td>0.97 (0.88–0.99)</td>
<td>0.88 (0.6–0.97)</td>
</tr>
<tr>
<td>Observer 2</td>
<td>0.96 (0.85–0.99)</td>
<td>0.99 (0.98–0.99)</td>
<td>0.99 (0.97–0.99)</td>
</tr>
</tbody>
</table>

Conclusion: In this study we showed that IMD measurements (supine, standing and sitting) were in good agreement with each other. It is of note that this finding obtained independently by both observers who had also good intra- and interobserver reliability. According to the results of our study investigators can reliably use any IMD measurement methods in their studies.

Disclosure: B. Ozata, None; B. Uyar, None; D. Solmaz, None; I. Sari, None; S. Akar, None; N. Akkoc, None.

1383
The Burden of Ankylosing Spondylitis and the Cost-Effectiveness of Anti-Tumor Necrosis Factor α Agents in Romania.
Ioan Ancuta1, Catalin Cordrea2, Ruxandra Ionescu3, Magda Parvu4 and Mihai Bojinca1, 1”Dr. I. Cantacuzeno” Hospital, Bucharest, Romania, 2”Dr. I. Stoia” Center for Rheumatic Diseases, Bucharest, Romania, 3Clinic Hospital Sf. Maria, Bucharest, Romania, 4”N.Gh. Lupu” Clinical Hospital, Bucharest, Romania

Background/Purpose: Ankylosing Spondylitis (AS) usually affects young males, severely impairing their quality of life. Chronic treatment of AS using anti-TNF α agents is costly and represents a main concern for the national health insurance system, currently covering costs for three drugs: Adalimumab (ADA), Etanercept (ETA) and Infliximab (INF). Limited budget prompted the need to find optimal therapeutic approach. We aimed to identify the best cost/efficiency ratio when comparing clinical outcomes of anti-TNF α agents ADA/ETA/INF and to develop future treatment guidelines.

Methods: In a longitudinal, population-based study we retrospectively investigated, as of June 2012, the clinical files of 320 patients treated with ADA (n=70, 40 mg/2 weeks), ETA (n=50, 50 mg/week) and INF (n=200, 5 mg/kg at week 0, 2 and 6 then at every 6 to 8 weeks), out of 1859 AS patients on record in database (2008–2012) of state health insurance system. Costs were calculated in local currency (RON), according to standard clinical practice prescribed doses and reimbursed drug list prices, no infusions or other additional costs were included. We used multiple analysis of variance (MANOVA) and chi-squared tests to analyze statistically significant differences (p<0.05) in treatment efficacy.

Results: Concomitant use of disease modifying therapy (DMARD) was similar in all groups. Treatment efficacy was assessed and compared using Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), tender joints count (TJC) and swollen joints count (SJC), C Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR). Assessments were made at 6 month intervals over a maximum period of 54 months after treatment initiation. In our nationally representative cohort, 266 (83.1%) patients were male. Overall, mean age was 37.4±9.8 years and average disease evolution 7.6±6.1 years. Sacroiliitis was present in 34 (10.6%) patients, calcaneum was affected in 45(14.1%), as confirmed on MRI scans, 27(8.4%) suffered from axial AS and 132 (41.2%) were diagnosed with mixed AS. Median baseline BASDAI values were 8.02±0.78, 8.07±0.92 and 8.13±0.82, in ADA, ETA and INF groups, respectively. We found statistical difference (p<0.0001) in CRP values at 6 months from baseline, but no difference at any other assessment. Similarly, there were no statistically significant differences between groups at any assessments for ESR, TJC and SJC. In contrast, drug cost analysis showed INF as the most expensive followed by ADA and ETA.
Conclusion: For the vast majority of endpoints, including BASDAI index, there were no statistically significant differences in treatment efficacy between the investigational groups. Therefore, we suggest that treatment cost rather than active compound, might be taken into consideration when choosing between these three anti-TNF α drugs for treatment of autoimmune AS.

Disclosure: I. Ancuta, None; C. Codreanu, None; R. Ionescu, None; M. Parvu, None; M. Rojnicu, None.

1384

The Frequency of Non-Radiographic Axial Spondyloarthritis in Relation to Symptom Duration in Patients Referred Because of Chronic Back Pain: Results From the Berlin Early Spondyloarthritis Clinic, Denis Podudubnyy1, Henning Brandt1, Janis Vahldiek2, Inge Spiller1, In-Ho Song1, Martin Rudwaleit1 and Joachim Sieper3. 1Charité Medical University, Campus Benjamin Franklin, Berlin, Germany, 2Endokrinologikum Berlin, Berlin, Germany, 3Charité Universitätsmedizin Berlin, Berlin, Germany

Background/Purpose: Non-radiographic axial spondyloarthritides (nr-axSpA) and radiographic axial SpA (=ankylosing spondylitis–AS) are considered currently as two stages of axial SpA. We reported recently that about 12% of the patients with non-radiographic axial SpA progress in AS over 2 years [1]. Although it can be expected that in the first years after back pain onset non-radiographic (without definite sacroiliitis on the x-ray) SpA is more likely to see patients with non-radiographic axial SpA progress in AS over 2 years. We currently as two stages of axial SpA. We reported recently that about 12% of the referred patients who were diagnosed with AS will progress to non-radiographic axial SpA.

Methods: Patients fulfilling the New York diagnostic criteria for AS were included. A diagnosis of definite axial SpA was made in 43.7% of the referred patients. We recorded data at baseline and determined several parameters used as diagnostic criteria.

Results:

- A diagnosis of definite axial SpA was made in 43.7% of the referred patients (n = 522). Axial SpA was diagnosed in a similar percentage of about 50% if back pain duration was <9 years but decreased to 36% if symptom duration was >9 years. Non-axSpA represented the majority of patient (67.3%) only if duration of back pain was 1 year and less at the time of referral. Between 1 and 6 years of back pain duration the probability of nr-axSpA and AS was nearly equal (1–3 years: 52.5% and 47.5%, respectively; 3–6 years: 53.7% and 46.3%, respectively). In patients with back pain duration of 6–9 years, AS was more likely (61.1%) to be diagnosed than nr-axSpA (38.9%), and this increased further over time - figure.

Conclusion: Non-radiographic axial SpA represents an important diagnosis in the structure of reasons of back pain, especially in patients with recent symptom onset.

Reference:

Disclosure: D. Podudubnyy, None; H. Brandt, None; J. Vahldiek, None; I. Spiller, None; I. H. Song, None; M. Rudwaleit, None; J. Sieper, None.

1385

Increased Body Mass Index in Ankylosing Spondylitis Is Associated with a Greater Burden of Symptoms and Poor Perceptions of the Benefits of Exercise. Laura J. Durcan1, Fiona Wilson2, Richard Conway1, Gaye Cunnane3 and Finbar (Barry) D. O’Shea1. 1St James’s Hospital, Dublin, Ireland, 2Trinity College, Dublin, Ireland

Background/Purpose: In Ankylosing Spondylitis (AS) the effect of obesity on disease characteristics and exercise perceptions is unknown. Exercise is an essential component in the management of AS. This study was undertaken to assess the attitudes of our AS patients to exercise and to evaluate the effect of increased BMI has on symptoms and disease activity.

Methods: AS patients fulfilling the New York diagnostic criteria were recruited consecutively from our dedicated AS clinic. Demographic data and disease characteristics were collected. Disease activity, symptomatology and functional disability were examined using standard AS questionnaires. Body mass index (BMI) was calculated using standardised methods as kg/m². Co-morbidity was analysed using the Charlson co-morbidity index. Patient’s attitudes towards exercise were assessed using the exercise benefits and barriers scale (EBBS). The total EBBS score was used to assess their overall perception of exercise and the barriers component was used to evaluate their conceptual barriers to exercise. We then compared the disease characteristics, perceptions regarding exercise and functional limitations in AS patients who were overweight to those who had a normal BMI. Continuous variables were compared using a t-test and categorical variables were assessed using chi squared testing.

Results: Forty six AS patients were included. The mean disease duration in the group was 12.8 years (SD 10.2), 76.1% (N = 35) were male, and 69.6% (N = 32) were taking biologic therapy. There were 37% (N = 17) either current or ex-smokers in the group. The mean BMI was 27.4 kg/m² (SD 4.0), 67.5% (N = 32) were overweight or obese. There was a statistically significant difference between those who are overweight and those with a normal BMI regarding their perceptions of exercise (EBBS 124.7 Vs 136.6 (p = 0.006)) indicating that those who are overweight have a worse perception of the benefits of exercise. With regards to those who were overweight versus those with a normal BMI there were significant differences in both BASFI and HAQ (BASFI 4.7 Vs 2.5 (p = 0.009), HAQ 0.88 Vs 0.26, (p = 0.002)). The disease activity in the groups were also significantly different (BASDAI 4.8 Vs 2.9 (p = 0.007) and patient global score 5.0 Vs 2.7 (p = 0.007)). There was no difference between the groups in terms of their co-morbid conditions as measured by the Charlson index (p = 0.3), smoking (p = 0.29), disease duration (p = 0.78), gender (p = 0.71), or treatment (p = 0.89).

Conclusion: The majority of AS patients in this cohort are overweight. These overweight patients have a greater burden of symptoms, worse perceptions regarding the benefits of exercise and enhanced awareness of their barriers to exercising. This is of particular concern in a disease where exercise plays a crucial role.

Disclosure: L. J. Durcan, None; F. Wilson, None; R. Conway, Roche Pharmaceuticals, 2, UCB Pharma, 2, Merck Pharmaceuticals, 7; G. Cunnane, None; F. D. O’Shea, None.

ACR/ARHP Poster Session B
Systemic Lupus Erythematosus: Clinical Aspects

Monday, November 12, 2012, 9:00 AM–6:00 PM

1386

Genetic Variation and Coronary Atherosclerosis in Patients with Systemic Lupus Erythematosus. Cecilia P. Chung1, Joseph F. Solus1, Annette Oeser1, Chun Li1, Paolo Ragge5, Jeffrey R. Smith1 and C. Michael Stein1. 1Vanderbilt University, Nashville, TN, 2Emory University, Atlanta, GA

Background/Purpose: Premature coronary artery disease is a major cause of morbidity and mortality in patients with systemic lupus erythematosus (SLE). However, this is not explained by traditional cardiovascular risk factors. We explored the genetic and inflammatory basis for premature coronary artery disease in lupus.

Methods: Patients with SLE referred to the Vanderbilt Inflammatory Arthritis Clinic were genotyped for single nucleotide polymorphisms (SNPs) in recent GWAS associated with systemic lupus erythematosus (SLE) susceptibility, rheumatoid arthritis (RA), and coronary artery disease (CAD). SNPs were also selected for linkage disequilibrium and functional data. A selection of polymorphisms was genotyped in a SLE and control cohort to assess association.

Results: Thirty-one SNPs were successfully genotyped. Twelve SNPs were associated with CAD in SLE. Nine SNPs were associated with SLE and RA in controls. SLE and RA controls were then genotyped for the 12 CAD associated SNPs.

Conclusion: Our study suggests that genetic variation in genes linked to systemic lupus erythematosus and RA are associated with premature coronary artery disease in this lupus cohort.

Disclosure: L. J. Durcan, None; F. Wilson, None; R. Conway, Roche Pharmaceuticals, 2, UCB Pharma, 2, Merck Pharmaceuticals, 7; G. Cunnane, None; F. D. O’Shea, None.
**Factors or markers of inflammation. Little is known about the contribution of genetic variation to atherosclerosis in this patient population. Therefore, we examined the hypothesis that, in patients with SLE, candidate gene polymorphisms were associated with the presence of coronary atherosclerosis.**

**Methods:** One hundred and twenty-five patients with SLE, enrolled in an ongoing study to evaluate the prevalence and associated risk factors of coronary atherosclerosis in SLE, were studied. Patients fulfilled the 1997 American College of Rheumatology classification criteria for SLE and were 18 years or older. Coronary artery calcium (CAC), a non-invasive measurement of coronary atherosclerosis, was measured by electron beam computed tomography. Using the Illumina Goldengate platform, we determined the genotype of 714 single-nucleotide polymorphisms (SNPs) in 176 selected candidate genes. Candidate genes were selected because of their relevance to atherosclerosis, cardiovascular risk. The associations between the presence of CAC and individual SNPs were assessed with logistic regression, adjusted for age, gender, and race. To account for multiple comparisons, a false discovery rate (FDR) threshold of 20% was specified.

**Results:** Patients with SLE were 41±12 years old, 91% were women and 64% were Caucasian. The presence of CAC was detected in 33 patients (26%). After adjustment for age, race, and sex, associations were detected for CSF1, ADIPOQ, REST, VCAM1, MIF, TNFSF4, INS, IRF5, TH, and a minor allele of S598 (Table). However, none of these associations remained significant after FDR correction.

**Conclusion:** We conclude that polymorphisms of genes coding CSF-1, adiponectin, resistin, VCAM-1, MIF, TNFSF4-4, insulin, IRF-5, TH, and HMOX-1 may be associated with the presence of coronary atherosclerosis in patients with SLE. Studies in additional cohorts will be informative.

**Disclosure:** C. P. Chung, None; J. F. Solus, None; A. Oeser, None; C. Li, None; P. Raggi, None; J. R. Smith, None; C. M. Stein, None.

### Table

<table>
<thead>
<tr>
<th>SNP</th>
<th>Gene</th>
<th>Major/more frequent minor allele</th>
<th>Minor allele frequency</th>
<th>Odds ratio* (95% CI)</th>
<th>p-value</th>
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</thead>
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<td>A,T</td>
<td>0.20</td>
<td>0.05 (0.01–0.03)</td>
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<td>0.10</td>
<td>0.21 (0.06–0.81)</td>
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</tr>
</tbody>
</table>

* Odds ratio for the comparison between minor and major allele.

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**Diagnostic Accuracy of Anti-dsDNA Antibodies in Unselected Patients with Recent Onset of Rheumatic Symptoms.** Michele Compagno1, Søren Jacobsen2, Ole Petter Rekvig3, Lennart Truedsson4, Niels H. H. Heegaard1, Johannes C. Nossm1, Andreas Jønsen5, Rasmus Steimann Jacobsen3, Gro Ostl Eilertsen6, Gunnar K. Sturfelt1 and Anders Bengtsson1. 1Lund University, Lund, Sweden, 2Copenhagen University Hospital, Copenhagen, Denmark, 3University Hospital, Tromso, Norway, 4Department of Laboratory Medicine, Section of Microbiology, Immunology and Glycobiology, Lund, Sweden, 5Statens Serum Institut, Copenhagen S, Denmark, 6University of Tromso, Tromso, Norway

**Background/Purpose:** Anti-dsDNA antibodies are widely used in diagnostic settings when SLE is suspected. Critidia Lucilae Immunofluorescence Test (CLIFT) and Enzyme Linked ImmunoSorbent Assay (ELISA) are commonly used assays to detect anti-dsDNA antibodies in clinical practice. The aim of the present study was to evaluate the diagnostic accuracy of CLIFT and ELISA in unselected patients with recent onset of rheumatic symptoms.

**Methods:** In the three participating centres, 1073 consecutive patients were locally screened for ANA. A total of 292 ANA positive patients and 292 matching ANA negative patients were selected. Anti-dsDNA antibodies were assessed at study entry by different laboratories with CLIFT (totally four times using two different commercial kits) and with ELISA (totally four times with three different commercial kits). The results of the laboratory tests were related to the clinical diagnosis formulated at study entry and verified after a long term follow-up period (median 4.8 years).

**Results:** Discrepant results were obtained from the different assessments regardless of the assay used, with kappa statistics value ranging between 0.25 and 0.75. At least one anti-dsDNA analysis was positive in 164 patients, but in only seven patients the positivity was confirmed by all the assessments. SLE diagnosis was initially made in 65 patients, of which 40 were anti-dsDNA positive. A wide spectrum of other diagnoses was observed among anti-dsDNA positive patients. Overall, about one third of anti-dsDNA positive patients were ANA negative. At follow-up after approximately 5 years, SLE diagnosis was unchanged in 63 patients (39 anti-dsDNA positive) and changed in only two (one anti-dsDNA positive). Among the 120 anti-dsDNA positive patients not diagnosed with SLE at study entry, only one developed SLE during the follow-up period.

**Conclusion:** Regardless of the assay used, assessment of anti-dsDNA antibodies was not reliable as diagnostic tool in our cohort of unselected patients with rheumatic symptoms. ANA showed poor reliability as screening test before anti-dsDNA analysis. Anti-dsDNA antibodies had surprisingly low positive predictive value for SLE diagnosis, despite their high specificity. For non SLE patients, being anti-dsDNA positive poses little risk of developing SLE within 5 years.

**Disclosure:** M. Compagno, None; S. Jacobsen, None; O. P. Rekvig, None; L. Truedsson, None; N. H. H. Heegaard, None; J. C. Nossm, None; A. Jønsen, None; R. Steimann Jacobsen, None; G. Eilertsen, None; G. K. Sturfelt, None; A. Bengtsson, None.

### 1389

**Erythrocyte Sedimentation Rate Is a Predictor of Renal and Overall Systemic Lupus Erythematosus Disease Activity.** George Stoian1, Hong Fang1, Laurence S. Magder2 and Michelle Petri1. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2University of Maryland, Baltimore, MD

**Background/Purpose:** To assess whether ESR levels correlate with the level of disease activity at each visit and whether a change in ESR could be useful in predicting changes in disease activity.
Methods: 34000 visits in a prospective SLE cohort were analyzed for the association of ESR and level of disease activity. Follow-up visits when patients had cancer, infection, pregnancy or were in renal failure were excluded.

Results: After adjusting for confounding factors, ESR correlated with the SELENA-SLEDAI, the physician global assessment (PGA), fatigue, renal, joint, rash, serositis, and hematologic visual analogue scales (VAS) and proteinuria (p<0.001). A change in ESR between two visits was highly correlated with a concurrent change in physician global assessment (PGA), renal, fatigue and joint VAS (p<0.0001) (Table). There was no statistically significant correlation between change in ESR between two visits and a future change in disease activity.

Table. Mean change in disease activity between two consecutive clinic visits, per 1 standard deviation change (27 mm/hr) in ESR.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Adjusted Difference in mean activity level (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLEDAI</td>
<td>0.09 (0.00, 0.19)</td>
<td>0.043</td>
</tr>
<tr>
<td>PGA</td>
<td>0.00 (0.03, 0.07)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Fatigue VAS</td>
<td>0.01 (0.00, 0.15)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Neuro VAS</td>
<td>-0.05 (-0.01, 0.02)</td>
<td>0.19</td>
</tr>
<tr>
<td>Rash VAS</td>
<td>0.006 (0.006, 0.019)</td>
<td>0.33</td>
</tr>
<tr>
<td>Renal VAS</td>
<td>0.030 (0.018, 0.043)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Joints VAS</td>
<td>0.030 (0.013, 0.046)</td>
<td>0.0004</td>
</tr>
<tr>
<td>Pulmonary VAS</td>
<td>-0.01 (-0.004, 0.002)</td>
<td>0.65</td>
</tr>
<tr>
<td>Hematology VAS</td>
<td>0.001 (0.007, 0.010)</td>
<td>0.79</td>
</tr>
<tr>
<td>Serositis VAS</td>
<td>0.005 (0.002, 0.011)</td>
<td>0.16</td>
</tr>
<tr>
<td>Hematuria</td>
<td>-0.006 (-0.000, 0.000)</td>
<td>0.36</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>0.009 (0.002, 0.016)</td>
<td>0.013</td>
</tr>
</tbody>
</table>

1 Adjusted for age, race, sex, and changes in weight, c3, c4, hematocrit, and anti-dsDNA, prednisone use, plaquenil use, and immunosuppressant use.

Conclusion: ESR is associated with disease activity in SLE measured by the SELENA-SLEDAI, the physician global assessment (PGA), and with organ specific activity including serositis, rash, joint, renal and hematologic visual analogue scales. A change in ESR between two visits was highly correlated with a change in physician global assessment (PGA), renal, fatigue and joint visual analogue scale (VAS). However, change in ESR between two visits did not predict the disease activity at the next (third) visit. Until more specific biomarkers are validated, serial ESR does have utility in following disease activity, in particular renal, in SLE.

Disclosure: G. Stojan, None; H. Fang, None; L. S. Magder, None; M. Petri, None.

1390

Vitamin D Deficiency Is Not Associated with Nor Does It Predict Progression of Coronary Artery Calcium or Carotid Intima-Media Thickness in Systemic Lupus Erythematosus. Adnan Kiani1, Hong Fang1, Ehtisham Akhter1, Laurence S. Magder1 and Michelle Petri1. 1 Johns Hopkins University School of Medicine, Baltimore, MD, 2University of Maryland, Baltimore, MD

Background/Purpose: In the general population, vitamin D deficiency is associated with cardiovascular disease including myocardial infarction and stroke. In SLE, Vitamin D deficiency has been associated with cardioint disease. We investigated whether low vitamin D would predict change in subclinical measures of atherosclerosis over 2 years.

Methods: 167 SLE patients (93% female, 63% Caucasian, 32% African-American, mean age 45 yrs) had measurement of coronary artery calcium and carotid intima-media thickness IMT (IMT) and vitamin D.

Results:

Table 1 shows the baseline characteristics by vitamin D status.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number (%) with the characteristic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vitamin D &lt;32 (n=133)</td>
<td>Vitamin D ≥32 (n=34)</td>
</tr>
<tr>
<td>Age</td>
<td>18-30</td>
<td>14 (11%)</td>
</tr>
<tr>
<td></td>
<td>31-49</td>
<td>75 (56%)</td>
</tr>
<tr>
<td></td>
<td>50+</td>
<td>44 (33%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>79 (59%)</td>
<td>27 (79%)</td>
</tr>
<tr>
<td>African-American</td>
<td>47 (35%)</td>
<td>5 (15%)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (5%)</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>124 (93%)</td>
<td>31 (91%)</td>
</tr>
<tr>
<td>Male</td>
<td>9 (7%)</td>
<td>3 (9%)</td>
</tr>
</tbody>
</table>

Table 2. Changes in coronary artery calcium (CAC) and carotid intima-media thickness (IMT).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean at baseline</th>
<th>Mean at 2 years</th>
<th>p-value</th>
<th>Difference in change (95% CI)*</th>
<th>p-value for difference between groups**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(CAC score+1)</td>
<td>1.18</td>
<td>1.23</td>
<td>0.05</td>
<td>0.63</td>
<td>-0.14 (-0.58, 0.30)</td>
</tr>
<tr>
<td>Vitamin D &lt;32</td>
<td>1.11</td>
<td>1.30</td>
<td>0.19</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Vitamin D ≥32</td>
<td>0.58</td>
<td>0.66</td>
<td>0.08</td>
<td>&lt;0.0001</td>
<td>0.01 (-0.02, 0.04)</td>
</tr>
</tbody>
</table>

This table is based on the 123 patients with vitamin D <32 and the 32 patients with vitamin D ≥32 for whom there were both baseline and follow-up measures. * Difference in change: measure in vitamin D <32 group minus measure in vitamin D ≥32 group.

Conclusion: Vitamin D deficiency was not associated with any measure of subclinical atherosclerosis in SLE. Another study by Bruce et al (Rheumatology-2012) did not show an association of low Vitamin D in SLE with carotid IMT or plaque either. Vitamin D deficiency did not predict progression of subclinical atherosclerosis over 2 years. Future studies with larger sample size and longer follow up are needed to confirm our findings.

Disclosure: A. Kiani, None; H. Fang, None; E. Akhter, None; L. S. Magder, None; M. Petri, None.

1391

Anti-Ku Autoantibodies in Systemic Lupus Erythematosus Versus Autoimmune Myositis As Measured by a Novel Chemiluminescence Assay. Michael Mahler1, Jason Wu1, Magdalena Szmytko-Kaczmarek1, Andreas Swart1, Marvin J. Fritzler1, Jean-Luc Senechal2 and John G. Hanly3. 1INOVA Diagnostics, Inc., San Diego, CA, 2INOVA Diagnostics, San Diego, 3Wroclaw Medical University, Wroclaw, Poland, 4Rheumatology clinic Neuss, Neuss, Germany, 5University of Calgary, Calgary, AB, 6Hopital Notre-Dame du CHUM, Montreal, QC, 7Dalhousie University and Capital Health, Halifax, NS

Background/Purpose: Autoantibodies targeting Ku, an abundant nuclear protein with DNA helicase activity, have been reported in patients with systemic autoimmune rheumatic diseases. Little is known about the clinical association of anti-Ku antibodies, especially when tested using novel technologies. The objective of the present study was to analyze the prevalence of anti-Ku antibodies in different pathologies using a novel chemiluminescence immunoassay (CIA) on the BIO-FLASH®, a fully random access automated immunoanalyzer.

Methods: Serum samples from adult patients with systemic lupus erythematosus (SLE, n=305) and autoimmune myositis patients (AIM, n=109) were used. Results were compared to disease controls (rheumatoid arthritis, n=30; infectious diseases, n=17) and healthy adults (HA, n=167). In addition, samples from patients referred to a rheumatology clinic submitted for routine autoantibody testing (n=1078) were studied. All samples were tested for anti-Ku antibodies by QUANTA Flash Ku (research use only, INOVA Diagnostics, San Diego, CA, USA) using recombinant Ku coupled to paramagnetic beads. SLE patient samples were also tested for other connective tissue disease associated autoantibodies using the respective QUANTA Lite® ELISAs (INOVA Diagnostics). Clinical data of anti-Ku positive patients (high titers) from the referral study were collected by retrospective chart review. Statistical analysis (Fisher exact test, receiver operating characteristics [ROC] analysis) was done with ANALYSE-IT version 2.03.

Results: At cut-off values of 10,000 or 15,000 relative light units (RLU), 43/305 (14.1%) or 30/305 (9.8%) SLE patients and 4/109 (3.7%) AIM patients were positive, respectively. The 4 positive AIM patients had myositis in overlap, including 2 patients with SLE and myositis. In the control cohorts, 4/167 (2.4%) or ≥2/167 (1.2%) HA (all low titer), respectively, 0/30 (0.0%) rheumatoid arthritis and 0/17 (0.0%) infectious disease patients were positive. The area under the curve values were: 0.65 for SLE vs. controls and 0.37 for AIM vs. controls. In three SLE patients, anti-Ku antibodies were the only detectable autoantibody. In the rheumatology clinic referral cohort, 12/1078 (1.1%) were positive for anti-Ku antibodies, 9 showing low and 3 high titers. The diagnoses of the 3 high positive anti-Ku positive patients were: suspected SLE, mixed connective tissue disease, and rheumatoid arthritis treated with anti-TNF in a patient with a positive ANA.

Conclusion: Anti-Ku antibodies detected by CIA are present in 14.1% or 9.8% of SLE, but in only 3.7% of AIM patients, 50% of whom have SLE.
This suggests that anti-Ku antibodies are associated with SLE rather than with AIM. This association may have been missed in previous studies due to the past use of indirect immunofluorescence screening assays or the high sensitivity of the current CIA assay.

Disclosure: M. Mahler, Inova Diagnostics, Inc.; J. Wu, Inova Diagnostics, Inc.; M. Szmyrka-Kaczmarek; A. Swart, None; M. J. Fritzler, Inova Diagnostics, Inc.; J. L. Senecal, None; J. G. Hanly, None.

1392
Clinical Correlation with Anti Double Stranded Deoxyribonucleic Acid Via Enzyme Linked Immunoassay Versus Multiplex Immunoassay. Megan L. Krause, Melissa R. Snyder, Cynthia S. Crowson, Abigail B. Green and Kevin G. Moder. Mayo Clinic, Rochester, MN

Background/Purpose: In systemic lupus erythematosus (SLE), antibodies to double-stranded DNA (dsDNA) are utilized for disease classification and assessment of activity. Enzyme immunoassays (EIAs) and multiplex immunoassays (MIAs) are frequently used. However, anti-dsDNA antibody assays are not well-standardized with previously reported low concordance rates. In this study, clinical factors and laboratory data were evaluated for their association with anti-dsDNA antibody testing performed by EIA and MIA.

Methods: Patients from a single institution (n=102) underwent anti-dsDNA antibody testing by EIA (INOVA Diagnostics) and MIA (BioRad Laboratories). Clinical diagnoses, SLE disease activity index (SLEDAI), medication exposure, and laboratory data (serologies, complement values, and inflammatory markers) were abstracted. Qualitative concordance between the two methods was defined as both methods being classified as “negative” or “positive” according to the manufacturer’s recommended reference ranges. Discordance was defined as one method having different categorization than the other, “positive,” “borderline/indeterminate,” or “negative.”

Results: Within the total cohort, 35% and 44% of patients were positive for anti-dsDNA antibodies by EIA and MIA, respectively. Further, 54 had a diagnosis of definite, probable, or cutaneous SLE with 63% positive by MIA and 50% by EIA. In addition, only 6% of these patients had negative concordance, while 37% demonstrated positive concordance (p=0.02). Of those negative by both methods, none had lupus nephritis. In patients with lupus nephritis, 35% demonstrated positive concordance. The remaining demonstrated discordance with a higher qualitative value of MIA in 52% compared to 13% with EIA higher (p=0.14). The mean SLEDAI score calculated without the anti-dsDNA value was 3.3 in patients with negative concordance, 3.7 in those negative by both methods, respectively. In patients with positive concordance, 53% were positive for anti-ss-A antibodies and anti-RNP antibodies compared to 8% and 23% of patients with negative concordance, respectively. Of patients with positive concordance, 53% were positive for anti-dsDNA antibodies by EIA and MIA, respectively. In patients with negative concordance, 37% of patients with positive anti-dsDNA were currently on at least one medication for SLE compared to 43% and 63% of patients with negative or borderline results (p=0.09).

Conclusion: The association between clinical factors and anti-dsDNA antibodies may be determined, in part, by the specific methodology. Further clarification of these relationships could assist with interpretation of anti-dsDNA antibody results as well as choice of a method for a specific clinical scenario.

Disclosure: M. L. Krause, None; M. R. Snyder, Bio-Rad Laboratories, 5, Inova Diagnostics, Inc.; C. S. Crowson, None; A. B. Green, None; K. G. Moder, None.

1393
Predictors of Panniculitis in Systemic Lupus Erythematosus. Ashika Odhav1, Michelle Petri2 and Hong Fang3. 1University of Missouri Kansas City School of Medicine, Kansas, MO, 2Johns Hopkins University School of Medicine, Baltimore, MD

Background/Purpose: Panniculitis is a rare, but devastating manifestation of SLE. We examined associates of panniculitis in a large SLE cohort.

Methods: 52 out of 2,149 SLE patients in the cohort had panniculitis (2.4%). The mean age at last assessment was 49±15 years. The patients were 46% African-American, 46% Caucasian, and 96% female. Other SLE manifestations were determined at baseline by history, physical examination, and chart review; patients were then seen quarterly in follow-up.

Results: The table shows the association of demographics, SLE manifestations and serologies with panniculitis. Panniculitis was strongly associated with discoid lupus and leg ulcers. It was also associated with serositis, seizures, myositis, alopoeia, and vasculitis. Proteinuria was significantly less frequent in those with panniculitis.

Association between Various Factors and Panniculitis in SLE

| Characteristics/Manifestations | Panniculitis (% N=52) | No panniculitis (% N=2097) | Odds Ratio (95% CI) | Adjusted P-value
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>History of smoking</td>
<td>48.1 37.8</td>
<td>1.3 (0.7, 2.3)</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td>40.4 21.8</td>
<td>2.1 (1.1, 3.7)</td>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td>Malar rash</td>
<td>57.7 51.0</td>
<td>1.3 (0.7, 2.3)</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>Discoid</td>
<td>50.0 19.0</td>
<td>3.8 (2.1, 6.9) &lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photosensitivity</td>
<td>63.5 53.7</td>
<td>1.4 (0.8, 2.6)</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Mouth ulcers</td>
<td>61.5 51.2</td>
<td>1.5 (0.9, 2.7)</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td>80.8 73.5</td>
<td>1.2 (0.6, 2.5)</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Serositis</td>
<td>67.3 49.8</td>
<td>2.0 (1.3, 3.7)</td>
<td>0.020</td>
<td></td>
</tr>
<tr>
<td>Proteinuria</td>
<td>28.9 44.3</td>
<td>0.4 (0.2, 0.8)</td>
<td>0.0062</td>
<td></td>
</tr>
<tr>
<td>Hematologic disorder</td>
<td>75.0 65.7</td>
<td>1.4 (0.8, 2.7)</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>ANA positivity</td>
<td>98.1 96.5</td>
<td>1.7 (0.1, 2.8)</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Myositis</td>
<td>19.2 7.7</td>
<td>2.3 (1.1, 4.9)</td>
<td>0.023</td>
<td></td>
</tr>
<tr>
<td>Alopoeia</td>
<td>73.1 53.1</td>
<td>2.0 (1.0, 3.8)</td>
<td>0.040</td>
<td></td>
</tr>
<tr>
<td>Vasculitis</td>
<td>28.9 14.2</td>
<td>2.2 (1.2, 4.2)</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>Leg ulcers</td>
<td>17.3 2.5</td>
<td>7.1 (3.2, 15.7) &lt;0.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizure</td>
<td>19.2 9.5</td>
<td>2.4 (1.2, 4.8)</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>Peripheral Neuropathy</td>
<td>11.5 3.7</td>
<td>2.5 (1.0, 6.4)</td>
<td>0.046</td>
<td></td>
</tr>
<tr>
<td>Leukopenia</td>
<td>59.6 43.9</td>
<td>1.8 (1.0, 3.2)</td>
<td>0.044</td>
<td></td>
</tr>
<tr>
<td>Lupus Anticoagulant</td>
<td>26.0 27.2</td>
<td>0.9 (0.5, 1.7)</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Low C3</td>
<td>46.2 55.6</td>
<td>0.6 (0.4, 1.1)</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Low C4</td>
<td>36.5 48.3</td>
<td>0.6 (0.3, 1.1)</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Increased ESR</td>
<td>82.7 74.9</td>
<td>1.4 (0.6, 3.0)</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>Anti-Sm</td>
<td>11.5 19.4</td>
<td>0.6 (0.2, 1.4)</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Anti-DNA</td>
<td>63.5 63.0</td>
<td>1.0 (0.5, 1.7)</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Anti-RA</td>
<td>38.5 30.6</td>
<td>1.4 (0.8, 2.6)</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>Anti-La</td>
<td>15.4 12.9</td>
<td>1.3 (0.6, 2.8)</td>
<td>0.52</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: In contrast to photosensitive cutaneous lupus, panniculitis is not associated with anti-Ro, anti-La, or smoking. It is strongly associated with discoid (discoid lesions often overlap panniculitis areas). It is not associated with any serologic test, and, in fact, is less frequent in those with renal lupus. The impact of panniculitis has been unrecognized, with 40% becoming disabled due to it.

Disclosure: A. Odhav, None; M. Petri, None; H. Fang, None.

1394
Health Status Burden and Impact of Fatigue On Patient Functioning in SLE Patients From a Phase 1b Study. Michelle Petri1, Ariane K. Kawata2, Ancilla W. Fernandes3, Kavita Gajria4, Warren Greth5 and Asha Hareen-dran6. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2United Biosource Corporation, Bethesda, MD, 3MedImmune LLC, Gaithersburg, MD, 4MedImmune, LLC, Gaithersburg, MD, 5United Biosource Corporation, London, United Kingdom

Background/Purpose: Systemic Lupus Erythematosus (SLE) has a significant impact on patient’s quality of life. Fatigue is the most common symptom of SLE and affects between 50–80% of SLE patients (Clean-thous et al. 2012; Tench et al. 2000; Krupp et al. 1990). Our objective was to evaluate the health related quality of life burden in SLE in a clinical trial and to explore the relationship between fatigue and overall health status.

Methods: Pooled treatment group data from a Phase Ib dose-escalation clinical trial study of adult patients with moderate to severe SLE were analyzed. Clinical trial outcomes included clinician-reported global assessment of disease severity (MAGDA) and function measures: Short Form-36 item Health Survey, Version 2 (SF-36v2), Fatigue Severity Scale (FSS), and patient numeric rating scale (NRS) global assessment. Descriptive analyses were conducted to characterize overall burden of SLE.
compared to US general population. The relationship between fatigue and overall health status was evaluated by comparing SF-36v2, patient and physician global assessments changes at endpoint from baseline between fatigue responders and non-responders. A fatigue response was defined as FSS change score ≤-1.0.

**Results:** There were 161 patients, predominantly female (96%) and white (72%), with average age of 43.12 years (range: 18–71). Mean SF-36v2 subscale scores ranged from 34.5 (SD = 9.0) for general health (GH) to 41.2 (SD = 13.2) for mental health (MH); summary component scores reflected overall problems with physical (PCS; mean = 35.2, SD = 9.7) and mental health (MCS; mean = 40.9, SD = 12.9). SLE patients had worse health status on all SF-36v2 subscale domains than US general population and comparable age and gender norms (effect size [ES] = -0.51 to -2.15; Figure 1). A comparison of change scores between fatigue responders and non-responders showed that fatigue responders had greater improvement on SF-36v2 and patient and physician global assessments than non-responders. Fatigue responders had larger ES improvements than non-responders on SF-36v2 bodily pain (BP; ES = 0.6 vs. 0.2), physical functioning (PF; ES = 0.6 vs. 0.1), social functioning (SF; ES = 0.6 vs. 0.0), and role physical (RP; ES = 0.7 vs. 0.1), patient global assessment NRS (ES = -0.7 vs. 0.0), and MDGA (ES = -1.6 vs. -0.7).

![Figure 1. Comparison of Mean Baseline SF-36v2 Subscale Scores in the SLE Clinical Study to US Population Norms](image)

**Conclusion:** SLE patients had poor HRQL in this study. All SF-36 domains including physical and mental health components were worse than general population averages. Improvement in fatigue was associated with improvements in the individual SF-36 domains as well as the physician’s global assessment of disease activity.

**Disclosure:** M. Petri, MedImmune LLC, UCB, Pfizer, HGS, OSK, TEVA, Anthera, 9; A. K. Kawata, MedImmune LLC, 5; A. W. fernandes, MedImmune LLC, 3; K. Gajria, MedImmune LLC, 3; W. Greth, MedImmune LLC, 3; A. Hareendran, MedImmune LLC, 5.

**1395**

The Validation of a New Simple Disease Activity Tool in Systemic Lupus Erythematosus (SLE): The Lupus Activity Scoring Tool (LAST) As Compared to the SLEDAI SeleNA Modification. Majed M. Khraishi, Rana Aslanov, and Krista Fudge. *Memorial University of Newfoundland, St Johns, NF,* 2Memorial University of Newfoundland, St John’s, NF, 3Corner Brook, NF.

**Background/Purpose:** SLE is a chronic autoimmune disease with variable manifestations. New developments in the understanding and treatment of SLE mandated closer monitoring of the disease activity and its response to treatment. Current disease activity indices (e.g. SLEDAI SELENA, BILAG & SLAM) have their own limitations. We designed a new disease activity evaluation tool: the Lupus Activity Scoring Tool (LAST) that simplifies the approach to quantify SLE activity. Standards of clinical variables as a measure of SLE activity seems to be valid. The development of easy to use electronic apps will make the use of these activity tracking tools easier to calculate and can be possibly utilized in non-specialist settings.

**Methods:** We measured plasma microparticles by their functional capacity to generate thrombin, ETP, and D-dimer levels in 986 SLE patients. The relationship between these biomarkers and history of thrombosis was estimated.

**Results:** The patients were 92% female, 37% African American, 55% Caucasian with mean age 48.1 ±13.1 years. Of the 986 patients, 258 had at least one thrombotic event, including deep venous thrombosis (113), stroke (75), myocardial infarction (26), other venous (21), and other arterial thrombosis (13). Elevated levels of D-dimer (> 0.88 mg/L) were not associated with thrombosis. Thrombin generated microparticles were associated with history of a thrombotic event (Table). In subanalyses, we found that this association was only found with respect to venous (but not arterial) events. Low ETP was associated with a higher likelihood of a history of thrombosis. However, controlling for antiocoagulant use, this association disappeared, suggesting that the association was due to the fact that those with a history of thrombosis were put on anticoagulants which reduced their ETP.

**Table 1.** Life-time rates of thrombotic events in SLE patients by biomarker levels

<table>
<thead>
<tr>
<th>Group</th>
<th># of person-years at risk</th>
<th>Rate per 100 person-years</th>
<th>Risk Ratio</th>
<th>95% Confidence Interval</th>
<th>P-value</th>
<th>Adjusted 1 Risk Ratio</th>
<th>95% Confidence Interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-dimer (High/Low)</td>
<td>&lt;0.88</td>
<td>173</td>
<td>28,305</td>
<td>6.1</td>
<td>1.0 (Ref. Group)</td>
<td>91</td>
<td>1.0 (Ref. Group)</td>
<td>92</td>
</tr>
<tr>
<td>Thrombin generated microparticles (High/Low)</td>
<td>5± 165</td>
<td>25,845</td>
<td>6.4</td>
<td>1.3 (1.0, 1.7)</td>
<td>0.15</td>
<td>1.5 (1.1, 1.9)</td>
<td>0.044</td>
<td>1.0 (Ref. Group)</td>
</tr>
<tr>
<td>ETP-quartiles</td>
<td>Everyone</td>
<td>258</td>
<td>42,515</td>
<td>6.1</td>
<td>1.0 (Ref. Group)</td>
<td>91</td>
<td>1.0 (Ref. Group)</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>395–436</td>
<td>36</td>
<td>10,030</td>
<td>3.8</td>
<td>0.3 (0.2, 0.5)</td>
<td>&lt;0.001</td>
<td>0.9 (0.6, 1.5)</td>
<td>0.52</td>
</tr>
</tbody>
</table>

1 Adjusting for ever having a positive ACR or RVVT test unless specified.
2 Adjusting for ever having a positive ACR or RVVT test and use of anticoagulants.

**Disclosure:** M. M. Khraishi, None; R. Aslanov, None; K. Fudge, None.
Conclusion: Thrombin generated plasma microparticles increase the risk of thrombosis at levels >5. These data indicated that hypercoagulability in SLE can be further characterized beyond antiphospholipid antibodies, allowing prophylactic therapy to be given to the subset at greatest risk.

Disclosure: M. Nastacio, None; H. Fang, None; T. Kickler, None; J. Jani, None; L. S. Magder, None; M. Petri, None.

1397

Risk Factors Associated with Early Central Nervous System Damage Detected Through Perfusion MRI in Patients with Systemic Lupus Erythematosus. Paola Tomietto1, Federica Casagrande2, Maja Ukmarn2, Luca Weis3, Pia Morassi3, Rita Moretti2, Gianni Biolo1, Carlo GiSansnte4 and Maria Assunta Cova2. 1AOU Ospedali Riuniti di Trieste, Trieste, Italy, 2Radiology Department, University of Trieste, Trieste, Italy, 3Internal Medicine Department, University of Trieste, Trieste, Italy

Background/Purpose: Antiphospholipid antibodies (aPL), hypertension and accumulated damage (SLICC-DI) have been associated to the severity of cerebral MRI lesions and to cognitive deficits in SLE. Perfusion weighted MRI (PWI) is a sensitive technique that assess the capillary microcirculation and might allow to detect an early vascular damage, eventually preceding the appearance of structural damage in conventional MRI. The aim of this study was to determine the main factors affecting CNS damage detected through perfusion MRI in SLE.

Methods: 20 consecutive SLE patients underwent a clinical evaluation to characterize central nervous system involvement (NPSLE) including the clinical history, a 45-minutes neuropsychological battery and the Hospital Anxiety and Depression Scale (HADS). All the patients underwent MRI examination performed on a 1.5T magnet. In all of them conventional (cMRI) and dynamic susceptibility contrast (DSC) sequences were performed. Cerebral blood flow (CBF), cerebral blood volume (CBV), mean transit time (MTT) and time to peak (TTP) maps were reconstructed for 19 patients. Region of interest (ROI) were placed symmetrically on normal appearing white matter (NAWM) in 12 areas (frontal and parietal WM, amygdala, corpus callosum and middle cerebellar peduncles). ROI relevant to distinguish patients with NPSLE vs patients without were selected on the basis of the receiver operating characteristic (ROC) curve analysis. SLEDAI, SLICC-DI, generic cardiovascular risk factors, positivity for Raynaud’s phenomenon, livedo reticularis, cutaneous vasculitis, aPL, anti-RNP and anti-DNA were determined for all the patients and included as independent variables in several stepwise regression analysis to determine which of them affected changes in CBF, CBV MTT and TTP of NAWM.

Results: Measures of CBV of right frontal WM (sensitivity 83.3%, specificity 71.4%) and of MTT in left frontal (sensitivity 58.3%, specificity 100%) and parietal WM (sensitivity 66.6%, specificity 85.7%) showed moderate accuracy (AUC 0.72) in distinguishing patients with and without NPSLE, according to the clinical classification. Among generic cardiovascular risk factors, smoking resulted as an independent factor affecting CBF and CBV in frontal and parietal subcortical NAWM, while cholesterol and hypertension were independent variables associated to MTT respectively of the fronto-parietal NAWM and corpus callosum. Among SLE-related factors, aPL and livedo reticulatris were independent factors affecting MTT of corpus callosum. Finally SLICC-DI resulted as an independent factor affecting all the parameters of PWI in fronto-parietal NAWM and corpus callosum.

Conclusion: This preliminary analysis showed as some cardiovascular risk factors, (smoking, hypertension, cholesterol levels), and some SLE-related factors (aPL, SLICC-DI, livedo reticulatris), previously reported as related to NPSLE, are associated to early changes of cerebral perfusion in fronto-parietal subcortical normal appearing white matter and corpus callosum. These data, if confirmed, suggest the importance of a tight control of cardiovascular risk factors, aPL and of the disease activity to prevent early central nervous system damage in SLE.

Disclosure: P. Tomietto, None; F. Casagrande, None; M. Ukmarn, None; L. Weis, None; P. Morassi, None; R. Moretti, None; G. Biolo, None; C. GiSansnte, None; M. A. Cova, None.

1398

Inflammatory Back Pain Increased in SLE and Associated with Anti-Sm Antibodies. Nesilhan Yilmaz1, Ayten Yazi1, Sibel Z. Aydin2, M. A. Cova1, Jose L. Alfaro-Lozano3, Alfredo A. Sanchez-Torres3, Zoila Rodriguez-Bellido3, Sheyla Rodriguez-Ulloa4 and Cesar A. Pastor-Asurza4. 1Hospital Militar Alvaro Del Toro; 2Sakarya Research and Training Hospital, Sakarya, Turkey, 3Medeniyet University, Goztepe Training and Research Hospital, Istanbul, Turkey, 4Marmara University, Istanbul, Turkey

Background/Purpose: Growing evidence suggest that autoantibodies may present in patients with ankylosing spondylitis. Here, we aim to determine the association of inflammatory back pain and autoantibodies in patients with systemic lupus erythematosus (SLE) which is a prototype autoimmune disease.

Methods: One hundred thirty two SLE patients (130 females, 2 males) and 100 healthy controls (98 females,2 males) were questionnairred for having inflammatory low back pain (LBP). The SI joints of SLE patients with LBP were evaluated by conventional radiography followed by color and duplex Doppler ultrasonography (CDDUS) examination. X-Rays were scored according to the modified New York criteria. CDDUS evaluations included the presence of a vessel in and/or around the SI joints and measurement of the RI, which is expected to decrease by inflammmation of the joint. The CDDUS results of 44 SLE patients (88 SI joints) were compared with 17 healthy controls (HC) (34 SI joints) without any low back pain.

Results: The incidence of LBP was 58/132 (43.9%) in SLE patients and 15/100 (15%) in HC (p<0.05). Forty four of SLE patients gave consent to participate the study. Within these patients 20/132 (15%) had inflammatory, 24/132 (18%) had noninflammatory LBP. None of the HC has inflammatory LBP. The mean age was 38.6±1.13 years and mean disease duration was 6.8±5.7 years. Mean SLEDAI was 1.94±1.94, BASDAI was 4.11±1.63. In SLE patients; Anti ds-DNA seropositivity was 17.38(6.0%), anti Sm was 6 (13.6%), anti RNP was 14 (31.8%), anti Ro was 9 (20.5%) and Anti La was 6 (13.6).Two of 16 (12.5%) HC had unilateral grade 1 sacroiliitis and 11/25 (44%) patients had unilateral, 2/44 (4.5%) patients had bilateral grade 1–2 sacroiliitis on X-ray of the SI joints. Vascularisation inside or around the SI joints was seen in 25/44 (56.8%) SLE patients with 41 of 88 SI joints (46.5%) and 12/17 (70.6%) HC with 18 of 34 SI joints (52.9%) (p>0.05). The mean RI of the SI joints was 0.66 ± 0.11 in SLE patients and 0.64 ± 0.07 in HC with no significant difference between the groups (p>0.05). Prevalence of sacroiliitis on X ray and power Doppler signal inside the SI joints on CDDUS examination had no correlation (Pearson: 0.06). Clinical features and autoantibody seropositivity were not related to sacroiliitis (p>0.05), except anti Sm antibodies (p=0.026).

Conclusion: Although a significant subset of SLE patients had inflammatory LBP, most patients had no severe radiological or CDDUS evidence of sacroiliitis implicating a mild axial disease. The association with anti-Sm antibodies needs further evaluation.

Disclosure: N. Yilmaz, None; A. Yazi1, None; S. Z. Aydin, None; S. Yavuz, None.

1399

Regional Fat Distribution Is Independently Associated with Damage Accrual in Systemic Lupus Erythematosus Female Patients. Manuel F. Ugarte-Gil1, Rocio V. Gamboa-Cardenas1, Karim E. Diaz-Deza1, Mariela Medina-Chinchon1, Johan Mariano Cucho-Veneegas1, Risto A. Perich-Campos1, Jose L. Alfaro-Lozano3, Alfredo A. Sanchez-Torres3, Zoila Rodriguez-Bellido3, Sheyla Rodriguez-Ulloa4 and Cesar A. Pastor-Asurza4. 1Hospital Militar Alvaro Del Toro; 2Sakarya Research and Training Hospital, Sakarya, Turkey, 3Medeniyet University, Goztepe Training and Research Hospital, Istanbul, Turkey, 4Marmara University, Istanbul, Turkey

Background/Purpose: In general population, a higher trunk fat and the ratio of trunk fat to leg fat (trunk-leg ratio) increase the risk for a cardiovascular event, and a higher leg fat decreases this risk. The purpose of this study is to determine if level of disease cumulative damage in Systemic Lupus Erythematosus (SLE) as measured by the SLICC/ACR damage index (SDI) is independently associated with body fat distribution in female patients with SLE.

Methods: In a cross-sectional single center study, we evaluated 101 consecutive SLE female patients who were seen at the Rheumatology department of our hospital. SLE was defined using the ACR criteria; body composition analysis was assessed by dual energy X-ray absorptiometry (DXA). A chart review, clinical evaluation and laboratory exams were performed. We defined damage using SDI. Disease activity was measured using SLEDAI. Body fat percentage and fat distribution was reported as trunk fat percentage and trunk-to-leg fat ratio. For the univariate analysis we performed a simple linear regression model, after that, we performed a logistic regression model adjusted to disease activity, metabolic syndrome, body mass index, age, disease duration, time of exposure to prednisone and current dose of prednisone.

Results: One hundred and one SLE patients with an average age of 42.64 (SD: 12.77) years were evaluated. Almost all of them were mestizo, only one

Disclosure: N. Yilmaz, None; A. Yazi1, None; S. Z. Aydin, None; S. Yavuz, None.
Characterization of Clinical Photosensitivity in Cutaneous Lupus Erythematosus. Kristen Foering1, Aileen Y. Chang2, Evan W. Piette3, Joyce Okawa1 and Victoria P. Werth4. 1University of Pennsylvania, Philadelphia PA, 2University of Pennsylvania, Philadelphia, PA, 3Perelman School of Medicine at the University of Pennsylvania and Philadelphia V.A. Medical Center, Philadelphia, PA, 4University of Pennsylvania and Philadelphia V.A. Medical Center, Philadelphia, PA

Background/Purpose: Photosensitivity (PS) is one of the most common manifestations of systemic lupus erythematosus (SLE), and is one of only 11 criteria used to make the diagnosis of SLE. However, the definition of photosensitivity is vague and its pathophysiology is not well understood.

Background/Purpose: Photosensitivity (PS) is one of the most common manifestations of systemic lupus erythematosus (SLE), and is one of only 11 criteria used to make the diagnosis of SLE. However, the definition of photosensitivity is vague and its pathophysiology is not well understood. There is a need to better define the clinical aspects of photosensitivity in lupus, to enhance further study of this difficult problem. The objective of this study was to characterize self-reported photosensitivity phenotypes among a primarily cutaneous lupus (CLE) population.

Methods: A novel photosensitivity questionnaire provided a framework for characterizing subjects’ experience of sun sensitivity. The PS questionnaire was based on information gathered over a 9-month period of subject interviews pertaining to sun exposure. Recurring themes of self-reported photosensitivity relating to morphology, characteristics, and timing of reactions were identified and incorporated into a brief PS questionnaire. The PS questionnaire was used to classify subject responses into five PS phenotypes: sun-induced CLE exacerbation (directCLE); general worsening of CLE in summer (genCLE); PMLE-like reactions (genSkin); general pruritus/paresthesias (genRxn); and systemic symptoms, e.g. headache, arthralgia (genSys). 100 subjects with CLE alone or both CLE and SLE were interviewed.

Results: 83% of subjects ascribed to any and 66% reported more than one PS phenotype. 47% cited direct examples of sun-induced CLE (directCLE). Other PS phenotypes were reported as follows: 22% genCLE, 38% genSkin, 36% genRxn, and 37% genSys. The genSys phenotype was reported by fewer discoid and subacute cutaneous LE compared to acute and tumid LE subjects, and less than 10% of subjects with CLE and SLE reported more paresthesias/pruritus than 23% and systemic symptoms (50% vs 26%) compared to those without SLE, p<0.05. Subjects with PMLE-like reactions had lower CLE Disease Area and Severity Index (CLASI) activity scores compared to other PS phenotypes (6.4±5.4 vs 11.5±11.1, p=0.02).

Conclusion: Self-reported photosensitivity in lupus ranges from CLE-specific reactions to generalized cutaneous eruptions to systemic symptoms. Clinical PS phenotypes are associated with CLE subtype, SLE diagnosis, and CLASI activity scores. Recognition of various PS phenotypes in CLE will permit improved definitions of clinical photosensitivity and allow for more precise investigation into the pathophysiology of photosensitivity in lupus.

Disclosure: K. Foering, None; A. Y. Chang, None; E. W. Piette, None; J. Okawa, None; V. P. Werth, None.


Background/Purpose: Patients with systemic lupus erythematosus (SLE) have a significantly increased risk of developing cardiovascular disease. The presence of chronic inflammation which characterizes SLE disease activity may contribute to this risk. Apolipoprotein A1 (ApoA1) plays a protective role against atherosclerosis. Anti-ApoA1 antibodies have been described in patients with coronary disease. Our previous cross-sectional studies showed that anti-ApoA1 levels are raised in patients with current and persistent disease activity but there are few longitudinal data. This abstract describes the result of longitudinal studies of anti-ApoA1 levels and measures of disease activity, serological profile and treatment in patients with SLE.

Methods: Longitudinal serum samples (n=398) were selected retrospectively from a cohort of 49 patients with SLE with a mean of 8 samples per patient (SD 2.16; min 3; max 14) and a mean follow-up of 89 months (SD 46; min 14; max 180). Serum from 40 healthy controls and 15 patients with rheumatoid arthritis (RA) was measured using a direct ELISA. Using the British Isles Lupus Assessment Group (BILAG) index, we categorized the samples by disease activity as follows. Current activity was defined as high if global BILAG score was ≥ 5 and
low if it was <5). Disease activity over the most recent 4 assessments was characterized as persistently low (all systems BILAG C, D or E) or persistently moderate-high (A or ≥1 B in any BILAG system on at least 2/4 occasions). 90% of all samples fell into one of these two categories and the rest were excluded.

Anti-dsDNA was defined as high or normal based on a cut-off of 50IU/ml. C3 was defined as low or normal based on a cut-off of 0.9g/l.

Data on the treatment at the time of each individual sample were also obtained, considering prednisolone dose and whether either immunosuppressants (IS) or hydroxychloroquine (HCQ) were used.

**Results:** 42% of the samples tested were positive for anti-ApoA1 (greater than mean + 3SD of healthy controls). Patients with SLE had significantly higher anti-ApoA1 levels than healthy controls and patients with RA (p<0.0001). No association between either sex or ethnicity and anti-ApoA1 levels was found. Higher anti-ApoA1 levels were significantly associated with the following factors:

- Low complement levels (p=0.017).
- Persistent disease activity (p=0.04).
- Disease activity on date of sample (p=0.04).
- Not being on HCQ (p<0.0001).
- Prednisolone dose<5mg/day (p=0.0067).

We found no association between anti-ApoA1 and positivity for anti-dsDNA orENA and no significant association with use of IS.

**Conclusion:** The presence of anti-ApoA1 antibodies has been shown in patients with SLE and may play a role in disturbing the normal lipid homeostasis which in turn may contribute to the increased cardiovascular risk associated with this disease. We have found that anti-ApoA1 levels are increased in patients with SLE compared to healthy controls and patients with RA. Anti-ApoA1 levels appear to be associated with both clinical and serological disease activity measures. The use of HCQ seems to be associated with lower anti-ApoA1 levels.

**Disclosure:** S. Croca, None; I. Giles, None; D. A. Isenberg, None; Y. Ioannou, None; A. Rahman, None.

1403

**Anti-Nucleosome Antibodies Are Associated with Disease Activity and Hydroxychloroquine Use in Patients with Lupus: A Longitudinal, Multivariate Analysis of 398 Samples.** Sara Croca, Ian Giles, David A. Isenberg, Yiannis Ioannou and Anisur Rahman. University College London, London, United Kingdom

**Background/Purpose:** Impaired apoptotic clearance appears to play a pivotal role in the pathogenesis of SLE leading to the accumulation of nuclear debris, such as nucleosomes, ultimately stimulating the production of autoantibodies. Both nucleosomes and anti-nucleosome antibodies (AN) have been found in serum of patients with SLE and appear to correlate with disease activity. AN have been particularly associated with renal and skin disease. This abstract describes the result of longitudinal studies of AN levels, ethnicity, autoantibody profile, treatment and measures of disease activity in patients with SLE.

**Methods:** Longitudinal serum samples (n=398) were selected retrospectively from a cohort of 49 patients with SLE with a mean of 8 samples per patient (SD 2.16; min 3; max 14) and a mean follow-up of 89 months (SD 46; min 14; max 180). Sera from 40 healthy controls were also tested. OD values were converted to standard absorbance units (AU) by comparison to a positive control serum sample loaded on every plate. AN levels were measured using a direct ELISA and a positive result was defined as mean + 3SD of the healthy controls (0.17). Using the British Isles Lupus Assessment Group (BILAG) index, we categorized the samples by disease activity as follows.

Current activity was defined as high if global BILAG score was ≥5 and low if it was <5. Disease activity over the most recent 4 assessments was characterized as persistently low activity (all systems BILAG C, D or E) or persistently moderate-high activity (A or ≥1 B in any BILAG system on at least 2/4 occasions). 90% of all samples fell into one of those two categories and the rest were excluded.

Anti-dsDNA was defined as high or normal based on a cut-off of 50IU/ml. C3 was defined as low or normal based on a cut-off of 0.9g/l.

Data on the treatment at the time of each individual sample were also obtained, considering prednisolone dose and whether either immunosuppressants (IS) or hydroxychloroquine (HCQ) were used.

**Results:** Table 1 shows that higher AN levels were significantly associated with low C3 and high anti-dsDNA levels as well as with higher current or persistent disease activity defined by the BILAG index. We found no association between AN levels and ethnicity, ENA positivity or флares in individual organs. Patients who were taking HCQ and those on low dose steroids (≤5mg/day) had significantly lower AN levels (p<0.0001). No differences were found with regards to presence or absence of IS.

**Disclosure:** S. Croca, None; I. Giles, None; D. A. Isenberg, None; Y. Ioannou, None; A. Rahman, None.

1404

**There Is an Association Between Disease Activity and Risk of Thromboembolism in SLE.** Reem Jan, Emily E. Lewis, Ting Ting Lu, Emily Siegelwald and W. Joseph McCune. University of Michigan, Ann Arbor, MI

**Background/Purpose:** Venous thromboembolism is a recognized complication of systemic lupus erythematosus (SLE). The role of antiphospholipid antibodies (aPL) in thrombogenesis is well documented; much less is known about the potential for an increased risk of thromboembolic disease in the absence of these markers. Inflammatory stimuli are prothrombotic, with apoptotic endothelial cells identified as a potential trigger through tissue-factor dependent pathways. We aim to determine whether venous thromboembolic events (VTE) in patients with SLE correlate with periods of enhanced disease activity.

**Methods:** A retrospective chart review was performed on 837 patients enrolled in the Michigan Lupus Cohort to identify patients diagnosed with VTE. Patients satisfied ≥4 ACR criteria for SLE. Diagnosis of VTE was defined as a positive venous doppler, CT scan of the thorax, or high probability VQ scan.

Risk factors for VTE were noted including: use of oral contraceptives within 3 months of the event, pregnancy/6 weeks postpartum, surgery within 3 months, smoking, inherited thrombophilia, malignancy, and the presence of nephritogenic proteinuria. We also noted the presence of aPL positivity (defined by positive lupus anticoagulant or antibodies to cardiolipin or beta-2 glycoprotein-1 IgG, IgM or IgA at >99% percentile of assay).

Disease activity was measured by the Systemic Lupus Disease Activity Index (SLEDAI).

Markers of disease activity at the time of VTE were recorded using the closest SLEDAI score within 3 months before, or up to 1 month after the event. Comparisons were made between the SLEDAI score at the time of the event and a baseline SLEDAI collected up to 12 months prior to the event for each patient.

**Results:** 72 patients were identified as having sustained a VTE (8.6%). Of these patients, 26 had serial SLEDAI data available. The most frequently detected confounding risk factors were recent surgery (30.6%; p=0.012) and the presence of aPL (25%; p=0.033). If aPL positivity was required to be present on two separate occasions, this no longer became a statistically significant association.

There was a significant association between VTE and disease activity, with a mean increase in SLEDAI score of 1.72 at the time of event (p=0.021; 95% CI 0.274–3.471).

**Disclosure:** Y. Ioannou, None; D. A. Isenberg, None; Y. Ioannou, None; A. Rahman, None.
Conclusion: Our results show a statistically significant association between disease activity and VTE, independent of the presence of aPL. This has implications for the management of patients with active SLE, including decisions regarding the safety of estrogens for contraception and the threshold for anticoagulation in high-risk situations such as pregnancy. It may also lend clinical support to a growing body of basic science research that suggests an association between inflammation and thrombosis.

Disclosure: R. Jan, None; E. E. Lewis, None; T. T. Lu, None; E. Siegwald, None; W. J. McCune, None.

1405
Real World Experience Comparing Multiplex Immunobead Assay versus Immunofluorescence Assay for Anti-Nuclear Antibody Detection At a University Hospital
Neha Dang, Brock E. Harper, Emilio B. Gonzalez, Silvia S. Pierangeli, Trisha M. Parekh, Michael J. Loeﬄelholz and Kimberly K. Bufton. University of Texas Medical Branch, Galveston, TX

Background/Purpose: Anti-nuclear antibody (ANA) is considered a screening method for diagnosis of autoimmune disorders. Immunofluorescence ANA assay (IF) remains the gold standard for detection of ANA as per the 2011 ACR position statement. Many laboratories perform immunoflouresaasys for detection of ANA as it is less labor-intensive to perform.

Methods: We collected data prospectively on patients tested for ANA by multiplex immunobead assay MIA (BioPlex ANA screen, Bio-Rad Laboratories, Hercules, CA, USA) and IF assay (HEp-2000 (ImmuNo Concepts, Sacramento, CA, USA)) from chart review of rheumatology patients from March 2011 to May 2012. Patients were separated into 4 groups based on positive and negative ANA by MIA and IF assay. Data were collected by individual chart review including age, gender, ethnicity, and indication for ANA testing. Sensitivity and specificity of the immuno assay were determined using the IF results as the “gold standard”.

Results: One hundred and ten (110) patient samples were tested for both assays. Multiplex immunobead assay (MIA) were considered positive based on the manufacturer’s instructions, and IF was considered positive at a titer ≥ 1:160; 12 (10%) were positive by both assays and were considered true positives (TP), 74 (67%) were negative by both or true negatives (TN), 15 (14%) were positive by IF and negative by MIA and were false negatives (FN); 9 (8%) were positive by MIA and negative by IF, or false positives (FP) (Table 1). Indications for ANA testing in the false negative group included systemic sclerosis, polymyositis, rheumatoid arthritis on treatment with anti-TNF therapy, undifferentiated connective tissue disorders, and polyarthritis (Table 2). Sensitivity and specificity for the multiplex immunoassay was 44%, and 89%, respectively.

Table 1. Comparison of ANA MIA and IF

<table>
<thead>
<tr>
<th>Multiplex positive n (%)</th>
<th>IF positive (≥1:160)</th>
<th>IF negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplex positive n (%)</td>
<td>12 (10%) TP</td>
<td>9 (8%) FN</td>
</tr>
<tr>
<td>Multiplex negative n (%)</td>
<td>15 (14%) FN</td>
<td>74 (67%) TN</td>
</tr>
</tbody>
</table>

Sample size 110

Table 2. Baseline Demographic comparison

<table>
<thead>
<tr>
<th>Multiplex +, IF – (FP)</th>
<th>Multiplex –, IF + (TN)</th>
<th>Multiplex +, IF + (TP)</th>
<th>Multiplex –, IF – (FN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean±SD) yrs</td>
<td>45±13</td>
<td>48±15</td>
<td>47±18</td>
</tr>
<tr>
<td>Females n (%)</td>
<td>11 (91%)</td>
<td>59 (79%)</td>
<td>8 (89%)</td>
</tr>
<tr>
<td>Ethnicity* (%)</td>
<td>AA (16%)</td>
<td>AA (13%)</td>
<td>AA (33%)</td>
</tr>
<tr>
<td></td>
<td>C (25%)</td>
<td>C (70%)</td>
<td>C (44%)</td>
</tr>
<tr>
<td></td>
<td>H (50%)</td>
<td>H (9%)</td>
<td>H (11%)</td>
</tr>
</tbody>
</table>

Indication for testing/ Clinical diagnosis (n)

- SLE
- Sjogren’s
- RA
- Systemic sclerosis/PM/DM
- Polymyalgias
- UCTD
- Others

* AA African American, C Caucasian, H Hispanic

Conclusion: Our study reveals a low sensitivity with high rate of false negatives when MIA is used for ANA screening compared to IF in a real world rheumatology setting of patients presenting with a variety of autoimmune diseases. Patients misclassified by the MIA included patients with definite ANA-associated autoimmune diseases. These data suggest that screening with an immuno assay would result in misclassification and potential delay or missed diagnoses of certain systemic autoimmune diseases. Immunofluorescence assay should remain the preferred assay for ANA testing in patients with suspicion of autoimmune disorders until high sensitivity platforms are developed.

Disclosure: N. Dang, None; B. E. Harper, None; E. B. Gonzalez, None; S. S. Pierangeli, BioRad Laboratories, 8; T. M. Parekh, None; M. J. Loeﬄelholz, BioRad Laboratories, 2; K. K. Bufton, None.

1406
The Cost of Management of Adult Active Systemic Lupus Erythematosus in the UK
Munther A. Khamash1, Christina Donatti2, Ian N. Bruce3, Caroline Gordon4, David A. Isenberg 5 and Ateka-Barrutia Oier1. 1Lupus Research Unit, The Rayne Institute, Kings College London School of Medicine, London, United Kingdom, 2IMS Health, United Kingdom, 3Arthritis Research UK Epidemiology Unit and NIHR Manchester Musculoskeletal Biomedical Research Unit, Manchester, United Kingdom, 4University of Birmingham, Birmingham, United Kingdom, 5University College London, London, United Kingdom

Background/Purpose: Several international studies have shown that systemic lupus erythematosus (SLE) has a considerable financial burden on patients and the health-care economy. Little recent information is available in most European countries about the cost of SLE care (treatment strategies, healthcare pathways, medical resource utilization), especially for patients with moderate to severe disease to make valid comparison with other countries. The aim of this study was to evaluate the annual direct medical costs of the management of adult SLE with active disease in the UK.

Methods: A multi-centre retrospective chart review involving four specialist lupus centres in the UK recruited 86 SLE patients: 38 severe and 48 non severe patients. At inclusion, patients had to have: 1) at least one change (increase in dose and/or new treatment) in treatment related to current SLE activity, and/or a new manifestations and/or worsening of clinical symptoms of SLE; or, 2) presence of at least one biomarker of SLE activity and concurrently, the presence of at least one clinical and/or hematological feature of SLE. Two-year direct costs were obtained by summarizing all the health resource costs related to laboratory and imaging tests, medical treatment, visits to doctors, hospitalization, day surgery, emergency room visits, inpatient stays and rehabilitation stays.

Results: Of the patients studied, 68 (94.4%) were female. The mean age was 45.5 (±13.9) years and the mean duration of SLE was 11.9 (±8.3) years. At baseline, 48/86 (55.8%) of patients had relapsing-remitting SLE and 29/86 (33.7%) had chronically active SLE; 73/86 (84.9%) of patients received corticosteroids, 63/86 (73.3%) antimalarials, 48/86 (55.8%) immunosuppressants and 17/86 (19.8%) NSAIDS. No biological drugs were prescribed at inclusion. The mean (SD) SELENA-SLEDAI score was 7.7 (5.7), and was statistically significantly greater in severe patients (9.6 vs 6.1, p=0.004). Organ damage was present in 34/86 (39.5%) of patients. Anti-dsDNA antibodies were tested in 83/86 (96.5%) at baseline; of which 53/83 (63.9%) were positive.
The median annual direct medical cost of management of adult SLE patients with active antiphospholipid antibody disease on medication for SLE was £2855.87 (US$4389.02) (mean [SD]: £3230.65 [£2333.21]) (US$4964.98 [US$3585.77]). The minimum and maximum costs (min: £389.06 [US$597.92], max: £7001.52 [US$14909.66]) respectively showed the wide range of costs, associated with a wide spectrum of disease activity and complications needing intervention in these lupus patients. The mean annual direct medical cost was 2.2 times higher in severe than in non-severe SLE patients (p<0.001).

Conclusion: The trend in terms of direct costs for treating active SLE patients and the marked gradient associated with increasing disease severity are consistent with Sutcliffe et al (2001), which calculated direct costs at £2613 and higher disease activity was associated with increased costs. There are very few published studies attempting to calculate the direct costs of SLE and this study provides current and reliable source of cost data for active SLE patients in the UK and comparable healthcare systems.

Disclosure: M. A. Khamasht, None; C. Donatti, None; I. N. Bruce, None; C. Gordon, None; D. A. Isenberg, None; A. B. Oier, None.

1407
The Effect of the Antiphospholipid Syndrome (APS) On Survival in Chinese Patients with SLE: A Prospective Study of 679 Patients. Chi Chin Mok, Ling Yin Ho, Ka Lung Yu and Chi Hung To. Tuen Mun Hospital, Hong Kong, Hong Kong

Background/Purpose: To study the effect of the antiphospholipid syndrome (APS) on survival in Chinese patients with SLE.

Methods: A cohort of 679 southern Chinese patients who fulfill at least 4 of the ACR criteria for SLE from 1995 to 2011 was studied. The status of the patients at last clinical visits (alive or death) was evaluated. The cumulative survival rate over time was studied by Kaplan-Meier’s plot. For those who died during the course of their disease, data were censored at the time of their deaths whereas data of other patients were censored at the time of last clinical visits. APS was defined by the modified Sydney criteria in 2006, i.e. the presence of arterial or venous thrombosis, or miscarriages (recurrent abortion or intra-uterine death) plus any one of the following positive twice at least 12 weeks part: (1) lupus anticoagulant; (2) moderate to high titers of antiphospholipid antibodies (IgG or IgM); or (3) beta-2-glycoprotein-I. Comparison of the survival of patients with and without APS was made.

Results: 679 SLE patients (92% women; age of disease onset 32.5 ± 14 years) were prospectively followed for 9.7 ± 7.3 years. Sixty-eight (10%) patients died and 33 (4.9%) patients were lost to follow-up. The main contributing causes of death in these patients were: infection (53%), cardiovascular events (6%), cerebrovascular events (15%), and cancer (9%). Forty-four (6.5%) patients qualified the criteria for APS, manifested as: ischemic stroke (55%), deep venous thrombosis (32%), obstetric morbidity (14%), cardiovascular events (9%) and peripheral vascular disease (9%). Twenty-three (52%) patients developed APS after the diagnosis of SLE. 16 (36%) patients had concomitant APS diagnosed at the same time as SLE and 5 (11%) patients had APS preceding SLE diagnosis. Nine (20%) APS patients died, which was significantly more frequent than the non-APS SLE patients (59/635[9%]; p=0.02). Patients with the APS died at an older age than those without APS (54.0 ± 11.4 vs 45.1 ± 18.2; p=0.07). The duration of SLE at the time of death was also longer in patients with the APS than those without (13.9 ± 10.4 vs 7.4 ± 7.4 years; p=0.01). The cumulative mortality of patients with APS was 4.6% at 5 years, 7.8% at 10 years and 22.2% at 15 years, which was not significantly higher than that of non-APS patients (5.4% at 5 years, 9.2% at 10 years and 11.3% at 15 years; p=0.14). However, if only patients with APS caused by arterial thrombosis were considered, the presence of APS was significantly associated with mortality (HR 2.29 [1.13–4.64]; p=0.02).

Conclusion: The presence of APS increases the mortality risk of patients with SLE, which is mainly contributed by arterial thrombotic events that occur late in the disease course.

Disclosure: C. C. Mok, None; L. Y. Ho, None; K. L. Yu, None; C. H. To, None.

1408
Monitoring Patients with Systemic Lupus Erythematosus in Clinical Practice: Have You Already Checked the Vaccination Status in Your Patients?. Olga Malycheva, Jean-Philipp Ivanov, Sybille Arnold and Chris- tian Baerwald. University Hospital, Leipzig, Germany

Background/Purpose: To study the vaccination status in a cohort of SLE patients.

Methods: A cross-sectional study was conducted between March and June 2015 in the outpatient clinic of the Department of Rheumatology, University Hospital Leipzig. A total of 200 patients with SLE were included. The vaccination status was documented and cross-checked with medical records.

Results: The median age of the patients was 44 years (range: 16–82 years). A total of 162 patients (81%) were vaccinated against influenza, 66 patients (33%) against hepatitis B, 76 patients (38%) against diphtheria and tetanus, 23 patients (12%) against mumps, 35 patients (18%) against measles and 82 patients (41%) against pneumococcal vaccine.

Discussion: The vaccination status of SLE patients in Leipzig is comparable with other studies. However, there is still a need for improving the vaccination coverage, especially for hepatitis B and diphtheria and tetanus.

Disclosure: O. Malycheva, None; J. P. Ivanov, None; S. Arnold, None; C. G. Baerwald, None.

1409
A Multicentre Clinical Study of Umbilical Cord Mesenchymal Stem Cells Transplantation in Active Systemic Lupus Erythematosus. Lingyun Sun1, Dandan Wang1, Jing Li2, Miao Zhang1, Yu Zhang1 and Xia Li4.1Department of Rheumatology and Immunology, The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China, 2Department of Rheumatology, Affiliated Hospital of Jiangsu University, Zhenjiang, China, 3Department of Rheumatology, Jiangsu Provincial People’s Hospital, Nanjing, China, 4Department of Rheumatology, Sabei People’s Hospital of Jiangsu Province, Yangzhou, China

Background/Purpose: Umbilical cord (UC) derived mesenchymal stem cells (MSCs) have shown safety profile and therapeutic effect in severe and refractory systemic lupus erythematosus (SLE) in our single-centre pilot study. The present multicentre clinical trial was undertaken in China to assess the efficacy and safety of allogeneic UC MSCs transplantation (MSCT) in active SLE patients.

Methods: Forty patients (aged ≥16 years) with active SLE (SLE Disease Activity Index >6) were enrolled from 4 clinical centres in China. All patients gave informed consents before transplantation, and allogeneic UC MSCs were infused intravenously on days 0 and 7. Adverse event was monitored during and after MSCs transplantation. Primary efficacy endpoints were major clinical response (MCR), partial clinical response (PCR) and reached at day 1 and 12 months post-transplantation. Secondary endpoints were changes in SLEDAI score, British Isles Lupus Assessment Group (BILAG) score, serum levels of creatinine, urea nitrogen, complement and albumin pre- and post-MSCT.

Disclosure: C. C. Mok, None; L. Y. Ho, None; K. L. Yu, None; C. H. To, None.
Results: Fourteen and fifteen patients achieved MCR (14/40, 35.0%) and PCR (15/40, 37.5%) at 6 months follow-up, respectively. Three and four patients experienced disease relapse at 9 (7.5%) and 12 (10%) months follow-up, respectively, after a prior clinical response. SLEDAI score significantly decreased at 3 (7.43±3.93), 6 (6.30±3.63), 9 (6.40±3.84) and 12 months (6.48±3.52) follow-up (P all <0.05 vs. baseline 10.83±4.63). Total BILAG score markedly decreased 3 months after MSCT, and continued to decrease in the following visit times. BILAG score for renal and hematopoietic system significantly improved. For those with lupus nephritis, 24-hour proteinuria declined after transplantation, with statistical differences at 9 (1.24±1.09 mg) and 12 months (1.41±1.33 mg). P<0.05 vs. baseline 2.24±1.43 mg). Serum creatinine and urea nitrogen decreased to the lowest level at 6 months, while slightly increased at 9 and 12 months due to the 7 relapsed cases. Additionally, Serum levels of albumin, complements 3 and 4 increased after MSCT, peaked at 6 months visit, then slightly declined at 9 and 12 months. Serum anti-nuclear antibody (ANA) and anti-double strand DNA (dsDNA) antibody decreased after MSCT, with statistical differences at 3 months follow-up. Furthermore, hemoglobin and platelet counts increased significantly at 3 (7.43±1.81 mg/dL) and 12 months (8.4±2.0 mg/dL) after MSCT in those with hematopoietic involvement. UC-MSCT was well tolerated and no adverse event was observed.

Conclusion: Our findings indicate that UC MSCT results in satisfactory clinical responses in SLE. However, several cases experienced disease relapse after MSCT visit, which suggests the necessity for repeated MSCT after 6 months in some patients.

Disclosure: L. Sun, None; D. Wang, None; J. Li, None; M. Zhang, None; Y. Zhang, None; X. Li, None.

1410

Relationship Between Individual Organ Damage and Mortality of Systemic Lupus Erythematosus (SLE): A Prospective Cohort Study of 679 Patients. Chi Chiu Mok, Ling Yin Ho and Ka Lung Yu. Tuen Mun Hospital, Hong Kong, Hong Kong

Background/Purpose: To study the relationship between damage in different organ systems and mortality in patients with SLE.

Methods: 679 patients who fulfilled at least 4 of the ACR criteria for SLE between 1995 and 2011 were prospectively followed. The cumulative incidence of organ damage was assessed using the SLE Damage Index (SDI). Cox regression analysis was used to study the association between damage in individual systems and mortality, after conditioning on the aggregate sum score for each LupusPRO score.

Results: 679 SLE patients were studied (623 women, 92%). All were ethnic Chinese. The mean age of onset of SLE was 32.5±13.6 years and the mean follow-up time of the entire cohort of patients was 11.7±8.9 months. 67 (9.9%) patients died during the course of illness and 33 (4.9%) patients were lost to follow-up. 23 (3.4%) patients developed end stage renal failure (ESRF). The main contributing causes of death were: infection (51%), cardiovascular events (12%), cerebrovascular events (16%), cancer (9%), suicide (3%) and others (8%). Inflammatory complications were the commonest causes of death both in patients with disease duration of less (55%) and more than 5 years (47%). In patients with SLE for less than 5 years, 19% of all deaths were caused by vascular events, which was lower than those with disease for more than 5 years (36%). The cumulative survival rate of the patients was 94.8% at 5 years, 91.3% at 10 years and 88% at 15 years. 301 (44%) patients had organ damage (SDI score >1). Among patients who had organ damage, the frequency of damage in individual systems was, in decreasing order: neuropsychiatric (N=102, 15%), musculoskeletal (N=93, 14%), renal (N=78, 11%), ocular (N=46, 6.8%), cardiovascular (N=38, 5.6%), pulmonary (N=36, 5.3%), gonadal (N=32, 4.7%), endothcine (N=23, 3.4%), peripheral vascular (N=22, 3.2%), malignancy (N=19, 2.8%) and gastrointestinal (N=8, 1.1%). Within the first 5 years of onset of SLE, neuropsychiatric damage was most frequent (10%), followed by renal (7.9%) and dermatological (7%) damage. In patients with SLE duration of more than 5 years, the commonest cause of damage was in the musculoskeletal system (18%), followed by neuropsychiatric (17%) and renal damage (13%).

The presence of any organ damage was strongly and significantly associated with mortality (HR 6.42[3.05–13.5]; p<0.001). Cox regression analysis revealed that damage in the neuropsychiatric system (HR 1.74[1.31–2.32]; p<0.001), renal (HR 1.97 [1.61–2.42]; p<0.001), cardiovascular (HR 1.75 [1.21–2.53]; p=0.03) and pulmonary (HR 2.63 [1.50–4.62]; p=0.001) systems was significantly associated with mortality.

Conclusion: In patients with SLE, organ damage predicts mortality, in particular damage in the renal, nervous, cardiovascular and pulmonary systems. Neuropsychiatric damage is most common in early disease while musculoskeletal damage is mostly seen in long-standing SLE. Prevention of infective and cardiovascular complications, and minimization of renal damage is important in improving the survival of SLE.

Disclosure: C. C. Mok, None; L. Y. Ho, None; K. L. Yu, None.

1411

Equivalence of Various Language Versions of Lupus Specific Patient Reported Outcomes Measure (LupusPRO). Meenakshi Jolly1, Mark Kosinski2, Sergio M.A. Tolosa3, Joel A. Block1, Rachel A. Makol4, Sergio Duran-Barragan5, Ana M. Benol6, Ivana Blazevic7, Luis M. Villa7, Dilucchio Coray7, Emmanuel P. Katsaros8, Karina Marianne D. Torralba9, Ioana Moldovan10, Anir Kaya11, Berna Goker12, Seminur Hamadaroghlu13, Melhem E. Teyczen14, Josiane Bourré-Tessier13, Sasha Bernatsky14, Ann E. Clarke15, Michael H. Weisman16, Sandra V. Navarra17, Daniel J. Wallace16 and Graciela S. Alarcon18. 1Rush University Medical Center, Chicago, IL, 2QualityMetric Inc, Lincoln, RI, 3Hospital San Juan Bautista, Catamarca, Argentina, 4University of Buenos Aires, Buenos Aires, Argentina, 5University of PuertoRico Medical School, Cayey Campus, San Juan, PR, 6Harbor UCLA Medical Center, Torrance, CA, 7Loma Linda Univ, Loma Linda, CA, 8USC Keck Schol of Medicine, Los Angeles, CA, 9Loma Linda Univ Medical Center, Loma Linda, CA, 10Gazi University Medical School, Ankara, Turkey, 11McGill University, Montreal, QC, 12Research Institute of the McGill University Health Ctre, Montreal, QC, 13MUHC, Montreal, QC, 14Cedars-Sinai Medical Center, Los Angeles, CA, 15University of Santo Tomas Hospital, Manila, Philippines, 16University of Alabama at Birmingham, Birmingham, AL.

Background/Purpose: Due to observed disparities in health outcomes in Systemic Lupus Erythematosus (SLE) across racial/ethnic groups, socioeconomic status, or health care systems, studies on group comparisons can highlight important contextual influences on health outcomes. However, comparative research requires the measurement tool used to quantify such health outcomes to have similar measurement qualities across settings (Measurement Equivalence). This property focuses on the internal structure of multi-item instruments. Currently measurement equivalence data is not available on any of the SLE specific patient reported outcome tools. Herein, we present measurement equivalence properties of various language versions of the LupusPRO that were tested across nations.

Methods: Data from the SOUL study (Study of Outcomes in Lupus) collected during cross-cultural validation studies of the LupusPRO in various languages were utilized: English [USA (n=180)], Canada (n=123), Philippines (n=100), Spanish [USA (n=121), Mexico (n=34), Argentina (n=56)] and Turkish (Turkey n=102). Confirmatory factor analysis (CFA) was conducted with the LupusPRO item responses using a robust weighted least squares estimator. The goodness of fit parameters used were the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). In addition, item to factor loadings were tested. For measurement equivalence, a logistic regression approach was used to test for differential item functioning (DIF) in each LupusPRO scale item across languages, while conditioning on the aggregate sum score for each LupusPRO score. The magnitude of DIF was quantified by a pseudo R2 difference measure and ≥2% variance was considered significant DIF across languages.

Results: Results of the CFA lend empirical support for the conceptual framework of the LupusPRO across languages. The model fit for the hypothesized item to scale relationships was good (CFI=0.94–0.98, TLI=0.95–0.99). In addition, item to factor representing the hypothesized item to scale relationships were also satisfactory. In general, items loaded >0.6 with their respective factor. Of the 43 LupusPRO items, only 6 items showed a marginal DIF: 1) woke up feeling worn out, 2) worried about losing income, 3) lacked control over appearance, 4) ability to plan activities and schedule events, 5) received comfort/strength from spiritual/religious beliefs, and 6) doctor was accessible when I had questions. Some of these could be due to cultural differences.

Conclusion: Since the LupusPRO demonstrates measurement equivalence across languages, it can now be used for comparative research.
studies to gain better insight into health outcomes disparities or effects of interventions across various groups of SLE patients in cross-national studies. Further evaluation and analysis of the items showing DIF are ongoing.

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1412 Vascular Cell Adhesion Molecule (VCAM-1) and Angiostatin in Systemic Lupus Erythematosus. Adham Kiani1, Hong Fang1, Tianfu Wu2, Chandra Mohan3 and Michelle Petri4. Johns Hopkins University School of Medicine, Baltimore, MD, 2University of Texas, Southwest Medical Center at Dallas, Dallas, TX, 3University of Texas Southwestern Medical Center, Dallas, TX

Background/Purpose: Vascular cell adhesion molecule-1 (VCAM-1), an adhesion molecule, is involved in the progression of glomerular and tubulo-interstitial injury. High levels of VCAM-1 have been found in the urine of patients with active lupus nephritis. Angiostatin, due to its anti-inflammatory action, has been shown to improve kidney function in murine models. Over expression of angiostatin inhibits leukocyte and macrophage migration and recruitment. We investigated both VCAM-1 and angiostatin as potential biomarkers for lupus nephritis.

Methods: VCAM-1 and angiostatin were measured during 2 to 16 clinic visits in 17 SLE patients (82% female, 42% African-American, 45% Caucasian, and 13% others) for a total of 88 visits by ELISA (R&D). Mean age was 38 years. We analyzed the relationship between these potential urinary biomarkers and the urine protein/creatinine ratio (urine Pr/Cr), the SLICC Renal Activity Score, SLEDAI renal descriptors and other clinical variables.

Results: Table 1. Mean (SD) Log-transformed and Normalized (by urine creatinine) VCAM-1 and Angiostatin, by Clinical Variables at Each Visit

<table>
<thead>
<tr>
<th>Clinical Variables at Each Visit</th>
<th>VCAM-1</th>
<th>Angiostatin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>21–44</td>
<td>9.1 (2.4)</td>
</tr>
<tr>
<td>Sex</td>
<td>35–70 (23)</td>
<td>9.2 (1.2)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>70–79 (23)</td>
<td>8.9 (1.1)</td>
</tr>
<tr>
<td>Physician’s Global Assessment</td>
<td>11.3 (±0.1)</td>
<td>7.1 (1.1)</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>6.4 (±0.1)</td>
<td>7.1 (1.1)</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.6 (±0.1)</td>
<td>7.1 (1.1)</td>
</tr>
<tr>
<td>Urine Protein/creatinine Ratio</td>
<td>0.10 (±0.05)</td>
<td>0.22 (±0.05)</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>0.28 (±0.12)</td>
<td>0.18 (±0.09)</td>
</tr>
<tr>
<td>Hydroxychloride</td>
<td>3.5 (±0.1)</td>
<td>3.5 (±0.1)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>3.6 (±0.1)</td>
<td>3.6 (±0.1)</td>
</tr>
<tr>
<td>Use of ACE/ARB inhibitor</td>
<td>2.6 (±0.1)</td>
<td>2.6 (±0.1)</td>
</tr>
<tr>
<td>SLICC Renal Activity Score</td>
<td>3.4 (±0.1)</td>
<td>3.4 (±0.1)</td>
</tr>
</tbody>
</table>

*P-values are based on a mixed effects model to account for the fact that some patients contributed multiple observations.

Conclusion: Both urine VCAM-1 and angiostatin had a strong association with multiple renal activity descriptors. However, in contrast to a previous murine study which showed angiostatin may improve kidney function, our study showed the reverse (Am J Physiol Renal Physiol 2009:F145–152). Further studies of urinary VCAM-1 and angiostatin with larger sample size, and long-term renal outcomes are justified.

Disclosure: A. Kiani, None; H. Fang, None; T. Wu, None; C. Mohan, None; M. Petri, None.

1413 Clinical Presentation, Treatment and Outcome of Membranous Nephropathy in SLE: A Comparison with Proliferative Lupus Glomerulonephritis in 141 Patients. Chi Chiu Mok, Ling Yin Ho and Ka Lung Yu. Tuen Mun Hospital, Hong Kong, Hong Kong

Background/Purpose: To study the presentation and outcome of membranous nephropathy in SLE in comparison with proliferative lupus glomerulonephritis.

Patients: Patients with biopsy-confirmed active lupus nephritis who were recruited in our randomized comparative trial of mycophenolate mofetil (MMF) vs tacrolimus (Tac) were studied. Participants were divided into 3 groups: group 1 (pure membranous lupus Gn; RPS/ISK class V); group 2 (mixed membranous and proliferative Gn; class V/III or IVS/IVG) and group 3 (proliferative lupus Gn; IVS/IVG). The clinical presentation, treatment response, outcome and complications were compared.

Results: 141 patients were studied (92% women; age 35.2±12.8 years; SLE duration 49.3±62 months at renal biopsy). There were 25 patients (18%), 31 patients (22%) and 85 patients (60%) in group 1, 2 and 3, respectively. At presentation, group 1/2 patients had significantly higher hemoglobin level (11.3±1.8 vs 9.9±1.7g/dL), creatinine clearance (CrCl) (90±31 vs 69.7±27ml/min), complement C3 level (0.62±0.27 vs 0.42±0.16g/L) but lower serum Cr (70.8±25 vs 91.5±33mmol/L) and anti-dsDNA titer (166±116 vs 234±89IU/mL<p=0.001) than that of group 3 patients (p=0.001 in all). 18 (32%) patients in group 1 had normal range C3 or anti-dsDNA, compared to 3 (4%) patients in group 3 (p=0.001). Nephrotic syndrome was more common in group 1/2 than group 3 (46% vs 32%; p=0.08). Blood pressure and serum albumin level was similar among the 3 groups. SLE disease activity index (SLEDAI) score was significantly lower in group 1/2 than group 3 patients (13.5±4.9 vs 18.0±5.33 points; p<0.001). Extra-renal activity was less common in group 1/2 than group 3 patients, but the difference was only statistically significant for arthritis (25% vs 42%; p=0.04). All patients were treated with high-dose prednisolone and either MMF (N=72) or Tac (N=69), followed by low-dose prednisolone and azathioprine for maintenance.

Conclusion: The presentation of histological membranous component in lupus nephritis is associated with heavier proteinuria, better renal function but less active lupus serology or extra-renal activity such as arthritis. One-third of patients have either normal complements or anti-dsDNA. Renal function decline in membranous lupus nephropathy is no different from proliferative lupus nephritis at 5 years, but thrombotic complications are more frequent.

Disclosure: C. C. Mok, None; L. Y. Ho, None; K. L. Yu, None.

1414 Combination of Mycophenolate Mofetil and Tacrolimus for Refractory Lupus Nephritis: A 12-Month Open-Labeled Trial. Chi Chiu Mok, Pak To Chan, Ling Yin Ho and Ka Lung Yu. Tuen Mun Hospital, Hong Kong, Hong Kong

Background/Purpose: To evaluate the efficacy and tolerability of a combination of mycophenolate mofetil (MMF) and tacrolimus (Tac) for refractory lupus nephritis.

Methods: Patients with refractory lupus nephritis were recruited. Inclusion criteria: (1) Active nephritis documented by renal biopsy within 24
months; (2) Failure to respond to ≥2 regimens which consisted of high-dose corticosteroid combined with another non-corticosteroid immunosuppressive agent together with ACE inhibitors. Each regimen should be used for ≥4 months at the maximally tolerated dosages of drugs. Exclusion criteria: (1) Failure of intolerance to either MMF/Tac and (2) Scr > 200 mmol/L. Treatment failure to previous regimens, defined as any one of the following: (1) Failure of proteinuria to improve to < 3g/day or urine protein-to-creatinine (uP/Cr) ratio to < 3.0; or < 50% of pre-treatment values; (2) Deteriorating Scr by ≥ 20% or loss in creatinine clearance (CrCl) by ≥ 30% not accounted by causes other than active nephritis; (3) Persistently active urinary sediments (RBC, active cellular casts ≤5/HPF). While prednisolone (£10mg/day) and ACE inhibitors were continued, other immunosuppressive agents were replaced by combined MMF (1g/day) and Tac (4mg/day). Patients were followed 2-monthly for the primary end-point (clinical response) at 12 months and adverse events.

Results: 18 patients (17 women) were recruited. The mean age of these patients was 35.3 ± 9.9 years and the mean SLE duration was 11.2 ± 4.6 months. The distribution of the ISN/RPS histological classes of lupus nephritis were: class IV/III (33%), pure V (39%), V-IV/IV (28%). Previous treatment regimens were: high-dose prednisolone (100%), CYP (pulse/oral) (39%), AZA (89%), MMF (89%), CSA (28%) and Tac (39%). The mean Scr, CrCl, uP/Cr, and serum albumin was 83.6 ± 29umol/L, 83.9 ± 30ml/min (56% < 90ml/min), 3.0 ± 1.3 and 29.4 ± 5.7g/l, respectively. Twelve (67%) patients had active urinary sediments and 13 (72%) patients had active lupus serology. After 12 months, 7 (39%) patients had very good response uP/Cr < 0.5; return of lupus serology to baseline; improvement/stabilization of CrCl; and resolution of urinary sediments, 1 (6%) patient had good response (uP/Cr < 1.0; improvement in lupus serology and urinary sediments; and stabilization of CrCl) and 3 (17%) patients had partial response (50% improvement in uP/Cr and CrCl < 3.0; improvement in serology and urinary sediments; and stabilization of CrCl). Seven (39%) did not respond to the protocol and required further salvage treatment. For those patients who responded to treatment, significantly improvement in uP/Cr, serum albumin and anti-dsDNA titer was observed. CrCl in these patients did not change significantly. 27 adverse events were reported: major infection (7%), minor infection including herpetic zoster (41%), diabetes (7%), dyspepsia/anorexia (7%), transient increase in serum Cr (7%), cramps (7%), alopecia (4%), facial twitching (4%), diabetes mellitus (4%) and others (11%). None of these had led to protocol withdrawal.

Conclusion: Combined MMF and Tac is a viable option for refractory lupus nephritis, with 61% patients improves after 12 months without significant adverse effects.

Disclosure: C. C. Mok, None; P. T. Chan, None; L. Y. Ho, None; K. L. Yu, None.

1415

Effect of Renal Disease On Survival of Patients with Systemic Lupus Erythematosus: A Prospective Cohort Study of 694 Patients. Chi Chiu Mok1, Raymond Kwok2 and Paul Yip3. 1Tuen Mun Hospital, Hong Kong, Hong Kong; 2University of Hong Kong, Hong Kong, Hong Kong

Background/ Purpose: To study the effect of renal disease on survival and life expectancy of patients with systemic lupus erythematosus (SLE).

Methods: Patients who fulfilled > = 4 ACR criteria for SLE who were prospectively followed in our unit from 1995 to 2011 were studied. The cumulative survival rate was calculated using Kaplan-Meier’s plot. The standardized mortality ratios (SMR) (adjusted for age and sex) compared to the general population within the same period of time was worked out. The effect of renal involvement, different histological classes, renal damage and end stage renal failure on survival of SLE was also evaluated by the Cox proportional hazard models, with adjustment for age, sex and use of various immunosuppressive drugs.

Results: 694 patients were studied (92% women; mean age of onset of SLE 32.9 ± 13.4 years). 368 (53%) had evidence of renal disease according to the ACR definition (persistent proteinuria of ≥ 0.5g/day; cellular casts or histological evidence). 285 (77%) patients had undergone renal biopsy for at least 1 time. The distribution of histological classes (ISN/RPS) was: class I (1%), class II (6%), class III (19%), class III + V (10%), class IV (47%), class V (16%) and others (1%). The mean follow-up time was 9.6 ± 7.3 years. 79 (11%) had renal damage as assessed by the SLE damage index (SDI) and 24 (3%) patients developed end stage renal failure (ESRF). The cumulative 5, 10 and 15 year survival of patients with renal involvement was 92.3%, 88.8% and 84.3%, respectively (significantly lower than that of patients without renal disease [97.0%, 93.7% and 91.6%, respectively; log rank test p = 0.004]). Cox regression demonstrated the age and sex adjusted hazard ratio (HR) of mortality in patients with renal disease and renal damage compared with those without renal was 2.23 [1.29–3.85] (p = 0.004) and 3.59 [2.20–5.87] (p < 0.001), respectively. The corresponding HR ratio for mortality in patients who developed ESRF was 9.20 [4.92–17.2] (p < 0.001). Patients with proliferative types of lupus nephritis (class III, IV + V) had significantly increased mortality (adjusted HR 2.28 [1.22–4.24]; p = 0.01). In contrast, pure membranous lupus nephropathy was not associated with increased mortality (adjusted HR 1.13 [0.65–1.93]; p = 0.66).

Conclusion: The presence of renal disease, in particular proliferative types of nephritis causing renal function impairment, significantly increases the mortality risk of patients with SLE.

Disclosure: C. C. Mok, None; R. Kwok, None; P. Yip, None.

1416

Tumor Necrosis Factor Alpha Is Associated with Mood Disorders in Patients with Systemic Lupus Erythematosus. Leticia L. Câmara1, R. Thelin2, L. T. Lapota1, N. A. Sinicato1, K. Pellegrini3, L. Costallat3 and S. Appenzzeller3. 1State University of Campinas, Campinas, Brazil; 2Faculdade de Ciencias Medicas, Universidade Estadual de Campinas, Campinas, Brazil; 3State University of Campinas, Sao Paulo, Brazil

Background/ Purpose: Elevated serum levels of tumor necrosis factor alpha (TNF-α) have been reported in patients with major depressive disorder and in patients with depression in multiple sclerosis. However, the association between activation of the immune system, levels of proinflammatory cytokines and mood disorders is still unknown in systemic lupus erythematosus (SLE).

Objective: To determine if increased serum levels of TNF-α are associated with mood disorders in SLE.

Methods: We included 153 SLE patients (women 148; mean age 32.16±14.49; range 10–67) and 41 healthy (women 32; mean age 31±12.04; range 12–59) age and sex matched controls. Mood disorders were determined through Becks Depression and Becks Anxiety Inventory in all participants. The total score ranges from 0 to 63 for BDI and BAI. The cutoffs used for the BDI were: 0–13: no/minimal depression; 14–19: mild depression; 20–28: moderate depression; 29–63: severe depression and for the BAI: 0–7: no/minimal level of anxiety; 8–15: mild anxiety; 16–25: moderate anxiety; 26–63: severe anxiety. SLE patients were further assessed for clinical and laboratory SLE manifestations, depression (OR = SLE Disease Activity Index (SLEDAI)), damage (Systemic Lupus International Collaborating Clinics/American College of Rheumatology Damage Index (SDI)) and current drug exposures. Serum samples were obtained from all participants in the absence of infections. TNF-α levels were measured by enzyme-linked immunosorbent assay using commercial kits from R&D Systems. Mann-Whitney Test was used to compare TNF-α concentrations between groups. Multivariate analysis was performed including sex, age, SLE duration, disease activity, and cumulative damage, severity of depression and anxiety and current drug exposures.

Results: Depression was identified in 70 (45.7%) SLE and in 10 (25%) controls (p = 0.001). Anxiety was identified in 93 (60.7%) SLE and in 17 controls (41.5%) (p = 0.001). Serum TNF-α levels were increased in individuals with depression (p < 0.001) and with anxiety (p = 0.037). A direct correlation between the severity of depression and serum TNF-α levels (r = 0.15; p = 0.023) was observed. TNF-α levels were significantly increased in patients with active disease (SLEDAI=3) (p = 0.007) and with current prednisone dosage (p < 0.001). In addition, we observed a correlation between serum TNF-α levels and SLEDAI (r = 0.23, p = 0.004) and with current prednisone dosage (r = 0.18; p = 0.031). No association between TNF-α levels and other clinical, laboratory variable and SDI scores was observed. No difference in TNF-α levels was observed between patients with and without hydroxocloroquine or other immunosuppressants. In the multivariate analysis, serum TNF-α levels were independently associated with disease activity (OR = 3.1, 95%CI 1.8–5.6) and with disease activity (OR = 4.4, 95%CI 1.3–7.1).

Conclusion: Serum TNF-α levels are elevated in individuals with mood disorders. In SLE, serum TNF-α levels were independently associated with...
Background/Purpose: Belimumab (Benlysta) is a monoclonal antibody that inhibits soluble B-lymphocyte Stimulator and improves SLE disease activity. This study was initiated to evaluate the use of Belimumab in academic SLE clinical practices.

Methods: An invitation to participate was sent to 16 physicians experienced in SLE Phase III clinical trials. All agreeing to participate completed a one page questionnaire for each patient prescribed Belimumab. The questionnaire contained demographic information on each patient (age, gender, race/ethnicity), SLE data (duration of disease, SELENA-SLEDAI, clinical manifestation(s) targeted, background medications), and Belimumab information (start date, clinical response, side effects). Clinical response was defined as the investigator’s impression of a ≥50% improvement in the initial manifestation being treated and no worsening in other organ systems.

Results: Of 16 invitations sent, ten investigators accepted to participate in the study. Questionnaires on 83 treated patients were returned. The mean age was 43.9±11.2 years old, 94% were female, 69.1% White, 24.1% Black, 8.1% Asian, and 6.0% Hispanic. The average SLE disease duration was 11.1±8.4 years. All patients were ANA positive. Concomitant medications included: immunosuppressants in 74.7% immunosuppressants in 75.9% (Azathioprine 19.3%, Mycophenolate Mofetil 43.4%, Methotrexate 13.3%), and prednisone in 72.3% (average dose of 13.1±11.5 mg, 63.3% on ≥10 mg). Only 2.4% of patients were not on background SLE medications. The dominant clinical manifestation driving treatment was arthritis (74.7%) followed by rash (41.0%) and serositis (15.5%). Other SLE manifestations included renal (7.2%), mucocutaneous, (24.0%), hematological (8.4%), and inability to taper steroids (8.4%). Approximately half of patients (55.4%) had two or more active manifestations. Forty-two patients were on Benlysta for at least 3 months. Of those, 23 (55%) patients clinically responded by 3 months with marked improvement in arthritis and/or rash. Twenty-three patients were on Benlysta for at least 6 months. Of those, 14 (60.9%) patients clinically responded with improvements in arthritis and/or rash. Of the 6 patients in whom Benlysta was discontinued, 2 had CNS lupus, 1 MI, 1 infection, 1 infusion reaction, and 1 elective surgery.

Conclusion: These early data support the use of Benlysta across all ethnic groups and efficacy similar to that reported in the Phase III trials. Relevant to patient and physician decision making, improvement was observed within 3 months.

Disclosure: A. D. Askanase, None; K. M. Shum, None; S. Kamp, None; F. C. Carthen, None; J. T. Aberle, None; J. T. Merrill, None.

1419
Infections Increase Risk of Arterial and Venous Thromboses in Systemic Lupus Erythematosus Patients: 4925 Patient Years of Follow-up, Renata Baronaite Hansen1 and Søren Jacobsen2. 1Copenhagen University Hospital Rigshospitalet, Copenhagen, Denmark, 2Copenhagen University Hospital, Copenhagen, Denmark

Background/Purpose: Patients with systemic lupus erythematosus (SLE) are at increased risk of developing cardiac heart disease as well as infections. Acute infections have been recognized to be associated with the development of arterial coronary events and previous studies have also demonstrated an increased risk of deep venous thrombosis and pulmonary embolism following an infection in general population. Our aim was to determine if there is an association between infections and risk of arterial and venous thrombotic events in patients with SLE.

Methods: Based on both retrospectively and prospectively collected data on 571 adult SLE patients fulfilling the ACR classification criteria, we identified all cases of acute infections requiring hospitalization, cutaneous herpes zoster, as well as arterial and venous thrombotic events. For each patient, the start of follow-up was the date of SLE diagnosis, and the end of follow-up was date of death or most recent information recorded.

Results: Patients were divided into 3 groups based on infection type: respiratory, cutaneous herpes zoster and other (urinary tract, cerebral, gastrointestinal, gynecological, cutaneous infections, bacteremia and bacterial endocarditis). Period of interest (POI) was defined as one year following an infection. Poisson regression analysis was used to estimate relative risks (RR) and their 95% confidence intervals (CI).

Conclusions: Of the 571 enrolled patients 89% were female and the mean age at diagnosis was 36 ± 16 years. The mean length of follow-up was 8.9 ± 7.6 years. The total amount of patient years of follow-up was 4925 years. 271 infections (104 acute respiratory, 41 cutaneous herpes zoster and 126 other acute infections),
as well as 98 arterial and 61 venous thromboses were identified. The table presents number of infections, number of thromboses during and outside POI, RR and corresponding 95% CI for arterial and venous thromboses in patients with different infection types.

Table 1. Association between infections and thrombotic events in SLE patients

<table>
<thead>
<tr>
<th>Type of infection</th>
<th>Arterial thromboses during POI, RR</th>
<th>Arterial thromboses outside POI, RR (95% CI)</th>
<th>Venous thromboses during POI, RR</th>
<th>Venous thromboses outside POI, RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>104</td>
<td>3.00 (1.22–7.38)</td>
<td>61/1078</td>
<td>93/60162</td>
</tr>
<tr>
<td>Other</td>
<td>126</td>
<td>2.48 (0.89–12.9)</td>
<td>1299</td>
<td>5/1299</td>
</tr>
<tr>
<td>Cutaneous herpes zoster</td>
<td>41</td>
<td>2.49 (0.96–6.21)</td>
<td>96/60831</td>
<td>61/60831</td>
</tr>
</tbody>
</table>

Conclusion: Our data showed that SLE patients were at increased risk of developing an arterial thrombosis within 12 months following a respiratory infection, and similar risk was observed for cutaneous herpes zoster and other infections. For venous thrombosis, the risk was increased following respiratory infections, but not following cutaneous herpes zoster or other infections. These data suggest that the increased risk of thromboses observed in SLE patients may also be partly explained by infections. To our knowledge, this is the first study describing an association between infections and risk of thromboses in SLE patients.

Disclosure: R. Baronaité Hansen, None; S. Jacobsen, None.

1420

Ethnicity and B Cell Depletion Therapy in Systemic Lupus Erythematosus, A. Lois-Iglesias1, J. Ishorari2 and D.A. Isenberg2. 1University Hospital Ramón y Cajal, Madrid, Spain. University College London, London, United Kingdom, 2University College London, London, United Kingdom

Background/Purpose: The aim of this study was to determine if there is any relation between ethnicity and outcome in patients with SLE treated with B cell depletion therapy (BCDT).

Methods: Between June 2000 and December 2011, 102 SLE patients received BCDT in our centre. The mean age was 31 years old. 92.2% were female. 41.2 % of them (42) received at least two cycles. It was administered intravenously, each cycle consisting of: cyclophosphamide 750–1500 mg, methylprednisolone 125–250 mg and rituximab 1 g, on 2 occasions, 2 weeks apart.

In this observational study we reviewed the disease activity assessments at the time of BCDT and six and twelve months later using the British Isles Lupus Assessment Group (BILAG) activity index, and the serological markers C3 and anti-dsDNA antibody levels.

Complete remission (CR) was defined as the loss of all BILAG A or B scores (to a C or D score). Partial remission (PR) was a change from a BILAG A or B score to a C or D score in at least 1 system, but with the persistence of 1 or more A or B scores in another system. No improvement was defined as a BILAG A or B score that remained unchanged after treatment. Worsening was also noted (no improvement and worsening = other, see below).

Results: In our cohort at the time of the initial BCDT 46 patients (45.1%) were Caucasian (C), 28 (27.4%) Afrocaribbean (AC), 21 (20.6%) Asian (As) and 2 (4.8%) O.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>C</th>
<th>AC</th>
<th>As</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months after BCDT 1st cycle</td>
<td>37.5%</td>
<td>25.5%/40%</td>
<td>25.5%/40%</td>
</tr>
<tr>
<td>12 months after BCDT 1st cycle</td>
<td>38.8%/24.3%/37.8%</td>
<td>38.8%/7.7%/53.8%</td>
<td>33.3%/16.7%/50%</td>
</tr>
<tr>
<td>6 months after BCDT 2nd cycle</td>
<td>38.1%/9.9%/52.4%</td>
<td>28.6%/28.6%/42.9%</td>
<td>53.9%/7.7%/38.3%</td>
</tr>
<tr>
<td>12 months after BCDT 2nd cycle</td>
<td>38.8%/15.8%/47.4%</td>
<td>42.1%/15.8%/42.1%</td>
<td>33.3%/22.2%/44.4%</td>
</tr>
</tbody>
</table>

These differences between the ethnicities were not statistically significant (p>0.05) and there were no significant differences between groups with respect to the number of patients who increased their C3 by 25% from baseline or decreased their anti-dsDNA antibody level by 50% or more.

Conclusion: Our data suggest that BCDT is equally effective in SLE patients of Caucasian, Afrocaribbean and Asian. However, a larger sample size is recommended to confirm this.

Disclosure: A. Lois-Iglesias, None; J. Ishorari, None; D. A. Isenberg, None.

1421

Antimalarials Protect Systemic Lupus Erythematosus Patients From Damage Accrual During the First Five Years of the Disease, Ioana Ruiz-Arruza, D. D. Gladman, Dominique Ibanez and Murray B. Urowitz. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Studies in the last 20 years have demonstrated that antimalarials (AM) prevent flares, protect from damage accrual, reduce the risk of thrombosis and increase survival, making them one of the cornerstone treatments for lupus. The aim of this study was to examine whether damage accrual, measured with the SLICC/ACR DI, over a 5 year period is reduced with the previous use of AM.

Methods: The present study was designed as a nested case-control embedded in an inception cohort of patients with SLE from our Lupus Clinic database, a long term prospective observational cohort study. All subjects fulfilled 4 of the ACR classification criteria or 3 ACR criteria plus having a histological lesion indicative of SLE.

All patients who had SLICC/ACR DI of 0 at inception and developed first damage in the time between the initial and the last follow-up visit at 5 years were considered cases. Two controls, comprising lupus patients in whom damage did not develop, were identified for each case and matched for known confounders for the development of damage: age, sex and disease activity at enrolment measured by the SLEDAI-2K.

AM exposure was classified as never or ever if patients were on either chloroquine or hydroxychloroquine at any visit prior to the onset of damage or during the 5 year interval for the controls.

Comparisons between cases and controls were made using descriptive statistics. Time to presence of damage was compared using Kaplan-Meier curves and time-dependent covariate proportional hazard models.

Results: 719 patients constituted the inception cohort. 490 had the first SLICC/ACR DI measure available within the first year and equal to 0. From the 354 who had at least 5 year follow-up in the clinic, 77 developed damage during the study period and 73 could be matched to 150 controls with no damage.

At first clinic visit, there were 84% women in both groups, with a mean age of 38.5 years in both groups and a SLEDAI-2K of 10.9 in the cases and 9.5 in the controls.

In the univariate analysis AM use was associated with a protective effect for the development of damage (cases 49.3% vs controls 70.7% p=0.002).

Analyzing the damage free survival with Kaplan-Meier curve, AM prolonged the time to damage accrual.

In the proportional hazard regression model, AM usage prior to the onset of damage reduced the probability for damage (HR 0.60 95%CI 0.38–0.95 p=0.03).

In further adjusting for potential risk factors (sex, age at diagnosis, disease duration, SLEDAI-2K) in the time-to-event regression analysis, AM was protective (HR 0.62 95%CI 0.39–0.99 p=0.05) and SLEDAI-2K at each visit increased the risk of damage (HR 1.05 95%CI 1.02–1.09 p<0.05).

Conclusion: AM is protective for damage accrual in SLE patients during the first five years of the disease, supporting their use at diagnosis of SLE.

Disclosure: I. Ruiz-Arruza, None; D. D. Gladman, None; D. Ibanez, None; M. B. Urowitz, None.
Clinical Associations of Anti-Smith Antibodies in Profile: A Multietnic Lupus Cohort. Yesenia C. Santiago-Casas1, Luis M. Vila2, Gerald McGwin Jr.2, Ryan S. Cantor3, Michelle Petri1, Rosalind Ramsey-Goldman4, John D. Reveille2, Robert P. Kimberly2, Graciela S. Alarcon2 and Elizabeth E. Brown1. 1University of Puerto Rico Medical Sciences Campus, San Juan, PR, 2University of Alabama at Birmingham, Birmingham, AL, 3Johns Hopkins University School of Medicine, Baltimore, MD, 4Northwestern University Feinberg School of Medicine, Chicago, IL, 5Univ of Texas Health Science Center at Houston, Houston, TX

Background/Purpose: Anti-Smith (anti-Sm) antibodies are highly specific for systemic lupus erythematosus (SLE) and have an important value in the diagnosis of this disease. However, whether these autoantibodies are associated to a specific subset of clinical manifestations or if they convey a prognostic value in lupus remains controversial. The aim of this study was to determine the association between anti-Sm antibodies and clinical manifestations, comorbidities, and disease damage in a large multietnic SLE cohort.

Methods: SLE patients (per ACR criteria), age ≥ 16 years, disease duration ≤ 10 years at enrollment, and defined ethnicity (African American, Hispanic or Caucasian), from a longitudinal cohort were studied. Socioeconomic-demographic features, cumulative clinical manifestations, comorbidities and the Systemic Lupus International Collaborating Clinics Damage Index (SDI) were determined. The association of the anti-Sm antibodies with clinical features was examined using multivariable logistic regression adjusting for age, gender, race/ethnicity, disease duration, education, smoking, and type of medical insurance.

Results: A total of 2,322 SLE patients were studied. The mean (standard deviation) age at diagnosis was 34.4 (12.8) years and the mean (SD) disease duration was 9.0 (7.9) years; 2,127 (91.6%) were women. Anti-Sm antibodies were present in 579 (24.9%) patients. In the multivariable analysis, SLE patients with anti-Sm antibodies were more likely to have serositis (odds ratio [OR] 1.51, 95% confidence interval [95% CI] 1.23–1.84), Raynaud’s phenomenon (OR 1.64, 95% CI 1.51, 95% CI 1.12–2.04), psychosis (OR 1.60, 95% CI 1.01–2.53), vasculitis (OR 1.51, 95% confidence interval [95% CI] 1.23–1.84), renal involvement (OR 1.33, 95% CI 1.08–1.64), neurologic involvement (OR 1.51, 95% CI 1.12–2.04), psychosis (OR 1.60, 95% CI 1.01–2.53), vasculitis (OR 1.50, 95% CI 1.17–1.94), Raynaud’s phenomenon (OR 1.64, 95% CI 1.34–2.00), hemolytic anemia (OR 1.73, 95% CI 1.28–2.35), leukopenia (OR 1.56, 95% CI 1.28–1.91), lymphopenia (OR 1.76, 95% CI 1.43–2.16), and arterial hypertension (OR 1.32, 95% CI 1.07–1.62). No significant associations were found for mucocutaneous manifestations and damage accrual.

Conclusion: In this cohort of SLE patients, anti-Sm antibodies were associated with several clinical features including serious manifestations such as renal disease, neurologic involvement, hemolytic anemia and vasculitis.

Disclosure: Y. C. Santiago-Casas, None; L. M. Vila, None; G. McGwin Jr., None; R. S. Cantor, None; M. Petri, None; R. Ramsey-Goldman, None; J. D. Reveille, None; R. P. Kimberly, None; G. S. Alarcon, None; E. E. Brown, None.

1423

Vascular Thrombosis and Pregnancy Morbidity in Patients with Systemic Lupus Erythematosus with Positive Antiphospholipid Profile and Thrombocytopenia. Amir Haddad, Murray B. Urowitz, Dominique Ibáñez and D. D. Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: The trigger for a thrombotic in patients with antiphospholipid antibodies is unknown. Thrombocytopenia is among the most common clinical manifestations of the Antiphospholipid antibody syndrome (APS). The purpose of this study was to investigate whether patients with lupus and positive antiphospholipid profile with thrombocytopenia are at more risk to have obstetric or thrombotic events than patients with antiphospholipid but without thrombocytopenia.

Methods: Patients with SLE and positive antiphospholipid (aPL) profile (Lupus anticoagulant (LA), anticardiolipin (aCL) antibody of IgG and/or IgM isotype or anti-β2-glycoprotein-I antibody of IgG and/or IgM isotype) and chronic thrombocytopenia (Platelet count<100,000) confirmed for 2 consecutive clinical visits followed at the prospective longitudinal lupus cohort since 1996 were recruited (study group). As controls a group of patients with SLE with positive aPL without thrombocytopenia were selected and matched by age, sex, age of SLE diagnosis, age at study start, disease duration and length of follow up period. Patients in the lupus cohort are followed at 2–6 month intervals according to a standard protocol which documented the presence of thrombotic events and obstetric morbidity as defined by the revised Sapporo criteria of APS. Descriptive analysis was used to describe the patients. Kaplan-Meier (KM) curves was used to compare time to 1st event between study groups.

Results: The study group included 21 patients and 63 controls, 81% were females with a mean age of 39.8 ± 13.0 years and age of SLE diagnosis at 31.7 ± 14.7 years. The mean disease duration was 8.1 ± 7.8 years and they were followed for an average of 12.1 ± 9.3 years.

During the study period, the medication used by cases and controls respectively were: on steroids 86% vs 79% (p=0.075); on antimalarials 43% vs 68% (p=0.07); on immunosuppressants 52% vs 43% (p=0.46); on ASA 20% vs 22% (p=1.00); and on anticoagulants 5% vs 10% (p=0.67).

16 events occurred in the study group compared to 43 events in the controls and included 6 Obstetrical morbidities in 2 patients in the study groups compared to 4 events in 2 patients in the controls (KM p=0.17), 9 arterial thrombosis in 4 patients in the study group compared to 24 events in 17 patients in the controls (KM p=0.19) and 1 event of venous thrombosis in 1 patient in the study group compared to 15 events in 10 patients in the controls (KM p=0.19).

Figure 1. The Kaplan-Meier curve for time to 1st event after Study Start.

Conclusion: Thrombocytopenia in patients with antiphospholipid antibodies in SLE is not associated with increased thrombotic events.

Disclosure: A. Haddad, None; M. B. Urowitz, None; D. Ibanez, None; D. D. Gladman, None.

1424

Prevalence and Clinical Significance of Severe Infection in Patients with Systemic Lupus Erythematosus: Preliminary Data From Relesser (Registry of lupus of the Spanish Society of Rheumatology). José M. Pego-Rotem1,2, Blas Rúa-Figueiras3, Francisco J. López-Longo3, Maria Galindo3,4, Jaime Calvo-Alén1, Alejandro Olivé2, Loreto Horcajada1, Esther Urijarte2, Eva Tomero2, Ana Sánchez-Atring5, Carlos Montilla1, José Rosas2, Antonio Fernández-Nebro6,7, Paloma Vela8, Mercedes Freire9,10, Lucia Silva12, Elvira Díez-Alvarez2, Carlos Marras10, Antonio Zúa1, Javier Narváez2, Jose Luis Marenco1, Monica Fernández de Castro11, Martín Gantés14 and Celia Erazquin25. 1Hospital do Meixoeiro, Vigo, Spain, 2Hospital Universitario de Salamanca, Salamanca, Spain, 3Hospital Universitario Dr Negrín, Las Palmas de Gran Canaria, Spain, 4Hospital Gregorio Marañón, Madrid, Spain, 5Instituto de Investigación Hospital 12 de Octubre, Madrid, Spain, 6Hospital San Cecilio, Leon, Spain, 7Hospital de Guadalajara, Guadalajara, Spain, 8Hospital de León, Leon, Spain, 9Hospital Universitario Virgen de la Arrixaca, Murcia, Spain, 10Hospital Universitario Ramón y Cajal, Madrid, Spain, 11Hospital de Bellvitge, Barcelona, Spain, 12Hospital de Valme, Seville, Spain, 13Hospital Puerta del Hierro-Majadahonda, Madrid, Spain, 14Hospital de Basurto, Basurto, Spain, 15Hospital Clinico de Tenerife, Tenerife, Spain, 16Hospital de Gran Canaria Dr Negrin, Las Palmas GC, Spain

Background/Purpose: Infection is a major cause of morbidity and mortality in systemic lupus erythematosus (SLE). Immunosuppression, co-
morbidities, and the disease itself makes patients with SLE susceptible to severe infections (Slnf) but the relative contribution each of these factors are not well known. We retrospectively assess the prevalence of Slnf and potential differences between patients with or without Slnf in a multicentric SLE cohort.

Methods: Patients with SLE on active follow up, with enough data about infection, from the first 684 patients registered on RELESSER. Cumulative clinical data were collected at the moment of the last assessment. Slnf was defined by the need for hospitalization. Charlson index (Chi) was used to evaluate comorbidity, and SLICC/ACR/DI (SDI) and Katz index (IS) to assess damage and SLE severity respectively. We analyzed the impact of infection on SLE mortality in the entire cohort.

Results: 583 SLE patients (92% ± 4 ACR criteria) were included; 88.3% females, mean age: 45.3 years, median SLE duration: 111 months (IQR: 47.8–188.4). 50 patients (14.5%) suffered ≥ 1 Slnf (any time). Median Slnf: I(1QR: 1–2). First Slnf localization: respiratory: 51.2%, urinary: 16.2% and bloodstream: (8.7%), with a predominant bacterial aetiology (42.5%). However, we found an elevated rate of non-isolations (48.7%), likely related to the predominance of respiratory infections. Comparing with patients without Slnf, patients with SLE and Slnf were older: 50(39–61) [median (P25–75)] vs. 43(34–53) years, p < 0.001, had longer duration of SLE:170 (83–253) vs.103(42–174) months (p < 0.001), more ISK: 4(2–5) vs. 2(1–3), p < 0.001, more SDI:1(0–3) vs. 0(0–1), p < 0.001 and a higher Chi: 3(1–4) vs. 1(1–2), p < 0.001. Furthermore, ≥ 2 Slnf also associated with more SDI (p = 0.003), more ISK (p = 0.027) and more Chi (p=0.001) comparing with only 1 Slnf. In addition, patients with lnf0 were more frequently hospitalized by SLE (excluding by infection): 30.0% vs. 45.0%, p < 0.001 and treated with corticosteroids (CE): 98.7% vs. 87.6%, p = 0.004, cyclophosphamide (CPM): 40.8% vs.17.3%, p < 0.001, or mycophenolate m. (MPM):33.8% vs. 17.1%, p = 0.001(any time), without differences in antimalarials use. At the moment of the first infection, 41 patients (77.4%) were treated with CE, 25(48.1%) with immunosuppressors, 5(20%) with CPM and 4(16.0%) with MPM, figures higher than the prevalence of these treatments in the last assessment available in RELESSER, i.e., GC: 51.8%, CPM: 1.1% and MPM: 12.3%. Only 3 of 12 (25.0%) deceased patients, died by Slnf. Excluding patients died by infection, the mortality was higher in SLE with history of Slnf (9.6 vs. 1.7%, p<0.000; y2 Pearson).

Conclusion: Despite being a low-severity cohort, the cumulative incidence of serious infection is high in our SLE patients. These data confirm the respiratory infection as the most common localization of Slnf in SLE. An antecedent of severe infection seem to associate to more severe SLE, more mortality and increased comorbidity, although these associations could be related with a longer disease exposure y/or older age.

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Circulating Free Protein S Levels May Be Linked to Cardiovascular Events and Venous Thrombosis in SLE. Gregg J. Silverman1, John Jung1, Elhisham Akhter2, Michelle Petri2 and Caroline Grönwall. 1NYU School of Medicine, New York, NY, 2Johns Hopkins University School of Medicine, Baltimore, MD

Background/Purpose: SLE patients are at risk for diverse organ systems involvement, which increases the challenges for diagnosis and predictions for the development of specific clinical features. In recent studies we have compared traditional and novel serologic markers and identified profiles that correlate with levels of overall clinical disease activity, and for specific organ system involvement (1). In the current studies we extended our studies to surveys of levels of Protein S, a vitamin K dependent factor implicated both in the coagulation cascade and as a ligand for the TAM receptor tyrosine kinase family that regulates inflammatory responses and apoptotic cell clearance.

Methods: In cross-sectional surveys of 90 SLE patients, we assessed levels of free Protein S with a commercial immunoassay. All clinical and experimental data was imported into a customized database where multivariate methods were used to seek natural divisions in the sample set based on a panel of IgM and IgG lupus/apoptosis-associated natural autoantibodies and to relate them to various clinical parameters.

Results: Low Protein S levels correlated with a history of DVT/PE (N=12, Spearman, P<0.0007, R=0.41)(Sens. 0.92, Spec.0.56). These correlations had greater significance than for well known lab correlates, that include high levels of IgG anti-cardiolipin (P=0.007, R= −0.29), IgG anti-b2-GPI (P=0.03, r= −0.23), and RVVT (P=0.001, R= −0.34). Patients with a history of MI/CVA also had significantly lower levels of free Protein S (N=17, P=0.001 R= −0.34) (Sens. 0.76, Spec.0.56). We found no correlations between protein S and overall SLE disease activity levels by SELENA-SLEDAI, physician’s global assessment, or organ damage by the SLICC index, or for nephritis. Although the vitamin K antagonist, coumadin, is reported to affect Protein S levels, we found no significant difference in Protein S levels between those with and without coumadin. For MI/CVA affected patients not treated with coumadin, we found significantly lower levels of Protein S compared to clinically unaffected SLE pts (P=0.01).

Conclusion: Significantly lower levels of free Protein S were found in the subsets of SLE patients with clinical DVT/PE and for MI/CVA events. These findings support the hypothesis that disturbance in levels of the anti-coagulant Protein S may play roles in both venous thromboprophylaxis and cardiovascular events.

Collectively, this study describes a potential biomarker, free Protein S, which identifies a specific SLE subgroup that may be at increased risk for pathogenetic mechanisms responsible for thrombotic events and serious CV events. Further investigations of this topic may allow for the development of better diagnostic and prognostic tests and personalized therapies in patients afflicted by SLE.

Reference
(1) Grönwall et al. Clinical Immunology 2012 142(3):390–8

Disclosures: G. J. Silverman, None; J. Jung, None; E. Akhter, None; M. Petri, None; C. Grönwall, None.

1426
The Clinical Relevance of a “False Negative” Enzyme Linked Immunoassay: Which Antinuclear Antibody Screening Test Is Preferred by Rheumatologists in an Integrated Health System? Rachita Bansal, David Bulbin, Alfred E. Denio, Sandi Kelsey and Harold Harrison. Geisinger Medical Center, Danville, PA

Background/Purpose: Historically, Immunofluorescence Assay (IFA) methodology has been the gold standard for ANA screening. Most clinical laboratories in recent years utilize the Enzyme Linked Immunoassay (ELISA) to screen for ANA rather than IFA as ELISA is automated and less expensive. Studies have suggested the sensitivity and specificity of the two methods are comparable but most of these studies were retrospective and not done in populations of patients referred to rheumatologists. There has been concern among rheumatologists that there may be a high “false negative” rate for ELISA when compared to IFA, potentially affecting a rheumatologist’s ability to diagnose patients with connective tissue disorders. We studied the incidence and clinical relevance of a negative ANA by ELISA when the IFA positive and when ordered by a rheumatologist.

Methods: We conducted a prospective study in a 12 person integrated health system rheumatology practice to determine the rate of “false negative” ANA by ELISA. 200 consecutive negative ELISA ANA’s ordered by rheumatologists were subsequently reanalyzed with IFA. We reviewed medical records of these patients and surveyed their rheumatologists regarding the clinical relevance of the positive IFA ANA finding for each patient identified. After their experience with the “false negative” ELISA and after providing the rheumatologists with the lab’s comparative costs of the 2 methodologies, their opinion about the most cost effective ANA screening strategy was solicited.

Results: Of 200 consecutive ELISA negative ANA’s ordered by rheumatologists reanalyzed using IFA, 15% were positive by IFA. Six’s had titers of 1:160 or greater. One was 1:10240. The rheumatologist survey demonstrated that of the 30 patients with false negative ANA by ELISA, the clinical suspicion of an underlying connective tissue disorder remained medium or high in 17 despite the negative ANA. In 8 patients, the clinical suspicion for a connective tissue disorder increased following the finding of a positive ANA by IFA and in 4 patients led to additional testing or start of treatment for a connective tissue disorder. The surveyed rheumatologists by a large majority felt that the abnormal ANA cut off tier should remain 1:160. After exposure with each “false negative” ELISA patient and after being provided with cost differences for the IFA and ELISA methodologies, the rheumatologists by a slim majority (14 to 13) recommended continuation of the current lab’s practice of screening all ANAs with ELISA rather than the option of...
Late Onset Systemic Lupus Erythematosus: Is It Actually A Milder Variant? Juan G. Ovalles-Bonilla1, Julia Martinez-Barrio1, Javier Lopez-Longo1, Inmaculada de la Torre1, Carlos Gonzalez Fernandez2, Maria Montoro Alvarez2, Francisco Aramburu1, Carolina Marin1, Luisa Martinez-Estupiñan1, Juan C. Nieto2, Michelle Hinojos3, Natalia Bello1, Indalecio Montenegro1 and Luis Carreño1. 1Gregorio Marañón Hospital, Madrid, Spain, 2Istituto Giannina Gaslini, Genova, Italy

Background/Purpose: Classically, late onset Systemic Lupus Erythematosus (SLE) has been described as a milder variant of the disease. The objective of this study is to describe the clinical and immunological features, the damage accrual and mortality of late onset compared with adult onset SLE.

Methods: The data was obtained from a long term prospective cohort of 353 patients diagnosed with SLE in the Rheumatology Department of Gregorio Marañón Hospital in Madrid, Spain. Demographic, clinical, and laboratory data were collected at disease onset and during its course from 1986 to 2006. Patients were divided into 2 groups: adult onset 19–49 years (n=276) and late onset ≥50 years (n=77). Organ damage was scored using the Systemic Lupus International Collaborative Clinics/American College of Rheumatology (SLICC/ACR) Score. Damage accrual was defined as an SLICC/ACR score ≥1. The groups were compared using the chi-square, Fisher-Holton and t-test student methods.

Results: A total of 353 patients were recruited, with a following mean time of 11 years. The female to male ratio differed significantly (p=0.005) between groups. At diagnosis, the late-onset group presented cutaneous manifestations less frequently (p<0.001). During follow-up, the late-onset group presented a lower incidence of arthritis (p=0.02), malar rash (p=0.001), photosensitivity (p=0.04), fever (p=0.03), low serum complement (p=0.001), hematologic (p=0.03) and renal (p=0.01) manifestations. The late-onset group had significantly more hypertension (p=0.03), neoplasms (p=0.02), damage accrual (p=0.007) and mortality (p=0.006). As for autoantibody profile, no statistically significant differences were found.

Conclusion: Late onset SLE is clinically different with less arthritis, fever, low serum complement, cutaneous, hematologic and renal manifestations, but with higher mortality and organ damage rates, compared with the adult on-set group. The higher frequency of damage accrual, mortality and hypertension observed in the late-onset group can be affected by aging-related factors other than disease activity or duration.

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Long-Term Outcomes of Children Born to Women with Systemic Lupus Erythematosus. Evelyne Vinet1, Mohammed Kaouache2, Christian A. Pineau3, Anne E. Clarke4, Caroline P. Gordon5, Robert W. Platt6 and Sasha Bernatsky7. 1McGill University Health Centre, Montréal, QC, 2Research Institute of the McGill University Health Ctre, Montreal, QC, 3MUHC, Montreal, QC, 4Medical School, Birmingham, United Kingdom, 5McGill University, Montréal, QC

Background/Purpose: SLE can cause considerable morbidity during pregnancy. Although several studies have evaluated foetal outcome in lupus pregnancy, very few have examined the long-term outcome of children born to mothers with SLE. In a large population-based study, we aimed to determine if children born to women with SLE have an increased risk of major congenital anomalies, serious infections, and cardiac conduction disturbances compared to children born to women without SLE.

Methods: We identified all women who had ≥1 hospitalization for delivery after SLE diagnosis using Quebec’s physician billing and hospitalization databases (1989–2009). Women were defined as SLE cases if they had any of the following: 1) ≥1 hospitalization with a diagnosis of SLE prior to the delivery, 2) a diagnosis of SLE recorded at the time of their hospitalization for delivery, or 3) ≥2 physician visits with a diagnosis of SLE, occurring 2–24 months apart, prior to the delivery. We randomly selected a general population control group, composed of women matched at least 4:1 for age and year of delivery, who did not have a diagnosis of SLE prior to or at the time of delivery.

We identified children born live to SLE cases and their matched controls, and ascertained major congenital anomalies (i.e. ≥1 hospitalization or physician visit for a major congenital anomaly <12 months of life), serious infections (i.e. ≥1 hospitalization with a primary diagnosis of infection), and cardiac conduction disturbances (i.e. ≥1 hospitalization or 2 physician visits occurring 2–24 months apart) through to end of database follow-up.

We performed multivariate analyses to adjust for maternal demographics, sex and birth order of child, major maternal co-morbidities, obstetrical complications, and relevant maternal medication.

Results: 507 women with SLE had 721 children, while 5862 matched controls had 8561 children. Compared to controls, children born to women with SLE experienced slightly more major congenital anomalies [13.6% (95% CI 11.3, 16.3) vs 10.4% (95% CI 9.7, 11.1)], serious infections [31.5% (95% CI 28.2, 35.0) vs 26.0% (95% CI 25.1, 26.9)], and cardiac conduction disturbances [3.1% (95% CI 2.0, 4.6) vs 1.2% (95% CI 1.0, 1.4)]. Mean age at the time of serious infection was 1.8 (95% CI 1.6, 2.0) year for children born to women with SLE and 1.9 (95% CI 2.0, 2.2) years for controls, while mean age at the time of cardiac conduction disturbance was 0.2 (95% CI 0.17, 0.22) year for children born to women with SLE and 1.8 (95% CI 1.7, 1.8) year for controls.

In multivariate analyses, children born to women with SLE had substantially increased rates of serious infections (HR 1.76, 95% CI 1.21, 2.56) and cardiac conduction disturbances (HR 1.90, 95% CI 1.03, 3.52) compared to controls. There was also a trend for an increased risk of major congenital anomalies in children born to women with SLE compared to controls (OR 1.24, 95% CI 0.98, 1.58).

Conclusion: Compared to children from the general population, children born to women with SLE have increased rates of serious infections and cardiac conduction disturbances. Our findings suggest that children born to mothers with SLE might also be at slightly increased risk of major congenital anomalies and prompt further research to elucidate this issue.

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Women With Systemic Lupus Erythematosus (SLE) May Have Different Predictors of Risk for Progression of Aorta Calcium (AS) Than Women without SLE. Apyna Lertratanakul1, Peggy W. Wu1, Alan Dyer1, William Pearce1, George Kondos2, Daniel Edmundowicz2, James Carr3 and Rosalind Ramsey-Goldman3.

**Background/Purpose:** Women with SLE have increased rates of subclinical atherosclerosis and cardiovascular (CV) events. We investigated which risk factors may be significant in the rate of subclinical atherosclerosis progression, as measured by AS, in women with (cases) and without (controls) SLE.

**Methods:** Baseline data were collected on cases and controls including demographics, self-reported and measured Framingham CV risk factors. SLE factors collected included modified SLE/ACR-DI Damage Index (SDI) (excluding CV outcomes). AS was measured by electron beam or multidimensional computed tomography at baseline and at 1 follow-up visit in the Study of Lupus Vascular and Bone Long-Term Endpoints (SOLVABLE). A high risk AS was defined as AS>100 and progression in AS at follow-up was defined as an AS>100 and an increase of >10% compared to baseline. A low risk AS was defined as AS<100. Univariate regression models of AS with risk factors were examined, and also adjusted for age. Presence of hypertension (HTN) was defined as systolic blood pressure (BP) ≥ 140 or diastolic BP ≥ 90 or on anti-HTN medication.

**Results:** At the baseline visit in 142 cases, their age was 43.3 ± 9.9 yrs, disease duration was 12.0 ± 8.4 yrs, SLEDAI was 3.8 ± 3.5, SDI was 1.5 ± 1.6 (mean ± SD). Imaging data with AS at baseline and follow-up were available on 100 cases; baseline AS scans were not performed in 36 cases. In 120 controls, their age was 46.7 ± 10.1 yrs (mean ± SD). Imaging data with AS at baseline and follow-up were available on 118 controls; 2 were missing baseline AS measurements. Mean ± SD follow-up time between imaging studies in 106 cases and 118 controls was 3.26 ± 0.35 yrs and 3.37 ± 0.41 yrs, respectively. Follow-up time was slightly different between cases and controls (p=0.05).

In 106 cases, 67 (63%) had low risk AS at baseline and at follow-up, 11 (10.4%) had low risk AS at baseline with progression at follow-up, 4 (3.8%) with high risk AS at baseline regressed to low risk at follow-up, and 0 with low risk AS at baseline progressed at follow-up. In 118 controls, 87 (73%) had low risk AS at baseline and at follow-up, 7 (5.9%) had low risk AS at baseline with progression at follow-up, 2 (1.7%) with high risk AS at baseline regressed to low risk at follow-up, and 0 with high risk AS at baseline progressed at follow-up.

In the women with SLE, AS progression was univariately associated with HTN, current smoking, older age, and higher BMI. After adjustment, only increased SDI remained significant (OR 1.60, 95% CI 1.22–2.16). In controls, AS progression was univariately associated with HTN, current smoking status, older age, and higher BMI. After adjustment, only current smoking status remained significant (OR 6.65, 95% CI 1.55–31.29).

**Conclusion:** Risk and controls, traditional CV risk factors are univariately associated with the progression of subclinical atherosclerosis as measured by AS. In cases, SLE damage is significantly associated with progression. While aging mediates the effect of many traditional CV risk factors for AS progression in women with and without SLE, increased risk due to SLE damage is independent of age. Further investigation with multivariate models is needed.

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Women With Systemic Lupus Erythematosus (SLE) May Have Different Predictors of Risk for Progression of Aorta Calcium (CA) Than Women without SLE. Apyna Lertratanakul1, Peggy W. Wu1, Alan Dyer1, William Pearce1, George Kondos2, Daniel Edmundowicz2, James Carr3 and Rosalind Ramsey-Goldman3.

**Background/Purpose:** Women with SLE have increased rates of subclinical atherosclerosis and cardiovascular (CV) events. We sought to determine which risk factors may be significant in the rate of subclinical atherosclerosis progression, as measured by coronary artery calcium score (CAC) in women with (cases) and without (controls) SLE.

**Methods:** Baseline data were collected on cases and controls including demographics, self-reported and measured traditional CV risk factors. SLE factors collected included modified SLE/ACR-DI Damage Index (SDI) (excluding CV outcomes). CAC was measured by electron beam or multidimensional computed tomography and at baseline and at 1 follow-up visit in the Study of Lupus Vascular and Bone Long-Term Endpoints (SOLVABLE). A high risk CAC was defined as CAC>10 and progression in CAC at follow-up was defined as a CAC>10 and an increase of >10% compared to baseline. Low risk CAC was defined as CAC<10. Univariate regression models of CAC with risk factors were examined. These models were further adjusted for age.

**Results:** At the baseline visit in 142 cases, the age was 43.3 ± 9.9 yrs, disease duration was 12.0 ± 8.4 yrs, SLEDAI was 3.8 ± 3.5, SDI was 1.5 ± 1.6 (mean ± SD). In 120 controls, the age was 46.7 ± 10.1 yrs (mean ± SD). Follow-up time between imaging studies in 142 cases and 120 controls was 3.25 ± 0.35 yrs and 3.37 ± 0.41 yrs (mean ± SD), respectively. Follow-up time was longer in controls than in cases (p=0.02).

In 142 cases, 103 (73%) had low risk CAC at baseline and at follow-up, 12 (8.5%) had low risk CAC at baseline with progression at follow-up, 2 (1.4%) with low risk CAC at baseline had regression to low risk at follow-up, and 21 (14.8%) with high risk CAC at baseline and progression at follow-up. Four (2.8%) had high risk CAC at baseline and follow-up without progression.

In 120 controls, 100 (83%) had low risk CAC at baseline and at follow-up, 7 (5.8%) had low risk CAC at baseline with progression at follow-up, 3 (2.5%) with high risk CAC at baseline had regression to low risk at follow-up, and 10 (8.3%) with high risk CAC at baseline and progression at follow-up. CAC progression in SLE was univariately associated with presence of diabetes, older age, and higher BMI. After adjustment for age, only SDI remained associated with CAC progression (Table 1). In controls, presence of hypertension and older age were univariately associated with CAC progression. After adjustment for age, no risk factors remained significant.

**Conclusion:** In cases and controls, traditional CV risk factors are univariately associated with the progression of subclinical atherosclerosis as measured by CAC. In cases, SLE damage is significantly associated with progression. While aging mediates the effect of many traditional CV risk factors for CAC progression in women with and without SLE, increased risk due to SLE damage is independent of age. Further investigation with multivariate models is needed.

**Disclosure:** A. Lertratanakul. Mary Kirkland Scholars Award, 2. Pfizer Clinical Rheumatology Fellowship Award, 2. P. W. Wu, NIH T32-AR07612, 2. Mary Kirkland Scholars Award, 2. A. Dyer, NIH P60-AR30302, 2. NIH P60-AR48098, 2; W. Pearce, NIH P60 AR30492, 2; G. Kondos, NIH P60 AR30492, 2; D. Edmundowicz, NIH P60 AR30492, 2; J. Carr, NIH P60 AR30492, 2; R. Ramsey-Goldman, NIH K24-AR02318, 2; NIH P60-AR30692, 2, NIH P60-AR48098, 2; NIH T32-AR07612, 2; Mary Kirkland Scholars Awards Research and Rheumaitonics, Inc., 2; NIH MO-1 RR00408, 2.

Table 1. Risk Factors Associated with Coronary Artery Calcium Progression in Cases and Controls, Adjusted for Age

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Cases OR (95% CI)</th>
<th>Controls OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTN*</td>
<td>1.06 (0.44–2.53)</td>
<td>0.93 (0.24–3.82)</td>
</tr>
<tr>
<td>Smoking</td>
<td>0.95 (0.63–1.57)</td>
<td>0.98 (0.54–1.77)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.4 (9.72–12.88)</td>
<td>NA**</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>1.01 (0.63–1.60)</td>
<td>1.20 (0.67–2.16)</td>
</tr>
<tr>
<td>BMI</td>
<td>1.48 (1.00–2.22)</td>
<td>1.16 (0.64–2.07)</td>
</tr>
<tr>
<td>SDI</td>
<td>1.56 (1.21–2.05)</td>
<td>NA</td>
</tr>
</tbody>
</table>

*HTN = systolic blood pressure>90 or on an anti-HTN medication **1 control subject noted having diabetes.
and therapeutic responses. We investigated contribution of various CNS examinations to clinical assessment in each subtype of NPSLE.

Methods: We retrospectively analyzed clinical features and the findings of CSF, EEG, CNS imaging modalities including MRI and SPECT in 41 patients (6 male, 35 female) who met ACR 1997 SLE classification criteria with neuropsychiatric symptoms from 2000 to 2011. The patients were categorized into 3 groups according to ACR-defined NPSLE syndromes at 1999; Patients with neurological symptoms (Group N), those with psychiatric symptoms (Group P), and those with the both (Group N+P).

Results: Median age at onset of SLE was 25 years old (range 5–63). About a half of the patients developed neuropsychiatric symptoms within a year from SLE onset. Based on the clinical symptoms such as cognitive dysfunction (37%), acute confusional state (32%), seizure (29%), headache (22%), aseptic meningitis (20%), and cerebrovascular disease (15%), the patients were classified into Group N (16 patients, 39%), Group P (13 patients, 32%), and Group N+P (12 patients, 29%). Pleocytosis and increased protein in CSF were the most frequently found in Group N, whereas increased protein with high IgG index was also observed in a part of patients in Group P. EEG abnormality, especially emergence of slow waves, was more prevalent in group P and N+P than group N. MRI showed any abnormalities in 85%. Diffuse white matter (WM) high intensity signals in Group N, and cerebral parenchymal atrophy and focal WM high intensity signals in group P and N+P were common. SPECT revealed the hypoperfusion, particularly in the frontal and parietal lobes in all patients but one, even in those having normal MRI. Most patients received potent immunosuppressive therapies including steroid pulse and IVCY, leading to clinical improvement in 69% of the remaining patients, clinical improvement was observed in 38 of them (95%). Six patients had to be switched to adalimumab due to etanercept side-effects or lack of efficacy. Eight of the ten patients (90%) with pleuropériarteritis achieved clinical remission in a mean period of 5.67±2.65 weeks. In four patients (80%) with SLE, FVC (%) rose from 43±12 to 58±16 (p<0.05) at the end of treatment. Thirty-five patients (92%) with joint involvement achieved remission of arthritis. Relapse was frequent after stopping medication and occurred 8–11 weeks after stopping treatment. The main adverse effects were local reactions (14%) and urinary tract infection (5%). Levels of ANA and/or anti-dsDNA rose in 6 patients (14%), but were not associated with lupus flare.

Conclusion: Cerebral hypoperfusion in SPECT was associated with NP lesions in SLE and the findings were closely correlated with disease activity especially in neurological deficits rather than psychiatric symptoms.

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Safety and Efficacy of Etanercept in Systemic LUPUS Erythematosus. Josefina Cortes-Hernandez1, Natalia Egri2, Miquel Vilardell-Tarres1 and Josep Ordí-Ros1. 1Hospital Universitari Vall d’Hebron, Institut de Recerca (VHIR), Barcelona, Spain; 2Vall De Hebron General Hospit, Barcelona, Spain

Background/Purpose: TNF is a strong mediator of inflammation with a controversial role in SLE. Whereas few open-label studies have shown efficacy of anti-TNFα agents in patients with SLE arthritis and renal disease, many others have reported its potential risk of autoantibody formation. The aim of the study was to evaluate the efficacy and safety of etanercept in patients with moderate active SLE without renal involvement.

Methods: In this open-label study, 42 SLE patients with cardiopulmonary and/or articular involvement (10 with serositis, 6 with shrinking lung syndrome (SLS) and 35 with arthritis) refractory to other therapies were given etanercept (50 mg/weekly) in addition to conventional immunosuppression therapy. Clinical response was categorized in complete response when a complete resolution of the symptoms and/or SLEDAI score <4 was achieved; partial response when there was a 50% clinical improvement and no response when there was no clinical improvement.

Results: Forty two lupus patients (34 female and 8 male, mean age 38.2 (18–60) were included and followed up prospectively for 24 months (3–6). Two of them withdrew from the study due to significant local reactions. Of the remaining patients, clinical improvement was observed in 38 of them (95%). Six patients had to be switched to adalimumab due to etanercept side-effects or lack of efficacy. Eight of the ten patients (90%) with pleuropériarteritis achieved clinical remission in a mean period of 5.67±2.65 weeks. In four patients (80%) with SLS, FVC (%) rose from 43±12 to 58±16 (p<0.05) at the end of treatment. Thirty-five patients (92%) with joint involvement achieved remission of arthritis. Relapse was frequent after stopping medication and occurred 8–11 weeks after stopping treatment. The main adverse effects were local reactions (14%) and urinary tract infection (5%). Levels of ANA and/or anti-dsDNA rose in 6 patients (14%), but were not associated with lupus flare.

Conclusion: Anti-TNF agents are safe and efficacious in SLE and did not lead to an increase SLE activity. In view of their anti-inflammatory properties they can be a therapeutic alternative for refractory serositis and SLS.

Disclosure: J. Cortes-Hernandez, None; N. Egri, None; M. Vilardell-Tarres, None; J. Ordí-Ros, None.

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Persistent Dyslipidemia Is a Risk Factor of Progression to Chronic Kidney Disease in Patients with Lupus Nephritis. Dong-Jin Park, Kyung-Eun Lee, Tae-Jong Kim, Yong-Wook Park and Shin-Seek Lee. Chonnam National University Medical School, Gwangju, South Korea

Background/Purpose: To investigate the effect of dyslipidemia at baseline and during follow-up period on the progression to chronic kidney disease (CKD) in patients with biopsy-proven lupus nephritis (LN).

Methods: We studied 68 patients who had kidney biopsy prior to the start of induction treatment, and who subsequently were treated with immunosuppressive drugs for at least 6 months. Sociodemographic, clinical, laboratory including lipid profile, and treatment-related data at the time of kidney biopsy and during follow-up were obtained by reviewing patients' charts. In addition, lipid profile data were collected at 6 months and 1 year of follow-up periods. Patients were divided into two groups based on mean levels of LDL cholesterol: the ≥100 mg/dl group with 25 patients and the <100 mg/dl group with 43 patients. Cox-proportional regression analyses were performed to identify independent predictors of progression to CKD in these patients.

Results: The higher LDL cholesterol group had a significantly older age at onset of LN, had higher WBC counts, and excreted more 24-hour urine protein than the lower LDL cholesterol group (p=0.010, p=0.035, and p=0.048, respectively). The high LDL cholesterol levels during the follow-up period was a significant predictor of CKD in LN patients in unadjusted model (hazard ratio [HR] 3.997, 95% CI 1.193–13.388, p=0.025), and this association remained significant after adjustment for confounders including estimated glomerular filtration rate (HR 3.592, 95% CI 1.067–12.094, p=0.039).

Conclusion: Our findings suggested that persistent dyslipidemia during 1-year follow-up after the onset of LN was an independent risk factor to predict the development of CKD in LN patients. Therefore, lipid profile should be monitored regularly and dyslipidemia should be managed aggressively to prevent deterioration of kidney function in these patients.

Disclosure: D. J. Park, None; K. E. Lee, None; T. J. Kim, None; Y. W. Park, None; S. S. Lee, None.

1434

Cardiovascular Morbidity in a Long-Term Follow-up Cohort of Systemic Lupus Erythematosus Patients in Southern Sweden. Ragnar Ingvarsson1, Ola Nived 2, Gunnar Sturfelt 1, Anders Bengtsson 3 and Andreas Jönsson4. 1Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden; 2University Hospital - Lund, Lund, Sweden; 3University Hospital Lund, Lund, Sweden; 4Section of Rheumatology, Lund, Sweden

Background/Purpose: The main objective was to study the incidence of myocardial infarction in a cohort of patients with Systemic Lupus Erythem-
Identifying Systemic Lupus Erythematosus Patients At Higher Risk of Coronary Artery Disease. Dominique Ibanez, D. D. Gladman and Murray B. Urowitz. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: There is a high prevalence of premature atherosclerosis among patients with SLE. The traditional Framingham risk score (FRS) identifies few of the SLE patients who go on to develop coronary artery disease (CAD). This is particularly true among patients aged 30 to 70. It has been suggested that a modified Framingham risk score (mFRS) where each item is multiplied by 2 more accurately identifies patients at Moderate/High risk of CAD, and more accurately predicts subsequent CAD. Moreover FRS predicts outcomes at 10 years. In a clinic setting, FRS and mFRS can be assessed more than once over time. The aim of this study was to determine whether the mFRS more accurately identifies patients at higher risk of CAD then FRS when the Risk Scores are assessed repeatedly through time.

Methods: Patients aged 30 to 70, seen at a large lupus clinic with multiple clinic visits, and in whom all of the variables necessary for the evaluation of FRS and mFRS were available, were included. FRS and mFRS were assessed for each visit and subsequent development of CAD was determined. CAD was defined as presence of myocardial infarction or angina. Descriptive statistics were used to characterize the survey population. Time-dependent conditional proportional hazard models were used to evaluate the Hazard Ratio associated with FRS and with mFRS for the development of future CAD. Adjustments were made in the models for disease activity at each clinic visit using SLEDAI-2K.

Results: A total of 630 patients were seen for 8098 visits where FRS and mFRS were assessed. 575 (91.3%) were female and their age at SLE diagnosis was 51.4 ± 11.2 years. At first visit in the study, the mean age was 42.4 ± 11.2 with disease duration of 11.1 ± 9.1 years. FRS and mFRS were evaluated for an average of 12.9 ± 9.6 visits per patient. The mean time from study start to the development of CAD or last clinic visit is 12.3 ± 9.7 years. A total of 37 patients went on to develop CAD. FRS was classified as Moderate/High for 1.2% of all visits and for 16.4% of all visits when using mFRS. 31 (4.9%) patients were classified as Moderate/High at least once in their follow-up compared to 221 (35.1%) for mFRS.

Conclusion: Acute myocardial infarction is more prevalent in females between the ages 45–54 with SLE compared with the population in a geographically defined area in southern Sweden.

Disclosure: R. Ingvarsson, None; O. Nived, None; G. Sturfelt, None; A. Bengtsson, None; A. Jønson, None.

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Conclusion: The Modified Framingham Risk Score can better identify patients with Moderate/High risk for CAD. Being applied over multiple visits through time, it better selects patients who are more likely to benefit from more intensive risk factors control.

Disclosure: D. Ibanez, None; D. D. Gladman, None; M. B. Urowitz, None.

1436

Application of European League Against Rheumatism Recommendations for the Management of Systemic Lupus Erythematosus Patients with Neuropsychiatric Involvement May Limit Unnecessary Diagnostic Testing and Curve Intensification of Immunosuppressive Therapy of Unclear Benefit. Cristina Pamfil1, Antonios Fanouarakis2, Argyro Repa3, Maria Melissourgaki4, Prodromos Sidiropoulos5, Ileana Filipescu6, Mirela Rinzi7, Simona Rednic8, George Bertisas9 and Dimitrios Boumpas1, University of Medicine and Pharmacy, Cluj, Romania, 2University of Crete, Iraklion, Greece, 3Emergency County Clinical Hospital Cluj Napoca, Cluj-Napoca, Romania, 4Panepistimio Kritis, Rethymnon, Greece

Background/Purpose: Systemic lupus erythematosus (SLE) patients may experience a wide variety of neurological and psychiatric manifestations (neuropsychiatric [NP] SLE [NPSLE]), which pose diagnostic and therapeutic challenges to clinicians leading to significant heterogeneity in their management. We have recently published evidence and expert based recommendations on NPSLE. We sought to measure them against usual care by auditing the management in our centers prior to issuing these recommendations.

Methods: NPSLE events were reviewed in two lupus centers in Iraklio, Greece and Cluj, Romania. Non-SLE-related events were excluded. We compared the diagnostic and treatment decisions in our cohort with the recommendations issued by the European League Against Rheumatism (EULAR) for specific NPSLE manifestations.

Results: A total of 105 NP events attributed to SLE were recorded in 89 patients (89% female, mean age 41.1 years, mean time from SLE onset to NPSLE 5.2 years) by exahert review over the last decade (2001–11). Most common events included cerebrovascular disease (n=19, 18%), cognitive dysfunction (n=17, 16%), intractable headache (n=10, 9.5%), psychosis (n=10, 9.5%), and transverse myelitis (n=10, 9.5%). Overall, the concordance between clinical decisions and the recommendations was 74% for diagnostic work-up and 67% for treatment of NPSLE (Table 1). Regarding diagnosis, lower concordance rates were noted in cases of cognitive dysfunction with only 5/17 (29%) SLE patients undergoing the recommended neuropsychological testing, and also in mood disorder where 4/7 (57%) patients had brain neuroimaging despite limited evidence for its usefulness. In contrast, the diagnostic work-up of major NPSLE such as seizure disorders, cranial neuropathy, and peripheral neuropathy, was generally in accordance with the recommendations. In terms of treatment, 40% of patients with seizure disorder and 40% of patients with cerebrovascular disease underwent intensification of immunosuppressive therapy without clear evidence of generalized SLE activity, as the recommendations suggest. Antipatelet or anticoagulant treatment was initiated in 34/39 (87%) of patients with NPSLE.

Conclusion: The diagnostic and therapeutic decisions in NPSLE patients managed in two European centers were often not in concordance with the existing EULAR recommendations. Applications of these recommendations

Table 1  Concordance of clinical practice with recommendations

<table>
<thead>
<tr>
<th>Event</th>
<th>N Diagnostic work-up</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>19 (18%)</td>
<td>9/19 (47.3%)</td>
</tr>
<tr>
<td>Cognitive disorder</td>
<td>17 (16%)</td>
<td>17/17 (100%)</td>
</tr>
<tr>
<td>Psychosis</td>
<td>10 (9.5%)</td>
<td>8/8 (100%)</td>
</tr>
<tr>
<td>Seizure disorder</td>
<td>9 (8.5%)</td>
<td>3/3 (100%)</td>
</tr>
<tr>
<td>Mood disorder</td>
<td>7 (6.6%)</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>Transverse myelitis</td>
<td>10 (9.5%)</td>
<td>5/10 (50%)</td>
</tr>
<tr>
<td>Cranial neuropathy</td>
<td>8 (7.5%)</td>
<td>2/2 (100%)</td>
</tr>
<tr>
<td>Peripheral neuropathy</td>
<td>6 (5.7%)</td>
<td>5/5 (100%)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Score: FRS</th>
<th>HR (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Score: mFRS</td>
<td>HR (95% CI)</td>
<td>p value</td>
</tr>
<tr>
<td>Risk Score</td>
<td>Risk Score</td>
<td></td>
</tr>
<tr>
<td>2.66 (0.63,11.33)</td>
<td>0.18</td>
<td>3.10 (1.76,5.8)</td>
</tr>
<tr>
<td>2.96 (0.70,12.58)</td>
<td>0.14</td>
<td>3.50 (1.81,7.7)</td>
</tr>
<tr>
<td>1.08 (1.02,1.15)</td>
<td>0.01</td>
<td>1.08 (1.02,1.15)</td>
</tr>
</tbody>
</table>

Abbreviations: a, brain imaging; b, glucocorticoids and immunosuppressants; c, MRI and VEG F d, antipatelet/anticoagulant; e, MRI and VEG F f, neuropsychological tests; g, disease and risk management; h, psycho-educational support; i, ophthalmological evaluation; j, electromyography and nerve conduction studies

Conclusion: The diagnostic and therapeutic decisions in NPSLE patients managed in two European centers were often not in concordance with the existing EULAR recommendations. Applications of these recommendations
may decrease unnecessary testing and curve intensifications of immunosuppressive therapy in cases where clear evidence is available. Longitudinal studies to further validate the impact of these recommendations in improving outcomes are needed.

Disclosure: C. Pamfil, None; A. Fanourakis, None; A. Repa, None; M. Melissourgiaki, None; P. Sidirooulos, None; I. Filipescu, None; M. Rinz, None; S. Rednic, None; G. Bertias, None; D. Boumpas, None.

1437

Majority of Lupusqol Domains Are Negatively Correlated with Systemic Lupus Activity Questionnaire (SLAQ) Score. Wendy Marder1, Martha Ganser2, Margaret Hyzy3 and Emily C. Somers4. University of Michigan, Ann Arbor, MI; University of Michigan, Ann Arbor, MI.

Background/Purpose: Systemic lupus erythematosus (SLE) disease activity measures such as the SLEDAI and BILAG require real time physician and laboratory assessment of patients, making them difficult to use in large, epidemiologic studies. The Systemic Lupus Activity Questionnaire (SLAQ) is a self-administered tool developed specifically for screening purposes and epidemiologic studies, and takes a lupus patient 5 minutes to complete. While the SLAQ is not intended for clinical management or in lieu of physician assessment for disease management purposes, it has been validated in a large community based cohort in response to other health indices such as SF12 and SF 36. We assessed correlations between these two self-administered SLE disease measures in a cohort of well characterized SLE patients at a large tertiary care outpatient setting.

Methods: SLE patients from the University of Michigan rheumatology clinics who met 4 or more ACR criteria and age 18 years or older were enrolled. Patients completed SLAQ and LupusQoL questionnaires, as well as sociodemographic data. The total SLAQ score is calculated on a scale of 0–47, with groups of symptoms aggregated and assigned different weights. LupusQoL consists of 34 items, grouped into 8 domains. Pearson’s correlation was utilized to assess the strength of associations between overall disease activity and individual QOL domains.

Results: 100 adult SLE patients responded, including 89 females and 11 males. Mean age was 40 years (sd 13 range 18–71). Patients were 66% White, 21% Black, 11% Other, 2% not reported. Mean SLAQ score was 13.3 (SD 9.0, range 0 to 39). SLAQ score (0–47 scale) was negatively associated with all QOL domains except body image, including physical health, pain, planning, intimate relationships, burden to others, emotional health, and fatigue. Pearson correlation coefficients ranged between −0.39 and −0.70.

Conclusion: Using lupus-specific self-report measures, increased disease activity (by SLAQ) is associated with reduced QOL (by LupusQOL) in 7 of 8 domains. While QOL measures have been examined more thoroughly in the epidemiologic setting. The total SLAQ score was 13.3 (SD 9.0, range 0 to 39). SLAQ score (0–47 scale) was negatively associated with all QOL domains except body image, including physical health, pain, planning, intimate relationships, burden to others, emotional health, and fatigue. Pearson correlation coefficients ranged between −0.39 and −0.70.

Disclosure: W. Marder, None; M. Ganser, None; M. Hyzy, None; E. C. Somers, None.

ACR/ARHP Poster Session B
Systemic Lupus Erythematosus - Animal Models

1438

Development of Systemic Lupus Erythematosus (SLE) in NZM 2328 Mice in the Absence of Any Single BAFF Receptor. Chaim O. Jacob1, Ning Yu1, Shunhua Guo1, Noam Jacob2, William J. Quinn3, Michael P. Cancro1, Ioannis Nasioulis1, Chaim Putterman2, Thiel Stohl3, Taci Magoun4 and William Stohl3. 1Department of Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA; 2University of Southern California Keck School of Medicine, Los Angeles, CA; 3University of Pennsylvania School of Medicine, Philadelphia, PA; 4Children’s Hospital at Montefiore, Bronx, NY; Albert Einstein College of Medicine, Bronx, NY; Human Genome Sciences, Rockville, MD.

Background/Purpose: To determine the necessity for any individual BAFF receptor in the development of SLE.

Methods: NZM 2328 wild-type (WT), NZM.Bcma−/−, NZM.Taci−/−, and NZM.Br3−/− mice were evaluated for lymphocyte phenotype and BAFF receptor expression by flow cytometry, for serum BAFF and total IgG and IgG anti-dsDNA levels by ELISA, for glomerular deposition of IgG and C3 by immunofluorescence, for renal histopathology, for renal histopathology, and for clinical disease.

Results: The phenotypes of NZM mice deficient in a single BAFF receptor were highly divergent. In comparison to WT mice, NZM.Bcma−/− and NZM.Taci−/− mice harbored increased spleen B cells, T cells, and plasma cells (PC), whereas serum total IgG and IgG anti-dsDNA levels were similar to WT levels. Although B cells were markedly reduced in NZM.Br3−/− mice, they nonetheless harbored increased T cells as well as WT-like numbers of PC and levels of IgG anti-dsDNA. Serum BAFF levels were increased in NZM.Taci−/− and NZM.Br3−/− mice but were decreased in NZM.Bcma−/− mice. Expression of TACI on B cells and of BCMA and TACI on bone marrow (BM) PC was reduced in NZM.Br3−/− mice, and expression of BR3 and TACI on BM PC was markedly diminished in NZM.Taci−/− mice. Despite their phenotypic differences, renal immunopathology in NZM.Bcma−/−, NZM.Taci−/−, and NZM.Br3−/− mice, including robust glomerular deposition of IgG and C3 and development of glomerular hypercellularity, glomerular crescents, mesangial matrix deposition, interstitial inflammation and fibrosis, tubular atrophy, and perivascular leukocyte infiltration, was at least as severe as in WT mice. Moreover, clinical disease was indistinguishable among the four cohorts of mice. Severe proteinuria began to develop in each of the cohorts at 4–5 months of age, and >90% of the mice in each cohort was affected by 12 months of age. Mortality in each of the cohorts was noted as early as 6–7 months of age, with >90% of the mice in each cohort being dead by 12 months of age.

Conclusion: Any single BAFF receptor, including BR3, is dispensable to development of full-blown clinical SLE in NZM mice. The development of disease in NZM.Br3−/− mice demonstrates that BAFF/BCMA and/or BAFF/TACI interactions importantly contribute to SLE. Moreover, development of disease in NZM.Br3−/− mice demonstrates that profound, chronic reduction in B cells does not equate with protection from SLE. As such, NZM.Br3−/− mice may serve as a useful model in elucidating why the efficacy of B cell-depletion therapy in human SLE is limited.

Disclosure: C. O. Jacob, None; N. Yu, None; S. Guo, None; N. Jacob, None; W. J. Quinn, None; M. P. Cancro, None; B. Gollav, None; C. Putterman, None; T. S. Migue, Human Genome Sciences, Inc.; W. Stohl, None.

1439

CTL-Promoting Effects of IL-21 Results in B Cell Elimination and Disease Improvement in a Murine Model of Lupus. Vinh Nguyen1, Daniel Veizaga-Udaeta2, Horea Rus3 and Violeta Rus3. University of Maryland School of Medicine, Baltimore, MD; 2University of Maryland at Baltimore County, MD; 3University of Maryland School of Medicine and Veteran Affairs Medical Center, Baltimore, MD.

Background/Purpose: IL-21 is a member of the type 1 cytokine family with pleiotropic activities. IL-21 enhances CD8 T cells maturation into cytotoxic T lymphocytes (CTL), promotes the differentiation of T follicular helper (Tfh) and Th17 cells while downregulating Tregulatory (Treg) cells and regulates B-cell proliferation and survival, Ig production and class switching. In humans, an association of IL-21 and IL-21R polymorphisms with SLE were reported, while studies in murine models of lupus have indicated that IL-21 blockade was beneficial in MRL-Fas−/−, BXSB-Yaa and chronic graft versus host disease (cGVHD) mice. Furthermore, we have shown that in the cGVHD model, IL-21 promotes the autoimmune phenotype by both B and CD4 T cell intrinsic mechanisms. The relative importance of IL-21R signaling in CD8 T cells on autoimmune parameters in murine lupus has not yet been assessed. In this study we set to determine whether the effect of IL-21 in promoting CD8 T cell differentiation into CTL leads to the elimination of autoreactive B cells and subsequently the attenuation of autoimmune parameters in murine lupus.

Methods: To address this question we have used two established models of chronic and acute cGVHD to dissect the effect on autoimmune parameters of IL-21R signaling in donor CD8 T cells. Specifically, IL-21R sufficient and deficient mice were used as donors in the B6-into-F1 model of acute (a)GVHD. In addition, the effect of exogenous IL-21 on autoimmune parameters was assessed in the DBA-into-F1 lupus-like model of cGVHD that is characterized by defective CTL activity resulting in the persistence of autoreactive B cells. In both models, parameters of acute and cGVHD including donor CD4 and CD8 T cell engraftment, host B cell number and...
activation, anti-sDNA autoAb production, in vivo donor anti-host CTL activity were assessed at two weeks after disease induction.

**Results:** Acute GVHD induced by injection of IL-21R−/− splenocytes on the B6 background into B6D2F1 hosts, resulted in the conversion of acute to chronic GVHD phenotype, as demonstrated by increased autoAb production, decreased host B cell elimination (37% ± 6% vs. 90% ± 2.3%, p = 0.03) and impaired in vivo CTL activity along with significant decrease in donor (c)CD4 and (c)CD8 cell expansion. In contrast, SLE DNA-into-F1 cGVHD mice that received mIL-21 exhibited attenuated autoimmune parameters with respect to host B cell expansion and activation, anti-sDNA autoAb production along with enhanced donor CD8 expansion and donor anti-host CTL activity. In both models, IL-21/IL-21R antagonism abrogated disease phenotype in murine lupus, enhancing CTL generation and subsequently host B cells elimination. Therefore, IL-21 in murine lupus will be crucial to further investigations of autoimmune diseases.

**Discussion:** The New Zealand Mice (NZM) 2328 model of murine lupus was utilized, with BALB/c and C57BL/6 mice as non-autoimmune controls. Percentage of neutrophils undergoing NETosis was assayed both at baseline and upon exposure to NZM or control serum. Autoantibodies (autoAbs) to NET proteins were characterized by immunofluorescence, western blotting, and in-house ELISAs for Abs to the LL-37 mouse orthologue CRAMP and in-house ELISAs for Abs to the EBNA-1 antigenic epitope PPPGMRPP (GMR). The cross-reactive cellular response to GRR and Sm starts within 10 days post-immunization with EBNA-1 in mCD40-LMP1 Tg mice. Cross-reactivity to the Sm epitope GMR occurs within 4 weeks after initial immunization. Enhanced cellular immune dysregulation with EBNA-1 immunization in mCD40-LMP1 mice is accompanied by enhanced splenomegaly, increased serum BUN and creatinine levels, and elevated anti-dsDNA and anti-Sm autoAb titers. 0.01) as compared to adjuvant and naïve mCD40-LMP1 mice.

**Conclusion:** Mice Tg for mCD40-LMP1 exhibit enhanced cellular responses to EBNA-1. In the presence of LMP1, EBNA-1 induces cellular immune dysregulation that leads to pathogenic autoimmune-specific immunization in lupus.

**Disclosure:** M. E. Munroe, None; J. R. Anderson, None; T. F. Gross, None; L. L. Stunz, None; G. A. Bishop, None; J. A. James, None.

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**Epstein Barr Virus CD40 Functional Mimic Latent Membrane Protein-1 Drives Cellular Molecular Mimicry in the Presence of Epstein Barr Virus Nuclear Antigen-1 in a Novel Murine Model of Lupus-Like Disease**

**Background/Purpose:** Immune dysregulation underlies the complex pathogenesis of SLE. Infection with Epstein Barr Virus (EBV) and expression of latent protein Epstein Barr Virus Nuclear Antigen-1 (EBNA-1), a humoral molecular mimic with SLE associated autoantigens, has been linked with SLE. Acting in an enhanced and sustained manner, the Latent Membrane Protein-1 (LMP1), another major EBV latent protein, cytoplasmic tail is necessary and sufficient as a functional mimic of the TNF Receptor, B cell stimulator molecule and NFkbeta activator of plasmacytoid dendritic cells in systemic lupus erythematosus (SLE). The NZM2328 murine model of lupus replicates a number of disease-relevant features such as accelerated atherosclerosis. The NZM2328 murine model of lupus demonstrates a granular pattern of reactivity with NETs, which in many places co-localized with anti-myeloperoxidase (MPO) and anti-neutrophil elastase (NE) staining. Using similar methodology, western blotting revealed NZM serum reactivity with specific proteins derived from NETs. By ELISA, NZM serum reacted more strongly with CRAMP (1.98 ± 0.19 vs. 1.00 ± 0.14, p = 0.017) and NET proteins (1.85 ± 0.16 vs. 1.00 ± 0.090; p = 0.014) than age-matched control serum. NET-like material—consisting of DNA, MPO, p/

**Conclusion:** The NZM2328 murine model of lupus replicates a number of features of human SLE with regards to aberrant neutrophil function. Tg/c+ mice include enhanced NETosis, anti-NET autoAb formation, and the potential for organ damage attributable to NETs. Future studies should better dissect the role of NETosis both in driving lupus pathogenesis and in contributing to organ damage such as skin disease, nephritis, and accelerated atherosclerosis.

**Disclosure:** J. S. Knight, None; A. A. O’Dell, None; W. Zhao, None; R. Khandpur, None; S. Valayarth, None; M. J. Kaplan, None.

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**IRF-1 Deficient Lupus-Prone MRL/Lpr Mice Show Reduced Glomerulonephritis but Develop Severe Intersitial Nephritis, Renal Vacuolization and Pulmonary Granulomas with Propensity for Th2 Polarity**

**Background/Purpose:** The transcription factor interferon regulatory factor-4 (IRF-4) and -1 (IRF-1) are members of the IRF family of transcription factors that play an important role in B cell development and activation. IRF-1 and IRF-4 activate B cell development through the induction of IRF-4 target genes, including those involved in B cell development and survival, such as Blimp-1, a master regulator of B cell differentiation into IgM+CD138+ plasma cells. IRF-1 deficiency results in the development of lupus-like disease in mice, characterized by increased autoantibody production, immune complex deposition, and organ damage. This study evaluates the nature of the immune response to EBNA-1 in mice with IRF-1 deficiency, and in those treated with a novel therapeutic approach, mycophenolate mofetil (MMF).

**Methods:** Mice were generated by crossing IRF-1−/− mice with MRL/Lpr mice, resulting in a lupus-prone lupus model. The autoimmune response to EBNA-1 in these mice was assessed by measuring serum antibodies to EBNA-1, anti-dsDNA, anti-Sm, and anti-Sm antigenic epitope PPPGMRPP (GMR). The cross-reactive cellular response to the Sm antigenic epitope GRR and Sm occurs within 4 weeks after initial immunization. Enhanced cellular immune dysregulation with EBNA-1 immunization in mCD40-LMP1 mice is accompanied by enhanced splenomegaly, increased serum BUN and creatinine levels, and elevated anti-dsDNA and anti-Sm autoAb titers. 0.01) as compared to adjuvant and naïve mCD40-LMP1 mice.

**Conclusion:** Mice Tg for mCD40-LMP1 exhibit enhanced cellular responses to EBNA-1. In the presence of LMP1, EBNA-1 induces cellular immune dysregulation that leads to pathogenic autoimmune-specific immunization in lupus.

**Disclosure:** M. E. Munroe, None; J. R. Anderson, None; T. F. Gross, None; L. L. Stunz, None; G. A. Bishop, None; J. A. James, None.

1441

**Epstein Barr Virus CD40 Functional Mimic Latent Membrane Protein-1 Drives Cellular Molecular Mimicry in the Presence of Epstein Barr Virus Nuclear Antigen-1 in a Novel Murine Model of Lupus-Like Disease**

**Background/Purpose:** Immune dysregulation underlies the complex pathogenesis of SLE. Infection with Epstein Barr Virus (EBV) and expression of latent protein Epstein Barr Virus Nuclear Antigen-1 (EBNA-1), a humoral molecular mimic with SLE associated autoantigens, has been linked with SLE. Acting in an enhanced and sustained manner, the Latent Membrane Protein-1 (LMP1), another major EBV latent protein, cytoplasmic tail is necessary and sufficient as a functional mimic of the TNF Receptor, B cell stimulator molecule and NFkbeta activator of plasmacytoid dendritic cells in systemic lupus erythematosus (SLE). The NZM2328 murine model of lupus replicates a number of disease-relevant features such as accelerated atherosclerosis. The NZM2328 murine model of lupus demonstrates a granular pattern of reactivity with NETs, which in many places co-localized with anti-myeloperoxidase (MPO) and anti-neutrophil elastase (NE) staining. Using similar methodology, western blotting revealed NZM serum reactivity with specific proteins derived from NETs. By ELISA, NZM serum reacted more strongly with CRAMP (1.98 ± 0.19 vs. 1.00 ± 0.14, p = 0.017) and NET proteins (1.85 ± 0.16 vs. 1.00 ± 0.090; p = 0.014) than age-matched control serum. NET-like material—consisting of DNA, MPO, and NE—was detected in nephritic NZM kidneys and in non-affecterd NZM skin, but not in control mice.

**Conclusion:** The NZM2328 murine model of lupus replicates a number of the features of human SLE with regards to aberrant neutrophil function. Tg/c+ mice include enhanced NETosis, anti-NET autoAb formation, and the potential for organ damage attributable to NETs. Future studies should better dissect the role of NETosis both in driving lupus pathogenesis and in contributing to organ damage such as skin disease, nephritis, and accelerated atherosclerosis.

**Disclosure:** J. S. Knight, None; A. A. O’Dell, None; W. Zhao, None; R. Khandpur, None; S. Valayarth, None; M. J. Kaplan, None.
tion regulators and involved in the development of Th2/Th17 and Th1 cells, respectively. MRL/lpr mice, a murine model of human SLE, spontaneously develop lupus-like disease. At ACR 2011, we reported that Irf1+/−/MRL/lpr mice, which lacked serum autoantibodies and Th17 cells, developed proliferative glomerulonephritis but minimal to no interstitial nephritis or renal vasculitis. Irf1+/−/MRL/lpr mice also developed granulomas containing Langhans-type multinucleated giant cells (MGCs) in multiple organs with significantly increased numbers of IFN-γ-producing CD4+ T cells, suggesting autoreactive Th1 cell-mediated mechanisms for their pathogenesis. To further define the role of autoreactive CD4+ T cells in murine lupus, we generated Irf1+/−/MRL/lpr mice and assessed their disease.

Methods: Irf1−/− MRL/lpr mice were generated by backcrossing Irf1−/−C57BL/6 mice onto MRL/lpr background for 7 generations by using speed congenic strategy. Mice were sacrificed at 18 weeks of age and histopathological analysis in multiple organs was performed. Infiltration of CD4+ T cells and CD68+ macrophages/moieties in tissues was detected by immunofluorescence or immunohistochemical staining. Splenic immune cell populations were analyzed by flow. To determine Th1/Th2/Th17 cell numbers, splenic CD4+ T cells were cultured with PMA/ionomycin, and IFN-γ, IL-4 or IL-17 production was detected by intracellular staining and flow analysis.

Results: Unlike WT or Irf1+/−/MRL/lpr mice, Irf1−/−/MRL/lpr mice showed severe infiltration in their renal interstitium and blood vessels characterized by predominant infiltration of CD4+ T cells. In contrast, minimal to no infiltration was observed in their glomeruli, suggesting independent mechanisms for development of interstitial nephritis and renal vasculitis. Irf1−/−/MRL/lpr mice also developed pulmonary granulomas characterized by predominant infiltration of CD68+ macrophages/epithelioid cells with formation of foreign body-type and Langhans-type MGCs. No granuloma was observed in age-matched WT MRL/lpr or Irf1+/−/MRL/lpr mice. Different appearances of renal disease and granulomas between Irf1−/− and Irf1+/−/MRL/lpr mice are summarized in the table. Intracellular cytokine analysis showed that there was significantly increased population of IL-4-producing CD4+ T cells in the spleens of Irf1−/−/MRL/lpr and C57BL/6 mice than their WT controls.

Conclusion: Our results indicate that IRF-1 plays an important role in the regulation of Th2 polarity in MRL/lpr and C57BL/6 mice. Development of inflammatory renal disease and pulmonary granulomas not in Irf1−/− C57BL/6 mice may have implications for the reduced Irf1+/−/MRL/lpr mice with significantly increased numbers of IL-4-producing CD4+ T cells suggesting autoreactive Th2 cell-mediated mechanisms for their pathogenesis.

Disclosure: H. Sekine, None; W. Zhao, None; S. Yalavarthi, None; M. J. Kaplan, None.

1444

HLA-D3R Controls Autoantibody Response to Sm in NZM2328. DR3+;AE0 Transgenic Mice. Vaidehi R. Chowdhary1, Chao Dai2, Shu Man Fu1 and Chella S. David1, 2Mayo Clinic, Rochester, MN, 2University of Virginia Health System, Charlottesville, VA

Background/Purpose: Large genome wide scans have confirmed the strong association of HLA-DR3 with risk of developing SLE and antibody response to Sm which is specific to lupus. To understand the role of HLA-DR3 in pathogenesis of lupus and anti-Sm response, we generated NZM2328 mice transgenic with HLA-DR3 and detected experimental mouse class II (A0). Female NZM2328 spontaneously develop anti-dsDNA and severe glomerulonephritis whereas incidence of glomerulonephritis is less in male mice.

Methods: HLA DR3.AE0 transgenic mice were repeatedly backcrossed to NZM2328 mice for 6 generations. Mice were genotyped by PCR and Flow cytometry. Various cohorts of mice were followed monthly for proteinuria using Albustix and sera collected. Urinary protein greater than 300 mg/dL (3+ or more) was considered significant. Anti-Sm antibodies were determined by ELISA and immunoprecipitation.

Results: The overall incidence of proteinuria in female NZM2328, DR3+;AE0 and NZM2328 mice at 12 months was 58% and 62% respectively (p=0.38) whereas male mice, as expected, had low incidence of proteinuria namely 11% in NZM2328 and 19% in NZM2328.DR3+;AE0. No proteinuria was seen in DR3+;AE0 and AE0 mice. Both NZM2328 and NZM2328.DR3+;AE0 developed anti-dsDNA antibodies. NZM2328 males and females, AE0 and DR3+;AE0 mice did not develop anti-Sm antibodies whereas both male and female NZM2328.DR3+;AE0 mice developed anti-Sm antibodies. Preliminary results from immunoprecipitation in few samples also confirm presence of anti-Sm antibody in NZM2328.DR3+;AE0 mice. These mice develop glomerulonephritis and kidney scores are shown in Table 1.

Table 1. Severity of glomerulonephritis in NZM2328 and NZM2328.DR3+.AE0 mice

<table>
<thead>
<tr>
<th>Group</th>
<th>Meanage</th>
<th>Expansion</th>
<th>Endocapillary Proliferation</th>
<th>Glomerular deposits</th>
<th>Extracapillary proliferation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZM2328</td>
<td>2.2 ± 0.75</td>
<td>1.8 ± 0.5</td>
<td>2 ± 0.9</td>
<td>0.16 ± 0.04</td>
<td></td>
</tr>
<tr>
<td>NZM2328.DR3+;AE0</td>
<td>3 ± 0</td>
<td>2.8 ± 0.5</td>
<td>3.5 ± 0.6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>NZM2328 Non-proteinic</td>
<td>1.7 ± 0.9</td>
<td>1.6 ± 1.2</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>NZM2328.DR3+;AE0 Non-proteinic</td>
<td>2 ± 1.2</td>
<td>1.2 ± 1.3</td>
<td>1.5 ± 1.1</td>
<td>0.16 ± 0.04</td>
<td></td>
</tr>
</tbody>
</table>

Total number of spleen cells, CD4+, CD8+, B220+ and Mac1+ cells were enumerated in NZM2328, NZM2328.DR3+;AE0 mice and were not
significantly different. Similarly the total numbers of thymocytes, CD4, CD8 double negative, double positive, single positives were also not different in both the groups. Certain CD4+, CD8+ T cell Vβ families were increased in NZM2328 and NZM2328. DR3+, AE0 mice compared to DR3+ AE0 mice.

Conclusion: These results strongly support that the HLA-DR3, in an autoimmune prone background, plays an important role in generating an immune response to Sm and development of glomerulonephritis.

Disclosure: V. R. Chowdary, None; C. Dai, None; S. M. Fu, None; C. S. David, None.

1445
Shared and Unique Molecular Features of Nephritis in 3 Models of Murine SLE, Ramalingam Bethunaickan1, Celine C. Berthier2, Matthias Kretzler2 and Anne Davidson3. 1Feinstein Institute for Medical Research, Manhasset, NY, 2University of Michigan, Ann Arbor, MI, 3University of Michigan, MI. 4Feinstein Institute for Medical Research, Manhasset, NY

Background/Purpose: Mouse models are useful for studying the pathogenesis of SLE nephritis but it is not clear which model is the most appropriate for understanding human disease. The goal of this study was to understand both shared and unique features of SLE nephritis in mouse models of proliferative and glomerulosclerotic renal disease.

Methods: Perfused kidneys from NZB/W F1, NZW/BXSB and NZM2410 mice were harvested before and after nephritis onset. Affymetrix based expression profiles of whole kidney RNA were analyzed using Genomatix Pathway Systems and Ingenuity Pathway Analysis software. Fold-change ≥1.4 for the up-regulated genes and ≤0.7 for the down-regulated genes and q < 0.001 were chosen as cut-off values. Only those genes with human orthologs were analyzed. Confirmation of gene expression patterns was performed using real-time PCR.

Results: 955, 1168 and 835 genes were regulated in the kidneys of nephritic NZB/W F1, NZW/BXSB and NZM2410 mice respectively. 263 genes were regulated in all three strains reflecting immune cell infiltration, endothelial cell activation, fibrinolysis, complement activation and cytokine signaling. STAT3 was the top transcription factor having a binding site in the regulated gene promoter and IL-6 signaling was a top pathway in the ingenuity analysis. Each strain also expressed a unique pattern of genes. NZB/W mice had dominant T cell and IL-1 signatures whereas NZW/BXSB mice had prominent integrin, complement signatures and p53 signatures. NZM2410 mice that have severe glomerulosclerosis and scant lymphocytic infiltrates had a dominant metabolic and mitochondrial dysfunction signature; part of this signature was shared with NZB/W mice. The two strains with proliferative disease NZB/W and NZW/BXSB shared a macrophage/DC infiltration and activation signature. Importantly, overlapping signatures with human SLE biopsies were observed for all three mouse strains.

Real-time PCR confirmed these gene expression profiles and showed significant differences in the inflammatory response between strains. For example regulatory T cells infiltrated the kidneys of NZB/W mice but not the other two strains. NZM2410 mice had features of renal macrophage activation but lacked dendritic cell infiltration and had less endothelial cell activation than the other two strains. Loss of nephrin, indicating podocyte death, was most marked in the NZM2410 strain and was not observed in NZW/BXSB mice. Robust markers of interstitial disease/renal injury and hyphoxia were shared between nephritic mice of all three strains. IL1β, a marker of tubular dysfunction was an earlier marker of proteinuria than Ln2.

Conclusion: These findings among genetically related strains of SLE prone mice illustrate the heterogeneity of renal responses to immune complex deposition and inflammation and suggest that individualized targeting of effector mechanisms might need to be based on biopsy findings. These findings further suggest that the progression of renal impairment in SLE shares many common mechanisms with other non-immune-mediated renal diseases and that strategies currently being applied in other diseases to prevent tissue hyphoxia and remodeling may also be useful in SLE.

Disclosure: R. Bethunaickan, None; C. C. Berthier, None; M. Kretzler, None; A. Davidson, None.
dependent and gene-dose-dependent manner in mouse strains with spontaneous lupus. As the synthetic triterpenoid methyl-2-cyano-3,12-dioxoolean-1,9-dien-28-oate (CDDO-Me) has been shown to inhibit AKT, MEK1/2, and NF-κB, and to induce caspase-mediated apoptosis, we proceeded to test the therapeutic potential of CDDO-Me on murine lupus.

Methods: In a preventive study, CDDO-Me or placebo were administered to 2 month old B6.Sle1.Sle2 mice (n = 10 per group) at a dose of 3mg/kg, 3 times a week for 2 months. In the treatment study, diseased NZM2410 (age = 7mo; n = 7 per group) were treated with CDDO-Me at a dose of 3mg/kg 5 times a week for 2 months. Proteinuria, BUN, autoantibody levels, cellularity and renal disease were examined to determine the efficacy of this agent.

Results: Splenic cellularity was reduced after CDDO-Me treatment. Particularly, the percentage of splenic CD4+ T cells was decreased (12.1 ± 0.35% vs 15.1 ± 1.2%, P = 0.021), while the percentage of CD8+ T cells was increased (9.73 ± 0.4% vs 6.8 ± 1.1%, P = 0.023) in the CDDO-Me treated group compared to the placebo group. In addition, CDDO-Me-treated mice exhibited significant reductions in serum autoantibody levels, including anti-dsDNA and anti-glomerular antibodies. Finally, CDDO-Me treatment attenuated renal disease in mice, as revealed by reduced 24-hour proteinuria, blood urea nitrogen, and glomerulonephritis. In order to confirm the therapeutic efficacy of CDDO-Me, we carried out a treatment study by administering CDDO-Me to a different lupus strain (NZM2410, age = 7mo; N = 4–7 per group) for a period of 2 months. These mice were already proteinuric at the beginning of the study. Once again, CDDO-Me was remarkably effective in improving survival, and reducing cellularity, circulating antibodies and proteinuria. Thus, we have established that CDDO-Me is therapeutically effective, even when administered after disease onset. In terms of the underlying molecular mechanisms, we demonstrated that CDDO-Me treatment dampened MEK1/2, ERK, and STAT3 signaling within lymphocytes. Importantly, the NF-E2-Related Factor 2 (Nrf2) pathway was activated after CDDO-Me treatment dampened MEK1/2, ERK, and STAT3 signaling within lymphocytes. Importantly, the NF-E2-Related Factor 2 (Nrf2) pathway was activated after CDDO-Me treatment indicating that CDDO-Me can attenuate renal damage in lupus via the inhibition of oxidative stress. Collectively, these findings underscore the importance of AKT/MEK1/2/NF-κB signaling in engendering murine lupus.

Conclusion: CDDO-me may effectively prevent the hematological, autoimmune and pathological manifestations of lupus via the blockade of multiple signaling nodes and oxidative stress.

Disclosure: T. Wu, None; Y. Ye, None; M. Yan, None; X. J. Zhou, None; M. Andreef, None; C. Mohan, None.

1448

Inhibition of Calcium/Calmodulin-Dependent Protein Kinase IV Suppresses the Autoimmunity in Lupus-Prone Mice. Kunihiro Ichinose1, Atsushi Kawakami2 and George C. Tsokos2. 1Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan, 2Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA

Background/Purpose: Systemic lupus erythematosus (SLE) is a chronic inflammatory disease associated with abnormal immune cell function. SLE T cells express high levels of calcium/calmodulin-dependent protein kinase IV (CaMKIV). We have shown previously that pharmacologic (Arthritis Rheum. 2011) or genetic silencing of Camkiv (J Immunol. 2011) suppresses lupus nephritis in lupus-prone mice. The purpose of this study was to determine whether pharmacologic inhibition of CaMKIV would improve immune function abnormalities.

Methods: We treated MRL/lpr mice with KN-93, a CaMKIV inhibitor. The agent was administered by intraperitoneal injections at a dosage of 2.67 ug/gm of body weight per mouse 3 times a week, starting at week 8 of age through week 16. We evaluated the presence of CD4+, CD8+, CD3+CD4-CD8- (double negative, DN) and CD62L low T cells and proinflammatory cytokine production. We also determined the effect of inhibition or silencing of CaMKIV on proinflammatory cytokine production by human T cells and macrophages.

Results: CaMKIV inhibition in MRL/lpr mice resulted in significant suppression of DN and CD62L low T cells population and IFN-γ production by T cells. In human activated T cells and macrophages, pharmacologic inhibition of CaMKIV resulted in suppression of IFN-γ production and CD69 expression by T cells and IL-1β, IL-6 and TNF-α by macrophages. Silencing of CaMKIV in murine activated T cells showed increased expression of FoxP3 mRNA level and decreased IL-17A mRNA level.

Conclusion: We conclude that pharmacologic inhibition of CaMKIV suppresses cell activation and cytokine production in lupus-prone mice. Our data justify the development of small-molecule CaMKIV inhibitors or silencing CaMKIV for the treatment of patients with SLE.

Disclosure: K. Ichinose, None; A. Kawakami, None; G. C. Tsokos, None.

1449

Numbers of Splenic Long-Lived Plasma Cells in Autoimmune and Pre-Autoimmune Lupus Mice Are Linked to a Hyper-Responsive Variant of the Thrombopoietin Receptor and Enhanced Megakaryopoesis. Oliver Winter1, Katrin Moser2, Rudolf A. Manz3 and Falk Hippel4. 1Charité - University Medicine Berlin, Berlin, Germany, 2German Arthritis Research Center (DRFZ) Berlin, Berlin, Germany, 3University of Lübeck, Lübeck, Germany, 4Charité University Hospital Berlin, Berlin, Germany

Background/Purpose: Autoantibodies contribute to the pathogenesis of the autoimmune disease Systemic Lupus Erythematosus (SLE) by stimulating the immune response. Further, deposits of immune complexes in the kidneys can lead to severe nephritis. The autoantibodies are secreted by short- and long-lived plasma cells located in the bone marrow and in the spleen. In NZB/W mice - a mouse model for SLE - both parental strains New Zealand Black (NZB) and New Zealand White (NZW) contribute different sle-loci to the formation of SLE. The NZB strain passes the sle2c locus in which the gene for the Thrombopoietin (TPO)-receptor (c-mpl) is located.
According to the relevance of megakaryocytes for the plasma cell niche and the correlation between plasma cell and megakaryocyte numbers, we wanted to elucidate whether c-Mpl and/or megakaryopoiesis is altered in autoimmune mice.

Methods: Therefore, we examined in wild type, NZB and NZW mice the amount of megakaryocytes and plasma cells in spleen and bone marrow, the occurrence of genetic variations for c-mpl and the degree of megakaryopoiesis upon TPO stimulation by histological survey, flow-cytometric and genetic analysis and by in vitro studies.

Results: We found, that in the spleen of NZB mice the number of long-lived plasma cells and megakaryocytes are 10-times higher than in wild type while in NZW mice the numbers are equal. We detected a missense mutation in the c-mpl gene of NZB mice leading to an amino acid replacement at the essential TPO-binding site. Upon TPO stimulation of splenocyte and bone marrow cultures NZB cultures responded significantly stronger resulting in the double amount of megakaryocytes compared to NZW cultures.

Conclusion: In summary, our data indicate that the mutated c-mpl gene located within the slex-e locus is leading to an augmented megakaryopoiesis which enables the accumulation of a greater number of autoreactive plasma cells and thus is contributing to the development of SLE.

Disclosure: O. Winter, None; K. Moser, None; R. A. Manz, None; F. Hiepe, None.

1450
MEDI-551 Depletes a Majority of Murine B Cells and Reduces Serum Titers of Autoantibodies in the SLE1-huCD19 TG Mice. Sandra Gallagher, Yue Wang, Isharat Yusuf, Thomas McCaughtry, Ronald Herbst and Laura Carter. MedImmune, Gaithersburg, MD

Background/Profile: Systemic Lupus Erythematosus (SLE) is characterized by chronic inflammation that can affect various organs. Hyperactive B cells appear to be key drivers in SLE disease. Although some monoclonal antibody (MAb) therapies targeting B cells have shown positive therapeutic effect, these therapies do not effectively deplete plasma cells or autoantibodies. MEDI-551 is an antibody-dependent cellular cytoxicity (ADCC)-enhanced, humanized, anti-CD19 MAb. Previous studies demonstrated that MEDI-551 can effectively deplete a broad range of tissue B cells in naïve mice. In immunized mice, MEDI-551 led to depletion of tissue plasma cells and a reduction of serum titers of responding antibodies. In this study, we examined the ability of MEDI-551 to deplete B cells in the SLE1-huCD19 TG mice and the impact on the autoimmune phenotype.

Methods: SLE1-huCD19 TG mice were given either a single IV dose of MEDI-551 or repeated doses biweekly for up to twelve weeks. The number of B cells in the blood, spleen, and bone marrow (BM) were detected by flow cytometry staining. In the spleen and bone marrow, the number of antibody secreting cells (ASC) specific for total IgG and IgM as well as anti-dsDNA IgG and IgM were determined by ELispot. Serum autoantibody and total immunoglobulin levels were determined by ELISA.

Results: Aged SLE1-huCD19 TG mice display classical autoimmune symptoms, including antibodies against self antigens and hyper-activation of B and T cells. A single dose of 10mg/kg MEDI-551 led to depletion of 90% of B cells in spleen, BM, and blood at day 7 post injection. Spleen germinal center B cells and plasma cells (PC) were largely sensitive to MEDI-551, and their numbers were reduced by 72%. BM PC, with numbers 80% less than spleen PC, were not significantly affected. In a follow-up longitudinal study, the SLE1-huCD19 TG mice were given biweekly dosing of MEDI-551 or PBS for up to twelve weeks. Repeated dosing of MEDI-551 resulted in significant (>90%) and sustained B cell depletion throughout the duration of the experiment. At week 12, spleen ASC were reduced by ≥90%; whereas, only dsDNA IgM BM ASC were reduced (70%). This reduction in spleen PC was correlated with a 40–80% reduction in autoantibodies specific for dsDNA, histone, and ANA. Total serum immunoglobulins were reduced ≤50% compared to control by 12 weeks.

Conclusion: In the autoimmune SLE1-huCD19 TG model, MEDI-551 is able to eliminate naïve as well as activated germinal center B cells and PC in spleen, but spared a majority of BM PC. MEDI-551 dosing resulted in a robust reduction of autoantibodies, whereas total Ig was moderately reduced. Thus, MEDI-551’s novel ability to remove a broad range of B cells and eliminate most disease-driving autoantibodies in an SLE model warrants continued research.

Disclosure: S. Gallagher, MedImmune, 3; Y. Wang, MedImmune, 3; I. Yusuf, MedImmune, 3; T. McCaughtry, MedImmune, 3; R. Herbst, MedImmune, 3; L. Carter, MedImmune, 3.

1451
Estrogen Receptor Alpha Deficiency Protects Against Cognitive Defects in Murine Lupus. Melissa A. Cunningham, Osama S. Naga, Heather A. Boger, Ann-Charlotte E. Granholm-Bentley and Gary S. Gilkeson. 1MUSC, Charleston, SC, 2Medical University of SC, Charleston, SC, 3Medical University of South Carolina, Charleston, SC.

Background/Purpose: Up to 80% of SLE patients have cognitive defects or affective disorders. The mechanism of CNS injury responsible for cognitive impairment is unknown. Anti-dsDNA antibodies cross-reacting with NMDA receptors in the brain mediate excitotoxic cell death, causing behavioral changes in lupus-prone mice. A breach in the blood-brain barrier (BBB) is required for these effects. Data suggest that BBB breakdown, pathogenic autoantibodies, and subsequent neuronal damage in key areas are critical to the development of neuropsychiatric SLE. We previously showed that estrogen receptor alpha (ERα) deficiency significantly reduced renal disease and increased survival in murine lupus. We hypothesized that ERα also plays a role in modulating BBB integrity and/or neuroinflammation leading to CNS dysfunction in lupus prone MRL/lpr mice.

Methods: MRL/lpr lupus mice (n=28) were ovariectomized at 4wks, received 90d-release estradiol pellets at 6wks, and underwent behavioral testing beginning at 8wks with radial arm water maze (RAWM) and novel object recognition (NOR). Mice were sacrificed at 12wks, or after re-testing at 20wks. Hippocampus, pre-frontal cortex, ventral striatum and parietal cortex were dissected. Western blotting and IHC were used to evaluate tight junction proteins, BBB and inflammatory mediators.

Results: MRL/lpr ERα−/− mice (n=9) performed significantly better in RAWM testing than WT MRL/lpr mice (n=11). There was a significant reduction in working memory errors (2.33 vs. 5.64, p=0.041), reference memory errors (5.22 vs. 12.73, p=0.033) and start arm errors (1.67 vs. 5.18, p=0.048) in ERα−/− mice at 8–10wks. There were no significant differences in NOR testing in discrimination index or latency to novel object, but ERα−/− mice spent significantly more time with both objects compared to WT MRL/lpr. Eight of 20 brains were processed and analyzed to date, with no significant differences seen in tight junction proteins (Zo-1 or occludin), however there is a trend towards reduced Zo-1 in hippocampus and cortex from ERα−/− mice. GFAP (astrogliosis marker) was not significantly different between groups, but there was a trend towards reduced iba1 (microgliosis marker) in hippocampus.

Conclusion: Preliminary data suggest a trend towards reduced microgliosis as a marker of inflammation in the hippocampus of ERα−/− mice. Most notably, ERα deficiency provides profound protection against cognitive deficits in MRL/lpr mice as early as 8wks of age.

Disclosure: M. A. Cunningham, None; O. S. Naga, None; H. A. Boger, None; A. C. E. Granholm-Bentley, None; G. S. Gilkeson, None.

1452
Inherent Strain-Based Differences in Qualitative CD4 T Cell Responses Determine Lupus Severity. Kateryna Soloviova, Maksym Pulaiev and Charles S. Via. Uniformed Services University of Health Sciences, Bethesda, MD.

Background/Purpose: A lupus-like disease can be induced in B6D2F1 mice by the transfer of parental DBA/2 splenocytes (DBA−/F1). Transfer of splenocytes from the other parent (B6−/F1) results in B6 anti-F1 CD8 cytotoxic T lymphocytes (CTL) that abort lupus by eliminating host lymphocytes, particularly B cells (acute graft-vs.-host disease[GVHD]). In DBA-
now show that T cells isolated from NZM2410 ERα−/− mice also produce less IL-17 and have reduced IL-21, ICOS, and IL23R mRNA levels compared with WT NZM2410. In addition, under Th17 polarizing conditions, fewer Th17 (IL17+CD4+) cells were attained from NZM2410 ERα−/− mice.

Conclusion: T cells from lupus-prone ERα−/− mice express less IL-17 and other markers of Th17 development and stabilization. Taken together, our previous and current data suggest that ERαs impacts the IL-23/IL-17 inflammatory pathway. A reduction in Th17 cells may partially explain the decrease in inflammatory renal damage and increased survival in ERα deficient animals.

Disclosure: M. A. Cunningham, None; O. S. Naga, None; J. G. Eudaly, None; G. S. Gilkeson, None.

1454
Characterization of Renal Mononuclear Phagocyte Populations in Murine SLE Nephritis. Ranjit Sahu, Ramalingam Bethuankaickn and Anne Davidson.

Background/Purpose: Macrophages and dendritic cells contribute to renal damage in chronic renal diseases including lupus nephritis. However owing to their multiple phenotypic and functional variations, the role of these cells in organ pathology is still not defined. The present work examines the phenotype and functional characteristics of renal macrophages and dendritic cells in two murine lupus nephritis models.

Methods: A bead based enrichment step followed by cell sorting was used to isolate populations of interest. Cells were cultured in M-CSF or GM-CSF +/- LPS/IFNγ and analyzed by microscopy and for arginase activity and nitrite production. Antigen presentation capability was measured in mixed lymphocyte reactions. Flow cytometry was performed using multiple phenotypic markers. Gene expression was performed using real-time PCR.

Results: We identified two populations of macrophages and three populations of dendritic cells in both SLE models, with a large increase in the number of cells belonging to two of these five populations during active nephritis. F4/80+ monocyte derived macrophages, that are normally resident in the kidneys and increase in number during nephritis, do not differentiate into either M1 or M2 macrophages upon cytokine stimulation and acquire a mixed pro and anti-inflammatory functional phenotype during nephritis in both SLE strains that resembles the constitutively activated phenotype of gut F4/80+ macrophages. F4/80+ macrophages are infrequent in the kidneys of both strains and do not alter their phenotype during nephritis. CD11c+CD103+ DCs accumulate in large numbers during nephritis. These cells have a myeloid DC phenotype and can easily be distinguished from resident renal CD103+ DCs on the basis of morphology, motility and cell surface phenotype. Patterns of TLR expression and chemokine receptors differ between subsets.

Conclusion: This study highlights the heterogeneity of the macrophage/DC infiltrate in chronic SLE nephritis and provides an initial phenotypic and functional analysis of the different cellular components that can now be used to define the role of each subset in nephritis progression or amelioration.

Disclosure: R. Sahu, None; R. Bethuankaickn, None; A. Davidson, None.

1455
Mitochondrial Dysfunction in the Liver of Lupus-Prone MRL/Lpr Mice Prior to Disease Onset. Zachary A. Oaks, Tiffany Telarico and Andras Perl.

Background/Purpose: Liver dysfunction, characterized by serum elevation of liver enzymes, is detectable in 20% of patients with systemic lupus erythematosus (SLE). Males had a higher prevalence of liver dysfunction (12/33: 36%) than females (65/387; 18%; p=0.014; Yu and Perl submitted). Patients with SLE have mitochondrial dysfunction with increased mitochondrial mass and transmembrane potential, yet the biochemical consequences of mitochondrial accumulation in SLE have yet
to be determined. ATP generation is reduced in SLE, a process which is regulated by O₂ consumption through the electron transport chain (ETC) of mitochondria. Here, we characterize utilization of O₂ through the ETC and the generation of oxidative stress in pre-disease lupus-prone MRL/lpr mice to determine whether mitochondrial dysfunction precedes onset of SLE.

**Methods:** Mitochondrial ETC activity of isolated liver mitochondria was assessed in 4-week-old MRL/lpr lupus-prone mice as well as C57BL/6, MRL/MpJ, and Black 6/lpr age and gender-matched controls mice. ETC was measured with a Clark electrode. State IV respiration, a measurement of O₂ consumption through complex II, was measured by addition of succinate, ADP, and inorganic phosphate to isolated mitochondria. Hydrogen peroxide (DCF-DA), superoxide (HE), peroxynitrite (TMRM), and mitochondrial mass (NAO) were measured by flow cytometry of isolated liver mitochondria. Statistical analysis of data was done by paired t-tests and Pearson’s correlation analysis using GraphPad 5.0 software, with a cutoff of p<0.05 considered significant.

**Results:** 4 week old male MRL/lpr mice exhibited increased mitochondrial respiratory capacity, measured by complex II respiration, in comparison to C57BL/6 (25.8%, p = 0.03) and Black 6/lpr (11.4%, p = 0.004) control strains. Mitochondrial mass was increased in male MRL/lpr mice in comparison to C57BL/6 (+26.5%, p = 0.04) and Black 6/lpr (+55.5%, p = 0.001). Male MRL/lpr mitochondria also had increased mitochondrial potential (+64.2%, p = 0.006), production of hydrogen peroxide (+60.0%, p = 0.02), superoxide (+72.4%, p = 0.03), nitric oxide (56.1%, p = 0.0004), and peroxynitrite (107.9%, p = 0.0005) relative to Black 6/lpr controls. Mitochondrial potential positively correlated with production of hydrogen peroxide (r = 0.883, p = 0.047), superoxide (r = 0.881, p = 0.049), and peroxynitrite (r = 0.912, p = 0.031). MRL/lpr females had increased complex II state 4 respiration (+51.2%, p = 0.02) relative to Black 6 controls.

**Conclusions:** Mitochondrial dysfunction, characterized by increased respiratory capacity and increased mitochondrial mass, precedes disease onset in lupus-prone MRL/lpr mice. We show these changes correlate with increased production of reactive oxygen and nitrogen intermediates, which cause oxidative stress in SLE. Mitochondrial dysfunction in MRL/lpr was more robust in males than females that may account for a higher prevalence of liver disease in men than women with SLE.

**Disclosure:** Z. A. Oaks, None; T. Telarico, None; A. Perl, None.

**1456**


**Background/Purpose:** The tolerogenic peptide, designated hCDR1, was shown to ameliorate manifestations of systemic lupus erythematosus (SLE) via down-regulation of pro-inflammatory cytokines, up-regulation of immunosuppressive cytokines and molecules and the induction of regulatory T cells. Because type I interferon (IFN-a) has been implicated in the pathogenesis of SLE, we investigated the effects of hCDR1 on IFN-a in a murine model of SLE and in human lupus.

**Methods:** (NZBxNZW)F1 female mice with established SLE manifestations were treated with hCDR1 (10 weekly subcutaneously injections) or with the vehicle alone. The effects on anti-dsDNA antibody levels, proteinuria and kidney immunohistology were assessed. Splenocytes were obtained for gene expression studies. Peripheral blood lymphocytes (PBL) of lupus patients (10), primary anti-phospholipid syndrome (APS) patients (5) and healthy controls (5) were incubated in vitro for 48 hours with hCDR1 or medium prior to gene expression assays. Lupus patients were treated for 26 weeks with hCDR1 (5) or placebo (4) in a Phase II clinical trial by weekly subcutaneous injections. Disease activity was assessed using SLEDAI-2K and BILAG scores [1]. Blood samples were collected, before and after treatment, in PAXgene tubes and frozen until mRNA isolation. Gene expression of IFN-a was determined by real-time RT-PCR.

**Results:** 4 week old mice of (NZBxNZW)F1 SLE afflicted mice with hCDR1 down-regulated significantly IFN-a gene expression (73% inhibition compared to vehicle, p = 0.002). The latter was associated with diminished anti-dsDNA titers as well as proteinuria and glomerular immune complex deposit levels. Further, hCDR1 reduced, in vitro, the IFN-a gene expression in PBL of lupus patients (74% inhibition compared to medium, p = 0.002). hCDR1 had no significant effects on the expression levels of IFN-a in PBL of primary APS patients or of healthy controls. Moreover, a significant reduction in IFN-a was determined in PBL of lupus patients that were treated with hCDR1 for 26 weeks (64.4% inhibition compared to pretreatment expression levels, p = 0.015). No inhibition of IFN-a expression was observed in PBL of placebo treated patients. In agreement, as previously reported, treatment with hCDR1, but not with placebo, resulted in a significant decrease of disease activity as determined by the BILAG and SLEDAI-2K scores [1].

**Conclusion:** Treatment with hCDR1 resulted in a significant amelioration of lupus manifestations in murine models. Studies of a limited number of lupus patients indicated beneficial effects in hCDR1 treated patients. We reported previously that hCDR1 affected various cell types and immune pathways involved in the pathogenesis of SLE. The present studies demonstrate that hCDR1 is also capable of down-regulating significantly (and specifically to lupus) IFN-a that has been recently considered as a target for SLE therapy. Thus, hCDR1 has a potential role as a novel, disease specific treatment for human lupus.

**Disclosure:** Z. M. Shoeger, None; H. Zinger, None; A. Sharabi, None; I. Asher, None; E. Mozes, None.

**1457**

**A Novel Small Molecular Anti-Rheumatic Drug, T-614, Ameliorates Lupus-Like Disease in MRL/lpr Mice by Suppressing B Cell Functions.** Qinqan Yan, Fang Du and Chunde Ba. Renji Hospital, Shanghai, China.

**Background/Purpose:** T-614 is a small molecular drug that has multiple immunomodulatory effects and has been used for treating rheumatoid arthritis. Previous work has revealed this agent may have inhibitory effects on B cells. Since excessive B cell activation is a characteristic of systemic lupus erythematosus (SLE), here we investigated efficacy of T-614 on lupus-like disease and its potential mechanism in MRL/lpr mouse, a classic lupus model.

**Methods:** Female MRL/lpr mice were randomly given T-614 (30mg/kg, iv), vehicle solution or cyclophosphamide (CTX, 20mg/kg w) as controls before their disease onset. 24-hour-urine and blood samples were collected regularly. Kidney and spleen samples of each mouse were collected at the end point of observation. Urine protein concentrations were measured by bicinchoninic acid protein assay, serum C3 and immunoglobulin were detected by ELISA, anti double strand DNA (dsDNA) antibody titers were quantified by radioimmunoassay and serum alanine transaminase (ALT), creatinine and blood cell counts were analyzed by auto analyzer. Expressions of B cell related cytokines by splenic cells were determined by real-time polymerase chain reaction, CD20+ B cell invasions in kidney were detected by immunohistochemistry, immune complex deposition in kidney was determined by immunofluorescence, and kidney injury was blindly scored by a renal pathologist.

**Results:** T-614 ameliorated lupus-like disease activity in MRL/lpr mice. Mice in T-614 group had lower frequency of severe proteinuria (over 20mg/24h, Figure A), lower serum creatinine (15.53 ± 0.5845 vs 19.19 ± 0.9184 μmol/L, P = 0.025) and higher levels of serum C3 (2.027 ± 0.1807 vs 1.296 ± 0.0866 g/L, P = 0.026) than vehicle controls. Kidneys from T-614 treated mice had less lymphocyte invasions, crescents, casts in tubula and vasculitis changes than those from controls. Glomerular injury scores showed statistically significant difference (median: 1.46, QR 1.35–3.745 vs median: 3.37, QR 2.17–4.0, P = 0.0381) between these two groups. Immunofluorescence also showed less immune complex depositions in kidneys from T-614 group. For B cells, T-614 remarkably reduced serum immunoglobulin (Figure B), anti-dsDNA antibody titers (Figure C) and B cell related cytokine (Figure D) expressions in splenic cells. Notably, effects of T-614 on immunoglobulin and B cell cytokines were comparable to CTX. Furthermore, mice from T-614 group had less CD20+ B cell invasions in their kidneys than vehicle group (median: 1.0 vs 2.0, QR 0.875–2.0 vs midian: 2.0, QR 2.0–3.0, P = 0.0157). Lastly, overt adverse effects, including infection, elevated serum ALT or abnormal peripheral blood cell counts, were not observed.
Conclusion: T-614 can ameliorate lupus-like disease in MRL/lpr mice most likely through B cell suppression without overt toxicity. Our results suggest that T-614 has potential for the therapy of SLE.

Disclosure: Q. Yan, None; F. Du, None; C. Bao, None.

ACR/ARHP Poster Session B
Systemic Sclerosis, Fibrosing Syndromes, and Raynaud’s – Clinical Aspects and Therapeutics
Monday, November 12, 2012, 9:00 AM–6:00 PM

**1458**

**Left Ventricular Diastolic Dysfunction May Play a Role in Pathophysiology and Poor Prognosis of Pulmonary Arterial Hypertension Associated with Systemic Sclerosis.** Sumiaki Tanaka1, Eisuke Ogawa1, Tatsuhiko Wada1, Tatsuo Nagai1, Jun Okada2 and Shunsei Hirohata1. 1Kitasato University School of Medicine, Sagamihara, Japan, 2Kitasato University, Sagamihara, Japan

**Background/Purpose:** Cardio-pulmonary involvements of systemic sclerosis (SSc), including cardiomyopathy, interstitial lung disease, and pulmonary arterial hypertension (PAH) are leading causes of SSc-related deaths. Several potent effective PAH-specific therapies have recently been recently available, improving survival of patients with overall PAH. However, the survival of patients with PAH associated with SSc (SSc-PAH) is still poorer than that of patients with PAH associate with other connective tissue diseases (CTDs). To explore the characteristics relevant to poor survival of SSc-PAH patients, we analyzed hemodynamics data.

**Methods:** We analyzed 157 right heart catheter data obtained from 66 patients with PAH associated with CTDs, including 30 patients with SSc, and 36 non-SSc-CTD patients (17 patients with SLE, 13 patients with MCTD and 6 patients with other CTDs), who had been followed between January 1980 and April 2012 in our hospital. We compared mean pulmonary artery pressure (mPAP), cardiac output (CO), pulmonary capillary wedge pressure (PCWP) and pulmonary vascular resistance (PVR) between SSc-PAH patients and non-SSc-PAH patients. Survival from the date of the initial diagnosis of PAH was measured, and analyzed using Cox’s proportional hazard model.

**Results:** The values (mean ± SD) of mPAP, CO, PCWP, and PVR at the initial diagnosis of PAH were 37.7 ± 11.3 mmHg, 4.6 ± 1.2 L/min, 7.7 ± 3.5 mmHg, and 6.9 ± 3.8 Wood’s units, respectively. Thirty-six of the 66 patients died. Cox’s proportional hazard model estimated that lower CO, higher PVR and higher PCWP, but not mPAP in hemodynamics at the initial diagnosis of PAH appeared to be risk factors for death (Table). Of the 36 patients who died, 20 were SSc-PAH patients. Moreover, PCWP measured throughout the course of PAH was significantly higher in SSc-PAH patients than that in non-SSc-PAH patients (8.66 ± 3.93 mmHg, 6.79 ± 2.73 mmHg, respectively; p=0.0354) (figure).

**Conclusion:** These results demonstrate that the presence of left ventricular diastolic dysfunction as evidenced by the elevation of PCWP plays a role in pathophysiology. The data therefore suggest the importance of care for left ventricular diastolic dysfunction under management using PAH-specific therapies in order to improve prognosis in SSc patients.

Disclosure: S. Tanaka, None; E. Ogawa, None; T. Wada, None; T. Nagai, None; J. Okada, None; S. Hirohata, None.

**1459**

**Limited Utility of Pulmonary Function Tests and B-Type Natriuretic Peptide As Screening Tools for Pre-Capillary Pulmonary Hypertension in Patients with Systemic Sclerosis.** Yuchiro Shira1, Yuichi Tamura1, Hidekata Yasuoka1, Tsutomu Takeuchi1, Toru Satoh1 and Masataka Kawan1. 1Keio University School of Medicine, Tokyo, Japan, 2Kyorin University School of Medicine, Tokyo, Japan

**Background/Purpose:** A series of recent studies indicate that early detection of pulmonary hypertension (PH) improves a survival in patients with systemic sclerosis (SSc). Thus, annual screening based on echocardiography combined with Doppler procedure is recommended in SSc patients. On the other hand, pulmonary function test (PFT) and B-type natriuretic peptide (BNP) are also reported to be useful for identifying patients with PH, but roles of these tests in routine PH screening remain unclear. We evaluated if PFT parameters and BNP, in combination with or without echocardiography, are useful as screening tools for PH in patients with SSc.

**Methods:** This single-center observational study enrolled 94 consecutive SSc patients who visited our center between January 2008 and June 2012, and underwent PFTs, serum BNP measurement, and echocardiography for PH screening. Our routine screening program consists of two steps: i) selection of patients suspected to have PH based on dyspnea symptoms and echocardiography that assesses morphology and estimated systolic pulmonary arterial pressure (esPAP) calculated from tricuspid regurgitation velocity and presumptive right atrial pressure (5 mmHg), and ii) diagnostic confirmation by right heart catheterization (RHC) in patients with esPAP >50 mmHg. esPAP 37–50 mmHg with echocardiographic variables suggestive of PH, or unexplained dyspnea. Patients with mean pulmonary arterial pressure ≥25 mmHg at rest and pulmonary capillary wedge pressure <15 mmHg were diagnosed as having pre-capillary PH (pre-PH). We also enrolled 14 incident SSc cases with pre-PH. PFT variables recorded were %FVC, %DLCO, %DLCO/VA, and a ratio of %FVC and %DLCO or %DLCO/VA. Receiver-operating characteristic (ROC) curve analysis was performed to obtain area under the curve (AUC) and optimal cut-off values.

**Results:** Of 94 patients screened, 19 underwent RHC, resulting in diagnosis of pre-PH in 5 patients. Individual screening parameters were compared between 89 patients without pre-PH and 19 with pre-PH consisting of 14 incident and 5 newly identified cases. There were significant differences in %DLCO, %DLCO/VA, %FVC/%DLCO ratio, %FVC/%DLCO/VA ratio,
and serum BNP between PH and non-PH groups (P <0.01 for all comparisons). ROC analysis revealed that %FVC%/DLCO was the best PFT parameter that discriminated PH and non-PH cases (AUC 0.76), while BNP and esPAP gave the higher AUC (0.93 and 0.98, respectively). The %FVC%/DLCO ratio provided sensitivity of 79% and specificity of 76% when cut-off was set at 2.45, while BNP gave sensitivity of 84% and specificity of 91% with the cut-off of 86 pg/mL. Diagnostic utility of these two tests were apparently inferior to esPAP, which provided sensitivity of 100% and specificity of 93% with the cut-off of 45 mmHg. When %FVC%/DLCO ratio and BNP were combined with esPAP, the specificity was increased from 93% to 96% without decrease of sensitivity.

**Conclusion:** Our results clearly indicate PFT or BNP alone was inappropriate for PH screening in SSC. Simultaneous measurement of PFT and BNP with echocardiography slightly improves diagnostic accuracy, indicating limited utility of these tests in current echocardiography-based screening program.

Disclosure: Y. Shirai, None; Y. Tamura, None; H. Yasouka, None; T. Takeuchi, None; T. Satoh, None; M. Kuwana, None.

### 1460

Unmasking Latent Pulmonary Arterial Hypertension by Fluid Challenge in Patients with Systemic Sclerosis. Ameex Sonigra1, Melanie Hurd- ford3, Patricia Lewis1, David Kilpatrick1, Nathan Dwyer1 and Jane Zochling2.

1Royal Hobart Hospital, Hobart, Australia, 2Menzies Research Institute, Hobart, Australia, 3Menzies Research Institute Tasmania, Hobart, Australia

**Background/Purpose:** Pulmonary arterial hypertension (PAH) is associated with high morbidity and mortality in Systemic Sclerosis. Early diagnosis and treatment leads to substantial improvements in quality of life, prognosis and mortality. Right heart catheterization remains the only test that can diagnose PAH and differentiate it from pulmonary venous hypertension or diastolic dysfunction. Controversies exist in unmasking PAH with exercise challenge due to the inability to differentiate PAH from other forms of PH.

**Methods:** Our study includes 173 Systemic Sclerosis patients enrolled in the Australian Systemic Sclerosis Epidemiology (TASSIE) study, recruited from rheumatologists, physicians, cardiologists, general practitioners and other health professionals across Tasmania since 2007. Echocardiogram and pulmonary function tests were routinely performed on each patient at screening and at annual follow up. Right heart catheter was performed when clinically indicated. A proportion of symptomatic patients underwent right heart catheterization with fluid challenge based on clinical suspicion of PAH or diastolic dysfunction. Treatment for PAH was initiated in all patients who qualified under current regulations. Treatment effects on their six minute walk distance were measured on each patient at follow-up. Improvement in 6MWT was observed in both groups (46.66 in New PH group vs 51.5 in the no-PH group) but there was not a further significant decrease in those who had a repeat DLCO at the time of diagnosis of PH. There was no difference in the age, sex, disease duration or SSC subgroup in patients with New PH and those with no PH. All patients had long disease duration (mean 11.7 years of Raynaud’s) and 64% had limited SSc. The baseline DLCO was low in both groups (46.66 in New PH group vs 51.5 in the no-PH group) but there was not a further significant decrease in those who had a repeat DLCO at the time of diagnosis of PH. There was no difference in 6MWT at baseline, but patients with New PH had a significant decrease in the mean 6MWT distance of 60.27 meters at the time of diagnosis of PH, compared to the no PH group (13m) (p<0.01). Those that progressed to PH also exhibited significant oxygen desaturation during 6MWT (saturation <92%) both at baseline and at time of diagnosis of PH which was not experienced by the no PH group (p<0.01). There were 22 deaths in the pre PH group: 3 year survival was 92%. Three of the 35 New PH patients died of PH, 6 pre-PAH died of interstitial lung disease, 6 had multisystem organ failure and 7 others were either non-SSc or unknown. Patients who died had lower DLCO at baseline than those who were still living. 53% vs 51% (p<0.01)

**Conclusion:** We show that 24% of the prePAH SSc patients developed PH by 4 years. In addition to the known high risk features of long standing limited scleroderma and a low DLCO, patients had a decreasing 6M WT distance and significant 02 desaturation prior to the diagnosis of PH by RHC. Overall, 3 year survival of these patients was 92%, but death rate of high risk patients were associated with a very low DLCO. Our study shows the usefulness of the serial 6MWT distance and exercise induced hypoxia to determine patients that may progress to PH. We hope that early identification and treatment of SSc -PH will significantly alter the long-term outcome of these patients.

Thanks to Peilin Cui for statistical analysis.

Disclosure: A. Z. Goldberg, None; V. M. Hsu, None; V. D. Steen, Gilead Science, 2, Aetion Pharmaceuticals US, 2, United Therapeutics, 2, Roche Pharmaceuticals, 2.

### 1462

Expert Consensus for Performing Right Heart Catheterization in Suspected Pulmonary Arterial Hypertension in Patients with Systemic Sclerosis: A Delphi Consensus Study with Cluster Analysis From the Eposs Group. Jerome Avouac1, Dörte Huscher2, Daniel E. Furst3, Oliver Distler4 and Yannick Allarone1.

1Paris Descartes University, Rheumatology A department, Cochin Hospital, Paris, France, 2German Rheumatism Research Centre and Charite´ University Medicine, Berlin, Germany, 3UCLA Medical School, Los Angeles, CA, 4University Hospital Zurich, Zurich, Switzerland

**Background/Purpose:** Pulmonary hypertension (PH) has emerged as a critical cause of death in systemic sclerosis (SSc). Recent data have highlighted the poorer outcomes of SSc associated PAH as compared to idiopathic PH. Therefore, the management of SSc associated PAH risk must be improved to allow early diagnosis. However, there is presently no guideline regarding the parameters that should lead the physician to perform right heart catheterization, the only tool unequivocally establishing...
the correct diagnosis. Our aim was, by consensus, to identify the most appropriate indications for RHC in patients with SSc.

Methods: A three-stage Delphi exercise involving worldwide PH experts was designed to answer the following question: “based on which parameters, performed on the basis of an annual screening of SSc patients in clinical practice, do you decide to refer patients for RHC?” The Delphi exercise was performed between March 2011 and December 2011.

The aim of the first stage was to obtain a comprehensive list of domains and tools to be considered before referring a SSc patient for RHC. This list combined evidence-based indications extracted from published reports on SSc-PH and expert opinions. For the second stage, experts were asked to rate each item proposed in the list, using a 5-point scale (1 indicates “not important/appropriate at all” and 5 indicates “very important/appropriate”). For the third stage, experts were asked to rate the items accepted after the second round, using the same 5-point scale. After each of stages 2 and 3, the number of domains and tools was reduced according to a cluster analysis. The number of clusters was generated by an automatic cluster algorithm using Bayes information criterion.

Results: 77 experts were contacted by e-mail to participate in this Delphi procedure. 47 (61%) participated in stage 1, 50 (65%) of the 77 in stage 2, and 48 (62%) of the 77 in stage 3. The list obtained after the first stage consisted on 7 domains (clinical, biomarkers, pulmonary function tests, echocardiography, cardiopulmonary exercise, imaging and EKG) containing a total of 142 tools. Cluster analysis performed after the second stage allowed discarding of 63 of the 142 initial tools. Cluster analysis performed after stage 3 reduced the EPOSS instrument to 3 domains containing 8 items (see table).

<table>
<thead>
<tr>
<th>Domains</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical tools</td>
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<td>*Unexplained dyspnea</td>
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<td></td>
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<td></td>
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Conclusion: Among experts in PH-SSc, a core set of indications for clinical practice has been defined to refer SSc patients to RHC in case of PH suspicion. This EPOSS instrument is the first expert guidelines for PH detection that is based on validated consensus methods. Although these indications are recommended by this expert group, it is an interim tool. It will be necessary to formally validate and extend the EPOSS instrument in further studies, both for clinical practice and in terms of additional research.

Disclosure: J. Avouac, Actelion Pharmaceuticals US, 2, Pfizer Inc, 2; D. Huscher, None; D. E. Furst, Abbott, Actelion, Amscan, BMS, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 2; Abbott, Actelion, Amscan, BMS, Biogenedcent, Centocor, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 5; Abbott, Actelion, UCB, 8; O. Biotte, Actelion, Bayer, Pfizer, Ergxome, BMS, Sanofi-Aventis, United BioSource Corporation, medica, Biovittiam, Boehringer Ingelheim Pharma, Novartis, 4 D Science and Active Biote, 2; Actelion, Bayer, Pfizer, Ergxome, BMS, Sanofi-Aventis, United BioSource Corporation, medica, Biovittiam, Boehringer Ingelheim Pharma, Novartis, 4 D Science and Active Biote, 2; Actelion, Pfizer and Ergxome, Y. V. Allano, Actelion Pharmaceuticals US, 2, Pfizer Inc, 2.

1463 Pulmonary Hypertension and Interstitial Lung Disease within Pharos: Impact of Extent of Fibrosis and Pulmonary Physiology On Cardiac Hemodynamic Parameters, Aryeh Fischer1, Stephen C. Mathai2, Marcy B. Bolster3, Lorinda Chung4, Mary Ellen Csuka5, Robyn T. Domsic6, Tracy M. Frech7, Mardi Gomberg-Maitland11, Aida Manu12, Robert W. Simms13 and Virginia D. Steen14. 1National Jewish Health, Denver, CO, studies, both for clinical practice and in terms of additional research. If no differences were recommended by this expert group, it is an interim tool. It will be necessary to formally validate and extend the EPOSS instrument in further studies, both for clinical practice and in terms of additional research.

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1464 Comparison of Baseline Characteristics of the Combined Response Index for Systemic Sclerosis (CRiSS) Cohort to Patients Enrolled in Clinical Trials of Diffuse Systemic Sclerosis, Heather Gladue1, De Furst2, Veronica Berrocal1, James R. Seibold3, Peter A. Merkel4, Maureen D. Mayes5, Kristine Phillips6, Robert W. Simms7, Shervin Assassi8, Philip J. Clements9, Paul Mararian10 and Dinesh Khanna11. 1University of Michigan, Ann Arbor, MI, 2University of California at Los Angeles, Los Angeles, CA, 3Scleroderma Research Consultants LLC, Avon, CT, 4University of Pennsylvania, Philadelphia, PA, 5University of Texas Health Science Center at Houston, Houston, TX, 6University of Michigan Medical School, Ann Arbor, MI, 7Brown University School of Medicine, Boston, MA, 8Univ of Texas Health Science Houston, Houston, TX, 9UCLA School of Medicine, Los Angeles, CA, 10UCR Medical School, Los Angeles, CA.

Background/Purpose: Randomized clinical trials (RCTs) of treatment of diffuse systemic sclerosis (dSSc) would benefit from a composite index that predicted efficacy better than current standard measures that are based on single organ systems. As a first step to achieve the goal of a validated composite index, a longitudinal observational registry was launched in the U.S.: the combined response index for SSc (CRiSS) cohort. We aim to compare the baseline characteristics of the 200 patient CRiSS cohort with those of 3 large dSSc clinical trials to ascertain whether the CRiSS patients are representative of the patients in dSSc clinical trials.

Methods: We compared the baseline clinical characteristics of the 200 patients enrolled in the CRiSS cohort to patients who participated in 3 large RCTs in dSSc: the Oral Collagen, the D-Penicillamine, and the Relaxin trials. Patients were enrolled into the CRiSS cohort from 4 scleroderma
centers and all study patients have early dcSSc (<5 years from first non-Raynaud’s sign or symptom).

Results: The Table provides comparison between CRISSE and the 3 RCTs. The CRISSE cohort is similar across all 3 trials for most of the 15 measured features. The CRISSE cohort is similar to the Oral Collagen trial being statistically not different for 13 of 15 measures; it is similar to the D-Pen cohort for 11 of 15 measures and similar to the Relaxin cohort for 9 of 15 measures.

While statistical differences existed for age, gender, BMI, tender joints, DLCO and MD global in some comparisons, majority were not clinically meaningful.

Table. Baseline data for study subjects in the CRISSE cohort and comparison clinical trials

<table>
<thead>
<tr>
<th>Variable</th>
<th>WHO 1</th>
<th>WHO 2</th>
<th>WHO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>p-value (1v2)</td>
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<td>0.0060</td>
<td>0.0119</td>
</tr>
<tr>
<td>p-value (1v3)</td>
<td>0.0023</td>
<td>0.0060</td>
<td>0.0119</td>
</tr>
<tr>
<td>p-value (2v3)</td>
<td>0.0023</td>
<td>0.0060</td>
<td>0.0119</td>
</tr>
</tbody>
</table>

Conclusions: Overall survival in the PH patients enrolled in PHAROS is better in this observational cohort than in other recent studies, but WHO Group classification did not affect survival over the present period of observation. How these categorizations affect the prognosis of PH pts will need to be continued in the long-term follow-up of the PHAROS cohort.

Background/Purpose: Pulmonary hypertension (PH) is a leading cause of death in patients (pts) with Systemic Sclerosis (SSc). The World Health Organization (WHO) classifies PH into groups: pulmonary arterial hypertension (PAH - Group 1); PH secondary to left heart dysfunction or pulmonary venous hypertension (PVH - Group 2); and PH secondary to pulmonary disease (PH-ILD - Group 3). Our objective was to compare the clinical features and survival among the 3 PH groups.

Methods: Pts in the PHAROS database with PH, defined by a mean PAWP ≤25 mmHg on initial right heart catheterization (RHC), were categorized by WHO criteria. A pulmonary capillary wedge pressure (PCWP) <15 mmHg differentiated Group 1 and 2. Pts with ILD with a forced vital capacity (FVC) <65% predicted or significant fibrosis on chest CT with a normal PCWP were included in group 3. Statistical analysis was carried out using ANOVA, logistic regression, and Kaplan-Meier estimates.

Results: There are 248 pts with PH in the PHAROS database: PAH – 160, PVH – 49, and PH-ILD 139. Demographic and clinical differences are summarized in the table below. PHAROS pts are slightly older, more likely to be anti-centromere (ACA) positive, and to have limited SSc. Pts with PVH are more likely to be African-American (AA).

Pts have been observed for up to 6.5 yrs. The median period of observation is PAH 5.02, PVH 1.86, and PH-ILD 2.82 yrs. The 1-year survivals were as follows: PAH 91.8%, PVH 95.2%, and PH-ILD 81.3%, and the 3-year survivals were: PAH 79.4%, PVH 79.1%, and PH-ILD 61.3%. Although the PH-ILD had only a 61% 3 year survival, Kaplan-Meier analysis did not show a significant difference in time to death between the groups, p = 0.28, and Cox regression analysis did not show a difference between the groups with respect to survival. Using univariate logistic regression, we assessed the following baseline features as predictors of death: age, gender, race, antibody, disease duration, SSc subtype, RHC parameters, and pericardial effusion. Diffuse subtype was a predictor of death with OR of 1.9 (95% CI 1.008, 3.82), p = 0.047. Higher mPAP on RHC was statistically significant with an OR 1.03 (1.005, 1.064), p = 0.026. The presence of an effusion missed statistical significance (OR 1.93 (0.977, 3.796), p = 0.058).

Conclusion: The CRISSE cohort is generally representative of patients enrolled in large multicenter RCTs of dcSSc and will be fit for the purpose of developing a composite response index. The CRISSE cohort will also be a valuable resource for studying the clinical characteristics of patients with early dcSSc followed at major academic centers and treated according to the current standards of care.

Disclosure: H. Gladue, None; D. Furst, Aman, Jansen, Roche, and UCB, 2, Aman, Jansen, Roche, and UCB, 2, V. Berrocal, None; J. R. Seibold, Actelion Pharmaceuticals EU, 5, United Therapeutics, 5, Bayer Pharmaceuticals, 5; P. A. Merkel, Actelion Pharmaceuticals US, 5, Genzyme Corporation, 5, Celgene, 2, Genentech and Biogen IDEC Inc., 2, Bristol-Myers Squibb, 2, Human Genome Sciences Inc., 2, Protogen Therapeutics, 2, M. D. Mayes, None; K. Phillips, None; R. W. Simms, None; S. Assassi, None; P. J. Clements, None; P. Maranian, None; R. T. Domsic, None; W. T. Huang, None; J. R. Seibold, None; W. T. Huang, None; S. L. Lyman, None; E. M. Horn, None; V. D. Steen, Gilead, 5.

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World Health Organization Classification of Pulmonary Hypertension and Survival in Systemic Sclerosis Patients in the Pharos Cohort. Jessica K. Gordon,1 Lorinda Chung,2 Robyn T. Domisch,3 Wei-Ti Huang,4 Stephen L. Lyman,1 Evelyn M. Horn5 and PHAROS Investigators. 1Hospital for Special Surgery, New York, NY, 5New York Presbyterian Hospital/Weill Cornell Medical College, New York, NY, 6Georgetown Univ Medical Center, Washington, DC, 7Washington, DC

Background/Purpose: Pulmonary hypertension (PH) is a leading cause of death in patients (pts) with Systemic Sclerosis (SSc). The World Health Organization (WHO) classifies PH into groups: pulmonary arterial hypertension (PAH - Group 1); PH secondary to left heart dysfunction or pulmonary venous hypertension (PVH - Group 2); and PH secondary to pulmonary disease (PH-ILD - Group 3). Our objective was to compare the clinical features and survival among the 3 PH groups.

Methods: Pts in the PHAROS database with PH, defined by a mean PAWP ≤25 mmHg on initial right heart catheterization (RHC), were categorized by WHO criteria. A pulmonary capillary wedge pressure (PCWP) <15 mmHg differentiated Group 1 and 2. Pts with ILD with a forced vital capacity (FVC) <65% predicted or significant fibrosis on chest CT with a normal PCWP were included in group 3. Statistical analysis was carried out using ANOVA, logistic regression, and Kaplan-Meier estimates.

Results: There are 248 pts with PH in the PHAROS database: PAH – 160, PVH – 49, and PH-ILD 139. Demographic and clinical differences are summarized in the table below. PHAROS pts are slightly older, more likely to be anti-centromere (ACA) positive, and to have limited SSc. Pts with PVH are more likely to be African-American (AA).

Pts have been observed for up to 6.5 yrs. The median period of observation is PAH 5.02, PVH 1.86, and PH-ILD 2.82 yrs. The 1-year survivals were as follows: PAH 91.8%, PVH 95.2%, and PH-ILD 81.3%, and the 3-year survivals were: PAH 79.4%, PVH 79.1%, and PH-ILD 61.3%. Although the PH-ILD had only a 61% 3 year survival, Kaplan-Meier analysis did not show a significant difference in time to death between the groups, p = 0.28, and Cox regression analysis did not show a difference between the groups with respect to survival. Using univariate logistic regression, we assessed the following baseline features as predictors of death: age, gender, race, antibody, disease duration, SSc subtype, RHC parameters, and pericardial effusion. Diffuse subtype was a predictor of death with OR of 1.9 (95% CI 1.008, 3.82), p = 0.047. Higher mPAP on RHC was statistically significant with an OR 1.03 (1.005, 1.064), p = 0.026. The presence of an effusion missed statistical significance (OR 1.93 (0.977, 3.796), p = 0.058).

Conclusion: The CRISSE cohort is generally representative of patients enrolled in large multicenter RCTs of dcSSc and will be fit for the purpose of developing a composite response index. The CRISSE cohort will also be a valuable resource for studying the clinical characteristics of patients with early dcSSc followed at major academic centers and treated according to the current standards of care.

Disclosure: J. K. Gordon, None; L. Chung, Gilead and Actelion, 5, Gilead, Actelion, Pfizer, United Therapists, 2; R. T. Domisch, None; W. T. Huang, None; S. L. Lyman, None; E. M. Horn, None; V. D. Steen, Gilead, 5.
cyclophosphamide, over one third of patients will experience a decline in lung function, death or require a lung transplant. The objective of this retrospective cohort is to document the causes of mortality in a UK based population with systemic sclerosis based in a tertiary centre in the North East of England over a period of seven years, and to review the causes of death in those patients treated aggressively with cyclophosphamide.

**Methods:** All patients attending a North East of England Tertiary Medical Centre with systemic sclerosis were identified using the departmental database. From this group, all patients who died between 2003 and 2010 were identified. Medical records were reviewed and government death certificates were obtained for these patients. Patients were excluded from the study if either of these resources were not available.

**Results:** Of the twenty patients identified, five were male and fifteen were female. Four patients had a diagnosis of diffuse systemic sclerosis. Sixteen had a diagnosis of limited disease.

More patients died of non-systemic sclerosis related (NSR) causes (55%) than systemic sclerosis related (SR) causes. These included cancer (not related to cyclophosphamide) (25%), infection (15%), and other chronic disease (15%). Of the eleven patients treated with cyclophosphamide therapy, nine (82%) died of their underlying lung disease. The leading scleroderma related cause of death in systemic sclerosis were ILD (30% of all deaths), followed by pulmonary hypertension (10% of all deaths).

**Conclusion:** This highlights the importance of screening for organ complications of systemic sclerosis. Patients are, however more likely to die of non-systemic sclerosis related diseases. Physicians should therefore also remain vigilant for NSR disease such as malignancy, which accounted for 25% of deaths.

**Disclosures:** R. L. Batten, None; B. Griffiths, None.

### 1467

**Association of Gastroesophageal Factors and Progression of Interstitial Lung Disease in the Canadian Scleroderma Research Group, a Large, Multicenter Database.** Xuli Jerry Zhang1, Ashley Bonner2, Murray Baron3, Marie Hudson4, Janet E. Pope1 and Canadian Scleroderma Research Group5.

1Western University, London, ON, 2McMaster University, Hamilton, ON, 3Jewish General Hospital, Montreal, QC, 4McGill University, Montreal, QC, 5Western University of Canada, St. Joseph’s Health Care, London, ON, 6Montreal

**Background/Purpose:** Interstitial lung disease (ILD) is a common complication of systemic sclerosis (SSc) and is a leading contributor to mortality in SSc patients. Once lung fibrosis occurs, lung function disease course may become stable or progressively decline. While some demographic and SSc-related factors have been associated with development of ILD, little is known about what contributes to progression. We studied the clinical manifestations of SSc-gastroesophageal (GE) involvement in relation to ILD status to determine associations between GE involvement and ILD progression in SSc. Our objective was to determine if GE reflux and dysphagia are associated with progressive ILD as measured by FPTIs over three years.

**Methods:** Canadian Scleroderma Research Group (CSRG), a multicenter database of adult SSc patients, annually evaluates and collects patient information including demographics, skin manifestations, internal organ involvement and function assessment data. Using indicators of GE involvement and annual pulmonary function test results from the CSRG database, comparisons were made between no ILD, stable ILD and progressive ILD groups based on FVC% predicted. Univariate and multivariate analysis were used to determine association between GE factors and ILD development and progression.

**Results:** The study included data of 1043 SSc patients with mean age of 55.7 years and mean disease duration of 10.8 years. Among the variables of interest, physician indicators such as esophageal dysmotility (P=0.009) and post-esophageal dilatation (P=0.041) along with patient indicators such as difficulty swallowing (P=0.016), waking up choking (P=0.026) appeared to significantly increase risk of developing ILD. In comparing progressive vs. stable ILD patients, early satiety (P=0.018) and combination term composed of post-dilatation*choking (p=0.042) increased risk of ILD progression.

**Table 1. Logistic regression models for dysphagia and GERD indicators**

<table>
<thead>
<tr>
<th>Model</th>
<th>COVARIATES</th>
<th>Difficulty</th>
<th>Swallowing</th>
<th>Choking</th>
<th>Heartburn</th>
<th>Food/Acid</th>
<th>Early Satiety</th>
<th>Interaction Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>ES/RA/102</td>
<td>0.497 (.024)</td>
<td>.500 (.026)</td>
<td>0.470 (.017)</td>
<td>0.480 (.020)</td>
<td>0.505 (.029)</td>
<td>0.485 (.028)</td>
<td>0.483 (.029)</td>
</tr>
<tr>
<td>Model 2</td>
<td>Age</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>0.480 (.020)</td>
<td>0.480 (.020)</td>
<td>0.480 (.020)</td>
</tr>
<tr>
<td>Model 3</td>
<td>Age</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>0.480 (.020)</td>
<td>0.480 (.020)</td>
<td>0.480 (.020)</td>
</tr>
<tr>
<td>Model 4</td>
<td>Age</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>1.060 (.014)</td>
<td>0.480 (.020)</td>
<td>0.480 (.020)</td>
<td>0.480 (.020)</td>
</tr>
</tbody>
</table>

**Conclusion:** Indicators of esophageal dysmotility and GERD studied appear to be associated with ILD in SSc, with some factors specifically related to progressive ILD. Further, the strong association of an interaction term of both dysmotility and GERD with progressive ILD illustrates a potential dose-response phenomenon. These results hold important implications for management of ILD in SSc.

**Disclosure:** J. E. Zhang, None; A. Bonner, None; M. Baron, None; M. Hudson, None, J. E. Pope, None; 1468

**Patient Perspective Informs Core Sets, Constructs of Metrics and Communication Tools for Patients with Connective Tissue Disease-Related Interstitial Lung Disease.** Shikha Mittoo1, Sid Frankel2, Daphne Le Sage3, Flavia V. Castelino4, Lisa Christopher-Stine5, Sonev Danoff6, Areyha Fischer2, Laura K. Hummers2, Ani A. Shah2, Jeffery J. Swigris7, Spohia Cena8, Sancia Ferguson9, Ignacio Garcia-Valladares8, Maithy Tran1, Harmanjot K. Grewal10 and Leslee Ann Saketko10.

1University of Toronto, Toronto, ON, 2University of Manitoba, Winnipeg, 3Center for CTD-ILD.

**Background/Purpose:** Interstitial lung disease (ILD) is a common complication of connective tissue disease (CTD) and is a leading contributor to mortality in SSc patients. Once lung fibrosis occurs, lung function disease course may become stable or progressively decline. While some demographic and SSc-related factors have been associated with development of ILD, little is known about what contributes to progression. We studied the clinical manifestations of SSc-gastroesophageal (GE) involvement in relation to ILD status to determine associations between GE involvement and ILD progression in SSc. Our objective was to determine if GE reflux and dysphagia are associated with progressive ILD as measured by FPTIs over three years.

**Methods:** Canadian Scleroderma Research Group (CSRG), a multicenter database of adult SSc patients, patients with CTD-ILD.

**Background:** Limited information on the patient experience exists in CTD-ILD. Herein supports that the patients’ perspective is essential to informing clinical practice and in developing optimal outcome measures for CTD-ILD.

**Methods:** Focus groups were dedicated to patients with each of the following ILD subtypes: rheumatoid arthritis, idiopathic inflammatory myositis, systemic sclerosis, and various CTD subtypes. Focus groups were followed with patient questionnaires and/or patient interview. Institutional review board approval was attained at all participating institutions.

**Results:** Included were English speaking adults with a diagnosis of ILD by either histologic or computed tomography (CT) evidence with either a) symptoms of cough and/or dysnea or b) restrictive pulmonary physiology or c) resting or exertion-related peripheral oxygen desaturation. CTD diagnoses were by rheumatologists based on accepted criteria. Patients with pulmonary hypertension or hypersensitivity pneumonitis were made excluded.

**Conclusion:** Indicators of esophageal dysmotility and GERD studied appear to be associated with ILD in SSc, with some factors specifically related to progressive ILD. Further, the strong association of an interaction term of both dysmotility and GERD with progressive ILD illustrates a potential dose-response phenomenon. These results hold important implications for management of ILD in SSc.

**Disclosure:** J. E. Zhang, None; A. Bonner, None; M. Baron, None; M. Hudson, None, J. E. Pope, None;
Results: Six focus groups of 6–9 (total 45) participants per group across 5 centres (University of Manitoba, University of Toronto, Louisiana State University, Johns Hopkins University, Massachusetts General/B Brigham and Womens) and two countries (Canada and USA) were conducted; the following themes that emerged from preliminary findings from a subset analysis.

I. Biopsychosocial Sphere:
A. Cough:
   i. Universal and relevant patient experience
   ii. Patients described types of coughs and its triggers
B. Dyspnea:
   i. Reference to breath/breathing rarely used
   ii. Often described within context of functional limitation or loss of pleasurable activity and/or connectedness (eg. reading to children)
II. Psychological Sphere:
A. Living with Uncertainty:
   i. Perpetuated by inadequate physician communication
   ii. Unknown and unpredictable disease course in the immediate and long-term (death)
   iii. Conflicts in management between CTD and ILD
B. Struggle Over the New Self:
   i. Maintaining an autonomy
   ii. Parenting and grand-parenting roles were a central concern
C. Development Of Resilience Through Coping (Self-Efficacy)

Conclusion: Patient experts have informed our understanding around communication and promising, relevant outcome measures in CTD-ILD. Medical expert consensus identified 5 domains in CTD-ILD for outcome measures. While dyspnea remained a core outcome measure for both patient and medical experts, cough was relevant to patients but not medical experts. A discordant language related to dyspnea exists between clinicians and patients and may impact performance of current and potential metrics related to dyspnea.

Disclosure: S. Mittoo, Actelion Pharmaceuticals US, 2. UCB Pharmaceuticals, 5. Abbott Pharmaceuticals, 5. S. Frankel, None; D. LeSage, None; F. V. Castelino, None; L. Christopher-Stine, None; S. Danoff, None; A. Fischer, NIH, 2. Actelion Pharmaceuticals US, 5. Actelion Pharmaceuticals US, 8. Actelion Pharmaceuticals US, 5. Gilead Pharmaceuticals, 8; L. K. Hummers, None; A. A. Shah, None; J. J. Swigris, None; S. Cena, None; S. Ferguson, None; I. Garcia-Valludares, None; M. Tran, None; H. K. Grewal, None; L. A. Saketkoo, United Therapeutics, 2. Actelion Pharmaceuticals US, 2.

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Background/Purpose: The presence of disease specific autoantibodies (aab): anti-centromere (CENP), anti-topoisomerase I (Topo-I), anti-RNA polymerase III (RNAP), and anti-fibrillarin (Fib). Current paradigms suggest that SSc aab profiles are relatively monospecific and that SSc-specific aab are mutually exclusive. We and anti-fibrillarin (Fib). Current paradigms suggest that SSc aab profiles are relatively monospecific and that SSc-specific aab are mutually exclusive. We

Conclusions: Our study indicates that the majority of SSc sera have multiple aab and independent segregation of the SSc-specific or SSc-related autoantibodies is not as clear-cut as current literature suggests. Furthermore, studies of clinical correlations with certain aab in SSc should be reconsidered in light of the complexity of the serological profiles of individual patients.

Disclosure: S. Mehra, None; M. Baron, None; M. Stephenson, None; M. Hudson, None; J. E. Pope, None; M. J. Fritzler, Inova Diagnostics, Inc., 5.

1470


Background/Purpose: Autoantibodies in scleroderma (systemic sclerosis, SSc) such as anti-topoisomerase I (Scl-70), RNA polymerase III, centromere, U3RNP/fibrillarin, and Th/To are associated with a unique subset of the disease and useful biomarkers in diagnosis and management. Among these, anti-Th/To is found in 4–13% of SSc patients and believed to be relatively specific for SSc, however, some reports show the detection of anti-Th/To in patients without SSc or some specific features such as interstitial lung disease (ILD). We sought to further characterize the clinical significance of anti-Th/To by focusing on non-SSc patients in an unselected cohort of rheumatology patients.

Methods: Patients enrolled in the registry from 2000 to 2012 were studied. All sera collected at the initial visit of each patient were tested by immunoprecipitation of 35S-methylene-labeled K562 cell extracts. In addition, 132 SSc and 45 non-SSc sera that had predominant nucleolar staining reported from diagnostic laboratories were tested by urea-PAGE and silver staining for RNA component analysis. Anti-Th/To was defined based on detection of 7–2 and 8–2 RNA in the immunoprecipitates. The clinical information of anti-Th/To positive patients were collected from the database and analyzed.

Results: Overall, 16 patients were found to have anti-Th/To; 7 had sclerodermatous skin changes (SSc group) while 9 patients had neither sclerodermatous skin changes nor a diagnosis of SSc (non-SSc group). All except one in the non-SSc group were female and 7/7 SSc and 7/9 non-SSc were Caucasians (2 in non-SSc were African Americans). In the SSc group, 5 had limited cutaneous (lcSSc) disease and 2 had the diffuse cutaneous (dcSSc) variant. In the non-SSc group, there was 1 SLE with Sjogren’s (SjS), 1 with polymyositis (PM) and 2 with primary SjS. Other patients had a diagnosis based on organ involvement or symptoms, such as ILD, pulmonary hypertension (PH), and/or Raynaud’s phenomenon (RP). Most non-SSc group patients had features typically associated with SSc: 5/9 RP, 2/9 pitting scars, 3/9 telangiectasias, 3/9 ILD, 2/9 PH. No SSc patients had ILD or PH. 4/9 patients in the non-SSc group may be considered sine scleroderma; 2 with ILD and RP (one also with PH) and 1 with PH and telangiectasias. Another patient had SjS, Hashimoto’s thyroiditis and ILD complicating by diffuse alveolar hemorrhage that resulted in his death.

Scleroderma

<table>
<thead>
<tr>
<th>Female, Caucasian</th>
<th>No scleroderma</th>
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<tbody>
<tr>
<td>7/7</td>
<td>8/9, 7/9</td>
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<table>
<thead>
<tr>
<th>Age (mean)</th>
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<tbody>
<tr>
<td>48</td>
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<table>
<thead>
<tr>
<th>Pitting scars</th>
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<tr>
<td>0% (0/7)</td>
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<table>
<thead>
<tr>
<th>Telangiectasia</th>
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<tbody>
<tr>
<td>0% (0/7)</td>
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<table>
<thead>
<tr>
<th>Interstitial Lung Disease</th>
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</thead>
<tbody>
<tr>
<td>0% (0/7)</td>
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<table>
<thead>
<tr>
<th>Pulmonary Hypertension</th>
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<tbody>
<tr>
<td>0% (0/7)</td>
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<table>
<thead>
<tr>
<th>Esophageal Dysmotility</th>
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<tr>
<td>0% (0/9)</td>
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<table>
<thead>
<tr>
<th>Pericardial effusion</th>
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<tr>
<td>0% (0/9)</td>
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</table>

Conclusion: A significant number of patients with anti-Th/To did not have a diagnosis of SSc. However, most of these patients were found to have other features associated with SSc, many of which may be considered the sine
scleroderma variant. In particular, non-SSc patients with anti-Ti/To were found to be enriched for ILD and PH when compared to SSc patients with anti-Ti/To. It may be worth testing for anti-Ti/To in patients with ILD or PH and anti-nuclear antibodies. Further studies on the clinical significance of anti-Ti/To in non-SSc patients are warranted.

Disclosure: A. D. Chauve, None; M. Satoh, None; A. Cerbelli, None; E. K. L. Chan, None; Y. Li, None; E. S. Sobel, None; W. H. Reeves, None; M. R. Bubh, None.

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Differential Expression of Hepatocyte Growth Factor (HGF) in Patients with Systemic Sclerosis-Associated Pulmonary Arterial Hypertension; Lorinda Chung1, Caterina Cramb1, William H. Robinson1, Virginia D. Steen2 and Roham T. Zamanian3. 1Stanford Univ Medical Center, Palo Alto, CA, 2VA Palo Alto Health Care System and Stanford University, Palo Alto, CA, 3Stanford University, Palo Alto, CA. 4Georgetown Univ Medical Center, Washington, DC

Background/Purpose: Pulmonary arterial hypertension (PAH) is one of the leading causes of death in patients with systemic sclerosis (SSc). Non-invasive biomarkers are needed to identify patients with early PAH who may benefit from early intervention. We sought to identify novel cytokines that differentiate patients with incident right heart catheterization (RHC)-confirmed SSc-PAH from SSc patients who are at high risk for PAH.

Methods: The Pulmonary Hypertension Assessment and Recognition of Outcomes in Scleroderma (PHAROS) Registry is a registry of SSc patients at high risk for or with incident RHC-confirmed PAH that includes 23 centers throughout the US. Pre-PAH patients fulfill at least one of the following criteria: pulmonary artery systolic pressure (PASP) ≥ 40 mmHg on transthoracic echocardiogram (TTE), diffusing capacity of carbon monoxide (DLCO) < 55% predicted, or forced vital capacity (FVC)/DLCO ratio > 1.6. Patients with definite incident PAH have a mean pulmonary artery pressure ≥ 25 mmHg and a pulmonary capillary wedge pressure ≥ 15 mmHg (without significant interstitial lung disease) on RHC performed ≥ 6 months from enrollment. Cytokine and chemokine profiling of 17 cytokines/chemokines measured by Bio-Plex bead arrays was performed comparing serum samples from 10 pre-PAH patients to 9 definite PAH patients. Significance Analysis of Microarrays (SAM) was used to identify statistical differences in cytokines/chemokines between the groups with a false discovery rate (q) <0.1. We also evaluated for longitudinal changes in cytokine profiles from 3 pre-PAH patients who subsequently developed definite PAH during follow-up.

Results: All patients were female with a mean age of 52±12 years and disease duration from first Raynaud’s symptom of 13±10 years. Two-thirds of patients had limited cutaneous disease, 37% were anti-centromere antibody positive, 32% had a nucleolar ANA, and 16% were anti-U1RNP antibody positive. Mean FVC and DLCO were 82±15% predicted, or forced vital capacity of carbon monoxide (DLCO) < 55% predicted, or forced vital capacity (FVC)/DLCO ratio > 1.6. Patients with definite incident PAH have a mean pulmonary artery pressure ≥ 25 mmHg and a pulmonary capillary wedge pressure ≥ 15 mmHg (without significant interstitial lung disease) on RHC performed ≥ 6 months from enrollment. Cytokine and chemokine profiling of 17 cytokines/chemokines measured by Bio-Plex bead arrays was performed comparing serum samples from 10 pre-PAH patients to 9 definite PAH patients. Significance Analysis of Microarrays (SAM) was used to identify statistical differences in cytokines/chemokines between the groups with a false discovery rate (q) <0.1. We also evaluated for longitudinal changes in cytokine profiles from 3 pre-PAH patients who subsequently developed definite PAH during follow-up.

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Conclusion: We found that patients with definite incident PAH from the PHAROS registry expressed higher levels of HGF than patients at high risk for PAH. HGF is a potent pro-angiogenic and anti-fibrotic factor, and has been shown to correlate significantly with right ventricular systolic pressure on echocardiogram as well as a diagnosis of PAH based on RHC. Our findings suggest that HGF expression levels may provide predictive information regarding the risk for PAH in patients with SSc in addition to clinical parameters such as DLCO and PASP on TTE.

Disclosure: L. Chung, Gilead and Actelion, 5; Gilead, Actelion, Pfizer, United Therapeutics, 2; C. Cramb, None; W. H. Robinson, None; V. D. Steen, Gilead; 5; R. T. Zamanian, Actelion, Gilead, United Therapeutics, Iliaca, & Bayer, 5, Actelion, United Therapeutics, 2.
Score, presence of ILD, DLCO as well as age, disease activity and different aspects of disease severity. The aim of this study was to compare the performance of ELF with its single components in correlating with the different clinical and instrumental variables in SSc, to determine whether any of the three biomarkers could have a specific predictive value as surrogate outcome measure in SSc.

Methods: The serum concentrations of the three biomarkers were analysed in 129 SSc patients employing the same platform used to calculate the ELF score (siemens, advia centaur). All patients were investigated for clinical and serological subset, disease duration, skin and internal organ involvement, HAQ-DI, disease severity and activity. Correlations were calculated using Spearman correlation test. Mann-Whitney test was used to perform comparison between groups. Statistical analysis was performed using GraphPrism software.

Results: Median, correlation coefficient and statistical significance of ELF and its single analytes are summarised in table 1. All three components of ELF showed a similar strong correlation with mRSS and HAQ-DI, confirming a strong predictive value on skin involvement. Interestingly, the concentration of HA was the only parameter correlating with Age, muscle severity and Heart severity, whereas it did not correlate with DLCO% or lung severity. In this regard the biomarker with better performance on Lung involvement was TIP-1, which showed a strong correlation with DLCO and lung Severity. Furthermore SSc patients with interstitial lung disease (ILD) showed significant higher levels of TIP-1 (P =0.0136) and TIP-1 was the only biomarker to correlate with the ESScSG-Activity Index. On the contrary, PIINP was the only one to correlate with Joint and kidney severity.

Coefficient correlation (rho) between ELF score and single serum markers with clinical parameters in 129 SSc patients

<table>
<thead>
<tr>
<th>ELF score</th>
<th>PIINP (ng/mL)</th>
<th>TIP-1 (ng/mL)</th>
<th>HA (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum values (median, range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.84, 6.49–10.84</td>
<td>6.25, 2.63–33.6</td>
<td>215.3, 85.5–531.2</td>
<td>41.53, 4.69–236.4</td>
</tr>
<tr>
<td>Age</td>
<td>0.34***</td>
<td>0.09</td>
<td>0.11</td>
</tr>
<tr>
<td>mRSS</td>
<td>0.26**</td>
<td>0.30**</td>
<td>0.33**</td>
</tr>
<tr>
<td>DLEO, absolute value</td>
<td>-0.26*</td>
<td>-0.1</td>
<td>-0.28**</td>
</tr>
<tr>
<td>DLEO %</td>
<td>-0.06</td>
<td>-0.05</td>
<td>-0.20*</td>
</tr>
<tr>
<td>Skin-sev</td>
<td>0.34***</td>
<td>0.34***</td>
<td>0.27***</td>
</tr>
<tr>
<td>Join/tendon-sev</td>
<td>0.26**</td>
<td>0.25**</td>
<td>0.13</td>
</tr>
<tr>
<td>Muscle-sev</td>
<td>0.34***</td>
<td>0.17</td>
<td>0.08</td>
</tr>
<tr>
<td>GI-sev</td>
<td>0.17</td>
<td>0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>Lung-sev</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.13</td>
</tr>
<tr>
<td>Heart-sev</td>
<td>0.16</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>Kidney-sev</td>
<td>0.16</td>
<td>0.23**</td>
<td>-0.001</td>
</tr>
<tr>
<td>ESScSG-AI</td>
<td>0.15</td>
<td>0.09</td>
<td>0.20*</td>
</tr>
<tr>
<td>HAQ-DI</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001

Conclusion: Subanalysis of the single serum markers included in the ELF score algorithm suggests that the different biomarkers may function as surrogate outcome measure of specific organ involvement in SSc. In this regard, longitudinal studies confirming the predictive value and sensitivity to change over time of the single biomarkers may pave the way to develop specific algorithms tailored to carry the maximum predictive value on specific organ involvement in SSc.

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1474

Interferon-Inducible Chemokines Correlate with Disease Severity in Systemic Sclerosis. Xiaochun Liu1, Maureen D. Mayes1, Filemon K. Tan1, Minghua Wu2, John D. Reveille2, Brock E. Harper3, Hilda T. Draeger4, 1University of Texas Health Science Center at Houston, Houston, TX, 2University of Texas Medical Branch, Galveston, TX, 3Univ of Texas Health Sci Ctr, San Antonio, TX, 4Univ of Texas Health Science Houston, Houston, TX

Background/Purpose: The most prominent gene expression profile in the peripheral blood of patients with systemic sclerosis (SSc) is an interferon (IFN) inducible signature. A large scale correlation of this signature with disease subtypes and features has not been performed due to scarcity of RNA samples. Herein, we identify plasma chemokines that correlate strongly with the IFN gene signature and investigate their correlation with disease features in a large early SSc cohort.

Methods: We examined the correlation of IFNγ-inducible protein-10 (IP-10/CXCL10), IFN-inducible T cell alpha chemoattractant (I-TAC/ CXCL11), and monocyte chemoattractant protein-1 (MCP-1/CCL2) with the IFN gene expression signature. We generated an IFN-inducible chemokine score with the correlated chemokines, IP-10 and I-TAC; and compared it in 266 patients enrolled in the GENISOS cohort (disease duration<5 years, 59% diffuse cutaneous involvement) to that of 97 matched controls. Subsequently, the correlation between the between the ELF biomarkers and organ damage severity was assessed. Finally, the course of chemokine score over time was examined in 63 follow-up plasma samples prospectively.

Results: The plasma IFN-inducible chemokine score highly correlated with the IFN-inducible gene expression signature (t=0.612, p=0.0015) and was significantly higher in SSc patients than matched controls (p<0.001). When the chemokine level was dichotomized based on the 95th percentile level in unaffected controls, 39.2% of patients had a positive chemokine score, which is more prevalent than any SSc-related autoantibody. Furthermore, the chemokine score was associated with the presence of anti-U1 ribonucleoprotein antibodies (RNP) (p<0.001) and absence of anti-RNA polymerase III antibodies (p=0.002), but not disease duration, disease type, or other autoantibodies. As shown in Table 1, the chemokine score correlated with the concomitantly obtained muscle, skin and lung components of the Medsger Severity Index, as well as FVC, DLco, creatine kinase independent of anti-RNP or other potential confounders (age, gender, ethnicity, disease duration, and treatment with immunosuppressive agents). Finally, there were no significant changes in the chemokine scores over time while their baseline levels correlated significantly with those on the follow-up visits (r=0.39, p=0.002). This indicates that the chemokine score is a stable marker of disease severity and does not fluctuate in a consistent time-dependent manner.

Table 1. Correlation of plasma IFN-inducible chemokines with disease severity

<table>
<thead>
<tr>
<th>ELF score</th>
<th>PIINP (ng/mL)</th>
<th>TIP-1 (ng/mL)</th>
<th>HA (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum values (median, range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FVC</td>
<td>-0.17</td>
<td>0.013</td>
<td>0.024</td>
</tr>
<tr>
<td>DLCO</td>
<td>-0.18</td>
<td>0.008</td>
<td>0.001</td>
</tr>
<tr>
<td>CK</td>
<td>0.21</td>
<td>0.002</td>
<td>0.004</td>
</tr>
<tr>
<td>mRSS</td>
<td>0.1</td>
<td>0.12</td>
<td>0.16</td>
</tr>
<tr>
<td>Skin</td>
<td>0.12</td>
<td>0.073</td>
<td>0.043</td>
</tr>
<tr>
<td>Muscle*</td>
<td>0.18</td>
<td>0.006</td>
<td>0.011</td>
</tr>
<tr>
<td>GI*</td>
<td>0.06</td>
<td>0.38</td>
<td>0.270</td>
</tr>
<tr>
<td>Lung*</td>
<td>0.15</td>
<td>0.021</td>
<td>0.009</td>
</tr>
<tr>
<td>Heart*</td>
<td>0.04</td>
<td>0.565</td>
<td>0.377</td>
</tr>
<tr>
<td>Kidney*</td>
<td>0.01</td>
<td>0.878</td>
<td>0.876</td>
</tr>
<tr>
<td>Joints*</td>
<td>0.10</td>
<td>0.106</td>
<td>0.117</td>
</tr>
</tbody>
</table>

* Components of Medsger Severity Index. ^ Multivariable model after adjustment for age at enrollment, gender, ethnicity, disease duration, and treatment with immunosuppressive agents. Abbreviations: Percent predicted forced vital capacity; DLco: Percent predicted diffusing capacity; mRSS: modified Rodnan Skin Score; CK: Creatine kinase. \( \rho \): Correlation coefficient; \( \beta \): regression coefficient.

Conclusion: The IFN-inducible chemokine score is a stable marker of more severe subtype of SSc. This composite score may be useful for risk stratification regardless of disease type, serology or duration. It also might identify the subgroup of patients that benefit from treatments targeting IFN pathways.

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1475

Does Skin Gene Expression Profile Predict Response to Imatinib? Shervin Assassi1, Jeffrey T. Chang1, Dinesh Khanna1, Xiaochun Liu1, Daniel Furst1 and Maureen D. Mayes1, 1Univ of Texas Health Science Center at Houston, Houston, TX, 2University of Michigan, Ann Arbor, MI, 3University of California at Los Angeles, Los Angeles, CA

Background/Purpose: Imatinib is a potent inhibitor of TGF-β signaling. Furthermore, a subgroup of SSc patients shows a prominent TGF-β gene expression signature in skin biopsies samples. We examined whether baseline TGF-β skin gene expression signature or other previously described signatures differentiate responders from non-responders to imatinib treatment.

Methods: Patients with SSc were enrolled in a 1-year open-label pilot study of imatinib (Khanna D, A&R 2011). All patients had active interstitial lung disease defined as forced vital capacity (FVC) < 55% predicted, dyspnea on exertion, and presence of a ground glass opacity on HRCT. Percent changes in the modified Rodnan Skin Score (mRSS) and % predicted FVC were calculated based on the baseline and last measurement in the study.
Baseline skin biopsies were available in five patients (3 diffuse and 2 limited cutaneous involvement) who completed a 12 month course of treatment. Additionally, 3 patients had 3 month data available who stopped due to adverse events. Percent change in mRSS ranged from 53% worsening to 33% improvement while percent change in FVC ranged from 9% worsening to 5% improvement. Global gene expression profiling was performed on Illumina HumanHT-12 arrays in the baseline patient samples and 36 unaffected controls. All patient and control samples were processed according to the same procedures and the microarrays were performed in one batch. Previously described TGFB-1, IL-13, and diffuse proliferative gene signatures (Milano et al. PLOs ONE 2008) were examined. We also developed an IFN-γ gene signature using control fibroblasts treated with IFNα. Unsupervised hierarchical clustering was performed after selecting genes that were present in the above gene signatures in separate analyses. The goal of our analysis was to examine whether clustering based on these gene lists separate responders from non-responders.

Results: As shown in Figure 1, these five patients clustered separately from the majority of control samples when the transcript list was filtered based on TGFB-1 responsive genes. However, there was no clear separation between responders and non-responders in regard to skin (Figure 1) or lung disease. Similarly, patients clustered separately from the majority of control samples when the transcript list was selected based on IL-13, diffuse proliferative, or IFN-α gene signatures. However, there was again no clear separation between responders and non-responders to treatment with imatinib. The findings were similar when additional 3 patients with 3 month data were included in the analysis.

Conclusions: This pilot study confirms presence of distinct gene signatures in skin biopsy samples of patients with SSC. However, neither the TGFB-1 signature nor the other investigated transcript signatures were able to predict response to imatinib.

Disclosure: S. Assassi, None; J. T. Chang, None; D. Khanna, Actelion, BMS, Gilead, Genentech, ISDIN, and United Therapeutics; 2. Actelion, BMS, Gilead, Genentech, ISDIN, and United Therapeutics; 3. A. Herrick, School of Translational Medicine, University of Manchester, Manchester Academic Health Science Centre, Salford Royal NHS Foundation Trust, Manchester, United Kingdom; 4. School of Clinical Rheumatology, Salford Royal NHS Foundation Trust, Salford, United Kingdom; 5. Department of Clinical Rheumatology, University of Manchester, Manchester Academic Health Science Centre, Salford Royal NHS Foundation Trust, Manchester, United Kingdom.

Conclusions: Our results support the notion that low caveolin-1 levels may play a role in the predisposition of the AA population to SSC-ILD through effects both on the migration of fibrocytes and fibrocyte precursors in damaged tissue and on fibrocyte differentiation.

Disclosure: E. Tourkina, None; C. Reese, None; B. Perry, None; S. Dyer, None; M. Bonner, None; R. P. Visconti, None; J. Zhang, None; R. M. Silver, None; S. Hoffman, None.

1476
Caveolin-1 Deficiency May Play a Role in the Predisposition of African Americans to SSc ILD. Elena Tourkina1, Charles Reese2, Beth Perry3, Shannece Dyer4, Michael Bonner5, Richard P. Visconti5, Jing Zhang5, Richard M. Silver5 and Stanley Hoffman1. 1Medical University of South Carolina, Charleston, SC; 2Medical University of SC, Charleston, SC; 3Medical University of SC, Charleston

Background/Purpose: Scleroderma-associated Interstitial Lung Disease (SSc-ILD) is more prevalent and more severe in African Americans (AA) than in Caucasian (C) patients, but little is known of the factors underlying this health disparity. In the course of studies comparing caveolin-1 function in SSC and healthy blood monocytes, we made the striking observation that healthy AA monocytes share abnormalities with SSc monocytes including low caveolin-1 levels. The aim of this study was to determine the consequences of low caveolin-1 expression in AA and SSc monocytes.

Methods: The study was approved by the university’s IRB for Human Subject Research. Monocytes were isolated from the blood of SSc-ILD patients and healthy donors using negative selection. SSc patients fulfilled the ACR criteria for the classification of systemic sclerosis. Monocyte migration was assayed in Multwell Chemotaxis Chambers, with or without treatment with caveolin-1 scaffolding domain (CSD) peptide and control peptides. CD14, CXCR4, alpha-smooth muscle actin (ASMA), and caveolin-1 levels were determined by Western blot analysis and immunostaining. For fibrocyte differentiation, peripheral blood mononuclear cells (PBMC) isolated from each patient were incubated for 14 days in 20 μM DME/20% FBS on fibronectin-coated plates with or without treatment with CSD.

Results: Like SSC-ILD monocytes, healthy AA monocytes differ from healthy C monocytes in signaling and in function. Healthy AA monocytes contained only 49% as much caveolin-1 as healthy C monocytes (n = 7). The percentage of AA monocytes that migrated in response to CXCR4-ligand, CXCL12, was almost three-fold enhanced (19 ± 2.5 vs 57 ± 4.3) compared to C monocytes (n = 10). Like SSc monocytes, when healthy AA monocytes were treated with CSD to restore caveolin-1 function, migration in response to CXCL12 was inhibited by at least 70%. When we compared the ability of healthy C monocytes, healthy AA monocytes, and SSc monocytes to differentiate into fibrocytes, we observed a three-fold increase (quantified in terms of number of spindle-shaped cells per high-power field) in both the SSc and healthy AA samples compared to the healthy C samples (C = 6.4 ± 2.1, AA = 17.3 ± 3.8, SSc = 16.5 ± 4.0; n = 12). In all three cell types, CSD treatment inhibited fibrocyte differentiation by >50%. Although fibrocyte differentiation is enhanced in both healthy AA and SSc, there are phenotypic differences between these two groups. When the CD14+ population is isolated by FACS from each source, then cultured on fibronectin-coated coverslips, the level of collagen I and caveolin-1 is similar for all three groups. CXCR4 is upregulated in both the AA and SSc fibrocytes, and ASMA was upregulated only in the SSc fibrocytes.

Conclusion: Our results support the notion that low caveolin-1 levels may play a role in the predisposition of the AA population to SSc-ILD through effects both on the migration of fibrocytes and fibrocyte precursors into damaged tissue and on fibrocyte differentiation.

Disclosure: E. Tourkina, None; C. Reese, None; B. Perry, None; S. Dyer, None; M. Bonner, None; R. P. Visconti, None; J. Zhang, None; R. M. Silver, None; S. Hoffman, None.

1477
Skin Autofluorescence As a Measure of Oxidative Stress in Systemic Sclerosis Is Not Affected by Skin Thickness, Erythema or Melanin.

Andrea Murray1, T. Moore2, J. Manning2, Christopher E.M. Goldblum3 and Ariane Herrick1. 1School of Translational Medicine, University of Manchester, Manchester Academic Health Science Centre, Salford Royal NHS Foundation Trust, Manchester, United Kingdom; 2Department of Clinical Rheumatology, Salford Royal NHS Foundation Trust, Salford, United Kingdom; 3Dermatology Centre, University of Manchester, Manchester Academic Health Science Centre, Salford Royal NHS Foundation Trust, Manchester, United Kingdom.

Background/Purpose: Skin autofluorescence (AF) has been suggested as a non-invasive measure of oxidative stress in patients with diabetes and other diseases. We have previously shown that skin AF is also increased in patients with systemic sclerosis (SSc). As part of the disease process, patients with SSc undergo fundamental changes in their skin properties including skin thickening, alteration in perfusion secondary to microvascular dysfunction, and altered pigmentation. There are concerns that these might influence AF. The aim of this study was to determine whether skin AF is altered by these changes and thus to assess whether skin AF is a valid non-invasive technique to measure oxidative stress in SSc. This is a key question given the increasing evidence implicating oxidative stress in pathophysiology.

Methods: Twenty healthy controls (HC [2 males, median 45 (interquartile range 39–52) years], 20 patients with limited cutaneous (LSSC, 2 males, 55 (50–67) years) and 20 with diffuse cutaneous SSc (DSSc, 6 males, 56 (52–66) years) participated. Skin AF, induced by ultraviolet light thickening, alteration in perfusion secondary to microvascular dysfunction, and altered pigmentation. There are concerns that these might influence AF.

Evidence implicating oxidative stress in pathophysiology.

Methods: Twenty healthy controls (HC [2 males, median 45 (interquartile range 39–52) years], 20 patients with limited cutaneous (LSSC, 2 males, 55 (50–67) years) and 20 with diffuse cutaneous SSc (DSSc, 6 males, 56 (52–66) years) participated. Skin AF, induced by ultraviolet light, was measured from white light reflection measurements with a spectrometer. Linear regression was used to assess the relationships between AF, skin thickness, EI and MI and SSc subtype.
Results: Linear regression confirmed previous findings that fluorescence is increased in patients with SSC as compared to controls. Patients with DCSSc showed a higher increase in AF than patients with LCSSc; data shown for one exemplar (forearm) in Table 1. Linear regression showed no associations between skin fluorescence and skin thickness, EI or MI (as shown on the last row of Table 1). No consistent differences for values of EI or MI were found between groups.

Table 1. Data for forearm for HC, LCSSc and DCSSc: mean (inter-quartile range); and linear regression at the forearm.

<table>
<thead>
<tr>
<th>Group/Method</th>
<th>AF (arbitrary units)</th>
<th>Skin thickness (micrometers)</th>
<th>EI (arbitrary units)</th>
<th>MI (arbitrary units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC</td>
<td>0.034 (0.030–0.048)</td>
<td>88 (82–103)</td>
<td>10.36 (7.02–11.16)</td>
<td>59.21 (55.32–63.23)</td>
</tr>
<tr>
<td>LCSSc</td>
<td>0.040 (0.030–0.051)</td>
<td>81 (62–99)</td>
<td>9.82 (7.77–14.05)</td>
<td>63.96 (55.25–66.28)</td>
</tr>
<tr>
<td>DCSSc</td>
<td>0.045 (0.034–0.060)</td>
<td>78 (75–106)</td>
<td>9.73 (7.14–14.35)</td>
<td>58.32 (40–64.80)</td>
</tr>
</tbody>
</table>

Linear regression:
- Difference from AF: na
- (95% confidence intervals, p-value)
  - (-2.30 X 10^-10 to 1.53 x 10^-04)
  - (-3.84 x 10^-04 to 1.97 x 10^-03)
- (95% confidence intervals, p-value)
  - 0.680
  - 0.182 to 0.062

Conclusion: The skin changes observed in patients with SSc, as measured by high frequency ultrasound and white light reflection, do not appear to influence skin AF measurements, i.e. skin AF is independent of skin thickness, EI and MI and should therefore be a valid technique for use in the assessment of oxidative stress in SSc.

Disclosure: A. Murray, None; T. Moore, None; J. Manning, None; C. E. Griffiths, None; A. Herrick, None.

1478 Gender-Associated Differences in Disease Characteristics and Outcome in Systemic Sclerosis. Svetlana I. Nityanova1, Voon H. Ong2 and Christopher P. Denton3. 1Royal Free Hospital, Medical School, London, England, 2Hospital Clinic University Barcelona, Barcelona, Spain, 3Hospital Universitario Central de Asturias, Asturias, Spain, 4Hospital Valle de Hebron, Barcelona, Spain, 5Hospital Vall d’Hebron, Barcelona, Spain, 6RESCLE, Barcelona, Spain

Background/Purpose: Systemic sclerosis (SSc) is characterized by extensive fibrosis, vascular dysfunction and the presence of several auto-antibodies. As in other autoimmune diseases, age at disease onset seems to modify initial and cumulative clinical manifestations. The aim of this study was to determine if the age at disease onset may modulate the clinical characteristics and evolution of patients with SSc.

Methods: The Spanish Network for Systemic Sclerosis recruited 1037 patients with a median follow-up of 5.2±6.8 years. Based on the mean ± 1SD of age at disease onset (45±16 years), patients were classified in 3 groups; Group 1: age equal or below 30 years (early onset); Group 2: age between 31 and 58 years, and Group 3: age equal or older than 59 years (late onset). We compared the initial clinical presentation, capillaroscopy pattern, immunological features, cumulative clinical manifestations and death rates between the three groups.

Results: One hundred and ninety five patients belonged to group 1, 651 to group 2 and 191 to group 3. Female distribution was similar between the three groups (91%, 86% and 88%). Interestingly, time from disease onset to diagnosis was significantly higher in patients with early onset (group 1) (12±13, 5.8±6.7, and 2.4±3.6 years; p<0.001). Raynaud’s phenomenon was the most frequent initial manifestation without differences between the three groups (88%, 84%, and 78%; p=0.134). Patients with early onset SSc had higher prevalence of myositis (11%, 7.2% and 2.9%; p=0.009), esophageal involvement (72%, 67% and 56%; p=0.004) and lower prevalence of centromeric antibodies (33%, 46% and 47%; p=0.007). In contrast, patients with late onset SSc was characterized by lower prevalence of digital ulcers (54%, 41%, and 34%; p<0.001) but higher rates of heart conduction system alterations (8.7%, 13%, and 21%; p=0.004), and pulmonary hypertension (12%, 19%, and 25%; p=0.048). Mortality tended to be higher in late onset patients (9.7%, 15%, and 18%; p=0.053) and the Kaplan-Meier survival curves were significantly different (p<0.0001) for the three groups of patients.

Conclusion: Age at disease onset is associated with differences in clinical presentation and outcome in patients with SSc.

Disclosure: M. A. Alba, None; J. C. Mejia, None; G. Espinosa, None; M. V. Egurbide, None; C. Tolosa, None; L. TrapieIlla, None; C. P. Simeon, None; V. Fonollona, None; A. RESCLE investigators, None.

1480 The 15% Rule in Scleroderma: A Systematic Review of the Frequency of Organ Complications in Systemic Sclerosis. Chayawee Muangchan1, Murray Baron2, Janet E. Pope3 and Canadian Scleroderma Research Group4. 1Mahidol University, Siriraj Hospital, Bangkok, Thailand, 2Jewish General Hospital, Montreal, QC, 3St. Joseph Health Care London, London, ON, 4Montreal, QC

Background/Purpose: The prevalence of each organ complication in scleroderma (SSc) varies by definition used. However, it is important to be aware of several complications that can be detected and treated. A simple rule of prevalence of organ complications in SSc can be helpful for clinicians. This study was done to determine the frequency of several SSc features including the difference did not reach statistical significance and at 10 years survival was 79% in women and 70% in men. There was also no difference in survival from development of significant organ complications between the genders.

Conclusion: Although male patients have significantly higher incidence of PF, reflected by the lower frequency of ACA and show a trend towards greater frequency of diffuse SSc subset compared to females, there was no significant increase in overall mortality.

Disclosure: S. L. Nityanova, None; V. H. Ong, None; C. P. Denton, None.
organ involvement (lung, heart, digital ulcers [DU], scleroderma renal crisis [SRC], pulmonary arterial hypertension [PAH]).

Methods: A comprehensive literature search of the Medline-OVID/EMBASE, Pub Med, and Scopus databases from 1980 to November 30th, 2011 was conducted to identify relevant articles with at least 50 SSc patients. Search words were within organ systems such as lung, heart, pulmonary artery, kidney, digital ulcers, arthritis, myopathy and secondary Sjogren’s. Study quality was assessed using the STROBE checklist. Prevalence of each organ complication was extracted from studies. Pooled prevalence and odds ratios (ORs) were calculated using the random effects method, and between-study heterogeneity was quantified using the I-squared statistic.

Results: 5916 articles were identified (913 from Embase, 1009 from Pub Med and 3994 from Scopus). 5665 were excluded of which 4912 were irrelevant, 237 did not report organ prevalence, 183 were case reports, 193 were reviews, 111 had less than 50 patients, 24 were not in English and 5 were not obtained; leaving 251 articles for full text review with 80 included in the meta-analysis. Where available, frequencies were also included from the Canadian Scleroderma Research Group (a database with more than 1000 SSc patients). There were no GI complications at a prevalence of 15% (GERD and dysphagia are far higher) and RP is nearly 100%. Xray ILD was common but significant restrictive ILD on PFTs occurred in approximately 15%.

Table 1. Mean (standard deviation) blood flow results by the 3 different methods

<table>
<thead>
<tr>
<th>SSc Feature</th>
<th># of studies</th>
<th># of patients total</th>
<th>Frequency</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac (CHF, low LEVF, pericarditis)</td>
<td>2</td>
<td>1024</td>
<td>15%</td>
<td>6–24%</td>
</tr>
<tr>
<td>Arthriaythmia from Ssc</td>
<td>11</td>
<td>15790</td>
<td>16%</td>
<td>13–18%</td>
</tr>
<tr>
<td>Diastolic dysfunction</td>
<td>5</td>
<td>15134</td>
<td>15%</td>
<td>14–16%</td>
</tr>
<tr>
<td>SRC in Ssc</td>
<td>21</td>
<td>23103</td>
<td>3%</td>
<td>2–4%</td>
</tr>
<tr>
<td>SRC in dcSSc</td>
<td>6</td>
<td>2848</td>
<td>12%</td>
<td>5–19%</td>
</tr>
<tr>
<td>PAH by R heart catheter or echo</td>
<td>15</td>
<td>7426</td>
<td>14%</td>
<td>10–17%</td>
</tr>
<tr>
<td>PAH by R heart catheter</td>
<td>7</td>
<td>6571</td>
<td>14%</td>
<td>8–20%</td>
</tr>
<tr>
<td>ILD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FVC&lt;80%</td>
<td>5</td>
<td>1070</td>
<td>17%</td>
<td>13–22%</td>
</tr>
<tr>
<td>FVC&lt;70%</td>
<td>4</td>
<td>2774</td>
<td>13%</td>
<td>10–16%</td>
</tr>
<tr>
<td>FVC&lt;55%</td>
<td>3</td>
<td>1427</td>
<td>14%</td>
<td>7–21%</td>
</tr>
<tr>
<td>Myopathy</td>
<td>14</td>
<td>4419</td>
<td>13%</td>
<td>10–16%</td>
</tr>
<tr>
<td>Arthritis</td>
<td>7</td>
<td>19834</td>
<td>14%</td>
<td>11–16%</td>
</tr>
<tr>
<td>Digital ulcer prevalent</td>
<td>10</td>
<td>6895</td>
<td>17%</td>
<td>12–21%</td>
</tr>
<tr>
<td>Complications DU</td>
<td>4</td>
<td>1756</td>
<td>12%</td>
<td>8–16%</td>
</tr>
<tr>
<td>Sjogren’s</td>
<td>5</td>
<td>2036</td>
<td>13%</td>
<td>11–16%</td>
</tr>
</tbody>
</table>

Conclusion: Many complications in SSc occur 15% of the time including low FVC, PAH, diastolic dysfunction, clinical and echo cardiac changes, arthriaythmias, inflammatory arthritis, myopathy, Sjogren’s and digital ulcers. 15% of digital ulcers have complications. SRC is uncommon but occurs in almost 15% of dcSSc. This is a helpful rule for frequency of organ involvement in SSc.

Disclosure: C. Muangchan; None. M. Baron; None. J. E. Pope; None.

1481

A Double-Blind Placebo-Controlled Crossover Trial of the Alpha-2C Adrenoceptor Antagonist ORM-12741 for Prevention of Cold-Induced Vasospasm in Patients with Systemic Sclerosis. Ariane Herrick1, Andrea Murray1, Angela Rack2, Juha Rouru1, Tonna Moore1, John Whiteside2, Pas Hakulinen1, Fredrick M. Wigley3 and Amir Snapir3. 1School of Translational Medicine, University of Manchester, Manchester Academic Health Science Centre, Salford Royal NHS Foundation Trust, Manchester, United Kingdom, 2Orion Pharma UK, Research & Development, Nottingham, United Kingdom, 3Orion Corporation Orion Pharma, Turku, Finland, 4Johns Hopkins University, Baltimore, MD

Background/Purpose: The alpha-2c adrenoceptor is thought to play a key role in mediating cold-induced vasospasm in the digits. A previous study suggested that in patients with systemic sclerosis (SSc), treatment with the alpha2c adrenoceptor antagonist OPC-23826 improved recovery of finger skin perfusion following a cold challenge. Our primary purpose was to evaluate the efficacy of the high potency alpha-2c adrenoceptor antagonist ORM-12741 in the attenuation of a cold-induced reduction in finger blood flow and temperature in patients with Raynaud’s phenomenon secondary to SSc. Secondary objectives were to assess safety and tolerability.

Methods: This was a phase IIa, randomised, double-blind, crossover, single-dose placebo-controlled, single-centre study. Patients attended 5 times: screen, treatment visits 1–3 (each at least one week apart), and an end of study visit 1–2 weeks after the last treatment. At each treatment visit, each subject after acclimatisation received a single oral dose of 30mg or 100mg of ORM-12741 or placebo. 30 minutes later s/he underwent a cold challenge (the hand was placed in a cold chamber cooled to −18°C until the finger temperature reached 12°C or until the subject could no longer tolerate the cold). Blood flow to the fingers was assessed by 3 methods (temperature by probe, laser Doppler imaging [LDI] and infrared thermography) performed before, during and after the cold challenge, until 70% of the drop in skin temperature had been recovered (but no longer than 45 minutes).

Results: 12 patients (10 female, mean age 58 years) were included. Recovery from cold challenge was faster after placebo treatment than with either dose of ORM-12741 as measured by temperature probe and LDI (Table 1). In 10 out of 12 subjects the area under the time-LDI curve was greater with placebo than with either ORM-12741 dose. Overall ORM-12741 was well tolerated. Headache was the most common adverse effect with 5 events (3 placebo, 5 active treatment) in 4 patients.

1. P = 0.045 versus placebo
2. P = 0.023 versus placebo

Table 1. Mean (standard deviation) blood flow results by the 3 different methods

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>ORM-12741 30mg</th>
<th>ORM-12741 100mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to 70% temperature recovery (by probe) (minutes)</td>
<td>21.4 (12.4)</td>
<td>25.7 (12.2)</td>
<td>26.9 (13.9)</td>
</tr>
<tr>
<td>LDI (Area under the curve, right index finger) (arbitrary flux units × time)</td>
<td>20.5 (13.7)</td>
<td>11.2 (10.6)2</td>
<td>9.6 (7.0)2</td>
</tr>
<tr>
<td>Thermography (area under the curve) (°C × time)</td>
<td>288.4 (172.2)</td>
<td>280.0 (108.8)</td>
<td>305.8 (136.3)</td>
</tr>
</tbody>
</table>

Conclusion: ORM-12741 did not expedite recovery from a cold challenge in the fingers of patients with SSc.

Disclosure: A. Herrick, Orion Pharma, 5; A. Murray, None; A. Rack, Orion Pharma, 5; J. Rouru, Orion Pharma, 3; T. Moore, None; J. Whiteside, Orion Pharma, 3; P. Hakulinen, Orion Pharma, 3; F. M. Wigley, Orion Pharma, 5; A. Snapir, Orion Pharma, 3.

Background/Purpose: to investigate blood flow and microvascular reactivity by laser speckle perfusion imager (Perimed, Jarfalla) in consecutive patients affected by Raynaud’s phenomenon at baseline and following dynamic stimulations.

Methods: skin blood flow in the dorsum of the hand was measured at baseline and after cold test and post-occlusive hyperemia test in 56 consecutive subjects affected by Raynaud’s phenomenon who attended the Rheumatology clinic of the university of Pisa between June 2011 and May 2012. 20 Healthy subjects (HS) were studied as controls. The protocol was approved by local ethic committee. All the subjects signed informed consent prior to the study. Statistical analysis was performed by ANOVA and logistic regression, both univariate and multivariate (SPSS). In view of the high number of comparisons involved, Bonferroni correction was applied.

Results: Raynaud’s subjects were divided into two cathegories: 20 primary Raynaud’s phenomenon (PRP) defined according to LeRoY criteria and 36 Raynaud’s secondary to Systemic sclerosis (SSc-RP). 28 SSc patients fulfilled American college of rheumatology criteria for diagnosis of SSc (4 diffuse cutaneous subset and 24 limited cutaneous subset) and 8 were classified according to very early diagnosis criteria for SSc (VEDOSS). After cold test SSc RP had a significant reduction of blood flow (~50%) as compared to HS (~19%) (p= 0.01). Time to rescue of the basal value was significantly higher in SSc-RP (58 minutes) as compared to HS (18 minutes) and PRP (19 minutes) (p=0.002). Peak flow after ischemic test was significant reduced in SSc-RP (~237%) and in HS (~258%) as compared to PRP (~485%) (p=0.03, p< 0.008). Post-ischemic AUC flow showed a significant difference between SSc-RP (~79%) and PRP (~167%) (p=0.01). Patchy pattern of flux distribution was significantly different between HS (5%), PRP (20%), and SSc-RP (84%) (p< 0.0001). Differences between groups sorted out by univariate analysis were entered in a multivariate model.
to outline items that independently discriminated between groups. Peak flow after ischemic test and patchy pattern of flux distribution independently discriminated between HS and PRP and SSc-RP. Within SSc patients, a significant difference in peak flow after ischemic test (543% vs 150% p = 0.002), in the post-occlusive hyperemic response (158 vs 58% p = 0.005) and in duration of hyperemic response after ischemic test (711 seconds vs 171 seconds p = 0.02) was shown between patients with very early SSc (VEDOSS) versus patients with definite SSc. No difference in the dynamic of microcirculation was noticed between diffuse and limited disease.

Conclusion: Our preliminary results indicate a clearcut alteration in the dynamic of microcirculation in SSc-RP as compared to PRP and HS. Within SSc patients, early disease seem to have a different pattern of microvascular reactivity as compared to established disease.

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1483
Predictors of Digital Ulcers in Systemic Sclerosis: Correlation Between Clinical and Hemodynamic Features, Capillaroscopy, Endothelium Dysfunction and Angiogenesis Biomarkers
Ivone Silva1, Isabel Almeida1, António Marinho2 and Carlos Vasconcelos1. 1Raynaud Clinics, Porto, Portugal, 2Unidade de Imunologia Clínica, Porto, Portugal, 3Hospital Geral Santo Antonio, Porto, Portugal.

Background/Purpose: Digital Ulcers (DU) are a major disabling complication of Systemic Sclerosis (SSc) interfering with personal and professional life of our patients. The aim of our study was to analyze functional dysfunction of endothelium, capillaroscopy and angiogenesis biomarkers in patients with SSc, with or without peripheral microvascular complications, in order to try to predict the development of digital ulcers in these patients.

Methods: This is a prospective study of a cohort of Systemic Sclerosis (SSc) and primary Raynaud Phenomenon (RP) patients attending our Raynaud’s Clinic (n = 106). Demographic and epidemiological data, autoimmune serological screening, inflammatory protein screening, Flow mediated dilation (FMD) and end diastolic volume (EDV), capillaroscopy, Endothelin-1 (ET-1), ADMA, VEGF and Endoglin were analyzed and compared to a control group (n = 31). Statistical calculations were performed using SPSS (v 20.0). Comparison and distribution between groups were performed using Kruskal-Wallis test. The Mann-Whitney test was used to compare continuous variables wit nominal variables. A p value ≤ 0.05 was considered significant.

Results: Flow mediated dilation (FMD) was reduced in patients with digital ulcers. The brachial artery diameter at 60 s after cuff deflation had statistical differences (P < 0.001) between SSc patients with digital ulcers compared to SSc patients without DU or primary Raynaud phenomenon (RP). End diastolic volume was significantly different between groups (P < 0.001) suggesting an increase in peripheral resistance in patients with DU. FMD was more reduced in patients with late pattern (Cutolo’s classification) in capillaroscopy and a statistical differences (P < 0.001) between early and late pattern (P < 0.007) was found. Endothelin-1 and ADMA were increased in patients with DU (P < 0.001) which might explain an excessive vasoconstrictor tone in these patients in association with occlusion of distal digital circulation (avascular areas in capillaroscopy) leading to the reduced FMD in patients with DU. VEGF was increased in SSc patients without DU, we found no difference with primary RP (P = 0.168). A statistical differences (P < 0.002) between patients with DU and SSc patients with no DU or with primary RP was found in VEGF. Endoglin was increased in patients with DU (P < 0.001). Patients with Cutolo’s late pattern in capillaroscopy had a increase in the angiostatic biomarker endoglin in comparison with the other groups (P < 0.005).

Conclusion: In our cohort, we identified patients at risk of developing DU: SSc 70% positive, decreased FMD and low EDV, late pattern of Cutolo’s classification, increased ET-1, ADMA and endoglin and a reduced VEGF. Microvascular lesions and an increase in the peripheral resistance associated to endothelial dysfunction and a impaired angiogenesis with an imbalance in favor of increased angiostatic biomarkers may be behind the underlying mechanism of DU. These data may help us identify patients with high risk of developing digital ulcers and defining a correct target therapy at an early stage.

Disclosure: I. Silva, None; I. Almeida, None; A. Marinho, None; C. Vasconcelos, None.
patients quality of life. Objectives of the study: evaluation of esophageal and anorectal involvement and of their correlations in very early SSc patients.

Methods: 56 VEDOSS patients (55 females), mean age 49.2 ± 14, were evaluated with esophageal and anorectal manometry. The demographic data, esophageal and anorectal symptoms (dysphagia, typical GERD symptoms and fecal incontinence and constipation), Raynaud phenomenon (presence/ absence, duration) autoantibodies profile (anticientromere antibodies [ACA], antinuclear antibodies [ANA], anti-Scl70 [Scl70]), videocapillaroscopy pattern (Normal, Early, Active, Late), puffy fingers, digital ulcers were recorded for all patients.

Results: Esophageal body dysmotility (absence of peristalsis or abnormal mean pressure of peristalsis) was present in 49 patients (94.2%) and it was associated with an hypertensive lower esophageal sphincter (LES) in 26 (53.1%). Anorectal manometry was abnormal in 85% of patients and in all these patients an esophageal involvement was found (absence of peristalsis in 29% of patients and an abnormal peristalsis in 67.7% of patients). Esophageal symptoms were present in 26 patients (50%). 22 patients (42.3%) showed puffy fingers that were associated with a smaller area of LES (p-value: 0.011). Only five patients (12.5%) complained anorectal symptoms. In 4 patients esophageal manometry was not performed because of scarce tolerance of the procedure and in 10 patients anorectal manometry was not performed for the same reason.

Conclusion: In VEDOSS patients esophageal and anorectal disorders are frequently detected even in asymptomatic patients. Our data showed that VEDOSS is characterized by simultaneous esophageal and anorectal involvement. Esophageal disorders seem to correlate with the presence of puffy fingers.

Disclosure: G. Lepri, None; S. Bellando-Randone, None; S. Guiducci, None; I. Gallo, None; G. Carnesech, None; J. Blagojevic, None; A. Radicati, None; F. Pucciani, None; M. Matteuci Cerini, None.

1486

Poor Outcome in Patients with Systemic Sclerosis and Myocardial Involvement: A Combined Approach Based On Clinical and Laboratory Findings, EKG-Holter and Cardiac Magnetic Resonance. Silvia Laura Bosello, Giacomo De Luca, Antonella Laria, Giorgia Berardi and Gianfranco Ferraccioli. Division of Rheumatology, Institute of Rheumatology and Affine Sciences, Catholic University of the Sacred Heart, Rome, Italy

Background/Purpose: Cardiac involvement is a relevant prognostic determinant in Systemic Sclerosis (SSc), but the diagnosis is often delayed due to the lack of a specific diagnostic algorithm. Objective of the present study is to define the role of a combined approach, based on evaluation of clinical symptoms, laboratory findings, EKG-holter and cardiac magnetic resonance (CMR), to characterize cardiac involvement in SSc-patients.

Methods: Twenty-five SSc-patients with symptoms of cardiac involvement (dyspnea, palpitation) or signs of cardiac failure and elevation of cardiac enzymes (MB-CK and/or troponin I) underwent EKG-holter and cardiac magnetic resonance (CMR). Median follow-up was 24±0.2 months.

Results: Major EKG-holter modifications were present in 45% of patients. CMR study demonstrated T2 hyperintensity in 2 patients while none of the patients presented early gadolinium enhancement and 16 (64.0%) patients presented almost one pattern of distribution, while 9 patients presented more than one: 81.3% of patients presented a midwall distribution of LGE, 50% of patients presented a subepicardial LGE with a linear distribution pattern and 37.5% presented a subendocardial LGE distribution. 28% of patients showed hypokinetic area and only one patient an akinetic area. The ejection fraction (EF) corrected for the age, was decreased in 7 patients (28%). The mean EF of left ventricle was 60.2±11.1%, and of right ventricle was 55.1±10.2%. Hypokinetik and akinetic area corresponded with the LGE area. The subepicardial distribution pattern was more frequent in patients with an early disease, while patients with diffuse skin involvement presented more frequently with the subendocardial pattern. This latest distribution pattern was also associated with a reduction of EF and with major-EKG abnormalities. The extension of LGE on CMR was evaluated according to a standardized left-ventricular segmentation (Cerqueira et al; Circulation 2002, 105:539-542). Patients with major abnormalities on EKG-holter presented a higher number of myocardial segments involved on CMR (4.8±2.3) with respect to the patients without EKG abnormalities (2.7±0.9) (p=0.041). A weak correlation was found between NYHA-dyspnea class and the number of involved myocardial segments on CMR (R=0.5, p=0.02). After a mean follow-up of 24±0.2 months, 4 patients(16%) died for arrhythmias or heart failure. All patients who died at follow-up had severe dyspnea, elevated cardiac enzymes, myocarditis, major EKG-holter abnormalities, reduction of EF and LGE on CMR at baseline; 75% of patients who died had a subendocardial distribution pattern of LGE on CMR.

Conclusion: Our study suggests that a combined approach, based on clinical presentation, laboratory findings, EKG-holter examination and study of distribution of LGE on CMR, is useful to characterize the extension of myocardial damage and to identify patients with a poor outcome related to heart involvement in SSc.

Disclosure: S. L. Bosello, None; G. De Luca, None; A. Laria, None; G. Berardi, None; G. Ferraccioli, None.

1487

Incidence of Fibromyalgia Syndrome in Systemic Sclerosis and Rheumatoid Arthritis. Comparative Results According to Clinical Diagnosis, Screening Test with Fibromyalgia Rapid Screening Tool, Diagnosis with ACR1990 and ACR2010 Criteria. Serge Perrot1, Maria Peixoto2, Philippe Bercouli3, Eric Hachulla4, Sebastien Ottaviani5 and Yannick Allarone6. 1Hopital Hotel Dieu, Paris, France, 2Cochin Hospital, Paris, France, 3APHP, Hopital Bichat, Paris, France, 4Department of Internal Medicine, Claude Huriez Hospital, University of Lille, Lille CEDEX, France, 5APHP, Paris, France, 6Paris Descartes University, Rheumatology A department, Cochinh Hospital, Paris, France

Background/Purpose: Fibromyalgia (FMS) is a chronic widespread pain condition that may be associated with inflammatory chronic disorders like rheumatoid arthritis (RA) and systemic sclerosis (SSc). In these latter, it is important to detect associated FMS since it may interfere with disease specific assessment. Moreover, in some studies, associated FMS could be related with the occurrence of Secondary Sjogren’s Syndrome (SSS). FMS diagnosis is frequently established by clinical analysis, although there are newly validated screening tools (Fibromyalgia Rapid Screening Tool (FiRST)) and diagnostic criteria (ACR 2010 criteria) that may confirm clinical impression.

The aims of the study was i) to estimate the incidence rate of FMS in RA and SSc, ii) to compare these rates according to clinical diagnosis, screening tool (FiRST), diagnostic criteria (ACR 1990 and 2010), iii) to test if FMS was associated with the occurrence of SSS.

Methods: Consecutive adult patients with confirmed RA or SSc (international classification criteria), visiting 4 university hospitals were included. Demographic characteristics were collected and FMS diagnosis was established by means of a standardized screening process (FMS clinical questionnaire)1,2,3. FMS screening by FiRST questionnaire, iii) FMS diagnosis by ACR 1990 classification criteria and ACR 2010 diagnostic criteria. Cohen’s Kappa correlation coefficient (K) was calculated for inter-agreement between diagnostic tools.

Results: In total, 274 patients were recruited: FMS was diagnosed (ACR2010) in 22.8% of the cases, without significant difference between RA and SSc (p=0.11). In global and each group, FMS occurrence was not associated with a SSS.

In the RA group, 172 patients (12.2 % men, 54.4 ± 15.11 years old) were recruited. FMS clinical diagnosis was proposed in 32.5%, detected by the FiRST in 22.6%, confirmed with ACR 1990 criteria in 22.1% and with ACR 2010 criteria in 19.1% of the RA patients. In RA, considering ACR 2010 criteria as the current gold standard, K was: 0.66 with clinical diagnosis, 0.47 with FiRST and 0.41 with ACR 1990 classification criteria.

In the SSc group, 122 patients (13.9% men, 58.2 ± 12.1 years old) were recruited: 54 with limited SSc and 66 with diffuse SSc. Clinical diagnosis of FMS was proposed in 39.3%, detected by the FiRST in 27.9%, confirmed with ACR 1990 criteria in 30.3% and with ACR 2010 criteria in 27.0% of the SSc patients.

In SSc, considering ACR 2010 criteria as the gold standard, K was 0.64 with clinical diagnosis, 0.63 with FiRST questionnaire, 0.50 with ACR 1990 classification criteria.

Conclusion: Our results reveal an unknown high prevalence of SSc associated FMS, which will need to be taken into account in the assessment of the patients who often report a heavy burden of pain. Both in SSc and RA, occurrence of FMS is not related to SSS. In both groups, there was a good correlation between FiRST and ACR FMS 2010 criteria. FiRST may represent a simple method to detect FMS in various rheumatological conditions. Further studies are needed to analyze FMS association with specific RA and SSc phenotypes.

Disclosure: S. Perrot, None; M. Peixoto, None; P. Dieude, None; E. Hachulla, None; S. Ottaviani, None; Y. Allarone, None.
Prevalence and Risk Factors of Low Bone Mineral Density in Chinese Patients with Systemic Sclerosis: A Case-Control Study. Chi Chiu Mok, Pak To Chan, Ka Li Chan, Ling Yin Ho and Chi Hung To. Tuen Mun Hospital, Hong Kong, Hong Kong

Background/Purpose: To study the prevalence and risk factors of low bone mineral density (BMD) in patients with systemic sclerosis (SSc).

Methods: Twenty consecutive SSc patients and 20 healthy control patients were screened for BMD and BC (fat and lean mass) by DXA scan. The mean ± SD and median (IQR) mRSS score of the SSc patients was 11.2 ± 9.8 (range 0–40) and 8 (IQR 4–14), respectively. The highest mean Medger SSc severity index was observed for involvement of forefinger/toe (0.89 ± 1.44), followed by joint/bend (0.89 ± 1.44), peripheral vascular system (0.86 ± 1.00), heart (0.23 ± 0.68) and the kidney (0.14 ± 0.60). Four (5%) SSc patients required aids for walking and 4(5%) other patients were chair-bound. Except for significantly lower body mass index (BMI) and body weight in SSc patients, the frequency of osteoporosis risk factors was similar to that of controls. The BMD of the lumbar spine, total hip, femoral neck and whole body was significantly lower in SSc patients than controls after adjustment for age, sex, BMI and menopausal status. Fourteen (17%) patients with SSc had low BMD of the lumbar spine expected for their age (Z score <−2.0) and 5(6%) patients had a total hip Z score of <−2.0. Osteopenia of the lumbar spine, total hip and femoral neck, defined as a Z score of between −1.0 and −2.0, occurred in 37%, 45% and 40% of the SSc patients, respectively. Four (7%) patients reported a personal history of fracture (all non-vertebral; two arose from low impact injury). The proportion of patients with osteopenia of the hip, femoral neck and lumbar spine was significantly higher in SSc patients than controls. Linear regression analyses revealed that increasing age was an independent risk factor for lower BMD in all sites. Low BMI was independently associated with low BMD of the total hip and femoral neck, whereas menopause was an independent associated factor of low BMD at the lumbar spine. Other covariates such as the subtype of SSc (diffuse vs limited SSc), parity, smoking, drinking, female sex, disease duration, menopause, ever use of glucocorticoids and family history of fractures were not significantly associated with lower BMD at these sites. The skin score and disease severity scores in any organs were not significantly associated with the BMD values.

Conclusion: BMD of the spine and hip is significantly lower in SSc patients than healthy subjects, which is independent of age, sex, menopause, low BMI and altered body composition.

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Peripheral Neuropathy: A Complication of Systemic Sclerosis. Melissa Reily¹, Tracy M. Frech², Maurren Murtaugh², Jason Penrod² and Barry M. Stults². ¹University of Utah, Salt Lake City, UT, ²University of Utah School of Medicine, SLC, UT, ³University of Utah, Salt Lake City, ⁴Salt Lake City Veterans Affairs Medical Center and University of Utah, Salt Lake City, UT

Background/Purpose: To perform bedside testing for peripheral neuropathy in our Systemic Sclerosis (SSc) population to determine whether foot care guidelines should be developed for SSc.

Methods: Twenty consecutive SSc patients and 20 healthy control patients were evaluated for peripheral neuropathy in both feet using the 10-g Semmes-Weinstein monofilament examination [SWME] three times on four sites bilaterally and vibration sensation using the on-off method on the dorsum of the 1st toe just below the nail with 128-Hz tuning fork eight times. Independent evaluations were performed on each subject by two investigators who had completed a training session to standardize each exam. Abnormal SWME testing was defined as at least one pedal site failing three monofilament assessments twice. Abnormal vibratory sensation was defined as inability to determine pressure from vibration, or as having 5 of 8 tests abnormal on the off-on methodology. Statistics were performed on SAS 9.3.

We examined the inter-rater variability using Cohen’s Kappa. We compared SWME and vibratory sensation in SSc to healthy controls using Fischer’s exact. T-test was used look at duration of disease and modified Rodnan skin score (mRSS) for those with abnormal SWME and vibratory sensation.

Results: Mean age was 56.2 years for the SSc population and 49.4 years for the healthy control population (p = 0.7). Disease distribution included 8 diffuse and 12 limited cutaneous SSc patients. Two of 20 SSc patients reported sensory foot symptoms consistent with peripheral neuropathy, prior to the examination. Inter-rater agreement of SWME and vibration sensation was good (κ = 0.72 and 0.83, respectively). Two healthy controls and 12 SSc patients demonstrated abnormal vibration sense (one-sided Fisher’s exact, p < 0.002). No healthy controls and 4 of the SSc had abnormal monofilament exam (one-sided Fishers exact, p = 0.053). The mRSS and duration of SSc did not differ between those with peripheral neuropathy as those without as diagnosed by these modalities (p = 0.07).

Conclusion: Patients with SSc have a high prevalence of pedal peripheral neuropathy, which may be asymptomatic and place them at risk for neuropathic complications. Similar to persons with diabetes, SSc patients should be screened annually for peripheral neuropathy. Those with significant abnormalities should be referred for routine podiatry care.

Disclosure: M. Reily, None; T. M. Frech, None; M. Murtaugh, None; J. Penrod, None; B. M. Stults, None.

ACR/ARHP Poster Session B
Systemic Sclerosis, Fibrosing Syndromes and Raynaud’s – Pathogenesis, Animal Models and Genetics
Monday, November 12, 2012, 9:00 AM–6:00 PM

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Dysregulation of Angiogenic Homeostasis in Systemic Sclerosis. Naglaa Y. Assaf¹, Hanan M. Farouk ² and Iman M. Aly ³. ¹Faculty of Medicine, Ain-Shams University, Cairo, Egypt, ²Ain-Shams University, Cairo, Egypt

Background/Purpose: systemic sclerosis (SSc) is a connective tissue disorder characterized by tissue hypoxia and excessive fibrosis of skin and internal organs. The present study was planned to evaluate the possible role of angiogenesis imbalance in the pathogenesis of SSc.

Methods: 25 SSc patients, 20 age and sex matched healthy controls were included. Assay of serum vascular endothelial growth factor (VEGF) and endostatin was done for all patients and controls using ELISA. Patients were subjected to modified Rodnan skin score (mRSS), pulmonary function tests (PFTS), and skin biopsies for histopathological skin thickness score assessment.

Results: There was significant increase in the mean levels of serum VEGF and endostatin in SSc patients compared to controls (t=4.07, p<0.001), mean values of serum endostatin is significantly increased in late compared to early stage of disease (t=6.65, p<0.01). SSc patients with restricted PFTS had significantly higher levels of serum endostatin compared to those without ischemic manifestations (t=6.27, p<0.001). SSc patients with restricted PFTS had significantly higher levels of serum endostatin compared to those without pulmonary affection (t=4.3, p<0.01).

Conclusion: Angiogenic inhibitor (endostatin) is induced and outweighs angiogenic inducer (VEGF) in late stage of SSc. Increased serum endostatin is associated with skin sclerosis severity and pulmonary fibrosis and favors SSc disease progression.

Disclosure: N. Y. Assaf, None; H. M. Farouk, None; I. M. Aly, None.

1491
Systemic Sclerosis – Effects of Agonistic Autoantibodies Directed Against the Angiotensin Receptor Type 1 and the Endothelin Receptor Type A On Effector Cells. Jeannine Guenther¹, Angela Kilk², Mike O. Becker ³ and Gabriela Riemenkasten³. ¹Charité University Hospital, Berlin, Germany, ²Charité University Hospital and German Rheumatism Research Centre, a Leibniz Institute, Berlin, Germany, ³Charité University Hospital, Berlin, Germany, ⁴Charité University Hospital, German Rheumatology Research Center, a Leibniz Institute, Berlin, Germany


Background/Purpose: Autoimmunity, vasculopathy and fibrosis are features of systemic sclerosis (SSc). The functional link between these three pathophysiological components is still missing. Research suggests an involvement of endothelin-1 and angiotensin II, and of the activation of their receptors by the natural ligands as well as by agonistic autoantibodies against these receptors in SSc-associated vasculopathy and fibrosis [1]. Autoantibodies against the angiotensin receptor type 1 (AT1R) and the endothelin receptor type A (ETAR) are present in the majority of SSc patients and high levels of the antibodies are associated with severe organ manifestations [1]. AT1R and ETAR are expressed in various cell types such as endothelial cells, fibroblasts, as well as cells of the adaptive and innate immune system. The aim of the present study was to identify the effects of these antibodies on those effector cells and establish a link to SSc pathogenesis.

Methods: Human microvascular endothelial cells, fibroblast, and peripheral blood mononuclear cells (PBMCs) from healthy donors were stimulated in vitro by affinity-purified IgG from sera of SSc patients containing anti-AT1R and anti-ETAR antibodies as well as by affinity-purified IgG from sera of healthy donors. Effects of the antibodies were measured by ELISA, migration assays, and PCR. To prove that the IgG effects are specifically due to AT1R and ETAR activation, specific receptor blockers were used. Cytokine expression was correlated with clinical data from the IgG donors.

Results: In endothelial cells, anti-AT1R and anti-ETAR antibodies induced adhesion molecules and IL-8 expression as well as pro-fibrotic and inflammatory cytokines. IL-8 levels were then measured using commercial ELISA kits. mRNA expression of COlA1, COL A2, TGF-b1, CTGF were also measured by standard real-time qPCR. The phosphorylation of STAT6 and Akt were evaluated by Phospho-Kinase Arrays. Various specific inhibitors for STAT6-mediated pathways, U0126 (Erk1/2 inhibitor), LY294002 (PI3K inhibitor), JAK inhibitor, and Tyk inhibitor (RO495) were used for evaluation of IL-13-mediated signaling.

Conclusions: With the flow cytometric analysis, we revealed the expression of IL-13Ra2, but didn’t detect IL-13 Ra1 with confirmation of the same Ra1 mAb detecting neutrophil expression of IL-13 Ra1. We also found that IL-13Ra2 expression was increased in SSc patients (13% vs 20%). On the contrary, Western blot analysis revealed both expression of IL-13 Ra1 and Ra2. With IL-13 stimulation, the phosphorylation of STAT6 and Akt was induced, and IL-13 plus Jak/Tyk inhibitor(s) suppressed the phosphorylation of STAT6, suggesting IL-13Ra1 was functional, though flow cytometry pattern does not show positive. Treatment with U0126 (Erk1/2 inhibitor) or LY294002 (PI3K inhibitor) did not suppress the phosphorylation of STAT6. We observed IL-13 increased collagen production in 72 hours (p = 0.009) compared to no stimuli. On the contrary, TNF-a decreased COLA1, COL A2, and CTGF mRNA compared to no stimuli. Conclusion: Our results suggest that IL-13 may be a potential stimulator of collagen production in skin fibroblast derived from patients with SSc and IL-13 signaling pathway would be a potential target for the new treatment of SSc.

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Transforming Growth Factor-β and Endothelin-1 Induce Endothelial-Mesenchymal Transition in Cultured Human Endothelial Cells. Stefano Saldano1, Paola Montagna1, Renata Brizzolara2, Barbara Villaggio3, Alberto Sulli1 and Maurizio Cutolo1. 1Research Laboratory and Academic Unit of Clinical Rheumatology, Department of Internal Medicine, University of Genova, Genova, Italy. 2Research Laboratory of Nephrology, Department of Internal Medicine, University of Genova, Genova, Italy

Background/Purpose: The endothelial/microvascular injury and the myofibroblast activation are crucial events that seem to contribute to the development of fibrosis in connective tissue diseases such as systemic sclerosis (SSc), which is characterized by increased local transforming growth factor-β (TGF-β) and endothelin-1 (ET-1) levels. Recently it was shown that myofibroblast activation from altered microvasculature may arise through the transition of endothelial to mesenchymal cells (EndoMT), thus expressing α-smooth muscle actin (α-SMA), vimentin and fibrillar collagens (3).

To investigate the possible involvement of TGF-β and ET-1 in the early step of EndoMT in cultures of human endothelial cells.

Methods: Human umbilical vein endothelial cells (HUVEC) were cultured in collagen-coated dishes with EGM-2 medium and used between the third and fifth passages. The cells were treated with ET-1 (100 nM) or TGF-β (10 ng/ml) for 1, 3 and 6 days. Untreated endothelial cells were used as controls (cnt). Cell proliferation was evaluated by methyl-thiazol-tetrazolium salt test (MTT) after 1 day. The expression of α-SMA as marker of myofibroblast phenotype, and platelet endothelial cell adhesion molecule (PECAM-1 or CD31), as marker of endothelial phenotype, was evaluated after 3 and 6 days of treatment by immunofluorescence (IF) and western blot analysis (WB) according to recent evidences. Data were obtained by eight different experiments and statistical analysis was carried out by a non-parametric Friedman test.

Results: After 6 days of treatment, TGF-β induced the α-SMA expression in cultured human endothelial cells, which maintain their capability to express CD31.

Interestingly, also ET-1 was able to stimulate the endothelial cells to express α-SMA after 6 days of treatment. The data were obtained by IF and confirmed by WB analysis.

In addition, MTT test showed that both TGF-β and ET-1 induced a statistically significant increase of proliferation of human endothelial cells vs. cnt (p<0.001).

Conclusion: These preliminary results show that both ET-1 and TGF-β seem to have similar effects in inducing the α-SMA expression and cell proliferation in human endothelial cells thus supporting a possible direct involvement in promoting the transition from endothelial to myofibroblast phenotype (2, 4–6). The implications in the fibrotic process that characterize SSc are matter of further evaluations.

References

Background/Purpose: Interleukin (IL)-13 is a pleiotropic cytokine involved in Th helper type 2 cell immune response and in the development of fibrotic conditions such as liver cirrhosis, and pulmonary fibrosis and also implicated in systemic sclerosis (SSc). Although elevated serum levels of IL-13 have been reported in SSc and recently CD8 T cells was found as a producing subset of IL-13, IL-13 effect of effector phase in the skin fibroblasts has not been well characterized in SSc. The aim of the present study was to investigate the fibrotic effects of IL-13 on the collagen production by skin fibroblasts from patients with SSc. We also evaluated the signal transduction of IL-13 in the cultured skin fibroblasts.

Methods: We examined the expression of IL-13Ra1 and IL-13Ra2 on skin fibroblasts by flow cytometry and Western blot analyses. Skin fibroblasts from patients with diffuse cutaneous SSc were cultured with indicated concentrations of IL-13 and TNFa for various periods. Procollagen type I C-peptide and TGF-B1 levels were then measured using commercial ELISA kits. mRNA expression of COlA1, ColA2, TGF-B1, CTGF were also measured by standard real-time qPCR. The phosphorylation of STAT6 and various MAPK and Akt pathways have been evaluated by Phospho-Kinase Arrays. Various specific inhibitors for STAT6-mediated pathways, U0126 (Erk1/2 inhibitor), LY294002 (PI3K inhibitor), JAK inhibitor, and Tyk inhibitor (RO495) were used for evaluation of IL-13-mediated signaling.

Results: With the flow cytometric analysis, we revealed the expression of IL-13Ra2, but didn’t detect IL-13 Ra1 with confirmation of the same Ra1 mAb detecting neutrophil expression of IL-13 Ra1. We also found that IL-13Ra2 expression was increased in SSc patients (13% vs 20%). On the contrary, Western blot analysis revealed both expression of IL-13 Ra1 and Ra2. With IL-13 stimulation, the phosphorylation of STAT6 and Akt was induced, and IL-13 plus Jak/Tyk inhibitor(s) suppressed the phosphorylation of STAT6, suggesting IL-13Ra1 was functional, though flow cytometry pattern does not show positive. Treatment with U0126 (Erk1/2 inhibitor) or LY294002 (PI3K inhibitor) did not suppress the phosphorylation of STAT6. We observed IL-13 increased collagen production in 72 hours (p = 0.009) compared to no stimuli. On the contrary, TNF-a decreased COLA1, COL A2, and CTGF mRNA compared to no stimuli. Conclusion: Our results suggest that IL-13 may be a potent stimulator of collagen production in skin fibroblast derived from patients with SSc and IL-13 signaling pathway would be a potential target for the new treatment of SSc. TNF-a may have inhibitory effect on fibroblastic development and the use of TNF blocking biological reagents in SSc would not be recommended in SSc.

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CD40 Signaling Results in Microvascular Endothelial Dysfunction: A Possible Clue to the Pathogenesis of Scleroderma Vasculopathy. Bashar Kahaleh and Yongqing Wang. University of Toledo, Toledo, OH

Background/ Purpose: Increased expression of CD40 in SSc Microvascular Endothelial Cells (MVEC) was noted on a gene expression array and increased concentrations of soluble CD40 ligand (sCD40L) was reported in scleroderma. In this study we investigated the effect of CD40 ligation on MVEC apoptosis, activation and dysfunction.

Methods: MVEC were isolated from involved SSc skin and from matched healthy control subjects. MVEC apoptosis was assessed by flow cytometry, caspases3/7 activity and cell viability. MVEC genes expression was determined by real-time-PCR and results were confirmed by western blot analysis. Endothelial permeability was assessed by FITC-Dextran permeability assay.

Results: Significant increase in CD40 expression of was noted in SSC-MVEC (3.2 folds ± 0.3 in SSc vs. control MVEC). Similar increase in expression level was noted in SS skin biopsies (2.4 folds ± 0.3 in SSC skin vs. control skin biopsies, n=3 each).

The addition of CD40 ligand to MVEC resulted in the following observations:

1. Reduction in nitric oxide synthase (NOS3) expression (80%±6 reduction in control-MVEC and 82%± 8 % in SSc-MVEC, mean 4 cell lines ±SD) and in prostacyclin synthase (PTGS1), 64%± 3% reduction in control-MVEC and 76%± 4.5 reduction in SSc-MVEC, mean 4 cell lines ±SD). While Endothelin 1 expression was significantly increased by 2.2± 0.12 folds in control MVEC and by 2.8±0.31 folds in SSc-MVEC.

2. Increase EC permeability (2.2± 0.3 in control-MVEC and 2.8± 0.34 in SSC-MVEC, folds±SD).

3. Significant increase expression of the CC and CXC chemokines including CCL2, interleukin-8, CXCL3, 5, 6 and 9.

4. Increase expression of IL1B, hepatocyte growth factor and adhesion molecules particularly ICAM1.

5. Significant down regulation of c-fos induced growth factor (FGF1, vascular endothelial growth factor D), epidermal growth factor, insulin-like growth factor 1 and metallopeptidase inhibitor TIMP2.

6. The addition of CD40L to MVEC cultured in 0.5% serum resulted in a dose dependent apoptosis of MVEC. SSc-MVEC were more susceptible to apoptosis than control MVEC, thus at 10 μg concentration of CD40L, MVEC apoptosis was 45%± 5 and 20%± 3 in SSc vs. control MVEC respectively (mean ± SD of 4 cell lines). Apoptosis was confirmed by increase caspase 3/7 activity 2.2 folds in control and 3.0 folds in SSc-MVEC.

Conclusion: The study demonstrates increase expression of CD40 in SSc skin and in SSc-MVEC. CD40 ligation led to reduce expression of vasodilatory and increase expression of vasoconstrictive genes. Moreover, addition of CD40L increased endothelial permeability and the acquisition of an activated/dysfunctional phenotype in association with increase MVEC apoptosis. In all instances, SSc MVEC were more susceptible to CD40 signaling effects than control MVEC. The results suggest that the blockade of CD40/CD40 ligand interaction could be an effective therapeutic strategy in SSc.

Disclosure: B. Kahaleh, None; Y. Wang, None.

Platelet Aggregability, Eicosanoid Biosynthesis and Oxidative Stress in Primary Raynaud’s Phenomenon and Systemic Sclerosis. John D. Pauling and Neil McHugh. Royal National Hospital for Rheumatic Diseases, Bath, United Kingdom

Background/ Purpose: Increased platelet activation, endothelial dysfunction and oxidative stress are all thought to contribute to the pathogenesis of Raynaud’s phenomenon (RP), particularly in the context of systemic sclerosis (SSc). We report the findings of a cross-sectional study evaluating platelet function, endothelial production of prostacyclin and a novel biomarker of oxidative stress in patients with primary RP and SSc.

Methods: Patients with primary RP and SSc who were not taking anti-platelet or non-steroidal anti-inflammatory drugs were included in the study. All patients had their disease characteristics and medication use documented. Platelet number and structure (mean platelet volume, platelet distribution width and plateletcrit) were assessed using automated haematology analysis. Platelet function was assessed using light transmission aggregation (maximum % aggregation over 5 minutes and maximum gradient of aggregation) to adenosine diphosphate (ADP, 1.25–10μL) and arachidonic acid (AA, 0.82–1.64mmol/L). Fasting levels of the major urinary metabolite of thromboxane (11-dehydro-TxB2), prostacyclin (2,3-dinor-6-keto-PGF1α) and non-enzymatic markers of lipid peroxidation and oxidative stress (F2-isoprostanes) were assessed using Gas Chromatography/Mass Spectrometry (GC/MS) analysis.

Results: Seventeen patients with primary RP and 17 with systemic sclerosis were recruited to the study. Age, gender, smoking status and use of vasodilator therapy were similar in each group (p>0.05). Platelet number and structure did not differ between groups. Maximum % aggregation to low concentration ADP (0.125–0.5μL) was significantly greater in SSc compared to primary RP (p<0.05 for all comparisons). Percent aggregation to high concentration ADP (10μL) and AA (1.64 and 0.82mmol/L) did not differ between groups, possibly representing a ceiling effect. The maximum gradient of aggregation was significantly greater for 1.64mmol/L AA in SSc compared to primary RP. Urinary metabolites of thromboxane (median 425 vs. 382 pg/mg creatinine [Cr]), prostacyclin (160 vs. 122 pg/mg Cr) and F2-isoprostanes (1.00 vs. 1.12 ng/ml Cr) did not differ between SSc and primary RP (p>0.05 for all comparisons). There were moderate correlations between urinary 11-dehydro-TxB2 and both 2,3-dinor-6-keto-PGF1α and F2-isoprostanes (Spearman’s Rho 0.537 and 0.612 respectively, p<0.001). A history of digital ulceration was associated with increased aggregation to 5μL ADP in SSc. There were no associations between disease characteristics and eicosanoid biosynthesis in SSc.

Conclusion: This pilot study has identified increased ex vivo platelet reactivity in SSc compared with primary RP. In vivo lipid biomarkers of platelet activation, endothelial function and oxidative stress did not differ between groups. Biosynthesis of thromboxane (a potent vasoconstrictor) is associated with increased oxidative stress and increased synthesis of prostacyclin (a potent vasodilator) in RP. Additional work evaluating the clinical associations of platelet function and eicosanoid biosynthesis in a larger cohort of patients with primary RP and SSc may help guide the use of anti-platelet therapy in these patient groups.

Disclosure: J. D. Pauling, None; N. McHugh, None.

Regulated Expression of Metallothionein Genes in Response to the Gadolinium Contrast Agent Omniscan in Normal Human Differentiated Macrophages and Dermal Fibroblasts. Peter J. Wormuth, Francisco Del Guado, Shankar Adya, Paolo Fortina and Sergio A. Jimenez. Jefferson Institute of Molecular Medicine, Division of Connective Tissue Diseases and Scleroderma Center, Thomas Jefferson University, Philadelphia, PA.

Background/ Purpose: Metallothioneins bind heavy metals with high affinity and can serve as storage proteins for labile Zn2+ which in turn can regulate immune system activity through interactions with Toll-like receptor (TLR) signal transduction. Nephrogenic Systemic Fibrosis (NSF) is a generalized progressive fibrotic disorder described in some patients with renal insufficiency exposed to various gadolinium based contrast agents (GdBCA). The GdBCA Omniscan activates expression and production of several proinflammatory and profibrotic cytokines and growth factors in normal differentiated human macrophages via TLR4 and TLR7 signaling. Since some GdBCAs are capable of inducing transmetallation by displacing Zn2+ from proteins the effect of GdBCA on expression levels of metallothionein genes in normal human macrophages and fibroblasts was examined in this study.

Methods: Terminaly differentiated macrophages generated from two normal buffy coats were exposed for 24 hour to either 50 mM Omnisan or saline. Total RNA was isolated, labeled and hybridized to Affymetrix human U133 Plus 2 microarrays. Volcano plots were used to identify differentially expressed genes between Omniscan treated and saline treated cells employing parametric testing assuming equal variances. Differential gene expression was confirmed by real-time PCR on the same RNA samples. Validation experi-
ments utilizing 3 additional differentiated macrophage isolates and two early passage (~6) normal human dermal fibroblasts examined the effect 1 mM Omniscan on the expression of metallothionein genes.

**Results:** Microarray analyses showed marked downregulation (~1.5 to 4 fold) of expression of multiple metallothionein genes (MT1E, MT1F, MT1G, MT1H, MT1M, MT1X and MT2A) in cells treated with 50 mM Omniscan compared to saline treated controls. These results were confirmed by real time-PCR analysis. Lower doses (1 nM) of Omniscan also downregulated the expression of these same genes as well as MT3 and MT4 whereas the expression of MT1A and MT1B was upregulated in normal human differentiated macrophages as well as in normal human dermal fibroblasts.

**Conclusion:** Global gene expression microarrays and real-time PCR analysis showed that exposure of terminally differentiated normal human macrophages to 50 mM Omniscan downregulated expression of multiple metallothionein genes in comparison to saline treated controls. Exposure of differentiated macrophages and normal human dermal fibroblasts to 1 mM Omniscan also decreased expression of these genes but increased expression following GdBCA exposure in macrophages and dermal fibroblasts may play a role in the pathogenesis of the severe fibrotic process of NSF pathogenesis.

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**Activation of Sirt1 Attenuates Bleomycin Induced Scleroderma Through Inhibiting Mammalian Target of Rapamyacin Activation.** Xiaoxia Zhu, Jianhua Qiu, Qiong Liu, Minrui Liang and Hejian Zou. Huashan Hospital, Fudan University, Shanghai, China, Neuroscience Center, Massachusetts General Hospital, Harvard Medical School, Massachusetts, USA, Boston, MA, Institute of Rheumatology, Immunology and Allergy, Shanghai Medical College, Fudan University, Shanghai, China, Huashan Hospital, Fudan University, Shanghai, China, Huashan Hospital, Shanghai, China

**Background/Purpose:** Scleroderma is an autoimmune disease, characterized by progressive fibrosis of skin and internal organs. Inflammation is one of the main manifestations of scleroderma, especially at the early stage. Inflammation is also an important initiating agent of fibrosis, suppression of inflammation may be a promising resolution to attenuate scleroderma. Sirt1 (a NAD+ dependent deacetylase) and its potent activator, resveratrol, both have been shown to have important role in regulation of inflammation.

**Methods:** In this study, we investigated the anti-inflammation role of Sirt1 and resveratrol in TNF-α treated fibroblasts and bleomycin induced mice experimental scleroderma, and further explore the anti-inflammatory mechanisms of Sirt1 and resveratrol in fibroblasts.

**Results:** Upregulation of matrix metalloproteinases 9 (MMP9), interleukin-1beta (IL-1β), IL-6 and inducible nitric oxide synthase (iNOS) were observed in the 3T3/NIH fibroblasts after being treated by TNF-α. Resveratrol suppressed the upregulation of inflammatory factors induced by TNF-α in a dose-dependent manner. And the suppression was significantly decreased if resveratrol was applied after the inflammation being induced. In the scleroderma mice model, bleomycin induced significant inflammation and fibrosis in the skin where infiltrated inflammatory cells, increased fiber bundles, upregulated collagen deposition were examined by HE staining and Masson’s trichrome staining. But the pathological changes in were then notably attenuated by resveratrol treatment in time and dose dependent manner. The bleomycin induced upregulation of inflammatory factors were also inhibited by resveratrol treatment in the mice skin. We further explored the potential anti-inflammatory mechanisms of resveratrol in vitro. We blocked Sirt1 expression by Sirt1 siRNA transfection in 3T3/NIH fibroblasts, and investigated that knockdown of Sirt1 caused cell sensitizing to TNF-α stimulation and diminished the inflammatory inhibition of resveratrol. Furthermore, in this study, we also found that resveratrol inhibited the phosphorylation of both mammalian target of rapamycin (mTOR) and S6 ribosomal protein (S6RP) while ameliorating the inflammation in TNF-α treated fibroblasts. And rapamycin, the specific inhibitor of mTOR, attenuated the TNF-α induced inflammation in the fibroblasts.

**Conclusion:** The results suggest that Sirt1 is an efficient target for suppression of inflammation and fibrosis in scleroderma. As a Sirt1 activator, resveratrol may be used for therapy in scleroderma. Suppression of mTOR/S6RP phosphorylation may be involved in the mechanisms. This study provides a novel insight or treatment of scleroderma and other inflammation-related diseases.

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dermal fibroblasts. In sGC-knockout fibroblasts, pre-treatment with the sGC stimulator BAY41–2272 did not reduce collagen release, demonstrating that the anti-fibrotic effects of BAY41–2272 are indeed mediated exclusively via sGC. To demonstrate that the second messenger cGMP is the central mediator of the sGC effects, we used the stable cGMP agonist 8-Bromo-cGMP. 8-Bromo-cGMP was effective in reducing TGF-β-dependent increase of collagen mRNA levels and collagen release in normal and SSc fibroblasts as well as in sGC-knockout fibroblasts. To further elucidate the novel link between sGC- and TGF-β-signaling, we studied nuclear p-smad2/3 levels. BAY41–2272 or 8-Bromo-cGMP prevented the TGF-β-induced increase in nuclear p-smad2/3 in normal and SSc fibroblasts. In sGC-knockout fibroblasts, only 8-Bromo-cGMP reduced p-smad2/3 levels, while BAY41–2272 had no effects. In vivo, we examined the anti-fibrotic effects of sGC stimulation in TGF-β-dependent, experimental dermal fibrosis (TBR model). BAY41–2272 dose-dependently reduced dermal thickening, hydroxyproline content and myofibroblast counts as well as p-smad2/3 levels, suggesting that sGC stimulation inhibited fibrogenesis via blocking TGF-β-signaling. We confirmed these findings in the more general disease model of bleomycin-induced dermal fibrosis, in which TGF-β is one of several important pro-fibrotic mediators.

**Conclusion:** We elucidated the molecular mechanisms underlying the anti-fibrotic effects of sGC signaling. Stimulation of sGC increases cGMP levels, which inhibits smad phosphorylation and results in decreased fibroblast activation and collagen release. Importantly, sGC stimulators have vasodilatory and anti-remodeling effects and are in phase 3 clinical trials for pulmonary arterial hypertension (PAH). Thus, sGC stimulators may soon become available for clinical trials and may provide simultaneous treatment of vascular disease and fibrosis in SSc.

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**1500 Activation of Pregnane X Receptor Induces Regression of Experimental Dermal Fibrosis.** Christian Beyer1, Alla Skapenko2, Aliya Distler2, Clara Dees1, Helena Reichert1, Louis E. Munoz3, Jan Leipe4, Hendrik Schulz-Koops5, Oliver Distler1, Georg Schett1 and Joerg HW Distler6. 1Department of Internal Medicine 3 and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 2University of Munich, Munich, Germany, 3University of Erlangen-Nuremberg, Erlangen, Germany, 4Division of Rheumatology and Clinical Immunology, Munich, Germany, 5University Hospital Zurich, Zurich, Switzerland, 6Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 7Department of Internal Medicine III and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

**Background/Purpose:** Pregnane-X-receptor (PXR) belongs to a superfamily of nuclear receptors that function as ligand-activated transcriptional factors. Although endogenous ligands have not yet been identified, PXR is a well-established master regulator of endobiotic metabolism as well as glucose and lipid homeostasis. Herein, we studied the role of PXR in experimental dermal fibrosis.

**Methods:** Mice were challenged with subcutaneous bleomycin injections and treated with 5-Pregnen-3β-ol-20-one-16α-carboxylate (PCN) to activate PXR (i.p. once daily, conc. 25 mg/kg). After treatment, murine skin samples were analyzed for skin thickness, hydroxyproline content, α-smooth muscle actin (α-SMA)-positive myofibroblast counts, and phosphorylated smad2/3 (p-smad2/3) levels. Interleukin (IL)-13 was measured by multiplex bead array technology in murine skin. In vitro, murine fibroblasts were treated with PCN prior to stimulation with TGF-β to determine direct effects of PXR on collagen release. To study the release of the TH2 cytokines IL-4 and IL-13 from murine CD4+ T cells, murine T cells were isolated from FVB mice, kept in TH2 and TH1 conditions, and treated with PCN.

**Results:** We found that PXR activation effectively prevented bleomycin-induced dermal fibrosis as shown by reduced skin thickening (by 85.9 ± 7.5%, p = 0.002), hydroxyproline content (by 50.5 ± 6.4%, p = 0.002) and myofibroblast counts (by 77.0 ± 12.0%, p = 0.005). Apart from preventing fibrosis, PXR stimulation induced regression of established bleomycin-induced dermal fibrosis in a modified treatment model with significant reductions of skin thickening, hydroxyproline content and myofibroblast counts below pre-treatment levels. When elucidating the molecular mechanisms of the anti-fibrotic activity of PXR, we found that PXR activation reduced p-smad2/3 levels by 62.5 ± 9.2% (p = 0.010) in the skin of bleomycin-challenged mice, suggesting that PXR activity inhibited pro-fibrotic canonical TGF-β signaling. Although PXR was expressed in low levels in dermal fibroblasts, PCN treatment did not change TGF-β-induced collagen release in vitro. This suggested indirect anti-fibrotic effects of PXR on the collagen release from fibroblasts. We therefore examined the effects of PXR stimulation on the release of the TH2 cytokines from murine CD4+ positive lymphocytes, which are well-established pro-fibrotic mediators in fibrotic disease. We found that PXR activation reduced the expression of pro-fibrotic T12 cytokine IL-13 by 60.0 ± 13.1% (p = 0.010 for 100 μM PCN). Of note, we could confirm these results in vivo since PXR stimulation significantly reduced IL-13 levels by 166 ± 17.3% (p = 0.001) in the skin from mice challenged with bleomycin.

**Conclusion:** In summary, we are the first to establish potent anti-fibrotic effects of the nuclear receptor PXR. Pharmacological activation of PXR interferes with IL-13 release from TH2 cells, which leads to inhibition of pro-fibrotic TGF-β signaling and results in decreased fibroblast activation and collagen release. These findings suggest that activation of PXR might be a novel anti-fibrotic approach in particular for early, inflammatory stages of SSc and other fibrotic diseases.

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Conclusion: An elevated periostin level in SSc patients was correlated with severity of skin sclerosis. Periostin may be a potential biomarker reflecting for disease severity in patients with SSc.

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1502 Hedgehog Signaling in Murine Chronic Sclerodermatous Graft-Versus-Host Disease. Pawel Zen1, Katrin Palmbo-Zen2, Aliyya Distler1, Michal Tomicik2, Stefan Vollath1, Louis E. Munoz2, Christian Beyer2, Clara Dees2, Friederike Egberts3, Ilaria Tinazzi3, Francesco Del Galdo3, Olivier Distler1, Georg Schett1, Bernd M. Spriewald4 and Joerg HW Distler1.

1. Department of Internal Medicine 3 and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 2. Institute of Rheumatology, Department of Rheumatology, 1st Faculty of Medicine, Charles University, Prague 2, Czech Republic, 3. Department of Dermatology, Schleswig-Holstein University Hospital, Campus Kiel, Kiel, Germany, 4. Sclerodermia Research Program, Leeds Institute of Molecular Medicine, Division of Musculoskeletal Diseases, University of Leeds, Leeds, United Kingdom, 5. Center of Experimental Rheumatology and Zurich Center of Integrative Human Physiology, University Hospital Zurich, Zurich, Switzerland, 6. Department of Internal Medicine V, University of Erlangen-Nuremberg, Erlangen, Germany.

Background/Purpose: Sclerodermatous chronic graft-versus-host disease (cGvHD) is a prognosis limiting complication of allogeneic bone marrow transplantation. cGvHD can manifest on virtually every organ system. However, the skin is most commonly affected with progressive skin fibrosis resembling the findings in systemic sclerosis (SSc). The hedgehog pathway plays a critical role in cellular differentiation during embryogenesis, but also for tissue homeostasis in adult. The prominent role of hedgehog signaling in various tumors prompted the development of small molecule inhibitors, some of which have already been successfully tested in clinical trials.

Methods: Sublethally irradiated recipient mice received miHAg-mismatched bone marrow to induce sclerodermatous cGvHD. Activation of sonic hedgehog (Shh) pathway in cGvHD was analyzed by immunohistochemistry for Shh and its downstream transcription factors Gli-1 and Gli-2 in human and murine skin. Smo- and PTP1B were measured using dihydroethidium. PDGFR phosphorylation was determined by immunoprecipitation and Western blotting. Quantitative PCR was performed with primers for Col1 and β-actin. Immunofluorescence was performed to probe for Col1 and αSMA. An enzyme linked immunosorbent assay was completed to detect MMP-1. Phosphatase activities were measured using the amount of phosphate released as an end point.

Results: Addition of NAC decreased superoxide in SSc dermal fibroblasts while DHLA did not. Both NAC and DHLA decreased PDGFR phosphorylation in SSc fibroblasts. Col1 mRNA was increased in SSc fibroblasts compared to normal (NL) at basal level, while NAC and DHLA decreased both Col1 mRNA and protein levels. SSc fibroblasts produced lower levels of MMP-1 compared to NL, but the levels increased after NAC or DHLA incubation. DHLA not only decreased the expression of αSMA in SSc dermal fibroblasts, but also restored the activities of phosphatases that inactivate the PDGFR, including PTP1B, SHP-2, and DEP-1. Almost as effective was NAC which restored PTP1B and DEP-1 activity, but not SHP-2.

Conclusion: Our results show that thiol antioxidants are beneficial for SSc dermal fibroblasts due to their ability to reverse the profibrotic phenotype of these cells. Thiol antioxidants decrease PDGFR activation, possibly by restoring the activities of phosphatases, and hence decrease Col1 production. In addition, they increase MMP-1 production, which decreases Col1. Moreover, DHLA lowered the expression of αSMA, suggesting that it could reverse the myofibroblast phenotype of SSc dermal fibroblasts. Hence thiol antioxidants could prove to be an effective treatment in SSc.

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Background/Purpose: Systemic sclerosis (Scleroderma, SSc) is a connective tissue disease characterized by vasculopathy and fibrosis of the skin and organs. Increase in superoxide production and platelet-derived growth factor receptor (PDGFR) activation promote collagen I (Col I) production, leading to fibrosis in SSc. Protein tyrosine phosphatases (PTPs), which are responsible for terminating the PDGFR pathway, are oxidatively inactivated in SSc dermal fibroblasts. In addition, these cells exhibit myofibroblast characteristics with increased α-smooth muscle actin (αSMA) expression. The goal of this study is to determine the effect of two thiol antioxidants, N-acetylcysteine (NAC) and dihydroxylic acid (DHLA), on the phenotype of SSc fibroblasts, specifically PDGFR stimulation, Col I synthesis, superoxide levels, phosphatase activity, αSMA expression, and matrix metalloproteinase 1 (MMP-1) production.

Methods: Punch biopsies (4 mm) from distal skin were obtained from patients with SSc (n = 5). Normal (NL) skin tissue was obtained from the tissue procurement service of the University of Michigan. Superoxide levels were measured using dihydroethidium. PDGFR phosphorylation was determined by immunoprecipitation and Western blotting. Quantitative PCR was performed with primers for Col 1 and β-actin. Immunofluorescence was performed to probe for Col 1 and αSMA. An enzyme linked immunosorbent assay was completed to detect MMP-1. Phosphatase activities were measured using the amount of phosphate released as an end point.

Results: Addition of NAC decreased superoxide in SSc dermal fibroblasts while DHLA did not. Both NAC and DHLA decreased PDGFR phosphorylation in SSc fibroblasts. Col1 mRNA was increased in SSc fibroblasts compared to normal (NL) at basal level, while NAC and DHLA decreased both Col1 mRNA and protein levels. SSc fibroblasts produced lower levels of MMP-1 compared to NL, but the levels increased after NAC or DHLA incubation. DHLA not only decreased the expression of αSMA in SSc dermal fibroblasts, but also restored the activities of phosphatases that inactivate the PDGFR, including PTP1B, SHP-2, and DEP-1. Almost as effective was NAC which restored PTP1B and DEP-1 activity, but not SHP-2.

Conclusion: Our results show that thiol antioxidants are beneficial for SSc dermal fibroblasts due to their ability to reverse the profibrotic phenotype of these cells. Thiol antioxidants decrease PDGFR activation, possibly by restoring the activities of phosphatases, and hence decrease Col1 production. In addition, they increase MMP-1 production, which decreases Col1. Moreover, DHLA lowered the expression of αSMA, suggesting that it could reverse the myofibroblast phenotype of SSc dermal fibroblasts. Hence thiol antioxidants could prove to be an effective treatment in SSc.

Disclosure: P. S. Tsou, None; B. Balogh, None; A. J. Pinney, None; E. Schiopu, United Therapeutics, 8; D. Khanna, Actelion, Gilead, Genentech, ISDIN, and United Therapeutics, 2, Actelion, Gilead, Genentech, ISDIN, and United Therapeutics, 5, United Therapeutics, 8; A. E. Koch, None.

1504 A Possible Contribution of Visfatin to the Resolution of Skin Sclerosis in Patients with Diffuse Cutaneous Systemic Sclerosis Via a Direct Antifibrotic Effect On Dermal Fibroblasts and Th1 Polarization of the Immune Response. Tetsuo Toyama, Yoshiohide Asano, Yuri Masui, Sayaka Shibuta, Kaname Akamata, Shinji Noda, Naohiko Aozasa, Takashi Taniguchi, Takehiro Takahashi, Yoichi Ichimura, Hayakazuki Sumida, Koichi Yanaba, Takafumi Kadono and Shinichi Sato. University of Tokyo Graduate School of Medicine, Tokyo, Japan.

Background/Purpose: Our latest studies have demonstrated that adipokynes, including adiponectin, apelin, and retinol-binding protein-4, are potentially involved in the development of complicated clinical symptoms associated with systemic sclerosis (SSc). Visfatin is another member of adipokynes with pro-fibrotic, pro-inflammatory, and immunomodulating properties, having been implicated in the pathogenesis of certain fibrotic and inflammatory autoimmune diseases. As an initial step of a series of studies regarding the role of visfatin in the pathogenesis of SSc, we herein investigate the clinical significance of serum visfatin levels and its contribution to the developmental process in this disorder.

Methods: Serum visfatin levels were determined by a specific ELISA in 57 SSc patients and 19 healthy controls. The effects of visfatin on the mRNA
levels of α2(I) collagen (COL1A2) and matrix metalloproteinase-1 (MMP-1) genes were examined in normal and SSc dermal fibroblasts by reverse-transcript real-time PCR. The levels of IL-12p70 produced by THP-1 cells differentiated with IFN-γ plus LPS in the presence or absence of visfatin were measured by a specific ELISA.

**Results:** Serum visfatin levels were comparable among total SSc, diffuse cutaneous SSc, limited cutaneous SSc, and healthy controls. The only finding in a series of analyses regarding the correlation of serum visfatin levels with clinical symptoms and laboratory data was the significantly longer disease duration in dcSSc with elevated serum visfatin levels than in those with normal levels.Consistently, serum visfatin levels were significantly elevated in late stage dcSSc (disease duration of > 6 years), but not in early and mid-stage dcSSc, compared with healthy controls, suggesting the possible contribution of visfatin to the resolution of skin sclerosis in late stage dcSSc. To assess this hypothesis, two sets of *in vitro* experiments were carried out using dermal fibroblasts and THP-1 cells. Visfatin suppressed the mRNA levels of COL1A2 gene, while increasing the mRNA levels of MMP-1 gene, in a dose-dependent manner in SSc dermal fibroblasts, whereas the mRNA levels of these genes were not affected by visfatin at all in normal dermal fibroblasts, indicating the direct anti-fibrotic effect of visfatin on SSc dermal fibroblasts. Furthermore, visfatin increased the production of IL-12p70 in THP-1 cells differentiated with IFN-γ plus LPS in a dose-dependent manner, suggesting the promotion of Th1 immune responses by visfatin.

**Conclusion:** Visfatin may contribute to the resolution of skin sclerosis in late stage dcSSc via the direct anti-fibrotic effect on dermal fibroblasts and Th1 polarization of the immune response.

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**1505**

**Inactivation of Tankyrases Ameliorates Canonical Wnt Signaling and Prevents Experimental Fibrosis.** Alinya Distler1, Lisa Deloch1, Jingping Huang2, Clara Dees3, Neng Yu Lin3, Christian Beyer4, Oliver Distler5, Georg A. Schett6 and Joerg HW Distler4. 1Department of Internal Medicine 3 and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 2University of Erlangen-Nuremberg, Erlangen, Germany, Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

**Background/Purpose:** Inactivation of tankyrases was well tolerated without any clinical signs of toxicity. Consistently, serum visfatin levels were significantly elevated in late stage dcSSc with elevated serum visfatin levels than in those with normal levels. Inactivation of tankyrases either by XAV-939 or by siRNA mediated knockdown of tankyrases prevented the activation of canonical Wnt signaling in experimental fibrosis and reduced the nuclear accumulation of β-catenin and the mRNA levels of the target gene c-myc. Pharmacologic inhibition of tankyrases was well tolerated without any clinical signs of toxicity. Treatment with XAV-939 potently reduced β-catenin-induced dermal thickening by 50% compared to sham-treated mice (p = 0.0007). XAV-939 also significantly reduced the differentiation of resting fibroblasts into myofibroblasts and accumulation of collagen. XAV-939 also exerted potent anti-fibrotic effects in adTBR driven skin fibrosis with reduced dermal thickening, decreased myofibroblast counts and reduced accumulation of collagen compared to sham-treated mice. siRNA mediated knockdown of tankyrases in the skin also exerted potent anti-fibrotic effects confirming that the anti-fibrotic effects of XAV-939 were not due to off-target effects.

**Conclusion:** Inactivation of tankyrases abrogated the activation of canonical Wnt signaling and demonstrated potent anti-fibrotic effects in different preclinical models of SSc without evidence of toxicity. Consistently, the great medical need, the potent anti-fibrotic effects, the good tolerability and first clinical trials with tankyrase inhibitors, tankyrases might be potential candidates for targeted therapies in SSc and other fibrotic diseases.

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**1506**

**Primary Human Scleroderma Dermal Endothelial Cells Exhibit Defective Angiogenesis.** Pei-Suen Tsou1, Bradley J. Rabquer2, Beatriz Balogh1, Anne Kendzicky1, Bashar Kahaleh2, Elena Schiopu1, Dinesh Khanna1 and Alisa E. Koch1. 1University of Michigan Medical School, Ann Arbor, MI, 2University of Toledo, Toledo, OH

**Background/Purpose:** Angiogenesis, the formation of new blood vessels, plays a critical role in a number of pathological processes including systemic sclerosis (scleroderma, SSc). SSc is a multifactorial disorder that is characterized by early inflammation, excessive extracellular matrix deposition, and vascular abnormalities. In this study we determined if the endothelial cell (EC) responses isolated from SSc skin mount a proangiogenic response towards angiogenic chemokines, including growth-regulated protein-γ (Gro-γ/CXCL3), granulocyte chemotactic protein-2 (GCP-2/CXCL6), and CXCL16. The expression of transcription factors inhibitor of DNA-binding protein-1 (Id-1 and Id-3) were examined.

**Methods:** Skin biopsies from the distal forearm (more involved) were obtained from patients with SSc. Normal (NL) skin tissue was obtained from the tissue procurement service of the University of Michigan. ECs were isolated from skin biopsies via magnetic selection. Immunofluorescence staining of EC markers such as CD31 and von Willebrand factor (vWF), as well as fibroblast markers such as collagen I and α-smooth muscle actin (αSMA) was performed. To determine if chemokines mediate specific angiogenic events in SSc ECs, chemotaxis assays were performed. ECs were stimulated with chemokines to determine which signaling pathways were activated. The expression of Id-1 and 3 were quantified by quantitative PCR.

**Results:** Both NL and SSc ECs stained positive for EC markers while they did not stain for fibroblast markers. SSc ECs migrated toward phorbol-12-myristate-13-acetate (PMA) but not to basic fibroblast growth factor (bFGF) compared to their corresponding controls, dimethyl sulfoxide (DMSO) or phosphate buffered saline (PBS). GCP-2/CXCL6 dose dependently induced both NL and SSc EC migration. In contrast, the ability of Gro-γ/CXCL3 and CXCL16 to promote cell migration was hampered in SSc ECs compared to NL ECs. GCP-2/CXCL6 stimulated the phosphorylation of Akt, c-Jun, Erk1/2, NFKB p65, and p38 kinases in a dose dependent manner in NL ECs, while only c-Jun, Erk1/2, and p38 kinases in SSc ECs. CXCL16 stimulated Akt, Erk1/2, NFBK p65, and p38 kinases phosphorylation in NL ECs, while only c-Jun, Erk1/2, and p38 kinases in SSc ECs. The mRNA levels of Id-1 and Id-3 in SSc ECs were 2.5 and 2.1 fold lower compared to NLs (p < 0.004).

**Conclusion:** Our results show that Gro-γ/CXCL3 and CXCL16 induce angiogenic activity in NL but not SSc ECs. This might be due to the differences in the signaling pathways activated by these chemokines in NL vs. SSc ECs. In addition, the lower expression of transcription factors Id-1 and Id-3 might also decrease the angiogenic response in these cells. The inability of proangiogenic chemokines to promote EC migration provides an additional mechanism for the impaired angiogenesis that characterizes SSc.

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Propylthiouracil Reduces Fibrosis in Chronic Oxidant Stress Mouse Model of Scleroderma. Gianluca Bagnato1, Alessandra Bitto2, Natasha Irrera1, Gabriele Pizzino1, Neal Roberts2, Maurizio Cinquegrani1, Donatella Sangari1, Francesco Squadrito1, Gianfilippo Bagnato1 and Antonino Saitta1.1University of Messina, Messina, Italy, 2Medical College of Virginia, Richmond, VA

Background/Purpose: Systemic sclerosis (SSc) is characterized by fibrosis of skin and visceral organs; vascular damage and resultant ischemia; and immunological dysregulation manifested by autoantibodies. Hypothyroidism, induced by either propylthiouracil (PTU) or thyroidectomy, has been shown to induce regression of pulmonary hypertension in the sumatriptan/hypoxia rat model involving blockade of vascular endothelial growth factor (VEGF). The aim of this study was therefore to evaluate the effect of PTU in another murine model closer to human SSc, a mouse model of diffuse SSc reported to cause the development of anti-topoisomerase antibodies.

Methods: SSc was induced in BALB/c mice by daily subcutaneous injections of HOCl as an oxidant stress for 6 weeks (Batteux F, Kavian N, Servettaz A. New insights on chemically induced animal models of systemic sclerosis. Curr Opin Rheumatol. 2011 Nov;23(6):511–8). Mice (n=25) were randomized in three arms to treatment with either HOCl (n=10); HOCl plus PTU (n=10); or vehicle alone (n=5). PTU treatment was initiated 30 minutes after HOCl subcutaneous injection (12 mg/kg) continuing daily for the 6 weeks. Skin and lung fibrosis were evaluated by histological methods. The severity of fibrosis was assessed using ordinal or nominal scales in both tissues and compared nonparametrically.

Results: Injections of HOCl induced both cutaneous and lung fibrosis in BALB/c mice, as reported in the model. Concomitant PTU treatment reduced skin thickness by 77% (images not shown) and reduced pulmonary fibrosis below the level of histological detectability, in effect preventing it entirely in this model. Pulmonary concentrations of VEGF were significantly higher in mice exposed to HOCl (p<0.001) and were reduced by concomitant treatment with PTU (p<0.001). Its downstream mediator ERK (extracellular signal-related kinase) followed the same pattern (images not shown).

Conclusion: PTU-induced hypothyroidism (or the PTU itself, via another mechanism of action not related to hypothyroidism, such as antioxidant effect) reduced significantly the development of fibrosis in the HOCl mouse model of SSc. No confirmatory thyroidectomy experiments were performed in this model, in contrast to those reported in the previous rat model. Further studies are therefore needed to investigate both the roles of thyroid function and reactive oxygen species in scleroderma pathogenesis, including analysis of any direct antioxidant effect of PTU, independent of its effect upon thyroid status.

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Simvastatin Attenuates Pulmonary Fibrosis in a Murine Model of Systemic Sclerosis. Gianluca Bagnato1, Alessandra Bitto2, Natasha Irrera1, Gabriele Pizzino1, Donatella Sangari1, Maurizio Cinquegrani1, Neal Roberts2, Gianfilippo Bagnato1, Francesco Squadrito1 and Antonino Saitta1.1University of Messina, Messina, Italy, 2Medical College of Virginia, Richmond, VA

Background/Purpose: Simvastatin is best known for its antilipidemic action due to its inhibition of 3-hydroxy-3-methylglutaryl CoenzymeA (HMG CoA) reductase. Inhibition of biological precursors in this pathway also enables pleiotrophic immunomodulatory and anti-inflammatory capabilities. The antifibrotic effect of simvastatin has been shown in human lung fibroblasts. This study aimed to measure beneficial effects of simvastatin, and to explore mechanisms of, development of pulmonary fibrosis and skin thickening in a murine model of systemic sclerosis.

Methods: Chronic oxidant stress SSc was induced in BALB/c mice by daily subcutaneous injections of HOCl for 6 weeks as characterized in detail as the Cochin chronic oxidant stress model of SSc (Batteux F, Kavian N, Servettaz A. New insights on chemically induced animal models of systemic sclerosis. Curr Opin Rheumatol. 2011 Nov;23(6):511–8). Mice (n=24) were randomized in three arms: treatment with either simvastatin plus HOCl (n=9); vehicle plus HOCl (n=10), or vehicle alone (n=5). Statin treatment (40 mg/kg) was initiated 30 minutes after HOCl subcutaneous injection and continued daily for the 6 weeks. Skin and lung fibrosis were evaluated by histological methods. The severity of fibrosis was assessed using ordinal or nominal scales in both tissues and the results compared nonparametrically.

Results: Injections of HOCl induced cutaneous and lung fibrosis in BALB/c mice as demonstrated by routine histological analysis. Simvastatin treatment both reduced skin thickness by 55% (upper row of 3 representative photomicrographs) and attenuated the histopathological change of HOCl-induced pulmonary fibrosis as shown in the lower series.

Conclusion: Simvastatin reduces the development of pulmonary fibrosis potentially modulating adverse lung parenchymal remodeling as shown by the reduced deposition of collagen in alveolar septae in this murine model. Simvastatin also reduces skin thickness in the model. The histological evidence from these experiments suggests that—given the low, 1 per million death rate from statin prescriptions and the morbidity and mortality of SSC pulmonary disease—consideration of human trials is warranted to determine the potential safety and efficacy of simvastatin for treatment of pulmonary fibrosis.

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Correlates of Skin Gene Expression Profile in Systemic Sclerosis. Shervin Assassi1, Jeffrey T. Chang2, Filemon K. Tan3, Minghua Wu4, Gloria A. Hernandez-Cortes1, Irum Zahir5, Daniel E. Turzer6, Dinesh Khanal7, and Maureen D. Maves1.1Univ of Texas Health Science at Houston, Houston, TX, 2Methodist Hospital, Houston, TX, 3University of Michigan, Ann Arbor, MI, 4David Geffen School of Medicine at UCLA, Los Angeles, CA
Background/Purpose: Skin global gene expression profiling indicates presence of distinct gene expression signatures in patients with systemic sclerosis (SSc). We examine the correlation of the skin gene expression profiles with clinical subsets of disease in a large sample of SSc patients.

Methods: In this study, 61 SSc patients (61% diffuse disease, mean disease duration: 7.7 years) and 36 gender, ethnicity, and age matched controls were examined. All skin biopsies were obtained from subjects’ arm and processed according to the same procedures. In 40 SSc patients, the skin was affected at the biopsy site. Global gene expression profiling was performed by Illumina HumanIT-12 arrays in one batch. Only 1 biopsy per subject was analyzed. Differentially expressed (DE) genes were detected in multivariable analysis with False Discovery Rate of 10% at the confidence level of 80%. Involved Canonical Pathways were identified by Ingenuity Pathway Analysis. Unsupervised hierarchical clustering was performed with all expressed genes and after filtering the gene list with the previously published TGF-β, IL-13, and CD68. Involved skin samples were evaluated in lesional skin of dnam1−/− mice by flow cytometry. The anti-fibrotic potential of a DnAM-1 neutralizing monoclonal antibody (mAb) was also evaluated in the mouse model of bleomycin-induced dermal fibrosis.

Results: Overexpression of DnAM-1 was detected in the lesional skin of SSc patients, especially in perivascular inflammatory cells. DnAM-1 mice were protected from bleomycin-induced dermal fibrosis with reduced dermal thickness (75±5% reduction, p = 0.02), hydroxyproline content (46±28% decrease, p = 0.02) and myofibroblast counts (39±5% reduction, p = 0.04). The numbers infiltrating T cells were decreased in lesional skin of dnam1−/− mice by 69±15% (p = 0.009). The number of B cells and monocytes was not significantly different in dnam1−/− and dnam1+ mice upon bleomycin challenge. Moreover, dnam1−/− mice displayed lesional skin decreased levels of inflammatory cytokines, such as IL-6 (59±12%, p = 0.001 decrease), and TNFα (50±15%, p = 0.03). Treatment with anti-DnAM-1 mAb significantly reduced dermal thickening by 64±6% (p = 0.01), hydroxyproline content by 61±8% (p = 0.001), and myofibroblast counts by 83±12% (p = 0.03). These results were similar to those observed in DnAM-1 deficient mice.

Conclusion: We demonstrate with two complementary approaches that inhibition of DnAM-1 significantly ameliorates dermal inflammation-driven fibrosis. DnAM-1 displays probiotic effects by promoting the infiltration of T cells, into lesional skin and by stimulating the release of inflammatory cytokines. In addition, molecular targeting strategy using a DnAM-1 neutralizing mAb confirmed potent antifibrotic properties of DnAM-1 inhibition. Our findings might have direct translational implications and inhibition of DnAM-1 might be a promising new approach for the treatment of SSc and potentially other fibrotic diseases.

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1511
Low Circulating Endothelial Progenitor Cell Levels and High VEGF Serum Levels Are Associated with the Late Nailfold Capillaroscopic Pattern in Systemic Sclerosis. Jerome Avouac1, Maela Vallucci2, Vanessa Smith1, Barbara Ruiz2, Alberto Pizzoni2, Gilles Chiocchia2, Maurizio Cutolo3 and Yannick Allain2. 1Paris Descartes University, Rheumatology A department, Cochin Hospital, Paris, France, 2Paris Descartes University, INSERM U1016, Institut Cochin, Sorbonne Paris Cité, Paris, France, 3Department of Rheumatology, Ghent University Hospital, Ghent, Belgium and Research Laboratory of Academic Rheumatology, Department of Internal Medicine, University of Genova, Genova, Italy, Institut Cochin - INSERM U1016 - CNRS (UMR 8104), Paris, France

Background/Purpose: To assess whether nailfold videocapillaroscopy (NVC) changes are associated with peripheral blood or serum levels of angiogenic biomarkers in systemic sclerosis (SSc).

Methods: Endothelial markers were assessed in a cohort of 60 SSc patients consecutively recruited. Circulating endothelial progenitor cells (EPCs) were quantified in peripheral blood by flow cytometry after cell sorting, as previously described (1). Serum levels of vascular endothelial growth factor (VEGF), plaenta growth factor (PGF), soluble vascular adhesion molecule (sVCAM), endothelin-1 (ET1), angiotensin-2, endoglin, endostatin and Tie-2, were measured by quantitative sandwich enzyme-linked immunosorbent assay (ELISA) technique (Quartikine kits, R&D systems). Capillaroscopy was performed on 8 fingers, at 200X magnification, by a single examiner (JA), on two consecutive fields extending over 1 mm, in the middle of the nailfold. Images were analysed anonymously by four investigators (VS, AS, CP and MC), blinded for the clinical and serum status of SSc patients and classified as early, active and late pattern (2).

Results: The mean ± standard deviation (SD) age of the 60 patients (46 women) was 56±13 year old and the mean ± SD disease duration was 8±5 years at baseline. Thirty-six patients had the diffuse cutaneous subset, and 24 the limited. Fourteen patients had an early, 22 an active, and 24 a late NVC pattern. By univariate analysis focused on biomarkers, patients with late NVC pattern exhibited significantly lower EPC levels.
and higher VEGF serum levels than patients with early and active patterns (p=0.001 and p=0.01, respectively). Endothelin serum levels were significantly higher in the active pattern compared to early and late patterns (p=0.02). In multivariate multiple regression analysis, lower EPC and higher VEGF levels were independently associated with the late capillaroscopic pattern (p=0.007 and p=0.0008 respectively). In an alternate model including these 2 biomarkers and SSc-related disease characteristics, lower EPC counts, higher VEGF levels, and a modified Rodnan skin (mRSS) score >14, were independently associated, in multiple regression analysis, with the late capillaroscopic pattern (p=0.02, p=0.0001 and p=0.0003, respectively).

Conclusion: Our data revealed decreased EPC counts in patients with the late capillaroscopic pattern, suggesting that deficient vasculogenesis may contribute to the severe loss of capillaries observed in this pattern. VEGF upregulation in the late pattern may appear as a compensatory mechanism to stimulate this deficient vasculogenesis and could be implicated in the altered vessel morphology observed in this pattern. In addition, a mRSS>14 was independently associated with the late NVC pattern, highlighting from the clinical side the fibrotic component of this pattern. Further studies are now needed to determine the predictive value of capillaroscopy, in combination with these biomarkers, for the development of the vascular complications of SSc.

References
(1) Avouac et al, Ann Rheum Dis 2008,
(2) Cutolo M et al. J Rheumatol 2000

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Bleomycin Delivery by Osmotic Pump: A Superior Model for Human ILD. Rebecca Lee, Michael Bonner, Charles Reese, Elena Tourkina, Zoltan Hajdu, Jing Zhang, Richard Visconti and Stanley Hoffman. Medical University of South Carolina, Charleston, SC.

Background/Purpose: Interstitial lung disease (ILD) represents a group of chronic, progressive, irreversible diseases associated with pulmonary fibrosis, including systemic sclerosis and idiopathic pulmonary fibrosis. In ILD, pulmonary fibrosis is accompanied by alveolar epithelial cell injury, inflammatory cell accumulation, fibroblast and myofibroblast proliferation, loss of the master regulatory protein caveolin-1 from fibroblasts and inflammatory cells, and excessive deposition of extracellular matrix (ECM) resulting in impaired pulmonary function. Fibrosis in ILD is predominantly localized in the subpleural region of the lung. ILD is modeled in rodents by bleomycin treatment. In most studies, bleomycin has been delivered directly into the lungs by intratracheal or intraoral administration; however, bleomycin has also been delivered using subcutaneous osmotic pumps. Here we have compared the effects in mice of bleomycin delivered by “Pump” or by the “Direct” route to determine which is a better model for human ILD.

Methods: Male CD1 mice (ten weeks old) are treated with bleomycin either by the “Direct” route (a single intraoral administration of 2 U/kg) and sacrificed on day 14, or by “Pump” (the pump delivers 100 U/kg continuously over 7 days, or is removed) and sacrificed on day 35. Tissue sections are stained histochemically and immunohistochemically for caveolin-1, inflammatory cell markers, several ECM proteins, and proteins associated with fibrosis. Other methods are used to analyze the progression of inflammation and fibrosis including Western blotting, gelatin zymography, collection of BAL fluid, and flow cytometry. The role of the loss of caveolin-1 in the progression of inflammation and fibrosis is determined by using the caveolin-1 scaffolding domain peptide to restore caveolin-1 function.

Results: The Pump model provides a much higher level of subpleural fibrosis than the Direct model as evaluated by Masson’s Trichrome stain and immunohistochemistry for the ECM proteins collagen I, tenasin-C, and periostrin, and the collagen chaperone HSP47 (Figs. 1 and 2). Conversely, there is a much higher level of inflammatory cell accumulation, weight loss, and death in the Direct model. There is a striking absence of caveolin-1 from the HSP47-positive cells in the Pump model. Experiments are underway to determine the effects of replacing caveolin-1 function in the Pump model.

Conclusion: The Pump model is superior to the Direct model because: 1) The resulting disease more accurately recapitulates human ILD, and 2) It is more convenient because there is less animal weight loss and death.

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TSLP Receptor Deficiency Reduces IL-13 Expression and Prevents Fibrosis in Experimental Scleroderma. Alicia Usategui1, Vanesa Miranda1, Gabriel Criado1, Manuel J. Del Rey1, Elena Izquierdo1, Warren J. Leonard2 and Jose L. Pablos1. Instituto de Investigación Hospital 12 de Octubre (1+2), Madrid, Spain, 2National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD.

Background/Purpose: Systemic sclerosis (SSc) is an autoimmune disease characterized by progressive fibrosis of the skin and internal organs. Although SSc shares pathogenetic features with other autoimmune diseases, the participation of proinflammatory Th2 cytokines is unique to SSc. However, the reasons for Th2 cytokine skewing are unknown. Thymic Stromal Lymphopoietin (TSLP) is a pivotal cytokine in induction of Th2 responses in allergic skin and lung inflammation. We have previously observed TSLP overexpres-
sion in human and experimental scleroderma (Arthritis Rheum 2011; 63: S904). To understand its function in this context, we have analyzed the contribution of TSLP to Th2 cytokine expression and fibrosis in a mouse model of scleroderma.

Methods: Skin fibrosis was induced in 6 week old female C57BL/6 TSLP receptor (TSLPR) deficient and wild type (WT) mice by subcutaneous injections of bleomycin (1mg/ml) into the shaved back skin daily for 4 weeks. Treated skin was harvested, and histological examination and collagen content were determined by Masson’s trichrome stain and total hydroxyproline content. Analysis of cytokines mRNA and protein expression in the skin was performed by quantitative RT-PCR, immunohistochemistry and ELISA. Quantitative data were compared by Mann-Whitney U-test and p-value<0.05 was considered significant.

Results: Bleomycin induced dermal fibrosis and an increase in the collagen content of the skin in both TSLPR deficient and WT mice. The fractional collagen area of the dermis and the total collagen protein content of the skin were significantly reduced in TSLPR deficient mice compared to WT mice. A significant increase in the expression of IL-13 and IL-17 but no IL-4 and IFN-γ mRNA in the skin was observed in bleomycin-injected compared to saline-injected WT mice. Expression of IL-13 and IL-17 mRNA in fibrotic skin was significantly reduced in TSLPR deficient mice compared to WT mice. An increase in the number of IL-13-positive cells by IHC was observed in bleomycin-injected skin compared to saline-injected controls. This response was significantly reduced in TSLPR deficient compared to WT mice.

Conclusion: The bleomycin-treated WT mice did not increase IL-17 protein expression in either group of mice.

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Differences in the Activation Levels and Expression Patterns of the Molecular Targets of Tyrosine Kinase Inhibitors May Account for the Heterogeneous Treatment Responses. Britt Mauser1, Affiya Akhmetshina2, Renate E. Gay3, None; Bett A. Michel1, Steffen Gay3, None; J. H. Distler2, None; Britta Maurer1, Alfiya Akhmetshina2, V. Miranda, None; B. N. Cronstein1, None; Canfite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, 3, 4D Science, 1; 4, Actelion, 2, Celgene, Bayer Pharma, IB Therapeutics, 3, Sanofi-Aventis, 4, Boehringer Ingelheim, 5, Array Biopharma and Active Biotech, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent SLE Foundation.

Background/Purpose: To understand the activation level and the cellular expression pattern of target molecules are able to predict treatment responses in animal models of fibrosis. The predominant vascular expression of TK targets in SSC patients might account for the minor anti-fibrotic effects of imatinib in clinical SSC trials.

Results: In diffuse SSc compared to healthy controls and limited SSc, the activation status of both PDGFRβ (8.0±0.9% cells/HPF) and c-abl (3.9±1.2% cells/HPF) was significantly increased (p<0.05). Whereas in the bleomycin model activated PDGFRβ and c-abl were ubiquitously expressed, particularly in skin fibroblasts, in Fra-2 tg mice there was a vascular predominance which might explain the lacking effect of nilotinib on skin fibrosis. In SSC patients, double staining showed that p-PDGFβR and p-c-abl were abundantly expressed in vascular smooth muscle cells (SM22α+) and endothelial cells (vWF+), but only occasionally in scattered dermal fibroblasts(prolylhydroxylase+).

Conclusion: Our study suggests that the activation level and the cellular expression pattern of target molecules are able to predict treatment responses in animal models of fibrosis. The predominant vascular expression of TK targets in SSC patients might account for the minor anti-fibrotic effects of imatinib in clinical SSC trials.

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1515

Pharmacological Blockade of Adenosine A2A Receptors (A2AAs) Prevents Radiation-Induced Dermal Injury. Miguel Perez Aso1, Yee C. Low2, Obinna Ezeanuzie3, Jamie Levine4 and Bruce N. Cronstein5. 1NYU School of Medicine, New York, NY, 2New York Univ Medical Center, New York, NY, 3NYU School of Medicine, Division of Rheumatology, New York, NY.

Background/Purpose: Ionizing radiation is a commonly used therapeutic modality and following irradiation dermal changes, including fibrosis and atrophy, may lead to such problems as contractures. The molecular basis for radiation fibrosis is not well understood. We have previously found that adenosine, acting as adenosine A2AAs receptors (A2AAAs), stimulates collagen production by human dermal fibroblasts and plays a central role in the development of dermal fibrosis in a murine model of scleroderma (bleomycin-induced dermal fibrosis). We therefore tested the hypothesis that A2AAAs play a role in radiation-induced fibrosis and studied the effect of adenosine A2AAAs blockade on development of radiation-induced changes of the skin.

Methods: After targeted irradiation (40Gy) to the skin on the dorsum of each mouse, the A2AAAs antagonist ZM241385 (2.5mg/ml in Carboxymethylcellulose 3%) was applied daily for 28 days. To determine the effect of irradiation on skin we measured skin, dermal and epithelial thickness, collagen alignment with Sirius Red stain, collagen deposition with the hydroxyproline assay and myofibroblast content by immunostaining for a-SMA.

Results: When compared to non-irradiated skin, irradiation induced an increase of the epidermal thickness (33.9±9.8 vs 94.2±13.3µm; p<0.01 N=4) but did not affect the skin fold or dermal thickness. In contrast, high dose ZM241385 (2.5mg/ml) completely prevented radiation-induced epidermal thickening (42.7±7.8µm; p<0.001 vs vehicle N=8). Direct measurement of collagen content (hydroxyproline) shows that the collagen increase after the radiation insult (control: 15.2±1.3 µg/ml; vs vehicle 21.6±1.4 µg/ml; p=0.05 N=5) is partially prevented by ZM241385 application (18.7±1.5 µg/mg N=8). Collagen alignment and packaging analysis by SiriusRed stain reveals that irradiation promotes a dramatic increase in loose packed collagen fibrils (421±104% of Control; p<0.05 N=9), which is significantly diminished by ZM241385 application (75.2±21% of Control; p<0.01 vs vehicle N=7). After irradiation-induced fibrosis, we detected an increase on myofibroblasts (α-SMA+) cells; 34±3 vs 83±10 cells per field; p<0.01 N=5) which was again prevented by ZM241385 application (57±2 cells per field; p<0.05 vs vehicle N=8).

Conclusion: Taken together, these data indicate that pharmacological blockade of A2AAAs prevents skin thickening in a murine model of irradiation-induced fibrosis, and suggests that topical application of an A2AAAs antagonist may be useful in the prevention or amelioration of radiation changes in the skin.

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TSLP Uprogation in Human SSC Skin and Induction of Overlapping Profibrotic Genes and Intracellular Signaling with IL-13 and TGF-β. Romy Christmann, Allison Mathes, Giuseppeffano Stifano, Aysja Y. Affandi, Andrea Bujor, Cristina Padilla and Robert Lafyatis. Boston University, Boston, MA

**Background/Purpose:** to investigate the expression of Thymic Stromal Lymphopoietin (TSLP) in diffuse cutaneous systemic sclerosis (dcSSc) patients and explore its effects in vivo and in vitro comparing with IL-13 and TGF-β treatment transients.

**Methods:** Skin biopsies (n=13; healthy controls (HC); n=12) were used for immunohistochemistry (IHC) and immunofluorescence studies using TSLP, CD4+, CD8+, CD31+, and CD163+ markers. Wild type (WT) and IL4Rα-deficient mice (IL4Rα-ko) were treated with TGF-beta, IL-13, Poly(I:C), or TSLP. Human fibroblasts and peripheral blood mononuclear cells (PBMCs) were stimulated with the same cytokines. Gene expression (microarray and r-qPCR) and protein levels of phospho-Smad2 were tested.

**Results:** TSLP was highly expressed in skin of dcSSc patients, stronger in perivascular areas, where we observed inflammatory cell infiltrates, and in interstitial cells. TSLP expression was co-localized with immune cells, such as CD4+, CD8+, although mainly produced by CD163+ cells. Skin of TSLP-treated mice showed upregulated clusters of genes that overlapped with IL-13 and TGF-beta-treated mice. In addition, a specific TSLP-cluster showed upregulation of CXCL9, proteasomes, and other interferon-regulated genes. In PBMCs, TSLP alone upregulated mannose-receptor-1 (MRC1), an alternatively-activated macrophage marker, to a similar degree as after IL-13 stimulation. MRC1 was also highly expressed in dcSSc skin compared to controls. TSLP kinetics, along 24 hours of stimulation in PBMCs, showed an early induction of TNF, MX1, and IFNγ, followed by an induction of CXCL9 and MRC1 gene-expression. Human fibroblasts and skin of mice-treated with TSLP showed TGF-beta-canonical pathway activation with phosphorylation of Smad2. The lack of IL4Rα in TSLP-treated mice promotes similar cutaneous inflammation and upregulation of profibrotic markers (PAI-1 and CXCL5). Poly(I:C)-treated mice, a Ssc-like murine model, showed high levels of TSLP in similar areas as seen in the skin of dcSSc patients and also mainly in infiltrating immune cells, shown by IHC.

**Conclusion:** TSLP is highly expressed in skin of dcSSc patients, mainly produced by macrophages, and regulates similar genes as other profibrotic cytokines (TGF-beta and IL-13), strongly suggesting that it promotes SSC fibrosis directly or by stimulating production or activation of these cytokines. TSLP also promotes a proinflammatory effect, which might explain this dual finding in SSC patients.

Disclosure: R. Christmann, None; A. Mathes, None; G. Stifano, None; A. J. Affandi, None; A. Bujor, None; C. Padilla, None; R. Lafyatis, None.

1517

TLR9 Signaling in Fibroblasts Promotes Pro-Fibrotic via TGF-Beta. Yang Yang1, Feng Fang2, Lei Liu2, Junjie Shangguan3, Boping Ye4 and John Varga5. China Pharmaceutical University, Nanjing, China, 2Northwestern University, Chicago, IL

**Background/Purpose:** Systemic sclerosis (SSc) is associated with progressive fibrosis and transforming growth factor β (TGF-β) is implicated in its pathogenesis. Toll-like receptors (TLR) respond to microbial pathogens or tissue damage, and activation via TLR9 receptor signaling by disrupting intracellular TLR9 trafficking.

**Conclusion:** TLR9 activation in fibroblasts is associated with TGF-β-mediated fibrotic responses. Novel small molecule inhibitors of TLR9 already in clinical trial for lupus are sufficient to abrogate these responses, suggesting a potential therapeutic strategy for blocking TLR9 in fibrosis.

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1518

Damage-Associated Endogenous TLR4 Ligand Fibronectin-EDA Is Overexpressed in Scleroderma and Drives Persistent Fibrosis Via TLR4 and Inhibition of TLR4 Prevents and Reverses Experimental Dermal Fibrosis: Novel Target for Scleroderma Therapy. Swati Bhattacharya, Zenashio Tamaki, Wenxia Wang, Paul Hoover, Adam Booth, Alyssa Dreyfus, Monique E. Hincheiiff, Feng Fang, Spiro Getios, Hang Yin, Eric S. White and John Varga. 1Northwestern Univ Med School, Chicago, IL, 2Northwestern Univ Med School, Chicago, IL, Chicago, IL, 3Northwestern University, Chicago, IL, 4Ann Arbor, MI, 5University of Michigan Medical School, Ann Arbor, MI, 6University of Colorado at Boulder, Boulder, CO, 7Northwestern University Medical School, Chicago, IL

**Background/Purpose:** Recent studies implicate innate immune signaling and Toll-like receptor-4 (TLR4) in fibrogenesis. We hypothesized that injury in scleroderma leads to tissue accumulation of damage-associated molecules such as fibronectin-EDA (Fn-EDA), which serve as endogenous ligands for TLR4. We sought to characterize the expression, mechanism of action and potential fibrogenic role of Fn-EDA. We further investigated the effect of pharmacological inhibition of TLR4 signaling on fibrogenesis.

**Methods:** TLR4 expression and Fn-EDA production and accumulation were evaluated in scleroderma skin biopsies and sera, in explanted normal and scleroderma skin fibroblasts, and in mouse models of scleroderma. The fibrogenic effect of Fn-EDA-TLR4 signaling was evaluated in explanted normal and scleroderma skin fibroblasts and in human organotypic skin raft cultures. The role of Fn-EDA in fibrogenesis was further evaluated using Fn-EDA-null mice. The effect of pharmacological inhibition of TLR4 signaling was evaluated in experimental models of dermal fibrosis and in explanted scleroderma fibroblasts.

**Results:** Fn-EDA was markedly upregulated in scleroderma serum and skin biopsies, and in lesional tissues from mice with bleomycin-induced scleroderma. Microarray analysis showed elevated Fn-EDA mRNA levels in skin biopsies from patients with diffuse cutaneous scleroderma. Explanted scleroderma fibroblasts in organotypic skin raft cultures produced elevated Fn-EDA and deposited it into the matrix. Fn-EDA stimulated collagen synthesis and myofibroblasts differentiation in vitro and induced dermal sclerosis in the skin equivalent. The profibrotic effects of Fn-EDA were TLR4-dependent and mediated via the microRNA miR29. Pharmacological TLR4 disruption using a novel small molecule inhibitor, or genetic deletion of Fn-EDA, protected mice from the development of skin fibrosis.

**Conclusion:** Together, these complementary in vitro and in vivo experiments firmly implicate TLR4-mediated innate immune signaling and aberrant Fn-EDA production and accumulation in driving persistent fibroblast activation and progressive fibrogenesis. Disrupting the TLR4-Fn-EDA axis by either preventing Fn-EDA accumulation, or blocking TLR4 signaling using selective small molecule inhibitors, represent appealing novel strategies for treating scleroderma.

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1519

Heterogeneous Nuclear RNP-K Is a Novel Cold-Related Autoantigen in Patients with Raynaud’s Phenomenon. Satoshi Serada, Minoru Fujimoto and Tetsuji Naka. National Institute of Biomedical Innovation, Ibaraki, Japan

**Background/Purpose:** Raynaud’s phenomenon (RP) is a vasospastic disorder and shows discloration of the fingers, toes, and occasionally other areas. RP affects 3–9% of the general population, but more frequently in patients with connective tissue diseases. In particular, more than 90% of systemic sclerosis (SSc) patients suffer from RP. While a variety of stress...
including cold and emotional stress have been reported to influence both cellular and humoral immune function, the pathogenesis of the RP is not fully understood. The aim of study was to identify a novel autoantigen related to cold-induced RP.

**Methods:** Cold-induced surface proteome alterations in human normal dermal microvascular endothelial cells (dHMVECs) were identified by iTRAQ (isobaric tag for relative and absolute quantitation) analysis. Autoantigens were screened by serological proteome analysis (SERPA) using the sera from patients with SSc-associated RP.

**Results:** By proteomic analyses combining iTRAQ and SERPA approach, heterogeneous nuclear RNA-PK (hnRNPK) was identified as a candidate autoantigen for patients with SSc-associated RP. Cold-induced translocation of hnRNPK to cell surface was verified by western blot (WB) and flow cytometric analysis. The presence of anti-hnRNPK autoantibody in patients sera with SSc-associated RP was confirmed by WB. ELISA analysis revealed that the prevalence of anti-hnRNPK autoantibody in patients with SSc-associated RP was 30.70% (35 of 114), which was significantly higher than that of SSc patients without RP (7.14%, 2 of 28, P = 0.0027) and healthy controls (0%, 0 of 27, P = 0.0001).

**Conclusion:** Autoantibody against hnRNPK is a potential marker for detecting a subset of SSc-associated RP. Cold stimulation may exacerbate RP by revealing autoantigens including hnRNPK and inducing autoimmune reaction in vascular endothelia.

**Disclosure:** S. Serada, None; M. Fujimoto, None; T. Naka, None.

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**1520**

**Role of 12/15-Lipoxygenase(LOX) in Patients with Systemic Sclerosis.**

Hirahito Endo, Makoto Kabraki, Koutarou Shikano, Sei Muraoka, Nahoko Fujimoto, Tatsushi Yamamoto, Kanako Kitahara, Kaito Kaneko, Yoshie Kusunoki, Natsuko Kusunoki, Kenji Takagi, Tomoko Hasunuma and Shinichi Kawai. School of Medicine, Faculty of Medicine, Tohoku University, Tokyo, Japan

**Background/Purpose:** Recently 12/15-lipoxygenase (LOX) and it’s metabolites have a prominent anti-fibrotic role during dermal fibrosis in sclerodera experimental model using 12/15-LOX deficient mice were reported (Ann Rheum Dis. 2012, 71, 1081). To evaluate the role of 12/15-lipoxygenase (LOX) in patients with systemic sclerosis (SSc) we measured 12/15-LOX and these enzyme metabolites.

**Methods:** SSc 32 patients: age 57±10.3 years old, disease duration 6.4±2.4 years, dcSSc: lcSSc 20:12, control: RA 20 patients, normal healthy subjects 20. We measured the level of 12-LOX, 15-LOX mRNA in peripheral blood mononuclear cells (PBMC) of patients with SSc by real time quantitative PCR. 12-LOX and 15-LOX metabolites 12(S)-Hydroxyeicosatetraenoic acid (HETE), 15(S)-HETE and lipoxin A4(LXA4) were measured by ELISA in plasma and bronchoalveolar lavage fluid (BALF) of patients with SSc.

**Results:** Level of plasma 12(S)-HETE of SSc was significantly higher than that of RA and normal subjects (SSc 10.76±3.22, RA 4.08±2.22, Control 3.77±1.62 ng/ml, P < 0.01). Level of plasma lipoxin A4 of SSc was also higher than that of RA and control (SSc 3.39±1.79, RA 0.75±0.35, normal 0.77±0.30 ng/ml). On the other hand level of plasma 15(S)-HETE in SSc was lower than that of control (SSc 0.07±1.18, RA 3.76±1.82, normal 2.39±0.98 ng/ml). Plasma 12(S)-HETE, LXA4 levels in dcSSc patients were higher than that of lcSSc (dcSSc 4.1±1.6, lcSSc 1.86±0.85 ng/ml). Expression of 12-LOX mRNA in PBMC of patients with SSc was higher than normal (SSc 4.7±1, control 1). Expression of 15LOX was not higher than SSc. BALF LXA4 and 15-LOX in lung biopsy specimens were lower than that of interstitial pneumonia.

**Conclusion:** Expression of platelet type 12-LOX was correlated with the progression of fibrotic lesion in patients with SSc. This data suggested that platelet type 12-LOX and 12(S)-HETE may be increased for the negative feedback mechanisms for fibrosis because these enzymes and metabolites had anti-fibrotic effects. 12/15-LOX systems may contribute a new therapeutic approach in skin and organ involvement in patients with SSc.

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**1521**

**A Possible Contribution of Decreased Cathepsin V Expression to the Development of Dermal Fibrosis, Proliferative Vasculopathy, and Altered Keratinocyte Phenotype in Systemic Sclerosis.**

Yoshhide Asano, Shota Noda, Takehiro Takaguchi, Soyayuki Shibata, Kazunori Aozasa, Takashi Taniguchi, Yohei Ichimura, Tetsuo Toyama, Hayakazu Sumida, Yoshihiro Kuwano, Koichi Yanaba and Shinichi Sato. University of Tokyo Graduate School of Medicine, Tokyo, Japan

**Background/Purpose:** Cathepsin V (CTSV) is a proteolytic enzyme potentially modulating Th17nglobular procollagen, collagen degradation, and keratinocyte differentiation; Although our latest paper demonstrated that cathepsin B, another member of cathepsin family, is potentially involved in the developmental process of dermal fibrosis and vasculopathy in systemic sclerosis (SSc), the role of cathepsin V, to the best of our knowledge, has not been well studies so far in this disorder. Therefore, we herein investigated the clinical correlation of serum CTSV levels and the expression levels of CTSV in skin and other dermal fibroblasts.

**Methods:** Serum CTSV levels were determined by enzyme-linked immunosorbent assay in 51 SSc patients and 18 normal controls. The expression levels of CTSV protein in normal and SSc skin were evaluated by immunohistochemistry. The contribution of transcription factor Friend leukemia virus integration 1 (Fli1), whose deficiency is associated with the development of SSc, to the altered expression of CTSV in SSc skin was examined in cultured dermal fibroblasts, dermal microvascular endothelial cells, and keratinocytes by reverse-transcript real-time PCR.

**Results:** Serum CTSV levels were significantly lower in diffuse cutaneous SSc (dcSSc) and limited cutaneous SSc (lcSSc) patients than in healthy controls. In early-stage dcSSc, serum CTSV levels were remarkably and uniformly decreased compared with healthy controls. The decrease in serum CTSV levels in mid- and late-stage dcSSc and in lcSSc was linked to the development of proliferative obliterator vasculopathy. In immunohistochemistry, CTSV expression was decreased in microvascular endothelial cells, pericytes/vascular smooth muscle cells, and keratinocytes of dcSSc and lcSSc skin and in dermal fibroblasts of dcSSc skin compared with control skin. Consistently, mRNA levels of CTSV gene were decreased in cultured dermal fibroblasts from early-stage dcSSc and in normal dermal fibroblasts treated with TGf-B1. Furthermore, Fli1 gene silencing by siRNA, which potentially reproduces SSc phenotype in microvascular endothelial cells and keratinocytes, reduced the mRNA levels of CTSV gene in human dermal microvascular endothelial cells and normal human keratinocytes.

**Conclusion:** Loss of CTSV expression may contribute to the specific phenotype of fibroblasts, endothelial cells, and keratinocytes in SSc, suggesting the possible involvement of decreased CTSV expression to the developmental process of this disorder.

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**1522**

**Differential Response to Endoplasmic Reticulum Stress Between Alveolar Epithelial Cells and Lung Fibroblasts in Systemic Sclerosis.**

Jun Liang1, Tanjina Akter1, Ila Atenalishvili1, Richard M. Silver2 and Galina S. Bogatkevich1. 1Medical University of SC, Charleston, SC, 2Medical University of SC, Charleston

**Background/Purpose:** Intestinal lung disease is a prevalent and worrisome complication of systemic sclerosis (SSc), which is now the leading cause of death in SSc. There is growing recognition that endoplasmic reticulum (ER) stress plays a pathogenic role in SSc-associated intestinal lung disease (SSc-ILD) and in other interstitial lung diseases. However, the nature of the response during ER stress in alveolar epithelial cells (AEC) and lung fibroblasts, two key players in pulmonary fibrosis, remains unknown. Here we demonstrate that differential ER stress response in these two cell types depends upon the expression of the pro-apoptotic CHOP homologous protein or “CHOP”, an important ER stress marker.

**Methods:** Lung tissues were collected postmortem from control subjects and from SSc patients who fulfilled the ACR preliminary criteria for SSc and had documented SSc-ILD. SSc-ILD was confirmed by histological examination of postmortem lung tissue. Additionally, lung tissues were obtained from mice with bleomycin-induced pulmonary fibrosis and from control animals. AEC and lung fibroblasts were isolated using standard
procedures. Lung tissues were analyzed by immunohistochemistry. Protein expression in AEC and lung fibroblasts was determined by immunoblotting; apoptosis was measured by enzyme-linked immunosorbent assay; chop promoter activity was analyzed by luciferase assay.

Results: We demonstrate for the first time that CHOP expression is profoundly increased in AEC surrounded by fibrotic tissues in SSc-ILD patients, but not in normal lung tissues. We observed staining for CHOP exclusively in AEC surrounded by fibrotic tissues. CHOP expression was also noted to be localized to thickened alveolar septae in SSc-ILD patients and in bleomycin-treated mice, but not in normal lung tissues from human or murine controls. In contrast, myofibroblasts (positively stained for α-SMA) show no significant immunoreactivity for CHOP. Thrombin, known to be elevated in SSc-ILD patients and in the bleomycin murine model of ILD, had no observable effect on CHOP expression in lung fibroblasts. However, thrombin was noted to upregulate CHOP expression in primary AEC and in AS49 cells via an Ets1-dependent pathway. Importantly, we demonstrate that lung myofibroblasts from SSc-ILD patients and from mice treated with bleomycin, which are resistant to apoptosis, lose the resistance to apoptosis when transfected with CHOP.

Conclusion: AEC and lung myofibroblasts in SSc-ILD exhibit a differential response to ER stress, which may confer the differential fate of these two cell types, i.e., the susceptibility to apoptosis of AEC and the resistance to apoptosis of lung myofibroblasts. The ER stress marker CHOP is involved in regulating apoptotic mechanisms in fibrotic lung tissue downstream of two key mediators, thrombin and TGF-β, making CHOP a possible novel target for the treatment of SSc-ILD.

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ACR/ARHP Poster Session B
Vasculitis
Monday, November 12, 2012, 9:00 AM–6:00 PM

1524
Systemic Vasculitis and Pregnancy: a Multicenter Study On Maternal and Neonatal Outcome of 43 Prospectively Followed Pregnancies. Micaela Fredi1, Maria Grazia Lazzaroni1, Chiari Tani1, Véronique Ramoni1, Maria Gerosa2, Flora Inverardi2, Laura Andreoli2, Laura Trespidi2, Mario Motta3, Andrea Lojacono4, Renato Sinico5, Antonio Brucato6, Roberto Caporali7, Pier Luigi Meroni8, Carlomaurizio Montecucco9, Marta Mosca10 and Angela Tincani11. 1Rheumatology Unit, University of Brescia, Brescia, Italy, 2Rheumatology Unit, Internal Medicine, University of Pisa, Pisa, Italy, 3IRCCS Policlinico San Matteo Foundation and University of Pavia and USC Internal Medicine, Bergamo, Italy, 4Division of Rheumatology, Istituto Ortopedico Gaetano Pini, Department of Clinical Sciences and Community Health, University of Milan, Milan, Italy, 5Division of Rheumatology, IRCCS Policlinico San Matteo Foundation and University of Pavia, Pavia, Italy, 6Milan, 7Neonatology and NICU, Spedali Civili, Brescia, Italy, 8Obstetric and Gynecology of Brescia, Brescia, Italy, 9Ospedale San Carlo Borromeo, Milano, Italy, 10USC Internal Medicine, Ospedali Riuniti, Bergamo, Italy

Background/Purpose: Systemic Vasculitis (SV) are rare diseases that may affect females during childbearing age. Quite a few data are available in literature, and mostly from case reports. Aim of our study is to evaluate the maternal/neonatal outcome, the activity of maternal disease before, during and after pregnancy in patients with diagnosis of SV followed in five Italian Institutions.

Methods: Our study is a retrospective analysis of 43 pregnancies (prospectively followed by a multispecialistic team, with a least 1 documented visit each trimester) in 33 patients with diagnosis of SV, according to Chapel Hill Consensus Conference and/or ACR Criteria for SV. We collected: Takayasu Arteritis (TA) (6pregnancies in 4 patients), Churg-Strauss Syndrome (CS) (6 in 6 pt), Polyarteritis Nodosa (PA) (3 in 2 pt), Behcet’s Disease (BD) (20 in 16 pt), Wegener Granulomatosis (WG) (3 in 3 pt), Henoch-Schönlein (HS) (2 in 1 pt) and ANCA associated-neuropathy (3 in 1 pt). Data regarding the duration of disease, serological and clinical features, pregnancy outcome, maternal and neonatal complications and therapy during pregnancy were collected from clinical charts.

Results: The mean age of the patients at the onset of the disease was 24.7yrs (with standard deviation (SD) of 6.9 yrs) and at the diagnosis was 26yrs (SD6.1yrs); our patients were Caucasians (28), afro-americans (2), Asians (2) and African (1). The mean duration of SV before pregnancy was 6.5 yrs (SD 5yrs). 5 patients were ANCA positive. 11 patients had been treated with cytotoxic or embriotoxic drugs but none of the pregnancies were exposed to such drugs. 1 out the 3 patients previously treated with cyclophosphamide had primary ovarian failure (POF). Five pregnancies were obtained by in vitro fertilization (all because of female infertility), one by oocyte donation in the patient with POF. During the 43 pregnancies, 6 flavors of SV occurred during the first trimester (13.9%), 7 (20%) occurred in the 35 evaluable in the second trimester and 3 in 33 (9%) whose data are available in the third trimester. The onset of BD at 1st week of gestation was reported in one patient. Pregnancy-related complications occurred in 14 pregnancies, among which 4 cases of gestational diabetes. The mean week of delivery was 37.7 (SD 3 weeks) with 5 preterm delivery (before the 34’week). The pregnancy outcome was 33 live births (2 twins pregnancy), 8 miscarriages (1in a twin pregnancy), 1 fetal death. 2 pregnancies are still ongoing. 6 newborns had neonatal complications. Data about the postpartum period were available for 34 pregnancies;11 flavors (32.3%) occurred.

Conclusion: Our data show that a strict multidisciplinary monitoring does not prevent maternal/neonatal complications in patients with Systemic Vasculitis. In addition puerperium should be regarded as a risk period for vasculitis flares, similarly to other systemic autoimmune diseases.

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1523
The Use of the International Classification of Function, Disability and Health As a Conceptual Framework for Comparison of the Content of Core Outcome Instruments with the Patient Perspective in Vasculitis. Nataliya Milman1, Peter A. Merkel2, Annemie Boonen3, Lee Strunin4, Ryan Borg5 and Peter Tugwell5. 1Ottawa Hospital, Riverside Campus, Ottawa, ON, 2University of Pennsylvania, Philadelphia, PA, 3University Hospital Maastricht, Maastricht, Netherlands, 4Boston University School of Public Health, Boston, MA, 5University of Ottawa, Ottawa General Hospital, Ottawa, ON

Background/Purpose: The International Classification of Functioning, Disability and Health (ICF) is a general health model endorsed by the World Health Organization. It describes health along 4 domains: body functions, body structures, activities and participation, and environmental factors. There is interest in applying ICF to human disease states to determine what domains of health are captured by current disease assessment tools.

In 2010 the OMERACT (Outcome Measures in Rheumatology Clinical Trials) initiative endorsed the Core Set of outcome measures for ANCA-associated vasculitis (AAV). The Core Set includes a choice of 3 disease activity measures (Birmingham Vasculitis Activity Score [BVAS], BVASv.3, BVAS for Wegener’s Granulomatosis), 1 damage measure (Vasculitis Damage Index [VDI]), 1 patient-reported outcome (Short Form-36 [SF36]), and death. This study examined the extent to which the AAV Core Set captures the impact of AAV relevant to patients, using the ICF classification.

Methods: Outcome measures included in the OMERACT Core Set for AAV were linked to the corresponding ICF categories according to the previously established ICF linkage rules. Two focus groups involving 9 patients were conducted. Patients identified aspects of disease that have an important impact on their lives. Focus group transcripts were analyzed according to standard qualitative analytic techniques. Identified concepts were linked to ICF categories. Coverage of various ICF domains by the Core Set tools was compared to coverage by the items identified by patients.

Results: All items of the Core Set’s measures of disease activity and damage linked to categories of the ICF domains ‘body functions’ and ‘body structures’. In contrast, the majority of items of SF36 linked to categories of the ICF domain ‘activities and participation’, with the remaining smaller number of items linking to categories of ‘body functions’ domain.

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AAV Core Set instruments and patients focus on different aspects of the domain ‘body functions’. The Core Set covers specific organ functions (e.g. hearing) while patients identify generalised and multifocal pain as most relevant. Sleep, temperament and personality, and exercise tolerance were areas in the ‘body functions’ domain identified by patients as important but not measured by any of the Core Set tools.

One broad area in the domain ‘activities and participation’ that was identified as crucial by patients but not covered by the Core Set is ‘interpersonal interactions and relationships’. Similarly, environmental factors are not part of the AAV Core Set, while for patients a number of such factors are relevant in establishing the impact of AAV (various products and technology, support and relationships, attitudes, and services).

Conclusion: The ICF model is useful for identifying areas of health important for capturing the impact of AAV from patients’ perspective but not covered by the currently utilized AAV outcome tools. These observations support the ongoing initiatives to expand the scope of outcome assessment in AAV, especially to include patient-reported outcomes.

Disclosure: N. Milman, UCB pharma, S; P. A. Merkel, None; A. Boonen, None; L. Strunin, None; R. Borg, None; P. Tugwell, None.

1525

Determinants of Poor Quality of Life in ANCA Associated Vasculitides (AAV), Neil Basu1, Andrew McClean2, Raashid Luqmani3, Lorraine Harper4, Oliver Flossmann5, David Jayne6, Mark Little6, Esther N. Amft7, Neeraj Dhaun8, John McLaren9, Vinod Kumar10, Lars Erwig1, Gareth T. Jones1, David M. Reid1 and Gary J. Macfarlane1. 1University of Aberdeen, Aberdeen, United Kingdom, 2University of Oxford, Oxford, United Kingdom, 3Royal Berkshire Hospital, Reading, United Kingdom, 4Addenbrookes Hospital University of Cambridge, Cambridge, United Kingdom, 5University of Birmingham, Birmingham, United Kingdom, 6University of Chicago, IL, 7Western General Hospital, Edinburgh, United Kingdom, 8Edinburgh Royal Infirmary, Edinburgh, United Kingdom, 9NHS Fife, Whyteman’s Brae Hospital, Kirkcaldy, United Kingdom, 10Ninewells Hospital, Dundee, United Kingdom

Background/Purpose: Patients with ANCA associated vasculitis (AAV) report significantly reduced quality of life (QOL), however the precise causes of such impairments are poorly understood.

This large study aimed to identify the determinants of poor QOL amongst AAV patients with view to informing future interventions designed to modify this crucial outcome.

Methods: A cross-sectional study was conducted. AAV cases were recruited from rheumatology and renal departments across the UK according to consecutive clinic attendance and classified using the EMEA vasculitis algorithm. Participants completed a questionnaire which determined to be effective in many rheumatic diseases. Therefore, we compared the Birmingham Vasculitis Activity Score to a patient-only index termed the “Routine Assessment of Disease Activity” (RAPID3) on an MDHAQ.

Conclusion: Poor QOL amongst AAV patients is determined by multiple clinical and psychosocial factors, however, fatigue appears to be the most important. Clinically, optimal control of underlying inflammation and neurological manifestations are likely to improve aspects of QOL, however multidisciplinary interventions targeting psychosocial determinants may offer even greater gains. Further work is required to develop treatment strategies specific to alleviating fatigue.

Disclosure: N. Basu, None; A. McClean, None; R. Luqmani, None; L. Harper, None; O. Flossmann, None; D. Jayne, None; M. Little, None; E. N. Amft, None; N. Dhaun, None; J. McLaren, None; V. Kumar, None; L. Erwig, None; G. T. Jones, None; D. M. Reid, None; G. J. Macfarlane, None.

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Patient Reported Outcomes in ANCA-Associated Vasculitis. A Prospective Comparison Between Birmingham Vasculitis Activity Score and Routine Assessment of Patient Index Data 3. Osama ElSallabi, Joel A. Block and Antoine Sreih. Rush University Medical Center, Chicago, IL

Background/Purpose: ANCA-associated vasculitis (AAV) is a rare group of diseases comprising Granulomatosis with polyangiitis (Wegener’s; GPA), Microscopic Polyangiitis (MPA), and Churg-Strauss Syndrome (CSS). These diseases often result in severe morbidity and frequent relapses. The Birmingham Vasculitis Activity Score v3 (BVAS) is a well-established and validated tool to measure AAV activity. However, current tools do not include patient-reported outcomes to assess for disease activity. The Multi-Dimensional Health Assessment Questionnaire (MDHAQ) has been documented to be effective in many rheumatic diseases. Therefore, we compared BVAS scores to a patient-only index termed the “Routine Assessment of Patient Index Data 3” (RAPID3) on an MDHAQ.

Methods: Patients with AAV treated by one rheumatologist at Rush University Medical Center in Chicago, IL from Jan 2010 to May 2012 were asked to participate and given MDHAQ to complete for 4 consecutive visits approximately every 6 months. An independent investigator scored RAPID3, which comprises 3 Core Data Set measures on the MDHAQ for function, pain, and patient global assessment (PATGL) and takes 5 seconds to score; scores range from 0 to 30, with higher scores being worse. BVAS was calculated at each patient visit; scores range from 0 to 63, with worse disease being higher. Both scores were compared using Spearman non-parametric correlations. BVAS was also compared to PATGL, which is a visual analogue scale from 0 to 10 and is one of the Core Data Set measures in RAPID3. Linear regression was used to adjust for disease duration of the disease, years of schooling and type of insurance. P ≤ 0.5 was considered significant. The institutional Review Board approved the study.

Table. Multivariable explanatory models of poor Quality of Life (QOL) amongst AAV patients

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio (95% CI)</th>
<th>Population attributable risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Fatigue (CS)</td>
<td>3.2 (1.5–6.9)</td>
<td>24.6%</td>
</tr>
<tr>
<td>High Sleep Disturbance (ESQ)</td>
<td>5.3 (2.3–12.1)</td>
<td>13.1%</td>
</tr>
<tr>
<td>High current PRED do se (&gt;5mg)</td>
<td>3.6 (1.7–7.8)</td>
<td>11.5%</td>
</tr>
<tr>
<td>Old Aged (≥70 years)</td>
<td>3.5 (1.4–8.9)</td>
<td>5%</td>
</tr>
<tr>
<td>Raised CRP</td>
<td>4.1 (1.6–10.6)</td>
<td>5%</td>
</tr>
<tr>
<td>Nervous system involvement (ever)</td>
<td>2.2 (0.6–7.2)</td>
<td>1.2%</td>
</tr>
<tr>
<td>Poor Mental related QOL (MCS) model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Fatigue (CS)</td>
<td>4.0 (1.8–8.9)</td>
<td>47.4%</td>
</tr>
<tr>
<td>Low Positive refruming (BC)</td>
<td>3.2 (1.6–6.6)</td>
<td>19.3%</td>
</tr>
<tr>
<td>Hypoalbuminemia</td>
<td>2.9 (1.3–6.6)</td>
<td>15.0%</td>
</tr>
<tr>
<td>Anxiety (HADS)</td>
<td>5.7 (2.1–15.0)</td>
<td>7.3%</td>
</tr>
<tr>
<td>Depression (HADS)</td>
<td>5.6 (2.0–15.8)</td>
<td>6.3%</td>
</tr>
<tr>
<td>Unemployment</td>
<td>6.1 (2.2–30.3)</td>
<td>5.5%</td>
</tr>
<tr>
<td>Substance dependence</td>
<td>2.1 (0.9–4.6)</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

*Dichotomised at general population mean; CFS Chalder Fatigue Scale; HADS Hospital Anxiety and Depression scale; BC Brief Cope; ESQ Estimation of Sleep Problems Questionnaire; PCS SF 36 Physical Component Summary; MCS SF36 Mental Component Summary

Disclosures: P. A. Merkel, None; A. Boonen, None; L. Strunin, None; R. Borg, None; P. Tugwell, None; O. Flossmann, None; M. Little, None; E. N. Amft, None; N. Dhaun, None; J. McLaren, None; V. Kumar, None; L. Erwig, None; G. T. Jones, None; D. M. Reid, None; G. J. Macfarlane, None.
Results: Twenty-nine patients with AAV consented and were included in the study, 22 had GPA, 5 GPA and 2 CSS. The mean age was 54.1 years, 77% were females, 69% Caucasians, 23% Hispanics, and 8% African-Americans. The mean duration of disease was 4.3 years. The mean BVAS at first visit was 6.1 ± 0.9 (range: 0–17), RAPID3 was 8.3 ± 1.3 (range: 0–22.7), and PTGA was 3.6 ± 0.5. RAPID3 correlated with BVAS at each visit (rho =0.45, 0.75, 0.73, 0.54 with p values of 0.02, <0.0001, 0.002, and 0.05 for visits 1 to 4, respectively) and PTAGL correlated with BVAS at 3 out of 4 visits, independently of RAPID3 (rho = 0.24, 0.75, 0.64, 0.59 with p values of 0.23, <0.0001, 0.01, 0.01 for visits 1 to 4, respectively).

Conclusion: RAPID3, a patient-only index, is correlated significantly with the BVAS. RAPID3 can be calculated in 5 seconds and does not require physician input, laboratory or imaging information. PATGL, a one simple measure of patient global assessment, may also reflect disease activity. As patient-relevant outcomes become increasingly important to insurers and to society, it is critical to identify valid patient-reported markers of vasculitis activity; RAPID3 permit longitudinal assessments of disease activity at any medical facility by any physician or even away from physician’s offices. In the face of increased expenses and busy practices, such instruments may help document patient status and add to clinical decisions.

Disclosure: O. ElSallabi, None; J. A. Block, None; A. Sreih, None.

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Background/Purpose: In granulomatosis with polyangiitis GPA), disease activity is assessed by physician-based measures. In some other rheumatic diseases, such as rheumatoid arthritis (RA) and ankylosing spondylitis (AS), the patient global assessment for disease activity (PtGA) contributes to composite disease activity scores such as the DAS28 (RA) and ASDAS (AS). The purpose of this study was i) to describe distribution of PtGA scores in patients with GPA enrolled in a clinical trial, ii) explore discordance between PtGA and physician global assessments for disease activity (MDglobal), and iii) determine if PtGA during disease remission is associated with future disease relapse.

Methods: Subjects were participants in a therapeutic clinical trial. Patients had active disease at enrollment, with study visits occurring at baseline, 6 weeks and every 3 months thereafter. PtGA was assessed on a visual analog scale from 0-100 with the question: “Please mark the line below indicating how active you believe your Wegener’s granularity has been in the past 28 days. Consider only how much your Wegener’s (the disease itself) is causing personal disturbance, and all IPQ-R dimensions except timeline were significantly associated with MFI scores (45%), severe disease manifestation (54%), median disease duration (7.4 years), and remission duration ≥ 1 year (27%). Mean MFI score was 15.0 (± 3.9). Disease activity, remission duration, age, race, depression, sleep disturbance, and all IPQ-R dimensions except timeline were significantly associated with MFI scores (Table). Sequential models demonstrated that IPQ-R dimensions (i.e. explained an additional 18% of variability in fatigue scores after accounting for disease status and clinical variables. 56% of variability in fatigue scores remained unexplained in the full model.

Table. Association of fatigue scores with disease status, clinical variables, and IPQ-R dimensions in three sequential, additive linear models.

Step Two: Add Clinical Variables
Step Three: Add IPQ-R Dimensions

<table>
<thead>
<tr>
<th>Disease Status</th>
<th>Disease Activity (active vs remission)</th>
<th>Age (per year)</th>
<th>Sex (male vs female)</th>
<th>Disease Duration (continuous)</th>
<th>Remission Duration (continuous)</th>
<th>Sleep Disturbed (yes vs no)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β = 1.01**</td>
<td>β = 0.01**</td>
<td>β = 0.35</td>
<td>β = 0.03**</td>
<td>β = 0.12**</td>
<td>β = 0.1**</td>
</tr>
<tr>
<td></td>
<td>1.02*</td>
<td>0.04**</td>
<td>1.01*</td>
<td>0.75*</td>
<td>0.34*</td>
<td>0.23*</td>
</tr>
<tr>
<td></td>
<td>0.18</td>
<td>0.18*</td>
<td>0.05</td>
<td>0.17*</td>
<td>0.10*</td>
<td>0.10*</td>
</tr>
<tr>
<td></td>
<td>0.02</td>
<td>0.02</td>
<td>0.001</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Outcome: MFI score (continuous, higher scores indicate greater fatigue). High scores on the identity, timeline, consequences, and emotional dimensions represent strong positive beliefs about the number of symptoms attributed to the illness, the frequency of the condition, the cyclical nature of the condition, the negative consequences of the illness, and the negative emotional impact of disease. High scores on the personal control, treatment control and coherence dimensions represent positive beliefs about the controllability of the illness and personal understanding of the condition.

Conclusion: In GPA, patient and physician assessments are frequently discordant. Higher PtGA during apparent remission is associated with future overt disease relapse. These data imply that PGA captures aspects of disease activity missed by physician-based measures. PtGA could contribute to a composite measure of disease activity in GPA.

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Conclusion: Patient-reported measures of disease activity and remission duration are associated with fatigue, suggesting that patients consider fatigue a manifestation of active vasculitis. Illness perceptions significantly explain differences in fatigue scores beyond what can be explained by measures of disease status and depression. These data suggest that in vasculitis i) fatigue is a major domain of illness only partially related to disease activity as currently assessed; ii) illness perceptions may have a causative role in fatigue; and iii) the mechanisms underlying fatigue are complex and multifactorial. These findings have important implications for the incorporation of fatigue measures into overall outcome assessment in vasculitis.

Disclosure: P. C. Grayson, None; N. Amudala, None; C. McAlear, None; R. Leduc, None; D. Sherer, None; R. Richesson, None; L. Fraenkel, None; P. A. Merkel, None.

1529

Upper Airway Gene Expression Profiling in Granulomatosis with Polyangiitis. Peter C. Grayson1, Katrina Stelling1, Paul A. Monach2, Ji Xiao3, Xiaohui Zhang1, Yuryi Alekseyev1, Stephano Monti1, Avrum Spira1 and Peter A. Merkel4. 1Boston University Medical Center, Boston, MA, 2Boston University, Boston, MA, 3University of Pennsylvania, Philadelphia, PA

Background/Purpose: Nasal disease occurs in the majority of patients with granulomatosis with polyangiitis (Wegener’s, GPA) and is often a presenting symptom of the disease. The objectives of this study were to use gene expression profiling techniques to gain insight into the biology of upper airway disease in GPA and explore the potential utility of genome-wide gene expression signatures as measures of nasal disease activity.

Methods: Nasal brushings of the inferior turbinate were obtained from 32 subjects with GPA (n=10 active nasal disease, n=13 prior nasal disease, n=9 never nasal disease) and 35 comparator subjects with and without inflammatory nasal disease (n=12 healthy, n=15 sarcoidosis, n=8 allergic rhinitis). RNA extracted from the brushings was processed and hybridized to Affymetrix Human Gene 1.0 ST Arrays. Gene expression changes associated with nasal disease activity were identified with a linear mixed effects model controlling for microarray batch, use of prednisone, and use of other immunosuppressant medication. Significant differences were defined at a threshold of false discovery rate (FDR) <0.1 and fold change >1.5. Functional enrichment of biologic pathways among the gene expression profiles associated with nasal disease activity was determined using Gene Set Enrichment Analysis (GSEA) (FDR <0.25). The relationship of nasal gene expression profiles to peripheral blood mononuclear and neutrophil gene expression levels associated with GPA (Cheadle et al A&K 2010) was determined using GSEA.

Results: The expression levels of 452 genes were associated with active nasal disease (n=20 with prior nasal disease, and 20 never nasal disease, in subjects with GPA. GSEA revealed enrichment of several biologic pathways among genes associated with nasal disease activity. The 20 most significantly enriched pathways among subjects with active nasal disease were also significantly enriched among subjects with prior nasal disease and included pathways related to immune response (eg HSA04679 Leukocyte Transendothelial Migration) and thrombosis (eg HSA04610 Complement And Cogulation Cascade). There was no overlap between biologic pathways enriched in subjects with never nasal disease, and pathways enriched among subjects with active or prior nasal disease. Peripheral blood neutrophil and mononuclear gene expression levels associated with GPA were similarly altered in the nasal gene expression profiles of subjects with active or prior nasal disease, but were not significantly enriched in subjects with never nasal disease.

Conclusion: Nasal gene expression profiles are associated with nasal disease activity in subjects with GPA. Pathways analysis suggests that the biologic functions of genes altered in subjects with active nasal disease are similar to subjects with prior nasal disease, and distinct from subjects with never nasal disease. Upper airway gene expression profiles in subjects with active and prior nasal disease were similar to patterns of gene expression changes derived from fractionated peripheral blood in GPA, suggesting that nasal gene expression profiles in GPA may reflect systemic disease activity.

Disclosure: P. C. Grayson, None; K. Stelling, None; P. A. Monach, None; J. Xiao, None; Z. Zhang, None; Y. Alekseyev, None; S. Monti, None; A. Spira, None; P. A. Merkel, None.

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Plasma Cell Analysis As a Biomarker for Disease Activity in Patients with Granulomatosis with Polyangiitis. Birnba F. Hoyer1, Adrian Taddeo1, Maika Rothkegel2, Gerd R. Burnsteiner3, Andreas H. Radbruch3 and Falk Hiepe1. 1Charité University Hospital, Berlin, Germany, 2Deutsches Rheumaforschungszentrum, Berlin, Germany, 3Charité – University Medicine Berlin, Berlin, Germany. 7

Background/Purpose: B cells are thought to play an important role in granulomatosis with polyangiitis (GPA) due to the presence of autoantibodies reacting with specific neutrophil granular enzymes (ANCA) in a vast majority of patients as well as the success of B cell depleting therapies in GPA. Renal manifestations in GPA are considered to be directly ANCA-mediated (Flak, RJ, 2002) whereas the granulomatous inflammation appears to be mediated by CD4 T cells.

Oneto understand the possible role of B cells in ANCA-associated vasculitis we analyzed the B cell subsets in the peripheral blood of patients with GPA and found marked changes correlating with disease activity as measured by the BVAS (Birmingham vasculitis activity score) as well as ANCA-levels.

Methods: 14 patients with GPA (7 with active disease, 7 with inactive disease) were analyzed by flow cytometry as compared to 17 healthy donors. Staining for CD27, CD20, MHCL, CD3, 4 and 8 was analyzed using flowjo software. Statistical analysis was performed using graph pad prism, and p-values of < 0.05 were considered as significant. The ethics committee of the Charité approved the study, and all patients had signed informed consent.

Results: Marked differences (p<0.0018) could be observed in plasma cell counts as well as ANCA patients (6.4±0.7 μl) with a BVAS-score >0 as compared to those with a BVAS-score =0 (2.52±1.6 μl) or healthy persons (2.27±1.15 μl). Plasma cell numbers as well as the frequency of plasma cells within all B cells correlated with the BVAS (r=0.9135, p<0.0001) as well as the ANCA-level in the serum (r=0.8316, p=0.0013). No significant differences could be observed for naive and memory B cells or the overall B cell numbers as compared to healthy donors.

Regarding T cells, there was a significant reduction of CD3 (p=0.01) and CD4 T (p=0.012) cells in patients with active GPA as compared to patients in remission, whereas CD8 T cells did not show any significant changes.

Conclusion: Plasma cell counts are increased in patients with active GPA which implies a role for plasma cell mediated effects in active GPA. This is probably due to B cell hyperactivity in GPA. Presumably, their main role is the production of autoantibodies, but also cytokine production. Independent of their direct contribution to the disease, they may serve as a biomarker of disease activity as they highly correlate with the BVAS.

Disclosure: B. F. Hoyer, None; A. Taddeo, None; M. Rothkegel, None; G. R. Burnsteiner, Abbott, BMS, MSD, Pfizer Inc., Roche, UC2, 2, Abbott, BMS, MSD, Pfizer Inc., Roche, UC2, 2, A. H. Radbruch, None; F. Hiepe, None.

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Comparative Proteomic Analysis of Neutrophils Between Microscopic Polyangiitis and Granulomatosis with Polyangiitis. Teisuke Uchida1, Kohei Nagai2, Toshiyuki Sato1, Mitsumi Arito1, Nobuko Iizuka, Manae Kukawka1, Naoya Suematsu1, Kazuki Okamoto1, Shiochi Ozaki1 and Tomohiro Kato1. 1Clinical Proteomics and Molecular Medicine, St. Marianna University Graduate School of Medicine, Kawasaki, Japan, 2St. Marianna University Graduate School of Medicine, Kawasaki, Japan

Background/Purpose: Both microscopic polyangiitis (MPA) and granulomatosis with polyangiitis (GPA) belong to ANCA-associated vasculitis (AAV), in which dysfunction of polymorphonuclear cells (PMN) is thought to be involved in their pathology. Clinically, it is often difficult to distinguish MPA from GPA. In this study, proteomic profiles of PMN of MPA and GPA patients and healthy controls (HC) were analyzed using two-dimensional difference gel electrophoresis (2D-DIGE), in order to know whether the proteomes are used to discriminate between AAV and HC, or MPA and GPA.

Methods: Proteins extracted from PMN obtained from 11 MPA patients, 9 GPA patients, and 10 HC were separated by 2D-DIGE. Differentially expressed protein spots were identified by MALDI-TOF MS. Then the obtained protein profiles were subjected to the multivariate data analysis by SIMCA-P (OPLS-DA).

Results: In all the 864 protein spots detected, intensity of 55 spots were found to be significantly different (p<0.05) among the three groups by an ANOVA analysis. 31 out of the 55 spots were identified by mass spectrom-
tery. The protein spots whose intensity is higher in MPA than in GPA include cytoskeletal proteins, while the proteins whose intensity as higher in GPA than MPA included protein inhibitors and anti-microbial proteins. The OPLS-DA analysis revealed that the expression profile of the 55 protein spots discriminated completely the AAV group from the HC group with a sufficiently high R² (0.903) and Q² (0.445) values, and also discriminated completely the MPA group from the GPA group with a sufficiently high R² (0.809) and Q² (0.627) values.

Conclusion: These results indicated that the profile of PMN proteins may be used as a biomarker that can discriminate AAV from HC, and MPA from GPA.

Disclosure: T. Uchida, None; K. Nagai, None; T. Sato, None; M. Arito, None; N. Iizuka, None; M. Kurokawa, None; N. Suematsu, None; K. Okamoto, None; S. Ozaki, None; T. Kato, None.

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Serum Angiopoietin-2 Level Reflects the Disease Activity and Renal Function in Antineutrophil Cytoplasmic Antibody-Associated Vasculitis. Yoko Wada1, Hiroe Sato1, Takeshi Nakatsue1, Shuichi Murakami1, Takeshi Kuroda1, Masaki Nakano1 and Ichiei Narita2. 1Niigata University Graduate School of Medical and Dental Sciences, Niigata, Japan, 2Niigata University, Niigata, Japan.

Background/Purpose: Angiopoietin-2 (Ang-2) has been identified as a key mediator of endothelial cell activation. Ang-1 and Ang-2 are antagonistic ligands which bind with similar affinity to the extracellular domain of the tyrosine kinase with Ig-like and epidermal growth factor-like domains 2 (Tie-2) receptor, which is almost exclusively expressed by endothelial cells. Ang-1/Tie-2 signalling maintains vessel integrity, inhibits vascular leakage, suppresses inflammatory gene expression and prevents recruitment and transmigration of leukocytes. In contrast, binding of Ang-2 disrupts protective Ang-1/Tie-2 signalling and facilitates endothelial inflammation. Recently, serum Ang-2 levels have been reported to be elevated in autoimmune disorders such as rheumatoid arthritis, systemic lupus erythematosus, and ANCA-associated vasculitis (AAV). The purpose of this study is to examine the serum Ang-2 levels in patients with AAV, and investigate the relationship with the clinical and laboratory findings.

Methods: Fifty-nine patients with AAV (microscopic polyangiitis (MPA), n=27), granulomatosis with polyangiitis (GPA, n=15), Churg-Strauss syndrome (CSS, n=14), others (n=3), who had been referred to Niigata University Medical and Dental Hospital between 2000 and 2011, were enrolled in this study. Written informed consent was obtained from each patient. The patients were divided into 2 groups according to their disease activities using Birminghamvasculitis activity score (BVAS) (active disease group (AD group, n=45) and remission disease group (RD group, n=14)). Serum Ang-2 levels and laboratory findings were examined in each subject, and the data were compared between these 2 groups. The data from all subjects were analyzed using Spearman’s rank correlation coefficient to determine the relationship with serum Ang-2 levels. Next, the patients with AD group were in accord in time with their stages of chronic kidney diseases (CKD) (CKD≤3 group, n=19, and CKD≥3 group, n=26), and the data were compared to examine the impact of renal function in this study.

Results: The serum Ang-2 level, C-reactive protein (CRP), white blood cell count, and urinary protein excretion were significantly higher in AD group compared with those in RD group. In Spearman’s rank correlation coefficient analysis using data from all subjects, the serum Ang-2 level was positively correlated with BVAS (r=0.62, p < 0.0001), CRP (r=0.47, p=0.0003), serum creatinine (Cr) (r=0.38, p=0.005), and urinary protein excretion (UP) (r=0.55, p < 0.0001), and negatively correlated with estimated glomerular filtration rate (eGFR) (r=−0.37, p=0.005). In the next analysis, patients in CKD≥3 were significantly older and BVAS was significantly higher compared to those with patients in CKD≤3 group. Ang-2 was elevated in CKD≥3 group without statistical significance. In Spearman’s rank correlation coefficient analysis, Ang-2 was positively correlated with CRP and BVAS in CKD≤3 group, while it was correlated with UP, eGFR, Cr, and CRP in CKD≥3 group.

Conclusion: Serum Ang-2 level was strongly correlated with the disease activity and renal function in AAV. These results indicated the possible role of Ang-2 in the development of AAV through endothelial injuries.

Disclosure: Y. Wada, None; H. Sato, None; T. Nakatsue, None; S. Murakami, None; T. Kuroda, None; M. Nakano, None; I. Narita, None.
for the IgG4-RD biopsies was 101 IgG4+ plasma cells/hpf (range: 13-240 IgG4+ cells), compared with 25 patients (range: 0–135) for the GPA patients (P = 0.035). IgG4+ plasma cells were numerically higher among GPA patients who were ANCA-positive as opposed to ANCA-negative (40 vs. 11 cells).

Table 1. Lung Histopathologic Features: Granulomatosis with polyangiitis (GPA) versus IgG4-related disease (IgG4-RD)

<table>
<thead>
<tr>
<th>Pathology Features</th>
<th>GPA</th>
<th>IgG4-RD</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutrophilic Abscesses</td>
<td>6/9 (67%)</td>
<td>0/5 (0)</td>
<td>0.03*</td>
</tr>
<tr>
<td>Histiocytes</td>
<td>8/9 (89%)</td>
<td>0/5 (0)</td>
<td>0.003*</td>
</tr>
<tr>
<td>Giant cells</td>
<td>8/9 (89%)</td>
<td>0/5 (0)</td>
<td>0.003*</td>
</tr>
<tr>
<td>Granulomas</td>
<td>8/9 (89%)</td>
<td>0/5 (0)</td>
<td>0.003*</td>
</tr>
<tr>
<td>Necrotizing granulomas</td>
<td>2/9 (22%)</td>
<td>0/5 (0)</td>
<td>NS</td>
</tr>
<tr>
<td>Vasculitis</td>
<td>3/9 (33%)</td>
<td>0/5 (0)</td>
<td>NS</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>5/9 (56%)</td>
<td>0/5 (0)</td>
<td>NS</td>
</tr>
<tr>
<td>Lymphoplasmacytic infiltrate</td>
<td>8/9 (89%)</td>
<td>5/5 (100%)</td>
<td>NS</td>
</tr>
<tr>
<td>Tissue eosinophilia</td>
<td>3/9 (33%)</td>
<td>5/5 (60%)</td>
<td>NS</td>
</tr>
<tr>
<td>Storiform fibrosis</td>
<td>3/9 (33%)</td>
<td>5/5 (100%)</td>
<td>0.03*</td>
</tr>
<tr>
<td>Obliterative phlebitis</td>
<td>0 (0)</td>
<td>4/5 (80%)</td>
<td>0.005*</td>
</tr>
</tbody>
</table>

Conclusion: Lung biopsies from both IgG4-RD and GPA patients are characterized by lymphoplasmacytic infiltrates and IgG4+ plasma cells. Histopathological features, particularly the finding of obliterative phlebitis in IgG4-RD and the absence of granulomatous inflammation, are essential in distinguishing between these conditions.

Disclosure: M. Carruthers, None; S. Shinagare, None; A. Khosroshahi, None; V. Deshpande, None; J. H. Stone, Genentech, 5.

1535

Genetic Background of Antineutrophil Cytoplasmic Antibody-Associated Vasculitis in a Japanese Population: Association of STAT4 with Myeloperoxidase Antineutrophil Cytoplasmic Antibody-Positive Vasculitis. Aya Kawasaki1, Naoya Inoue1, Chihiro Ajimi1, Ikue Ito1, Ken-ei Sada1, Shigeto Kobayashi1, Hido Hiroshida1, Hiroshi Furukawa1, Makoto Tomita1, Takayuki Sumida1, Shigeto Tohma1, Nobuyuki Miyasaka2, Shoichi Ozaki2, Hiroshi Nakamura2, Shigeto Tohma3, Ken-ei Sada2, Shigeto Tohma3, Tokio Medical and Dental University, Tokyo, Japan, 2National Institute of Infectious Diseases, Tokyo, Japan, 3University of Tsukuba, Tsukuba, Japan, 4St. Marianna University, Kawasaki, Japan, 5Juntendo University Koshigaya Hospital, Tokyo, Japan, 6Tokyo Medical and Dental University, Tokyo, Japan, 7National Institute of Infectious Diseases, Tokyo, Japan

Background/Purpose: ANCA is a useful diagnostic marker in systemic vasculitides with small-vessel involvement, but depending on the particular test used the myeloperoxidase (MPO)-ANCA results are variable. Unfortunately, the exact origins of the antigens used in most commercial assays have been confidential. In the present study, we performed a comparative analysis between a novel MPO-ANCA assay that targets the native MPO (nMPO) antigen and commercially available assays using sera of patients with clinical features of ANCA-associated vasculitides (AAV).

Methods: Serum samples from 24 patients strongly suspected of having AAV were tested for the presence of MPO-ANCA by the novel nMPO-ANCA assay and by other commercial-based MPO-ANCA assays. These results were compared to 24 patients that tested positive with our nMPO-ANCA assay alone showed clinical features of AAV.

Results: Eighteen out of 24 patients (75%) were positive for nMPO-ANCA compared to 13 out of 24 patients (54%) by one of the most frequently used commercial-based MPO-ANCA ELISA assays in Japan. Interestingly, the patients that tested positive with our nMPO-ANCA assay alone showed clinical features of AAV marked by prolonged fever, polyarthritis, and mild nephritis. The titers of nMPO-ANCA decreased in association with clinical improvement after treatment.

Conclusion: Our data suggest that a positive nMPO-ANCA result, which identifies antibodies to human native MPO antigen, identifies patients with a subset of patients with AAV and a distinct clinical profile. In addition, the titer appeared to correlate with AAV disease activity. While additional studies in larger patient populations will be needed, the nMPO-ANCA test could have clinical utility in detecting AAV-affected patients who have tested negative using commercially available assays.

Disclosure: Y. Yamanishi, None; T. Ito-Ibara, None; S. Kobayashi, None; P. Y. Shone, UC-B; G. S. Firestein, None; H. Hashimoto, None; K. Suzuki, None.

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1Cleveland Clinic Foundation, Cleveland, OH, 2Medical College of Wisconsin, Milwaukee, WI, 3Cleveland Clinic Foundation A50, Cleveland, OH, 4Cleveland Clinic, Cleveland, OH

Background/Purpose: Previous studies from our group suggested that the inflammatory events that occur during relapses in patients with Granulo-
matosis with Polyangitis (GPA, Wegener’s) may have a direct role in the pathogenesis of atherosclerosis. We also showed that circulating microparticle (MPs) levels were elevated during relapse and correlated with platelet reactivity. We further elucidated possible mechanisms by which MPs act at the interface between inflammation and atherosclerosis in GPA.

**Methods**: Human dermal microvascular endothelial cells (huDMVEC, Clonetics CAMBREX) were cultured in EGM-2MV media from Lonza. MPs isolated from GPA patients, healthy controls or derived from THP-1 human monocyct cells in vitro, were added at various ratios to the huDMVEC and incubated for timed periods. Cells were then detached, washed, and re-suspended in buffer and analyzed by immuno-fluorescence flow cytometry with anti-ICAM-1 IgG to detect endothelial cell activation. An isotope-matched control IgG was used as control. In addition, fluorescent tagged normal human platelets were incubated with GPA patient-derived MPs (MP/platelet ratio of 10:1) and platelet activation was detected by flow cytometry with PAC-1, an antibody to the activated form of the a2b3 integrin.

**Results**: GPA patient-derived MPs, when incubated for 4h with huDMVEC, induced surface expression of ICAM-1. MP depleted plasma was used as a control and did not influence ICAM-1 expression. ICAM-1 induction by MPs was blocked by cycloheximide indicating a requirement for new protein synthesis and showing that the ICAM-1 was not transferred to the cells by the MPs. MPs isolated from control subjects or from cultured THP-1 cells exerted a similar activating effect on huDMVEC, suggesting that the effect of MP on EC activation was a general feature of MPs. Platelet surface expression of activated a2b3 integrin was also significantly enhanced when platelets from healthy donors were pre-incubated with patient-derived MPs and then exposed to low doses of ADP (1 μM).

**Conclusion**: Our findings demonstrate that MPs isolated from plasma of GPA patients can activate platelets and vascular endothelial cells. These findings suggest possible roles for MPs as an interface between inflammation and athero-thrombosis in GPA.

**Disclosure**: R. Hajj-All None; R. L. Silverstein None; G. S. Hoffman None; C. A. Langford None.

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ANCA-Associated Vasculitis in Hispanic Americans: An Unrecognized Severity, Ranadeep Mandhadi 1, Fadi Aldaghlawi 2, Asad Khan 2, Vajiha Sreih 3, Joel A. Block 3 and Antoine Sreih 3. 1Mount Sinai Hospital, Chicago, IL, 2Rush University Medical Center, Chicago, IL, 3Stroger Hospital of Cook County, Chicago, IL

**Background/Purpose**: ANCA-associated vasculitis, once a disease thought to predominate in Caucasians, is now increasingly recognized in diverse ethnic populations. However, there has been little systematic analysis of ANCA-associated vasculitis among minorities in the United States, particularly among Hispanics. We have observed anecdotally that Hispanics appeared to present with systemic disease and severe renal involvement. Here, we describe the clinical severity and disease outcome in a group of Hispanic patients with ANCA-associated vasculitides, and test the hypothesis that Hispanics have more severe disease relative to an age- and gender-matched Caucasian population living in the same geographical area.

**Methods**: We identified 21 Hispanic and 25 Caucasian patients treated for ANCA-associated vasculitis at Stroger Hospital of Cook County and Rush University Medical Center in Chicago, IL from January 2006 to December 2011. Ethnicity was determined by self-report. The definition and diagnosis of Granulomatosis with Polyangitis (Wegener’s; GPA), Microscopic Polyangitis (MPA), and Churg-Strauss Syndrome (CSS) followed the American College of Rheumatology criteria and the 1992 Chapel Hill Consensus Conference criteria. Patient demographics, laboratory data, Birmingham Vasculitis Activity Score (BVAS), and Vasculitis Damage Index (VDI) were analyzed. The presence of renal involvement was defined by: elevated serum creatinine, hematuria >10RBC/hpf, RBC casts, and/or proteinuria >1+. Student’s t-test and chi-square tests were employed, p<0.05 was considered significant.

**Results**: Of the 46 patients, 27 had GPA, 11 had MPA, 7 had CSS, and 1 renal-limited vasculitis. There was no difference between Hispanics and Caucasians in the median age at diagnosis (49.5 years in Hispanics and 50.3 years in Caucasians, p=0.36), time to diagnosis (263 days in Hispanics and 288 days in Caucasians, p=0.72), nor in the gender distribution (47.6% females among Hispanics versus 64% among Caucasians, p=0.37). As opposed to Caucasians, Hispanics had a higher mean BVAS at presentation (16.75 ± 7.7 versus 12.4 ± 6.7, p=0.03), a higher mean VDI at presentation (2.9 ± 1.5 versus 1.9 ± 1.2, p=0.03) and a cumulative mean VDI (3.9 ± 1.7 versus 2.5 ± 1.9, p=0.01) in Hispanics versus Caucasians respectively. In addition, there was a trend towards higher prevalence of renal involvement in Hispanics (89% of Hispanics vs. 56% of Caucasians, p=0.06). Seventy percent of Hispanics had acute renal failure (Mean highest creatinine= 4.01 ± 3.01 mg/dl) of whom half required dialysis, versus 29% of Caucasians (Mean highest creatinine= 1.98 ± 1.67 mg/dl, p=0.05) and only two patients requiring dialysis. Two Hispanic patients died shortly after presentation. There were no deaths among Caucasians.

**Conclusion**: In contrast to Caucasians, who tended to have a limited form of vasculitis at presentation, Hispanics with ANCA-associated vasculitis presented with more systemic and severe disease with higher damage indices. Whether these differences are due to genetic, socio-economic, or healthcare access disparities is yet to be studied. Early detection and intervention in these patients may alter the course of the disease and reduce morbidity and mortality.

**Disclosure**: R. Mandhadi None; F. Aldaghlawi None; A. Khan None; V. Irshad None; J. A. Block None; A. Sreih None.

1539

Microscopic Polyangitis: A Large Single Center Series. Leslie D. Wilke 1, Guy P. Fiocco 2 and Marilyn Prince-Fiocco 3, Scott & White Memorial Center, Temple, TX, 2Scott & White Clinic, Temple, TX, 3Temple, TX

**Background/Purpose**: Microscopic polyangitis (MPA) is a rare systemic, ANCA (anti-neutrophil cytoplasmic antibody)-associated vasculitis of unclear etiology, characterized by necrotizing small vessel involvement with few or no immune complex deposits. Necrotizing glomerulonephritis is common. Pulmonary capillaritis causing alveolar hemorrhage and hemoptysis is well-recognized, but most case series are reported in the nephrology literature and emphasize renal considerations (1). We present a single center 10-year retrospective review of 40 patients meeting the Chapel Hill Consensus Conference case definition of MPA, with specific p-ANCA and MPO (myeloperoxidase) positivity, with emphasis on initial and subsequent pulmonary manifestations.

**Methods**: We searched the electronic data base as well as separate databases in our laboratory within our large integrated clinic-hospital system and reviewed charts of all patients with related ICD-9 codes for “vasculitis” in the last 10 years. Patients included in the study were both p-ANCA and MPO positive and met clinical and pathologic criteria for MPA. Patients with only c-ANCA disease or significant granulomatous on pathologic evaluation were excluded. Several variables were reviewed (Table 1).

**Characteristic** | N = 40
---|---
Mean Age at Diagnosis | 58.9 years (range: 14-83 years)
Gender | Male 37.5% (15)
| Female 62.5% (25)
Male/Female ratio | 1.16
Race | White 73% (29)
| Black 5% (2)
| Hispanic 20% (8)
| Other 2.5% (1)
Vital status as of 2011 | Alive 60% (24)
| Deceased 30% (12)
| Unknown 10% (4)
Smoking history prior to diagnosis | 50% (20)
FEV1/FVC > 70 | 70.5% (12 of 17)
Pulmonary involvement only | 5% (2)
Renal involvement only | 12.5% (5)
Pulmonary and renal involvement | 75% (30)
Hemoptysis | 40% (16)
Concomitant Medical History | Positive ANA 18 (45%)
| Hypertension 57.3% (23)
| Diabetes mellitus 20% (8)
| Cr >1.5 at time of diagnosis 62.5% (25)
Progression to hemodialysis | 27.5% (11)
Diagnostic modalities | Bronchoscopy 60% (24)
| Renal Biopsy 60% (24)
| Lung Biopsy 12.5% (5)
Other Biopsy 10% (4)
Causal Diagnosis | 15% (6)
Treatment | Cyclophosphamide + Corticosteroids 60% (24)
| Corticosteroids Alone 10% (4)
| Azathioprine Alone 5% (2)
| Azathioprine + Corticosteroids 10 (4)
| Rituximab 5% (2)
| Mycophenolate mofetil 12.5% (5)
| Cyclophosphamide + Corticosteroids + Plasmapheresis 5% (2)
| Corticosteroids + Rituximab + Mycophenolate = 2.5% (1)
Plasmapheresis | No Treatment 2.5% (1)
Results: Onset of illness was usually abrupt and included respiratory symptoms. Most common presenting complaint was cough. Hemoptysis occurred during the course of illness in 40%.

Pulmonary evaluation included bronchoscopy in 60% and surgical lung biopsy in 12%, usually related to pulmonary hemorrhage.

Treatment doses and duration were quite variable but included combination corticosteroids and cytotoxic therapy in 60%. Therapy was directed by nephrology in 52.5%. Rheumatology and Pulmonary directed therapy in 22.5% patients each. One patient did not undergo therapy. The course of illness was variable, with few significant pulmonary relapses. Hemodialysis occurred in 28%. Known deaths occurred in 12, with none directly attributable to the disease process.

Conclusion:
1) Pulmonary involvement is much more frequent than the current literature report of 25–50% when features in addition to hemorrhage are recorded. (1,2)
2) MPA at onset usually includes respiratory symptoms. Demographic and medical variables failed to identify predisposing factors.
3) No clear guidelines direct the evaluation and management of MPA patients. Consistent communication between pulmonary, nephrology, and rheumatology services could improve our understanding of the disease process.

References

Disclosure: L. D. Wilke, None; G. P. Fiocco, None; M. Prince-Fiocco, None.

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Practice Patterns in the Treatment of ANCA-Associated Vasculitis: Exploring Differences Among Subspecialties At a Single Academic Medical Center. Lindsay J. Forbes1, Kenneth W. Griffin2 and Robert F. Spiera1, 1 Cedars-Sinai Medical Center, Los Angeles, CA, 2 Weill Cornell Medical College, New York, NY

Background/Purpose: Randomized controlled trial evidence helps guide physician treatment choices for ANCA-Associated Vasculitis (AAV). Data for remission maintenance therapy following rituximab (RTX) in generalized disease, as well as the use of RTX in limited disease, however, is currently lacking. In the absence of such data, treatment choices are largely driven by physician preferences. Our aim was to examine AAV treatment preferences to determine if patient gender and age and physician subspecialty affect treatment choices.

Methods: We invited rheumatologists, nephrologists and pulmonologists from an academic medical center to participate in a web-based survey. Three scenarios (remission induction in generalized disease; remission maintenance in generalized disease; remission induction in limited disease) were presented for 4 patient profiles (25 and 68 year old female/male). Physician treatment choices and reasons for these choices (efficacy, toxicity, cost/availability, comfort with use) were obtained. Differences between groups were analyzed using Chi-Square and Fisher’s exact tests.

Results: Of 117 surveys sent, 46 were completed by 29 rheumatologists (63%), 8 pulmonologists (17%) and 9 nephrologists (19%).

For remission induction in generalized disease, 52% of physicians selected RTX, 42% CTX, 3% mycophenolate mofetil, and 3% no preference. Physicians were significantly more likely to choose RTX for young females compared with young males (p<0.001), and older females (p<0.001). Toxicity was the most common reason for this choice. There was a trend toward rheumatologists choosing RTX over CTX compared with the other subspecialties.

For remission maintenance therapy among subspecialties. It did appear, however, that pulmonologists were significantly less likely to choose azathioprine (AZA) (p=0.002) and nephrologists methotrexate (MTX) (p=0.007) than the other subspecialties.

For remission induction in limited disease, most chose RTX (36%), particularly for young females, followed by CTX (26%), MTX (24%), AZA (6%), thremipropham/5-fluorouracil (4%) and 4% no preference. Efficacy was the most common reason for selecting RTX. Rheumatologists chose RTX (34%) and MTX (31%) about equally, whereas pulmonologists chose RTX (67%) and nephrologists chose CTX (40%) most often.

Conclusion: Most physicians favor RTX for remission induction in young females with generalized disease because of toxicity issues, with a trend toward rheumatologists prescribing RTX more frequently than other subspecialties in this setting. Surprisingly, most physicians preferred RTX for remission induction even for limited disease, despite lack of clinical trial data supporting its use in this context. There was less agreement as to choice of remission maintenance therapy among subspecialties.

Disclosure: L. J. Forbes, None; K. W. Griffin, None; R. F. Spiera, Roche-Genentech, 5.

1541

Does Leflunomide Have a Place As Remission Maintenance Therapy in ANCA-Associated Vasculitis? A Bayesian Network Meta-Analysis with Hypothesis Driven Sensitivity Analyses to Adjust for Potential Biases. Glen S. Hazlewood1, Claudia Metzler2, George A. Tomlinson3, Wolfgang L. Gross4, Brian M. Feldman5, Loic Guillemin6 and Christian Pagnoux7, 1 University of Toronto, Toronto, ON, 2 University of Lubeck, Bad Branstedly, Germany, 3 Medical University at Lubeck, Lubeck, Germany, 4 The Hospital for Sick Children, Toronto, ON, 5 Cochin University Hospital, Paris, France, 6 Mount Sinai Hospital, Toronto, ON

Background/Purpose: To determine the relative treatment effects of maintenance therapy in adult patients with ANCA-associated vasculitis who have achieved remission, using a Bayesian network meta-analysis of randomized controlled trials (RCT). Secondary: To model the impact of a priori hypotheses about potential biases in a RCT comparing leflunomide (LEF) to methotrexate (MTX) on the relative treatment effects.

Methods: Study selection: RCTs identified from an existing systematic review and updated PUBMED and MEDLINE searches comparing at least 2 of the following maintenance agents: MTX, LEF, azathioprine (AZA) or mycophenolate mofetil (MMF). Population: Adult patients (age ≥18) with ANCA-associated vasculitis who have achieved clinical remission. Outcome: Relapse-free survival. Data analysis: A Bayesian arms-based fixed-effects network meta-analysis was performed using hazard ratio data. Sensitivity analyses were performed by down-weighting the effect of LEF in the LEF-MTX RCT because of the early trial termination (using a published meta-analysis of the impact of early termination) and by modeling the removal of early methotrexate relapses, and the initial dose titration of MTX in this trial was slow.

Results: Three trials were available (LEF-MTX; MTX-AZA; AZA-MMF). In the primary analysis, LEF was superior to MMF (HR:0.26 [0.08, 0.87]) and showed a trend towards superiority to AZA (HR:0.43 [0.14, 1.36]) and MTX (HR:0.47 [0.18, 1.22]). The probability that each treatment was the best was: LEF 90%, AZA 6%, MTX 4% and MMF 1%. The probability that LEF was the best decreased to 74% after the treatment effect for LEF/MTX was down-weighted for early trial termination in the LEF-MTX RCT. LEF remained the highest ranked treatment unless >6/13 of the initial MTX relapses (all relapses within the first 7 months) were censored.

Table 1. Physician Treatment Preferences for Remission Maintenance Therapy in Generalized ANCA-Associated Vasculitis

<table>
<thead>
<tr>
<th>Outcome</th>
<th>MTX*</th>
<th>M-MF*</th>
<th>AZA*</th>
<th>LEF*</th>
<th>No Preference*</th>
</tr>
</thead>
<tbody>
<tr>
<td>After All Induction (N=128)</td>
<td>45 (35)</td>
<td>27 (21)</td>
<td>20 (16)</td>
<td>35 (29)</td>
<td>MTX (29) AZA (26)</td>
</tr>
<tr>
<td>After CTX Induction (N=56)</td>
<td>13 (23)</td>
<td>9 (16)</td>
<td>16 (29)</td>
<td>8 (14)</td>
<td>MTX (16) AZA (14)</td>
</tr>
<tr>
<td>After RTX Induction (N=64)</td>
<td>29 (46)</td>
<td>20 (31)</td>
<td>4 (6)</td>
<td>1 (2)</td>
<td>MTX (12) AZA (10)</td>
</tr>
</tbody>
</table>

*AZA=azathioprine, MTX=methotrexate, M-MF=mycophenolate mofetil, RTX=rituximab, CTX=cyclophosphamide, LFN=leflunomide, T/P/MX=thremipropham/sulfamethoxazole
Conclusion: Based on indirect evidence, there is a high probability that LEF is an effective maintenance therapy for ANCA-associated vasculitis after adjusting for potential study biases. Further RCTs of LEF should be considered to provide direct evidence.

Disclosure: G. S. Hazlewood, None; C. Metzler, Sandofi-Aventis Pharmaceutical, 9; G. A. Tomlinson, None; W. L. Gross, None; B. M. Feldman, None; L. Guillaumin, None; C. Pagnoux, None.

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The Efficacy of Rituximab Vs Cyclophosphamide for Treatment of Renal Disease in ANCA-Associated Vasculitis: The RAVE Trial

Geetha D, Fervenza FC for the RAVE-Itn Research Group. Duvuru Geetha1 and Fernando Fervenza2. 1Johns Hopkins University, Baltimore, MD, 2Mayo Clinic, Rochester, MN

Background/Purpose: Rituximab (RTX) is non-inferior to cyclophosphamide (CYC) followed by azathioprine (AZA) for remission-induction in severe ANCA associated vasculitis (AAV) but details of outcomes among patients with renal involvement have not been reported. We present the long-term outcomes of patients who had renal involvement at baseline in the RAVE trial.

Methods: Patients with renal involvement defined by a Birmingham Vasculitis Activity Score/Wegener’s Granulomatosis (BVAS/WG) renal item score ≥ 3 at baseline were included. Glomerular filtration rate was estimated (e-GFR) by Cockcroft-Gault formula. Complete remission (CR) was defined by BVAS/WG = 0, off prednisone; Renal flare by renal BVAS/WG ≥ 3. Remission rates, slopes of eGFR and renal flares were compared between treatment groups.

Results: 102 of the 197 (52%) patients had renal involvement at entry (GPA: 68; MPA: 34; PR3-ANCA: 58; MPO-ANCA: 44; new diagnosis: 58; relapsing disease: 44). The mean age was 55 years, 52% were males. 51 patients each received RTX or CYC/AZA. Except for lower mean baseline e-GFR in the RTX group (53 ml/min vs 69ml/min p=0.01), there were no clinical differences between the treatment groups. 60.8% patients treated with RTX and 62.7 % patients treated with CYC/AZA achieved CR by 6 months, and 74.5 % and 76.5% at any time on the originally assigned treatment, respectively. Median times to CR were similar in both groups. The mean e-GFR increased in parallel in the two groups during the 18 months. The number of renal flares did not differ between the two groups at 6, 12, or 18 months. When stratified by ANCA or AAV type or new vs relapsing disease, there were no differences in remission rates or slopes of eGFR increase at 18 months. Four MPA patients treated with RTX without maintenance therapy with CYC/AZA for induction and maintenance of remission in ANCA-associated vasculitis were sought in PubMed, EMBASE, and Cochrane databases during June 2012. Significant non-randomized controlled trials were also reviewed for a separate analysis. Data was extracted by 2 reviewers and analyzed with RevMan 5 software.

Results: Three randomized controlled trials were found. In all, rituximab was demonstrated more efficacious in achieving remission, preventing relapse and decreasing ANCA titers (Figures 1A, 1B, 1C). There was also a trend favoring rituximab in achieving remission in nine non-randomized studies that were analyzed separately (Figure 2A).

Conclusion: Rituximab has been shown a new and effective alternative for achieving remission in ANCA-associated vasculitides when compared to standard cyclophosphamide-based treatment.

Disclosure: C. Mejia, None; C. J. Lozada, None.

1544

Long-Term Outcome of Patients with Granulomatosis with Polyangiitis (Wegener’s) Treated with Rituximab

Lamina Azar, Jason Springer, Meng Xu, Tiffany M. Clark, Carol A. Langford and Gary S. Hoffman. Cleveland Clinic Foundation, Cleveland, OH

Background/Purpose: Rituximab (RTX) is an efficacious alternative to cyclophosphamide for treatment of granulomatosis with polyangiitis (GPA). However, relapses have been observed, long-term efficacy is not known and strategies to reduce risk of relapses after RTX-induced remission are just beginning to be explored. This study was performed to evaluate long-term efficacy and risks of RTX when used alone or in conjunction with another immunosuppressive agent other than steroids.

Methods: Single center retrospective review: patients (pts) with GPA who fulfilled 1990 ACR criteria and were treated with at least 1 course of RTX. Subset analysis included the effect of receiving a 2nd immunosuppressive agent, other than steroids. Remission defined as BVAS/WG = 0.

Results: Total of 110 pts, 56 F, 54 M, received 211 courses of RTX. In 77% of cases, 2 infusions of 1gm were given 2 weeks apart. Mean age at 1st RTX (RTX1) was 50 yrs. Indications for RTX1 were: new onset (5), relapsing (85), persistent disease (15) and remission maintenance (5). At the time of RTX1, median BVAS/WG was 4 (range 1–11). Median follow up after RTX1 was 23 months (mo) (range 1–137). Apart from 3 pts with worsening or persistent lung involvement, complete remission was achieved in 99/102 pts with active disease and available information. 45 pts (42%) received only 1 course of RTX and remained in remission following up (median 10mo); 66% of these pts were on 2nd agent after RTX1. Among 21 pts followed >2 years after RTX1, 38% sustained long-lasting remissions, for up to 6 yrs. Fifty pts experienced 79 relapses after RTX1. Median time to 1st relapse was 13mo (range 2.5–66). Median dose of prednisone at time of relapse vs without relapse was 5 mg (range 0–30) vs 3.5 mg (range 0–25), respectively. The incidence of relapse over time after RTX1 was lower in patients who received a 2nd agent (figure; p=0.006). Among pts who received a 2nd agent (52), 42% relapsed vs.
65% of those who did not receive a 2nd agent (43). The 2nd agents used were: AZA (29), MTX (15) and MMF (8). Median follow up in the 2 groups was 13 and 11 mo and median time to relapse was 16mo vs 11mo, respectively. Of pts who relapsed while on a 2nd agent, 27% had at least 1 major organ involved per BVAS/WG vs 39% of pts who were not on a 2nd agent. Serious adverse events did not differ between groups. Serious infections occurred after RTX1 in 7.6% (2nd agent subset) and 6.9% (no 2nd agent subset), respectively. At the time of relapse, 42.2% of pts were peripheral blood cell depleted (data for 45 relapses in 31 pts).

Conclusion: RTX is a very effective remission-inducing agent for GPA. 97% of treated pts achieved remission. Within a subset treated once and followed for > 2 yrs, remissions endured for 2-6 yrs in 38%. While 46% of pts had ≥1 relapses, use of a 2nd immunosuppressive agent diminished likelihood of relapse. A 2nd agent did not result in a greater number of serious adverse events.

Disclosure: L. Azar, None; J. Springer, None; M. Xu, None; T. M. Clark, None; C. A. Langford, None; G. S. Hoffman, None.

1545 Long-Term Follow-up of 118 Polyarteritis Nodosa and Microscopic Polyangiitis without Poor-Prognosis Factors. Maxime Samson1, Xavier Puechfa1, Hervé Devilliers2, Camillo Ribi3, Pascal Cohen4, Boris Bienvenu4, Christian Pagnoux5, Luc Mouton6, Loïc Guillevin6,7 and French Vasculitis Study Group FVSG8, 1Hôpital Cochin, University Paris Descartes, Paris, France, 2Hôpital Cochin, Paris, France, 3CHU Dijon, Dijon, France, 4Hôpital Universitaire Cantonal de Genève, Geneva, Switzerland, 5Service de médecine interne, Centre de Références des Vascularites, Université Paris Descartes, APHP, Hôpital Cochin, 75005 Paris, France, Paris, France, 6Division of Internal Medicine, Centre Hospitalier Régional Universitaire de Caen, Côte de Nacre, Caen, France, 7Division de Médecine Interne, Hôpital Cochin, University Paris Descartes, Paris, France

Background/Purpose: Polyarteritis nodosa (PAN) and microscopic polyangiitis (MPA) are 2 vasculitides characterized by necrotizing inflammation of the vessel wall. They share several clinical features and may be treated similarly. Nonevertheless, manifestations, as defined by the Five-Factor Score (FFS), respond to corticosteroids (CS) alone. This study aimed to describe the long-term follow-up of PAN and MPA patients without poor-prognosis factors.

Methods: Data from patients included in a prospective trial1 were updated in 2012. New Chapel Hill criteria were applied to classify PAN and MPA. The following definitions were used: relapses, the recurrence and/or new appearance of ≥1 vasculitis manifestation(s) after remission lasting ≥3 months; major relapses, the emergence of major organ involvement (FFS≥1, 30% creatinine-level rise, pulmonary hemorrhage, threatened vision, new multifocal neurological lesions or mononeuritis multiplex, gastrointestinal hemorrhage or perforation and/or gangrene); failure, the absence of clinical remission with the assigned treatment. Times to relapse and/or death were calculated from that of treatment onset. Time to first event, failure, minor or major relapse and/or death defined the disease-free survival.

Results: Among the 124 patients screened, 6 were excluded (2 FFS≥1, 4 other vasculitides). Mean ±SD overall follow-up was 98.2 ±41.9 months. For the 118 patients (61 MPA and 57 PAN), mean age at diagnosis was 55.6 ± 16.5 years, mean Birmingham Vasculitis Activity Score 2003 11.8 ± 5.5; ANCA-positivity: 3 (5.3%) PAN (cANCA-, anti-proteinase-3 and -myeloperoxidase negative) and 31 (50.8%) MPA (pANCA+, 77.4% myeloperoxidase-specific). After CS alone, 97/118 (82.2%, 49 MPA and 48 PAN) achieved remission; 21/118 (17.8%, 12 MPA, 9 PAN) failed on CS and received a second- or third-line therapy with immunosuppressant(s) (IS) that achieved remission in 19 cases (11 MPA, 8 PAN), and 2 patients (1.7%, 1 PAN, 1 MPA) died before remission. After remission, 61/116 (52.6%, 35 MPA, 26 PAN) patients relapsed 25.6 ±27.9 months after starting treatment, 30 (25.9%, 20 MPA, 10 PAN) experiencing ≥1 major relapse after 47.8 ± 36.2 months of follow-up. The respective 5-, 7- and 8-year overall survival rates were 92%, 85% and 81%, with no significant difference between PAN and MPA patients (p = 0.289). Relapse-free survival and major relapse-free survival tended to be shorter for MPA than PAN patients (p = 0.174 and 0.06, respectively). Disease-free survival was significantly shorter for MPA than PAN patients (p = 0.021). Throughout follow-up, 46.6% of patients required ≥1 IS. At the last follow-up visit, 44% were still taking CS, 15% an IS and the mean vasculitis damage index score was 1.9 ± 1.9, with the most frequent sequelae being peripheral neuropathy, hypertension and osteoporosis.

Conclusion: For PAN or MPA patients with FFS=0 at diagnosis, overall survival at 120 months was good, with first-line CS alone able to achieve remission in >80% of them. However, relapses remained frequent, especially of MPA, meaning that 46.6% of the patients required immunosuppressant(s).

Disclosure: M. Samson, None; X. Puechfa, Pfizer Inc, 5, Roche Pharmaceuticals, 5, H. Devilliers, None; C. Ribi, None; P. Cohen, None; B. Bienvenu, None; C. Pagnoux, None; L. Mouton, None; L. Guillevin, None; F. V. S. G. FVSG, None.

1546 Rhinosinusitis and Nasal Polyps in the Diagnosis and Follow up of Patients with Eosinophilic Granulomatosis with Polyangiitis (ex-Churg Strauss Syndrome), Chiara Baldini1, Veronica Secchia2, Manuela Latorre2, Paolo Iannicelli2, Daniela Martin1, Francesco Ferro1, Nicoletta Luciano1, Antonio Tavoni1, Stefano Sellari Franceschini2 and Stefano Bombardieri1, 1Rheumatology Unit, University of Pisa, Pisa, Italy, 2Unit of Otorhinolaryngology, Department of Neuroscience, University of Pisa, Pisa, Italy, 3Pneumology Unit, Italy

Background/Purpose: Chronic rhinosinusitis with nasal polyposis (CRSswp) is a common manifestation of granulomatosis with polyangitis (EGPA), and may represent an invalidating feature of the disease, causing nasal blockage and loss of smell. The aim of this study was to determine the frequency of CRSwp in a series of patients with EGPA and the impact of sino-nasal involvement on the patients’ quality of life.

Methods: Consecutive patients with EGPA (ACR criteria) were prospectively enrolled in this observational cross-sectional study. Patients’ cumulative clinical and serological features were collected including: ANCA status, blood eosinophilia, total IgE, IL-2, IL-4, IL-5 and eosinophilic cationic protein levels (ECP). Nasal polyps were graded according to the Lund nasal endoscopy scoring system. To evaluate the impact of the sino-nasal symptoms on the quality of life (QOL), the short form (SF)-36 and the Sino-Nasal Outcome Test (SNOT-22) were used. Correlations between the different variables were analyzed using linear regression and the Spearman coefficient (p < 0.05).

Results: Twenty-six EGPA patients (12E:14M, 57±15yrs, mean follow-up =6±5yrs) were enrolled in the study. About one third of the patients (32%) was allergic to one or more common aero-allergen and high levels of IgE were found in 10/26 EGPA patients; 3/26 patients referred aspirin hypersensitivity and 3/26 patients were current smokers. Endoscopic intranasal evaluation identified: CRSwp in 14/26 cases, chronic rhinosinusitis (CRS) in 5/26, non-allergic rhinitis (NAR) in 4/26 and allergic rhinitis (AR) in 2/26 patients. One patient had a normal nasal endoscopy examination. The diagnosis of sino-nasal involvement preceded the diagnosis of EGPA of a mean period of 23±21 yrs. Surgery was needed in 13/26 cases, with 5/13 patients undergoing polypectomy, 2/13 septoplasty and 6/13 functional endoscopic sinus surgery. Polyps recurred in 9/13 EGPA patients over the follow-up. No correlation was found among CRSwp or Lund scores and ANCA status, blood eosinophilia, total IgE, IL-2, IL-4, IL-5 and ECP. Significant correlations were observed among CRSwp, LUND score and chronic use of nasal corticosteroids and between SNOT-22 and SF-36 questionnaire. There was no correlation between Lund and SNOT-22 scores.

Conclusion: Nasal polyps may represent the initial feature of EGPA, and may have a great impact on the patients’ quality of life. The Lund score correlates well with CRSwp severity and chronic use of nasal corticosteroids but measures a different aspect of disease to “subjective” symptom scores.
This demonstrates the strengths and limitations of a commonly used staging system in EGPA and CRSwP.

Disclosure: C. Baldini, None; V. Seccia, None; M. Latorre, None; P. Iannicelli, None; D. Martini, None; F. Ferro, None; N. Luciano, None; A. Tavoni, None; S. Sellari Francescini, None; S. Bombardieri, None.

1547

A 4 Plus 2 Infusion Protocol of Rituximab Provides Long-Term Beneficial Effects in Patients with HCV-Associated Mixed Cryoglobulinemia with Membranoproliferative Nephritis and Severe Polyneuropathy.

Dario Roccatello1, Savino Sciascia2, Simone Baldovino1 and Daniela Rossi1.
1Centro di Ricerche di Immunologia Clinica ed Immunopatologia e Documentazione su Malattie Rare (CMID), Università di Torino, Torino, Italy, 2Lupus Research Unit, The Rayne Institute, Kings College London School of Medicine, London, United Kingdom

Background/Purpose: Mixed cryoglobulinemia syndrome (MCs) is a systemic vasculitis characterized by multiple organ involvement due to the vascular deposition of immune-complexes, mainly the cryoglobulins. B cells expansion frequently triggered by HCV infection plays a central role in MCs. The long term effects of B-cells depletion in MCs are still on debate.

Methods: Twenty seven patients, (mean age 60.2 [range 35–78] years. HCV infection in 96% of cases) with symptomatic type-II MCs with systemic manifestations, including renal involvement (diffuse membranoproliferative glomerulonephritis in 15 cases), peripheral neuropathy (26 cases) and large skin ulcers (9 case, in 7 necrotizing) were considered eligible for Rituximab (RTX) therapy. RTX was administered at a dose of 375 mg/m² on days 1, 15 and 22. Two more doses were administered 1 and 2 months later. No other immunosuppressive drugs were added. Response was evaluated by assessing the changes in clinical signs, symptoms, laboratory parameters and electrocardiography for a very long term follow-up (mean 54.3 months [12–96]).

Results: Complete remission of pre-treatment active manifestations was observed in all the cases of skin purpuric lesions and non-healing vascular ulcer, and in 80% of the peripheral neuropathy, mainly paresthesia. A significant improvement in the clinical neuropathy disability score was observed. Electromyography examination revealed that the amplitude of compound motor action potential had increased. Cryoglobulinemic neuropathy, observed in 15 patients, significantly improved during the follow-up starting from the second month after RTX (serum creatinine from 2.2±1.9SD to 1.6±2.12SD mg/dl, p<0.05; 24-hour proteinuria from 2.3±2.1SD to 0.9±2.0SD g/24h, p<0.05). Improvement of cryoglobulinemic serological hallmarks, such as cryocrit and low complement C4, was reported. The safety of RTX was confirmed by the absence of side effects recorded during the follow-up. Rituximab was performed in 9 relapsed cases (after a mean of 31.1 months, range 12–54) with resolutive beneficial effects.

Conclusion: In this open prospective study, RTX appeared to be effective and safe in the treatment of patients with MCs-associated neuropathy and membranoproliferative nephritis.

Disclosure: D. Roccatello, None; S. Sciascia, None; S. Baldovino, None; D. Rossi, None.

1548

Cutaneous Vasculitis as a Paraneoplastic Syndrome.


Background/Purpose: Cutaneous Leukocytoclastic Vasculitis (CLV) may be associated with malignancies, and sometimes it behaves as a paraneoplastic syndrome. This association has been reported in a variable proportion of CLV patients (from 0 to 8%) depending on population selection. Our aim was to assess the frequency and features of CLV associated to neoplasia in a wide and unselected series of CLV.

Methods: Study of CV associated to neoplasia in a series of 877 patients diagnosed as having CLV in the Rheumatology and Dermatology Divisions from a University Nephrology Hospital.

Results: 16 out of 877 patients (1.82%) presenting with CLV were finally diagnosed as having an underlying malignancy. There were 9 hematological and 7 solid malignancies. In all of them, skin lesions were the first clinical manifestation and the median interval to the diagnosis of the malignancy from the onset of CLV was 17 days (range 8–50 days). The most frequent skin lesions were palpable purpura (13 patients), legs ulcers (2 patients), urticaria (2 patient) and erythema (1 patient). Other manifestations were constitutional syndrome (10 patients) and arthralgias and/or arthritis (6 cases). There was no serious visceral vasculitis involvement. Cytopenia was frequently observed in the full blood cell count (11 cases), especially in those cases of vasculitis associated to hematological malignancies. Immature peripheral blood cells were observed in 9 cases. Immunological testing (ANA, Rheumatoid factor, C3, C4, and ANCA) were negative or within normal range in all cases. 10 patients died due to the malignancy and 6 patients recovered following malignancy therapy.

1549

Sibling Relative Risk and Heritability of Kawasaki Disease; A Nationwide Population Study in Taiwan.

1-Chun Jou1, Chang-Fu Kuo1, Jing-Long Huang1, Chang-Teng Wu1, Shao-Hsuan Hsia1 and Hsiao-Chun Chang2.
1Chang Gung Memorial Hospital, Taoyuan, Taiwan, 2University of Nottingham, Nottingham, United Kingdom

Background/Purpose: Kawasaki disease (KD) is an autoimmune disease involving primarily medium-sized vessels and is the leading cause of acquired cardiac disease in children. The pathogenesis is still unknown and the
evidence for familial aggregation in Kawasaki disease is rare. The aims of this study was to estimate sibling relative risk (RR) and heritability of KD.

**Methods:** Using data from the National Health Insurance Research Database in Taiwan, we conducted a nationwide cross-sectional study of 2,683,174 males and 2,483,901 females who were younger than 20 years in 2010. KD was defined as children < 20 years of age hospitalised with a primary or secondary diagnosis of KD between 1996 and 2010. We identified individuals with KD and siblings affected by KD and compared the prevalence of the disease between individuals with and without an affected sibling. The identification of sibling of each individual was determined using the NHIRD registry for beneficiaries, which specifies relationships between the insured person who paid the insurance fee and his/her dependents and allows first-degree relatives (father, mother, son, daughter, brother, sister, twin) to be identified directly. Full siblings were identified as individuals who shared the same parents. The marginal Cox proportional hazard model with an equal follow-up time for all subjects was used to estimate RR and the 95% confidence interval (CI). This model was used to account for shared environment and case clustering within families with robust variance, and to adjust for age, place of residence, income levels and occupation. The RR was estimated for different first-degree relative categories and for the number of first-degree relatives affected by gout. Heritability (h2) was estimated using the multifactorial polygenic model.

**Results:** There were 7,443 male and 4,558 female individuals who had KD between 1996 and 2010. Individuals with an affected sibling with KD had a higher prevalence of KD (1.53%) than those without (0.22%). The risk of KD in individuals with an affected sibling was 6.39 (95% CI, 4.63–8.83) times greater than that in individuals without an affect sibling. The sibling RR (95% CI) was slightly higher among female individuals with affected siblings (6.79, 4.50–10.27) than male ones (6.11, 4.19–8.90). The heritability of KD was 0.45 (95% CI, 0.36–0.55).

**Conclusion:** This study provides population-based estimate for sibling RR and demonstrates familial aggregation of KD. The results suggest a significant genetic contribution to the KD susceptibility.

**Disclosure:** I. J. Chou, None; C. F. Kuo, None; J. L. Huang, None; C. T. Wu, None; S. H. Hsia, None; H. C. Chang, None.
PACNS). The most frequent initial manifestations were focal neurological deficits (83%), headaches (54%), cognitive impairment (35%), aphasia (35%) and/or seizures (33%). Compared to biopsy-proven PACNS, angiography-diagnosed PACNS patients had more frequent focal neurological deficits (p=0.004) and bilateral infarctions on MRI (p=0.04) but less frequent encephalitic manifestations, like seizures or cognitive disorders (p=0.003 and 0.04, respectively). Twenty-two (52%) of the 42 MRI with gadolinium injection showed enhanced-parenchymatous/leptomeningeal (22/10) lesions. All but 1 patient received corticosteroids (CS) and 44 cyclophosphamide (CYC). At the time of this analysis (median follow-up, 35 [6–148] mo), 3 (6%) patients had died; 20 (51%) of the 49 survivors had poor outcomes (13 [27%] relapsed, 7 [13%] had no disease control) and 40 (77%) had some persistent neurological damage. Patients with gadolinium leptomeningeal enhancement responded promptly to therapy but relapsed more often (80%) than those without (14%; p<0.0001). Multivariable analysis retained only intraparenchymatous and meningeal gadolinium uptakes at diagnosis as independent predictors of poor prognosis or relapse (HR=2.45 [95% CI, 1.99–6.08] and 1.88 [95% CI, 0.80–4.46], respectively).

Conclusion: In this PACNS cohort, more than half the patients responded to CS–CYC and had good outcomes at 3 yr, but neurological damage was frequent. Leptomeningeal and intraparenchymatous enhancements on MRI were associated with a poorer outcome. Gadolinium leptomeningeal enhancement corresponded promptly to therapy but relapsed more often (80%) than those without (14%; p<0.0001). Multivariable analysis retained only intraparenchymatous and meningeal gadolinium uptakes at diagnosis as independent predictors of poor prognosis or relapse (HR=2.45 [95% CI, 1.99–6.08] and 1.88 [95% CI, 0.80–4.46], respectively).

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**1552**


**Background/Purpose:** To determine the clinical presentation, treatment and outcomes of vasculitis (RV) associated with rheumatoid arthritis (RA) in the era of biologic use. 2. To identify risk factors associated with the development of RV.

**Methods:** A retrospective cohort of patients with RV evaluated at Mayo Clinic Rochester in 2000–2009 was identified. RA was defined as histopathological evidence of and/or a definitive clinical or radiological diagnosis of vasculitis made by a rheumatologist in a patient meeting the 1987 ACR classification criteria for RA. In a case-control study to identify risk factors for RV, RA cases were compared in a 1:2 ratio to controls (RA without RV).

**Results:** Eighty-six patients (58% women, 88% white) with RV were identified. All met the 1984 Scott and Bacon criteria for systemic RV. Histopathological confirmation was available for 58%. RV manifestations included cutaneous vasculitis (65%), vasculitic neuropathy (35%), CNS vasculitis (8%), mesenteric vasculitis (2%), scleritis/episcleritis (2%), pulmonary angiitis (1%) and necrotizing glomerulonephritis (1%). Median age at RV diagnosis was 63 y (IQR 51–71 y) and median duration of RA was 10.8 y (IQR 2.7–21 y). 29% were current smokers at RV diagnosis. Majority had a positive rheumatoid factor (84%), anti-CCP antibody (67%), elevated ESR (66%) and CRP (69%). For treatment, 99% received corticosteroids, 29% cyclophosphamide, 55% other DMARDs and 28% biologic response modifiers (BRM). At 6 months, 38% patients achieved complete remission, 52% had partial improvement, while 10% noted no clinical improvement. Median follow up was 16 months (IQR 2.4–59) during which 21% patients died and 30% had a relapse of RV. Predictors of relapse included smoking at RV diagnosis, lower mean ESR at presentation, and cyclophosphamide use. Among RV patients, those treated with a BRM for their RA were younger (56 vs 65 y, p=0.004) and had a lower incidence of vasculitic neuropathy (21% vs 47%, p = 0.015) than those treated without a BRM. In none of the 34 patients treated with a BRM prior to RV, was the BRM conclusively implicated to be a trigger for RV.

The 86 RV cases were compared to 172 RA controls. After adjusting for age and disease duration, increased RV risk was associated with male sex, current smoking at RA diagnosis, coexistent peripheral vascular disease (PVD) and cerebrovascular disease. Patients with high disease severity characterized by a composite index of erosions, nodulosis and 1 or more joint surgery had a significantly higher risk of RV (Odds ratio 2.0, 95% CI 1.1–3.7). Biologic use also increased the odds for RV while use of hydroxychloroquine (OR 0.54, p=0.03) and low dose aspirin for cardioprotection (OR 0.42, p=0.02) were associated with lower odds of developing RV.

**Conclusion:** In this large series of patients with RV, the predominant clinical manifestations were cutaneous vasculitis and vasculitic neuropathy. Male sex, smoking, RA severity, PVD and cerebrovascular disease increased the odds of developing RV. Among patients with RV, use of BRM was associated with a lower frequency of vasculitic neuropathy. Even in the ‘biologic era’, RV remains a serious complication of RA and is associated with significant mortality.

Disclosure: A. Makol, None; C. S. Crowson, None; E. L. Matteson, Centocor, Inc.; Johnson and Johnson, 2; Genentech and Biogen IDEC Inc., 2; Hoffmann-La Roche, Inc., 2; Human Genome Sciences, Inc., 2; Pfizer Inc, 2; Novartis Pharmaceutical Corporation, 2; Roche Pharmaceuticals, 2; UCB Group, 2; Centocor, Inc., 5; Horizon Pharma, 5; Novartis Pharmaceutical Corporation, 5; K. J. Warrington, None.

**ACR/ARHP Poster Session B**

**Clinical Practice/Patient Care**

Monday, November 12, 2012, 9:00 AM–6:00 PM

**1553**

The Effect of Knee Replacement On Participation Outcomes: The Multicenter Osteoarthritis Study and Osteoarthritis Initiative. Jessica L. Maxwell1, Jingbo Niu2, Julie J. Keyser3, Tuina Neogi3, Tianshong Yang3, Michael C. Nevitt3, Jasvinder A. Singh4, Laura Frey-Law5 and David T. Felson. 1Boston Univ Sargent College, Boston, MA, 2Boston Univ School of Medicine, Boston, MA, 3University of California-San Francisco, San Francisco, CA, 4University of Alabama at Birmingham, Birmingham, AL, 5University of Iowa, Iowa City, IA

**Background/Purpose:** Little research has explored participation outcomes, defined as involvement in life situations, among persons following knee replacement (KR). We recently reported (OARSI 2012) that persons undergoing KR did not necessarily show improvement in participation after surgery. These findings, however, could be due to confounding by indication, thus we sought to examine whether participation restriction differed among persons following KR compared to similarly matched group with symptomatic knee osteoarthritis (OA).

**Methods:** Subjects were selected from the Multicenter Osteoarthritis (MOST) Study and the Osteoarthritis Initiative (OAI). We took the pre-KR pain and physical function WOMAC scores of MOST and OAI subjects who were at least one year after KR and matched each of these by quartiles to I–2 subjects with symptomatic knee OA, (defined as radiographic evidence of knee OA and frequent knee pain over the last 30 days). Participation was measured using the Life Disability Instrument (LDLI) at the 60 month visit in MOST and at 48 months in OAI; restriction was defined using a previously established cut-point of < 69/100 on the Instrumental Limitation subscale of the LLDI (LLDI-IL). Data on covariates was collected at the pre-KR/index visit.

We compared the proportion of subjects with participation restrictions for each group overall and stratified by sex, race, age (< 65, 65–74, >75 years), # of comorbidities (> 1), and depressive symptoms (> 16 on CES-D) using chi square analyses. We evaluated the association between KR status and participation restrictions while adjusting for the above covariates, as well as body mass index, educational level, and presence of lower limb or back pain, using conditional logistic regression.

**Results:** Participation restriction was assessed on average 3 years post-KR and was common in both the post-KR group (45%) and in those with SxOA who had comparable pain/function (43%). There were no statistical differences in the proportion of participation restriction among subjects in each KR group overall or after stratification. The SxOA group had more younger subjects, fewer Whites and more with other lower limb pain (Table 1). After adjusting for these differences in groups, there was no difference in the odds of participation restriction among subjects with KR compared to those with SxOA (OR 1.0 (0.6, 1.6). Other factors independently associated with participation restrictions included male sex and increased depressive symptoms (Table 2).
Table 1. Demographic and clinical status of subjects at pre-KR visit

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Knee Replacement Group</th>
<th>Symptomatic Osteoarthritis Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, n</td>
<td>277</td>
<td>552</td>
<td></td>
</tr>
<tr>
<td>Sex: Women, %</td>
<td>66</td>
<td>64</td>
<td>0.5</td>
</tr>
<tr>
<td>Race: White, %</td>
<td>75</td>
<td>76</td>
<td>0.07</td>
</tr>
<tr>
<td>Age: ≤65 years, %</td>
<td>46</td>
<td>55</td>
<td>0.01</td>
</tr>
<tr>
<td>65–74 years, %</td>
<td>45</td>
<td>35</td>
<td>0.006</td>
</tr>
<tr>
<td>75+ years, %</td>
<td>9</td>
<td>10</td>
<td>0.8</td>
</tr>
<tr>
<td>Body Mass Index, mean (SD)</td>
<td>32.2 (6.4)</td>
<td>32.4 (6.6)</td>
<td>0.99</td>
</tr>
<tr>
<td>Comorbidities: ≥1, %</td>
<td>43</td>
<td>43</td>
<td>0.9</td>
</tr>
<tr>
<td>Depressive Symptoms: ≥16, %</td>
<td>15</td>
<td>17</td>
<td>0.3</td>
</tr>
<tr>
<td>Education: ≤ High School, %</td>
<td>5</td>
<td>6</td>
<td>0.6</td>
</tr>
<tr>
<td>Pain in lower limbs/back, %</td>
<td>75</td>
<td>83</td>
<td>0.01</td>
</tr>
<tr>
<td>WOMAC physical function, mean (SD), range 0–68</td>
<td>26.2 (11.7)*</td>
<td>26.1 (11.8)*</td>
<td>0.8</td>
</tr>
<tr>
<td>WOMAC pain, mean (SD), range 0–20</td>
<td>8.1 (3.8)*</td>
<td>8.1 (3.8)*</td>
<td>0.9</td>
</tr>
</tbody>
</table>

* Knee replacement and symptomatic OA group matched on these variables

**Adjusted forKR group, sex, race, age category, educational status, # of comorbidities, bmi, depressive symptoms, lower limb and back pain

Conclusion: Despite prior evidence of improvements in pain and function after knee replacement, the current study demonstrates that after KR, there is no clear difference between those who underwent KR and those who still have SxOA in terms of participation in life activities. Other factors such as sex and depressive symptoms may play more of a role in one’s involvement in life situations.

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1554

Clusters of Fatigue—a Comparison Between Persons with Systemic Lupus Erythematosus and Age and Gender Matched Controls. Susanne Pettersson1, Karin Eriksson2, Carina Boström2, Elisabet Svenningson3, Iva Gunnarsson1 and Elisabet MB Welin Henriksson3, 1Karolinska University Hospital, Stockholm, Sweden, 2Karolinska Institutet Rheum, Stockholm, Sweden, 3Karolinska Institutet Rheum, Stockholm, Sweden

Background/Purpose: The aim (1) of this study was to explore fatigue in patients with SLE with age and gender match controls using cluster analysis and (2) analyze the clusters concerning health related quality of life (HRQoL), anxiety, depression and life-style habits.

Methods: This cross-sectional study included patients with SLE and paired controls (age and gender). The respondents answered self-assessment of fatigue, Fatigue severity scale (FSS), Vitality (VT) from SF-36 and Multidimensional Assessment of Fatigue scale (MAF). All three questionnaires were answered by 616 persons (mean age 47 years, SD 14.6, range 18–84) and hierarchical cluster analysis were used to form homogeneous groups of fatigue. Further the Medical Short Form-36 (SF-36) were used to collect data on HRQoL and The Hospital Anxiety and Depression Scale (HADS) with the two sub-scales, anxiety (HADS-A) and depression (HADS-D).

Results: Patients with SLE had higher levels of fatigue than the controls on all three fatigue questionnaires as well as all dimensions of HRQoL and depression. The hierarchic cluster analysis identified three divergent clusters of fatigue with significantly different levels of fatigue. The clusters were denominated by their levels of fatigue. The persons in the High fatigue cluster (n=221) were dominated by patients (88%) and most affected by depression and anxiety, had lowest levels of HRQoL. This cluster had the lowest proportion of persons working ≥50% and they lived more often without a partner. The Low fatigue cluster (n= 240) was dominated by the controls (78%) and included persons with highest perceived HRQoL, lowest distribution of anxiety and no detected depression (p<0.001). They represented the lowest proportion of smoker (13% vs 20%, both High and Intermediate).

Persons in the Intermediate fatigue cluster (n=155) had smoking habits similar to the High fatigue cluster, and sleeping habits towards the Low fatigue cluster. The intermediate fatigue cluster had the most equal distribution at 48% patients and 52% controls, their level of fatigue were more moderate. There were no differences in gender distribution, age or sedentary behavior between the three clusters.

Comparing patients in the three clusters no significant difference was found regarding the number of ACR criteria, disease duration, or organ damage (SLICC/ACR). However, patients in the High fatigue cluster had more disease activity (SLAM) (mean 9.0, CI 8.3–9.7) than both the Low fatigue cluster (mean 4.2, CI 3.3–5.2, p<0.001) and the Intermediate fatigue cluster (mean 5.3, CI 4.7–6.0, p<0.001). However, there was no difference in disease activity between the Low fatigue cluster and the Intermediate fatigue cluster.

Conclusion: The analysis confirmed that a high number of patients with SLE are affected by fatigue but also that non-SLE persons were clustered together with the patients (6%) in the High fatigue cluster. Notable is that in this cross-sectional study a minority (7%) of patients with SLE report low levels of fatigue, high wellbeing and healthier life-style habits e.g interestingly less smoker.

Disclosure: S. Pettersson, None; K. Eriksson, None; C. Boström, None; E. Svenningson, None; I. Gunnarsson, None; E. M. Welin Henriksson, None.
consistently higher than in the paired model. The MCID estimates were least favorable for the single numeric rating scale. In the free comments section fewer respondents supported the use of the single-question measure compared to the other questionnaires.

**Conclusion:** Based on our results, all seven instruments are adequate for detecting clinically important differences of fatigue in patients with SLE. However, the use of a single-question measure was not supported by the MCID estimates or by comments from the respondents.

**Disclosure:** S. Pettersson, None; I. E. Lundberg, None; E. M. Welin Henriksson, None.

1556

**The Effect of Ginger Therapy On Symptoms of Osteoarthritis: An Open Pilot Study.** Tessa Therkleson. Edith Cowan University, Perth, Australia

**Background/Purpose:** Osteoarthritis (OA) is a painful, progressive disease of synovial joints characterised by deterioration of cartilage and bone and inflammation. Osteoarthritis of the knee and hip joints is common and a major cause of musculoskeletal pain and disability in older adults. In addition to conventional pharmacological management, people with OA often use complementary and alternative treatments. In vitro studies find ginger extract inhibits the inflammatory enzymes COX-2 and 5-lipoxygenase. Ginger seems to be absorbed after topical application by a compress that provides heat and relaxation therapy. European hospitals specialising in traditional therapies routinely use ginger compresses applied to the lower back for treatment of inflammatory conditions. In order for topical ginger treatments to be used more widely, a pre-packaged ginger patch was developed. This pilot study assessed the effects of the ginger compress and standardised ginger patch and the potential effect size of the treatments.

**Methods:** Twenty adult volunteers with osteoarthritis aged 35 – 90 years, recruited from medical centres and the community, were randomly assigned using a block size of 4, to ginger treatment with ginger compress (GC) or ginger patch (GP). Both treatments were provided daily for seven consecutive days at medical centres by trained nurses. While lying supine either a warm GC or GP was secured on the mid back for 45 minutes. All participants were offered a supply of the GP for self-treatment at home for the following 24 weeks. The 5-item modified Health Assessment Questionnaire (MHAQ) was used to assess pain, global effect, fatigue, functional status and health satisfaction. The MHAQ was completed once a week for 3 weeks and 4 weekly for 24 weeks.

**Results:** Participants (mean age 64 years, 80% female) had a mean pain score at baseline of 2.1, with 3 being the most extreme pain. Most participants had OA of the hips and/or knees (17/20, 85%). All participants had a reduction in pain one week after ginger therapy, with a mean pain score 1.1. A comparison of MHAQ scores for the GC and GP groups show a strong co-relation, with p = 0.98 at baseline and p = 0.97 at 7 days. After seven days of ginger treatment the MHAQ mean total scores for all participants for pain, fatigue, global effect and functional status were reduced by 48%, 49%, 40% and 31% respectively, with scores progressively declining over the following 24 weeks. Pain, fatigue, global effect and functional status were all statistically significantly reduced from baseline to 7 days, 12 weeks and 24 weeks after therapy (p < 0.001). Health status satisfaction improved for both GC and GP, with 80% dissatisfied 7 days before therapy to 70% satisfied 7 days after therapy and 82% satisfied 24 weeks after therapy.

**Conclusion:** This pilot study suggests ginger therapy using both the ginger compress and ginger patch has the potential to relieve symptoms and increase independence for people with osteoarthritis. These data will be utilised in the design of a randomised placebo-controlled trial of the ginger patch.

**Disclosure:** T. Therkleson, RATO Health Ltd, 4.

1557

**What Percentage of Postmenopausal Women Younger Than Age 65 Years Have Low Bone Mineral Density At a Family Health Center?** Marvin Vaishnani and Feyrouz T. Al-Ashkar. Cleveland Clinic, Lorain Institute, Lorain, OH

**Background/Purpose:** Many younger women, < 65 years of age may have low bone mineral density (BMD) that remains undetected in clinical practice due to following Medicare age guidelines of 65 years and older for BMD test and other factors. Prevalence of low BMD is a growing public health issue in the population but these have not been well quantified in this younger age group of women. This study aims to describe prevalence of low BMD at a family health center in postmenopausal women younger than 65 years and identifying common risk factors noted in this age group.

**Methods:** Retrospective chart review was done of patients who had dual-energy x-ray absorptiometry (DXA) scan performed at family health center between Jan 2010 to May 2012, on Hologic® DXA machine. Postmenopausal women less than 65 years of age were included (amenorrhea ≥ 12 months). Patients who have been on osteoporosis medication therapy and used estrogen postmenopausal were also included in this study. The data of risk factors was collected from patient questionnaire present in medical charts. Patients were grouped into those with low T-score < -1.0, T-score ≤ -2.0, and T-score ≤ -2.5. T-scores of the spine (following the International Society for Clinical Densitometry guidelines), femoral neck, total hip, one-third radius (when available) was reviewed and from these the lowest T-score was used in the results.

**Results:** A total of 702 patient charts were reviewed. The age ranges from 30 to 64 years and average age of patients was 56.74 years. We found 71.93% of patients have T-score < -1.0, 35.47% of patients have T-score ≤ -2.0, and 17.52% of patients have T-score ≤ -2.5. The risk factors noted among T-score < -1.0 are summarized in figure-2 below and 88.51% were found to have at least 1 or more risk factors out of five.

**Figure 1.** This figure represents percentage of patients in a T-score group. (n=702).

**Figure 2.** This figure represents percentage of patients among T-score < -1.0 have this risk factors. (n=505)

**Conclusion:** The results show high prevalence of low BMD in postmenopausal women younger than age 65 years at this family health center. Although population prevalence cannot be calculated from this study, findings.
suggest that low BMD is fairly prevalent in this age group. A larger study
would be needed to further evaluate low BMD in postmenopausal women
younger than 65 years of age. If confirmed this should alarm clinicians to
obtain BMD testing in women earlier than age 65 years and especially so in
those who have the identified risk factors and to identify the younger age
group women with undiagnosed osteoporosis.

Disclosure: M. Vaishnani, None; F. T. Al-Ashkar, None.

1558

“It Gets Me Down Every Single Day”: Are Men with Rheumatoid Arthritis Getting the Support They Need? Caroline A. Flurey1, Marianne Morris1, Jon Pollock1, Rodney A. Hughes1, Pamela Richards1 and Sarah Hewlett1. 1University of the West of England, Bristol, United Kingdom, 2St. Peter’s Hospital, Chertsey Surrey, United Kingdom, 3University of Bristol, Bristol, United Kingdom

Background/Purpose: Daily life with RA has been explained as unpredictable and full of uncertainty. However, most research about daily life with RA was conducted before current more aggressive medications, and in women. The purpose is to explore daily life on modern therapies.

Methods: Q-Methodology: 30 RA patients sorted 39 statements (generated from previous qualitative interviews) about daily life with RA across a forced distribution, in ranked order of agreement. Data were analysed using centroid factor analysis with varimax rotation (i.e. the participants and not the item, the variables). Demographic and clinical data were collected and patients completed comments booklets about their rationale for sorting the statements.

Results: Three factors were generated, which explained 33% of the study variance and accounted for 23 of the 30 participants. None of the Q-sorts were confounded (loading on more than one factor). A participant loading of 0.41 reached significance at p<.01. Factor A (Taking Control: “Just a fact of life”) and Factor B (Keeping RA in its place: “It’s a very small part of you”) were predominantly male participants (86%, 100%) and have been reported previously.

Factor C: Struggling Through: “It gets me down every single day” comprised 8 participants, 63% male: mean disease duration 15.3yrs (SD 14.3), age 55.5yrs (SD 7.1), HAQ score 1.3 (SD 0.9), patient global 4.8 (SD 2.5), 50% on biologic therapies. These predominantly male patients are never symptom free, experiencing pain and fatigue daily: “It’s like feeling ill all the time”, they describe fatigue as “the worst symptom”. They worry and get angry and frustrated about their RA: “I get very frustrated with it, the problem is then I get irritated and take it out on the wife”. This group report being unable to effectively manage their symptoms, some “don’t know what to avoid”, whilst others use unadvisable methods: “I find cocaine numbs the pain”. They report being unable to be spontaneous or to exercise and they struggle to explain their experience to their family. These patients feel their body has let them down, life is unfair: “Why me? Why now?” and the idea that they are lucky in comparison to others is “ridiculous”.

We re-examined the preceding qualitative interviews that generated these Q-statements, and this clarified these men’s views further. Having RA means men’s traditional masculine coping strategies have to be adapted: “I get very frustrated with it, the problem is then I get irritated and take it out on the wife.”. This group reporting an inability to effectively manage their symptoms, some “don’t know what to avoid”, whilst others use unadvisable methods: “I find cocaine numbs the pain”. They report being unable to be spontaneous or to exercise and they struggle to explain their experience to their family. These patients feel their body has let them down, life is unfair: “Why me? Why now?” and the idea that they are lucky in comparison to others is “ridiculous”.

Conclusion: Whilst some patients cope well with their RA, others struggle to accept and adapt to their condition; the majority of these being male. These findings indicate a need to address the unique support needs of men with RA and to consider providing support that is acceptable to their masculine identities.

Disclosure: C. A. Flurey, None; M. Morris, None; J. Pollock, None; R. A. Hughes, None; P. Richards, None; S. Hewlett, None.

1559

Treatment Outcomes From a Nurse-Led Rheumatology Clinic in Monitoring of anti-TNF Therapy – a Randomised Controlled Trial. Ingrid Larsson1, Bengt Fridlund1, Barbro Arvidsson1, Annika Teleman1 and Stefan Bergman1. 1School of Health Sciences, Linköping University, Linköping, Sweden, 2School of Social and Health Sciences, Halmstad University, Halmstad, Sweden, 3Spenshults Hosp of Rheum Dis, Oskarström, Sweden, 4R&D Center, Spenshult Hospital, Oskarström, Sweden

Background/Purpose: Patients with chronic inflammatory arthritis (CIA) treated with anti-TNF therapy are usually followed up by rheumatologists. Nurse-led rheumatology clinics have been proposed for patients with low disease activity or in remission. The purpose of this trial was to compare treatment outcomes from a nurse-led rheumatology clinic and a rheumatologist clinic for patients undergoing anti-TNF therapy with low disease activity or in remission.

Methods: A randomized controlled trial (RCT) with a 12-month follow-up was conducted with 107 patients randomised into two groups with a 6-month follow up to a nurse-led rheumatology clinic based on a person-centred care (intervention group; n=53) or to a rheumatologist-led clinic (control group; n=54). The intention of the interventional trial was to replace one of the two annual rheumatologist monitoring visits by a nurse-led rheumatology monitoring visit for patients undergoing anti-TNF therapy. Inclusion criteria were patients undergoing anti-TNF therapy and Disease Activity Score 28 (DAS28) ≤3.2. The hypothesis was that the outcomes from nurse-led clinic will not be inferior to those obtained by rheumatologist-led clinic at 12-month follow-up. Primary outcome was disease activity measured by DAS28.

Results: After 12 months 47 patients in the intervention group and 50 patients in the control group completed the trial and there were no differences (p=0.66) in mean change of DAS28 between the intervention or control group. There were no differences (p>0.05) in mean change in Visual Analogue Scales (VAS) for pain, Health Assessment Questionnaire (HAQ), satisfaction or security with the rheumatology care between the two groups.

Table. Mean difference of changes after 12 months between intervention group (Nurse-led rheumatology clinic) (n=47) and control group (Rheumatologist-led clinic) (n=50)

Nurse-led rheumatology clinic-Rheumatologist-led clinic

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean difference of changes (Std Error Differences)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAS28 (mean)</td>
<td>−0.06 (0.14)</td>
<td>0.66</td>
</tr>
<tr>
<td>ESR (mm/h)</td>
<td>−1.06 (1.47)</td>
<td>0.47</td>
</tr>
<tr>
<td>Swollen joints (28)</td>
<td>0.13 (0.24)</td>
<td>0.60</td>
</tr>
<tr>
<td>Tender joints (28)</td>
<td>0.33 (0.40)</td>
<td>0.42</td>
</tr>
<tr>
<td>Global Health VAS (mm)</td>
<td>4.29 (3.46)</td>
<td>0.22</td>
</tr>
<tr>
<td>HAQ</td>
<td>0.02 (0.06)</td>
<td>0.79</td>
</tr>
<tr>
<td>Pain VAS (mm)</td>
<td>−0.24 (0.81)</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Conclusion: In monitoring of anti-TNF therapy treatment outcomes for patients at a nurse-led rheumatology clinic are not inferior to those obtained by rheumatologist-led clinic at 12-month follow-up. The follow-up care of anti-TNF therapy may advantageously be performed by a nurse-led clinic based on a person-centred care. The results from this trial demonstrated that patients with CIA undergoing anti-TNF therapy, with low disease activity or in remission, could be monitored by a nurse-led rheumatology clinic without any differences in outcome as measured by DAS28.

Disclosure: I. Larsson, None; B. Fridlund, None; B. Arvidsson, None; A. Telemann, None; S. Bergman, None.

1560

What Will Determine Adherence to Pharmaceutical Treatment for Rheumatoid Arthritis? A Systematic Review. Amelieke Pasma1, Adriaan van ’t Spijker2, Jan van Busschbach1, Johanna M. W. Hazes1 and Jolanda J. Luim2. 1Erasmus MC University Medical Centre, Rotterdam, Netherlands, 2Erasmus MC - University Medical Center, Rotterdam, Netherlands

Background/Purpose: In the early stages of Rheumatoid Arthritis (RA), adherence to the prescribed treatment is important to prevent irreversible joint damage. However, medication adherence rates in RA patients can be improved. To explain the suboptimal adherence, factors that influence adherence should be elucidated. These factors were last reviewed in 1982. Since then, treatment strategies for RA have changed, which means that nowadays different factors might play a role. Our aim is therefore to review adherence rates reported in the literature, to identify factors associated with adherence, to review the strength of the association between these factors and adherence and to cluster the identified factors according to the Health Belief Model (HBM) (Figure 1).
Methods: PubMed, PsycINFO, EMBase and CINAHL databases were systematically searched from inception to February 2011. Articles were included if they addressed medication adherence, used a reproducible definition, determinants and its statistical relationship. Methodological quality was assessed using a quality assessment list for observational studies derived from recommendations from Sanderson, Tatt and Higgins (2007). The strength of evidence for factors associated with adherence was assessed by defining 5 levels of evidence. Facilitating factors were interpreted using the HBM.

Results: 18 out of the 147 identified studies were included. Adherence rates ranged between 49.5% and 98.5%. 64 factors were identified and grouped according the HBM into demographic and psychosocial characteristics, cues to action and perceived benefits versus perceived barriers. The belief that the medication is necessary and DMARD use prior to the use of anti-TNF had strong evidence for a positive association with adherence. There is limited evidence for positive associations between adherence and race other than White, general cognition, satisfactory contact with the healthcare provider and the provision of adequate information from the healthcare provider. There is limited evidence for negative associations between adherence and having HMO insurance, weekly costs of TNF-I, having a busy lifestyle, receiving contradicting information or delivered information in an insensitive way by the rheumatologist. 18 factors were unrelated to adherence. The results are presented in figure 1.

Conclusion: The strongest relation with adherence is found for prior use of DMARDs before using anti-TNF and beliefs about medication. Because the last one is modifiable, this provides hope to improve medication adherence. Since research on factors influencing adherence has mostly focussed on demographic and disease futures, future studies should use a theoretical framework to explore the role of interpersonal and other relevant factors.

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Factors Influencing Implementation of Intensive Treatment Strategies for Early Rheumatoid Arthritis. Sabrina Meyfroidt1, Diedier De Cock1, Kristien Van der Elst1, Laura van Hulst1, Marlies Hulscher1, Johan Joly1, Rene Westhovens2 and Patrick Verschueren1, University Hospitals KU Leuven, Leuven, Belgium, 2Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

Background/Purpose: Despite the availability and demonstrated effectiveness of intensive treatment strategies for early rheumatoid arthritis (RA), a discrepancy seems to exist between theoretical acceptance and practical implementation. Limited studies have looked at factors influencing the implementation of intensive treatment strategies for early RA in daily practice. The purpose of this study was to explore and identify these factors across different healthcare settings in Flanders.

Methods: This study involved rheumatologists, nurses and patients participating in the CareRA trial, a multicentre RCT comparing different intensive treatment strategies for early RA based on the original Cobra step down schedule with conventional DMARDs (MTX + Sulphasalazine, MTX + Leflunomide, MTX monotherapy) plus step-down glucocorticoids.

Two qualitative research methods were used, including semi-structured interviews and observations at outpatient clinics. Each interview was recorded, transcribed literally and analyzed thematically.

Results: We interviewed 26 rheumatologists, 6 nurses and 24 RA patients and observed interactions between 5 rheumatologists and their patients at consultation. Greatest facilitators reported by rheumatologists and nurses included available scientific evidence, personal faith in treatment strategy, comprehensive support and low cost of medication. For patients, trust in caregivers was a facilitator, as well as faith in the treatment strategy. Rheumatologists had no doubts about the value of MTX but some questioned the combination strategy, others the effectiveness of and/or the dosage of individual compounds. Patients were only in doubt of glucocorticoids and MTX. Additional barriers for rheumatologists included fear for patients’ misconceptions, concerns of applicability to the individual patient, break in routine, interference with organizational structures and processes, time constraints and lack of financial support.

Conclusion: The factors emerging from our study highlight the complexity of implementing intensive treatment strategies for early RA in daily clinical practice. Future improvement strategies should capitalize on the facilitators identified while at the same time addressing the barriers. The generalizability of these findings to other health care systems needs further examination.

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1562

Benign Joint Hypermobility Syndrome More Common Than Expected, Both in Controls and in SLE Patients. Piia Malcus-Johnsson1, Lotta Köhlin1, Gunnar K. Sturfelt1 and Ola Nived1, 1Department of Rheumatology, University Hospital, Lund, Sweden, 2Lund University, Lund, Sweden, 3University Hospital - Lund, Lund, Sweden

Background/Purpose: Benign joint hypermobility syndrome (BJHS) in connection to rheumatic disease is sparsely investigated. It has been postulated that BJHS is more frequent in SLE than in the healthy population. The aim of this study was to investigate the frequency of BJHS in SLE patients.

Methods: Seventy-one female individuals with SLE, age 18–65, were consecutively according to age groups, enrolled to the study and were matched by healthy female controls of the same age. The study required one visit to the clinic. All individuals were examined by physician (ON/ GS) for Brighton criteria and medical symptoms, by physical therapist (LK) and occupational therapist (PMJ) for Beighton scores and manifestations in body structures and body functions.

Results: Thirty-nine (55 %) individuals in SLE group and 22 (31%) in the control group satisfied Brighton criteria for BJHS (p<.004), most commonly satisfying one major and two minor criterias, whereas 16 (23%) individuals in the control group satisfied Brighton criteria for BJHS (p<.019). Differences were found in right hand dexterity (p<.003), pinch force (right p<.005) and estimating hand pain at work on VAS (p<.025). No differences were found in deformities of the hands.

Conclusion: The data also showed that BJHS is more frequent in SLE than in the healthy population. This study confirms that the connection to rheumatic disease is sparsely investigated. It has been postulated that BJHS is more frequent in SLE than in the healthy population. The aim of this study was to investigate the frequency of BJHS in SLE patients.

Disclosure: S. Meyfroidt, None; D. De Cock, None; K. Van der Elst, None; L. van Hulst, None; M. Hulscher, None; J. Joly, None; R. Westhovens, None; P. Verschueren, None.
p<.005, arthralgia minor (p<.014) and in addition symptoms from bowel (p<.008).

Conclusion: From this study no certain conclusion can be drawn whether SLE and BJHS are related, but for both cases and controls BJHS was much more common than in other published age matched Caucasian series from Sweden.

Disclosure: P. Malcus- Johnsson, None; J. Kohlin, None; G. K. Sturfelt, None; O. Nived, None.

1563
Is Automated DATA Capture As Reliable As Manual DATA Entry in Survey Based Research? Rachel A. Mikolaitis, Jessica Cornejo, Chris Alonzo, Joel A. Block and Meenaksi Jolly. Rush University Medical Center, Chicago, IL

Background/Purpose: The collection of patient reported outcomes requires accruing survey data from patients during routine medical visits. Many of these are paper-based and require manual data-entry for adequate analysis. However, entering surveys by hand is tedious, time consuming, and may result in entry-errors. Teleform data capture technology automates paper-based processes especially in high volume settings, decreases processing time and cuts personnel and material costs, but the accuracy of automated data capture has not been well documented in clinical settings.

Aims: To test the reliability of teleform captured data against traditional hand entered patient health outcomes data.

Methods: As a quality improvement initiative, we populated survey data from 50 patients using both methods in parallel. The survey had 43 multiple choice questions on health outcomes using a Likert scale. This scale was entered into the teleform program for each question. We programmed the teleform to ensure that each question had a response, and to alert the user for each missing response. We calculated internal consistency reliability by Cronbach alpha using a two-way random method to test for absolute agreement in item responses using the two methods. This analysis was repeated for each of the 43 items.

Results: The Internal consistency reliability estimates for 43 items ranged from 0.98 to 1.0. In the 7% of the items where the responses were not in 100% agreement, the discrepancy occurred by misclassification of the Likert category response by one point (0 and 1) in three different questions and subjects. This occurred due to human error in data entry by hand, or the scanner recognizing a small mark in the “0” response boxes.

Conclusion: Teleforms data-capturing for data entry is reliable and feasible for patient driven research in Rheumatology. This program has good reliability concerning correct data entry and is a faster way for data managers to capture large amounts of data in a shorter period.

Disclosure: R. A. Mikolaitis, None; J. Cornejo, None; C. Alonzo, None; J. A. Block, None; M. Jolly, GlaxoSmithKline, 5, MedImmune, 7, The Binding Site, 2, Lupus Foundation of America, 2.

1564
Misperceptions of FMS Patients about Their Disease. Robert S. Katz1, Hannah Bond2, Jessica L. Polyak3, Lauren Kwan4 and Susan Shott5. Rush University Medical Center, Chicago, IL, 6Rheumatology Associates, Chicago, IL

Background/Purpose: Many patients with the fibromyalgia syndrome (FMS) bring in disability forms for the practitioner to fill out or have Social Security Disability applications requesting medical records mailed to the office. We asked a group of patients with fibromyalgia whether they were capable of working full-time or part-time and what strategies they use to continue working, if they are able to.

Methods: 76 office patients with FMS (68 women and 8 men; mean age 50 ± 13) completed a questionnaire about the impact of FMS on their ability to work.

Results: 48.7% were not working, 38.2% were working full-time, and 13.2% were working part-time. The reasons for not working were: FMS, 51.4%; medical problems other than FMS, 43.2%; choice, 21.6%; retired, 16.2%; childcare or other homecare responsibilities, 5.4%. The reasons for working part-time instead of full-time were: choice, 70.0%; FMS, 30.0%; medical problems other than FMS, 10.0%. Non-working respondents who were asked how FMS affected their ability to work provided the following responses: so much pain that it limited their ability to work, 54.1%; so fatigued that they couldn’t work the required number of hours, 48.6%; difficulty focusing or concentrating, 45.9%; frequently late to work or miss too much work, 13.5%; employers not sensitive to FMS impairments, 13.5%.

Working respondents who were asked how they were able to work with FMS provided the following responses: not giving in to FMS, 64.1%; staying busy, 53.8%; keeping a positive attitude, 48.7%; exercise, 38.5%; eating well, 38.5%; getting enough sleep, 33.3%; pacing themselves or taking breaks, 30.8%; listening to their bodies, 30.8%; medications, 28.2%; taking one thing at a time, 28.2%; relaxing, 25.6%; trying alternative therapies, 25.6%; understanding FMS, 23.1%; and setting goals, 20.5%.

Conclusion: Pain, fatigue and cognitive dysfunction seriously limited the ability of fibromyalgia patients to work. Patients who were able to continue working utilized tactics including not giving up, staying busy, maintaining a positive attitude, exercise, eating well, getting enough sleep and other strategies. Those who are disabled generally felt they were incapable of successfully using those strategies.

Disclosure: R. S. Katz, None; H. Bond, None; J. L. Polyak, None; L. Kwan, None; S. Shott, None.

1566
Fibromyalgia’s Impact On Relationships. Robert S. Katz1, Alexandra Small2, Sharon M. Ferber3 and Susan Shott4. Rush University Medical Center, Chicago, IL, 6University of Illinois Medical School, 3Advocates for Funding Fibromyalgia Treatment, Education and Research(AFFTER), Libertyville, IL

Background/Purpose: The Fibromyalgia Syndrome (FMS) can place a strain on patients’ personal relationships. Having a close support network is helpful in coping with illnesses, but chronic pain, fatigue, and other invisible symptoms associated with FMS can damage connections with family, friends, and co-workers. In this study, we asked FMS patients about the nature of their ties to their families, friends, and co-workers.

Methods: As a part of an Internet survey administered by the volunteer community fibromyalgia organization, AFFTER (Advocates for Fibromyalgia Funding, Treatment, Education and Research), 763 female respondents with self-described FMS responded to questions on how FMS has affected their relationships with family, friends, and co-workers. Only women’s symptoms, 76.2%; medications to treat my illness have serious side effects that include cancer, 19.0%.

Conclusion: Fibromyalgia patients commonly think their illness is related to stress, previous trauma or the cause is unknown. However, some believe fibromyalgia is an autoimmune disease. About one third of patients think that fibromyalgia is a progressive illness. Some patients have other misconceptions based on the questionnaire. Further education from practitioners needs to be given to some fibromyalgia patients to disabuse them of certain incorrect assumptions regarding the etiology and the likely course of their illness

Disclosure: R. S. Katz, None; H. Bond, None; J. L. Polyak, None; L. Kwan, None; S. Shott, None.
Responses were analyzed to eliminate confounding by gender. The McNemar test was done to compare percentages, using a 0.05 significance level.

**Results:** The mean FMS respondent age was 50.2 ± 10.8 years. Only 12.5% of the FMS group reported that co-workers were supportive, and only 18.1% reported that in-laws were supportive. Support was better among other groups: spouses/significant others (59.1%), children (41.8%), close friends (44.8%), and parents (38.0%) (p < 0.001). Only 9.0% of FMS patients reported that co-workers understood their limitations, and just 12.6% of patients responded that their in-laws understood the limitations imposed by the illness, compared to higher percentages in spouses/significant others (52.0%), children (36.9%), and close friends (35.1%). Only 29.7% of parents (p < 0.001) had an understanding of the limitations imposed by fibromyalgia. FMS patients reported that they sometimes had seriously damaged relationships with spouses/significant others (14.6%) and close friends (11.6%).

**Conclusion:** Except for spousal understanding (59.1%), patients perceived that less than 50% of other groups were supportive. While some FMS patients viewed spouses/significant others and close friends as strong sources of support, others reported a significant strain on those relationships. Very frequently, FMS patients reported that co-workers, in-laws, and parents were not sympathetic or kind.

These results indicate that the perceived strain on relationships as a result of having FMS can be severe, especially among coworkers, in-laws, and parents of patients. The strain on relationships could partially be due to the fact that the symptoms of FMS are invisible and therefore are often underestimated among friends and relatives of FMS patients. Better education of the public about FMS and counseling for patients may help in repairing some of these broken relationships.

**Disclosure:** R. S. Katz, None; A. Small, None; S. M. Ferbert, None; S. Shott, None.

**1567**

**Sleep Study with Armband Device in Fibromyalgia Patients: Fibromyalgia Patients Don't Rest Their Weary Muscles**

Robert S. Katz1, Alexandre Small2, Ben J. Small3 and Jessica L. Polyak4. 1Rush University Medical School, Chicago, IL, 2University of Illinois Medical School, 3Rush Rheumatology Associates, Chicago, IL, 4Rheumatology Associates, Chicago, IL

**Background/Purpose:** Patients with the fibromyalgia syndrome (FMS) have frequent awakenings and poor sleep efficiency. The purpose of this study is to evaluate sleep patterns in fibromyalgia patients using an armband monitoring device, so patients could monitor sleep at home.

**Methods:** 16 patients with fibromyalgia and 3 normal controls were given an armband sleep device manufactured by SenseWear. Patients wore the sleep monitor for at least 4 consecutive nights. We assessed duration of sleep, sleep efficiency, and the number of awakenings reported by the device and compared those with patient self-reported sleep patterns on a VAS scale of 1–10, with 10 being those who interfered completely with daily activities.

**Results:** Fibromyalgia patients consisted of 10 females and 6 males.

<table>
<thead>
<tr>
<th>Controls</th>
<th># of hours lying down (mean)</th>
<th># of hours sleeping (mean)</th>
<th># of awakenings (mean)</th>
<th>Sleep Efficiency (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibromyalgia</td>
<td>6.24 (5.35)</td>
<td>4.67 (0.67)</td>
<td>11 (1.1)</td>
<td>75.70% (7.50%)</td>
</tr>
</tbody>
</table>

**Conclusion:** Fibromyalgia patients wearing a sleep monitor at home exhibit many awakenings and poor sleep efficiency compared with controls. Fibromyalgia patients moved around a lot at night, possibly preventing adequate rest of their painful muscles. Ambulatory sleep monitoring to evaluate sleep efficiency, including the number of awakenings and nocturnal movement, may be helpful in understanding the pathophysiology of the myalgias of FMS. Patients can easily monitor their number of awakenings and their sleep efficiency without spending an evening in a sleep lab, and sleep evaluations might help in assessing the effectiveness of therapies for fibromyalgia.

**Disclosure:** R. S. Katz, None; A. Small, None; B. J. Small, None; J. L. Polyak, None.

**1568**

**A Survey Study of Methotrexate Use by Rheumatologists and Their Patients with Rheumatoid Arthritis.** Peter Nash1 and Dave Nicholls2. 1University of Queensland, Brisbane, Australia, 2Coast Joint Care, Maroochydore, Australia

**Background/Purpose:** Methotrexate (MTX) is the anchor medication for the management of rheumatoid arthritis (RA); however there is limited patient-focused data available on the use of MTX, which could be used to improve RA outcomes. The primary objective of this study, termed MATRIX (Mapping Australian Treatment Reality Involving MTX), was to assess the use and perceptions of MTX by patients with RA. Secondary objectives included the assessment of patient-reported adverse events, the use of alcohol, folate acid, and biologic agents, and the perceptions of rheumatologists. Here we highlight tolerability to MTX, the perceptions of rheumatologists, and the use of biologic agents.

**Methods:** Rheumatologists (N = 46 of 50 completed surveys) and their patients with RA (N = 1,313 of 1,500 completed surveys; consecutively sampled) completed pre-tested, voluntary, anonymous, self-administered questionnaires about their experience with MTX.

**Results:** Generally, patients reported taking oral MTX regularly (78% currently taking MTX, 92% orally, 70% ≥ 10 mg/week) and followed prescription instructions (91% took folic acid; 46% abstained from alcohol). However, 17% of patients had discontinued from MTX (13% within 1 to 2 years), mostly because of adverse events (12%). For patients taking MTX, adverse events (including nausea, headache, mouth ulcers, light-headedness, and diarrhea) were noted by 60% of patients, but events were experienced regularly (92%) and some were continual (13%). Most patients (72%) reported never missing a dose of MTX, but 6% miss at least 1 dose every 2 months and 8% intentionally and regularly “take a break” from MTX, despite regular attendance at the clinic. Although rheumatologists were aware of tolerance to MTX, they generally underestimated the positive attitude that patients had towards their MTX therapy; for example 35% of patients would prefer to discontinue MTX but rheumatologists estimated 47% of patients would prefer to discontinue MTX. Rheumatologists also underestimated the proportion of patients who reported taking biologic agent ‘monotherapy’ (ie, without MTX; ≤ 20%); 29% of patients were on biological agents, and of these, 29% were taking biologic agent ‘monotherapy’ and 70% were taking biologic agents in combination with MTX. The most common biologic agents were adalimumab, etanercept, and tocilizumab; tocilizumab use was higher with biologic agent ‘monotherapy’. Of note, compared with all patients a significantly higher proportion of patients taking biologic agents would prefer to discontinue MTX (43%).

**Conclusion:** MTX was well-used and positively perceived by patients with RA. However, our study highlights the need for rheumatologists to monitor patient use of RA medication with the aim of ensuring patients continue with, and maximize, their use of MTX therapy, particularly in combination with biologic agents.

**Disclosure:** P. Nash, Roche Pharmaceuticals, 2, Roche Pharmaceuticals, 5; D. Nicholls, Roche Pharmaceuticals, 8, Roche Pharmaceuticals, 5.

**1569**

**Optimizing Care for Patients with Rheumatoid Arthritis Newly Treated with Biologics by Evaluating Health Status with AIMS-2**

Mie Fussana1, Hideko Nakahara1, Keisuke Kawamoto2, Satoko Nozato1, Midori Taguchi1, Kohji Nishioka2, Shinji Higa2, Eiji Takeuchi2, Kayoko Higashi3, Masao Yukioka1, Tsuyoshi Igarashi2, Taro Kuritani2, Keiji Maeda3 and Yasushi Miura4. 1Kobe University, Kobe, Japan, 2NTT West Osaka Hospital, Osaka, Japan, 3Yukioka Hospital, Osaka, Japan

**Background/Purpose:** The use and perception of MTX by patients with RA treated with biologics. Of note, compared with all patients a significantly higher proportion of patients taking biologic agents would prefer to discontinue MTX (43%).

**Methods:** Patients with RA treated with 8 mg/kg of tocilizumab (TCZ) every 4 weeks, 3mg/kg of infliximab (IFX) at 0.2, 6, and thereafter every 8 weeks, 25mg of etanercept (ETN) twice a week were participated in this study. Health status with Arthritis Impact Measurement Scale 2 (AIMS-2), disease activity scores (tender joint count (TJC), swollen joint count (SJC),
Discrepancies Between Disease Activity and Disease Burden. Margot J.M. Walter1, Adriaan van ‘t Spijker 1, Annelieke Pasma2, Johanna M.W. Hazes1, None; A. van ’t Spijker, None; A. Pasma, None; J. M. W. Hazes, None; J. J. Luime, None.

**1571**

“Fatigue in Adult Patients with Rheumatoid Arthritis - Associations with Demographic Factors, Disease Related Factors, Body Awareness, Emotional and Psychosocial Factors” Helena Lööf1, Fredrik Sabooccoh1, Elisabet Welin Henriksson1, Staffan Lindblad2 and Unn-Britt Johansson1. 1Karolinska Institutet, Department of Clinical Sciences, Danderyd Hospital, Stockholm, Sweden, 2Karolinska Institutet, Department of Clinical Sciences, Danderyd Hospital, Division of Medicine, Stockholm, Sweden, 3Karolinska Institutet, Department of Neurobiology, Care Sciences and Society., Stockholm, Sweden, 4Karolinska University Hospital, Stockholm, Sweden

**Background/ Purpose:** Patient’s with Rheumatoid arthritis highlight fatigue as a major concern, as well as pain as a priority for improvement. Previous study has found that significant fatigue occurs in up to 70 percent of patients with Rheumatoid arthritis, and 82 percent of Rheumatoid arthritis patients (who consider their disease to be “somewhat to completely controlled”) continue to report moderate to severe pain. Variables that are found to be related to fatigue are illness-related aspects, physical functioning, cognitive/emotional functioning and social environmental aspects. Pain affects quality of life, and the psychological well-being of the individual living with Rheumatoid arthritis is significantly affected by the fundamental life changes and the complexity of the disease process. Emotions have been pointed out as having a key role in the adjustment among people with Rheumatoid arthritis, and in the context of chronic pain in general. Furthermore, the tendency to focus attention on bodily sensations and internal stimuli, i.e. body awareness, has been associated with amplification of both somatic and emotional distress. Negatively toned self-focused bodily attention has been linked to less effective decision making strategies and worse adherence. The purpose of this study was to examine perceptions of fatigue and pain in adult patients with Rheumatoid arthritis and to investigate association with demographic factors, disease related factors, body awareness, emotional and psychosocial factors.

**Methods:** Data were collected from a convenience sample of patients with Rheumatoid arthritis recruited from a Rheumatology clinic. Eligible for inclusion were patients between 20–80 years diagnosed with Rheumatoid arthritis for at least a period of six months, according to American College of Rheumatology criteria for Rheumatoid arthritis. The patients filled out questionnaires, fatigue was measured by using the Multidimensional Assessment of Fatigue (MAF) scale, and the Visual Analogue Scale (VAS) was used to assess components of pain. To evaluate factors related to fatigue and pain, multiple stepwise linear regression analysis were performed. In the first step a univariate ANOVA was performed for all relevant independent factors. In the next step a backwards stepwise regression was performed. When the final model was found, the model assumptions was evaluated based on the residual diagnosis.

**Results:** 120 patients with Rheumatoid arthritis participated in the study (female 86%, < 45 years 22.5%, 46-65 years 42.5%, > 65 years 35 %). Fatigue in Rheumatoid arthritis associate significant with no smoking, (p=0.021), disease activity, DAS 28 (p=0.049), body awareness, BAQ (p=0.006) and PANAS, positive affect (p=0.008). The pain in Rheumatoid arthritis was significantly associated with health related quality of life, EQ-5D (p=0.008) and disease activity, DAS 28 (p=0.001). The final models for fatigue and pain were considered acceptable. Adjusted R-square were 28.6 % for fatigue and 50.0 % for pain.

**Conclusion:** Discrepancies between self-reported disease activity and physician reported disease activity in patients with low levels of disease activity may be useful in addition to disease activity, DAS 28 could be themed in mental stress, lack of physical fitness, difficulty in finding balance between rest and activity, feeling misunderstood by others and medication use. Patients highlighted that the reasons of the high disease burden are difficult to explain, and different combination of factors affecting self-reported disease activity hold for individual patients.

**Stress management, finding the right balance and tailored physical exercise may help to improve general well being in these patients enabling them to cope better with their rheumatoid arthritis.**
Conclusion: This study identifies that in patients with Rheumatoid arthritis fatigue and pain appears to be associated with disease related factors. Furthermore, fatigue was related to body awareness and emotional factors.

Disclosure: H. Löfd, None; F. Saboonchi, None; E. Welin Henriksson, None; S. Lindblad, None; U. B. Johansson, None.

1572
Developing a Health Literacy Universal Precautions Toolkit for Rheumatology: Leigh F. Callahan1, Victoria Hawk2, Kimberly A. Brooks2, Betsy Hackney3, Deb MacDonald1, Lindsay Penny Prizer1, Beth L. Jonas2, Thomas K. Bauer4, Rita E. Rudd5, Cindy Brach6 and Darren Dewalt7. 1University of North Carolina, Chapel Hill, NC, 2University of North Carolina at Chapel Hill, Chapel Hill, NC, 3University of North Carolina Chapel Hill, Chapel Hill, NC, 4University of New Mexico, Albuquerque, NM, 5Winston Salem, NC, 6Harvard School of Public Health, Boston, MA, 7Agency for Health Care Research and Quality, Rockville, MD

Background/Purpose: Research supports that health disparities exist between those with limited versus adequate literacy skills. Limited health literacy is associated with medication errors, increased healthcare costs, and inadequate care for chronic health conditions. In 2010, our team developed and tested a Health Literacy Universal Precautions Toolkit (HLUPTK) for use in primary care practices. Studies in rheumatology have demonstrated a significant number of patients have low literacy. The purpose of this project was to adapt the HLUPTK for use in rheumatology practices (HLUPTK-R).

Methods: We reviewed the HLUPTK and its 20 tools to determine areas for adaptation, expansion and discipline specific customization. An environmental scan was conducted to identify and assess existing health literacy tools, resources and well-designed education materials for use in the rheumatology setting. Gaps in rheumatology specific materials were also identified. A discipline specific toolkit was developed and tested in 4 rheumatology practices of various size and locations (urban vs. rural). A study team member visited all practices prior to testing. Over the 2-month testing period, practice staff reviewed the toolkit, conducted a health literacy assessment, and selected and tested a small-scale implementation of 2 or more tools. Practices completed questionnaires and participated in conference calls with the study team pre- and post-testing. They also completed Plan-Do-Study-Act (PDSA) worksheets for tested tools. Based on practice feedback and the testing results, the toolkit was revised.

Results: A new toolkit, HLUPTK-R, has been developed. Rheumatology specific resources have been added including a teachback video focusing on a patient with rheumatoid arthritis, a rheumatology-specific plain language guide, medication aides and education materials designed for rheumatic diseases. Based on feedback from the practices, the tools were shortened and reformatted. In addition, 2 new tools were developed and included: one for communicating care to other physicians and another for planning small changes in the practice setting. Furthermore based on key changes adopted by our practices, two new Quick Start guides were developed – one focused on patient encounters and the other on the practice setting. The Quick Start guides are designed to introduce the practice to the concepts of health literacy and making small changes without the need for coaching that the more comprehensive HLUPTK-R appears to require.

Conclusion: This new toolkit offers clinicians and staff in rheumatology practices a step-by-step approach to improving healthcare for patients of all literacy levels using discipline specific examples and tools. HLUPTK-R and quick start guides are now available for broader use and testing.

Disclosure: L. F. Callahan, None; V. Hawk, None; K. A. Brooks, None; B. Hackney, None; D. MacDonald, None; L. Penny Prizer, None; B. L. Jonas, None; T. K. Bauer, None; R. E. Rudd, None; C. Brach, None; D. Dewalt, None.

1573
Baseline Screening Recommendations for Rheumatoid Arthritis Patients Treated with Disease Modifying Anti-Rheumatic Drugs: Does an Educational Intervention Change Practice in an Outpatient Clinic? Debra C. Lloyd1, John N. Mecchella1 and Daniel Albert2. 1Dartmouth-Hitchcock Medical Center, Lebanon, NH, 2Dartmouth-Hitchcock Medical Center, Lebanon, NH

Background/Purpose: In 2008, the American College of Rheumatology (ACR) developed recommendations for use of non-biologic and biologic DMARDs in the treatment of rheumatoid arthritis (RA). The purpose of this study was to assess change in baseline screening practices following completion of an educational intervention reflecting the ACR recommendations.

Methods: An educational intervention designed to update providers in and new recommendations from the ACR was completed in an outpatient rheumatology clinic in September 2009. Staff education activities included: 1) individual review of the ACR 2008 Recommendations for the Use of Non-biologic and Biologic Disease-Modifying Antirheumatic Drugs in Rheumatoid Arthritis (DMARD); 2) development and review of “DMARD reference” sheets; 3) formal presentation of key points from the journal article to clinic staff.

Retrospective chart reviews were completed on new RA patients seen in a hospital-based outpatient clinic for a six month period immediately before and after review of the guidelines. Documentation of recommended baseline screening test results (laboratory studies, imaging and tuberculosis testing) for DMARD was assessed.

Inclusion criteria: 1) New patient to rheumatology between 04/01/2009 and 03/31/2012 (NPW); 2), rheumatoid arthritis, inflammatory arthritis (ICD 9 codes 714.0 and 714.9); 3) DMARD (methotrexate or leflunomide) therapy planned.

Exclusion criteria: 1) Alternate diagnosis after initial or subsequent evaluation; 2) no DMARD (methotrexate or leflunomide) treatment; 3) follow up appointment(s) cancelled or not attended; 4) not a new patient to rheumatology clinic; 5) current therapy with DMARD (prescribed at alternate site).

Baseline screening data for DMARDs and biologic agents was consistently identifiable in the patient record.

A file for all patients with diagnosis code of 714.0 and 714.9, seen anywhere in the hospital/clinic system between 10/2007 and 12/2010, arriving as an NPW in rheumatology was reviewed. There were 256 patients seen between 04/01/2009 and 03/31/2010. 184 records were reviewed. Data for 144 records were excluded and data from 40 records (n = 20 pre-intervention; n = 20 post-intervention) were included.

Results: Comparison of the results (CBC, LFTs, CREA, ALB, HEP B, HEP C, and CXR) for the two groups was completed using a y2 analysis and Fisher’s exact test and there was no significant difference between pre and post scores.

Baseline screening for DMARD therapy was completed in 90% of the baseline for CBC, LFTs, CREA and ALB in both the pre and post intervention periods. Hepatitis B and C screening was completed in 25% of the pre and post intervention screenings. CXR was completed in 20% of the pre-intervention baseline screenings and 50% of the post-intervention screenings but this difference did not achieve statistical significance.

Conclusion: Completion of recommended baseline screening testing for patients receiving DMARD treatment did not increase after the educational intervention. This is constant with other failed attempts to change clinician behavior through short term educational interventions. This suggests that incorporating workflow redesign into the electronic medical record is likely to be more effective.

Disclosure: D. C. Lloyd, None; J. N. Mecchella, None; D. Albert, None.

1574
The Correlation of Disease Activity, Functional Status and Quality of Life with Sleep Disturbance and Balance Status in Ankylosing Spondylitis (AS). Mehmet Tuncay Duruoz, Zuhre Sari Surmeli and Esra Topcu. Celal Bayar University Medical School, Manisa, Turkey

Background/Purpose: To assess the correlation of disease activity, functional and metrological status and quality of life with sleep quality and balance status in AS.

Methods: Subjects with Ankylosing Spondylitis (AS) according to Modified New York criteria were recruited into the study. Disease activity was assessed with BASDAI. Functional status (BASFI), quality of life (ASQOL) and metrological score (BASMI) were assessed. Beck Depression Inventory (BDI), Pittsburg Sleep Quality Index (PSQI), Leeds Assessment Scale of Handicap (Leeds Scale) were managed. Berg Balance Scale, Tinetti Balance Assessment Tool and VAS-fear of falling were used to assess patients’ balance.

Results: Forty two AS patients (36 male) with mean age 38.38 (SD=11.28) years were recruited. The disease duration was 139.06 (SD=100.37) months.

There were significant correlations between BASDAI and Beck Depression Inventory (r=-0.01), Pittsburg Sleep Quality Index (r=-0.01). BASDAI scores were not correlated with Tinetti Balance Assessment Tool (r=0.107). VAS Fear of Falling (r=0.111), Leeds Scale (r=0.072) and Berg Balance Scale (r=0.164). BASFI had significant correlations with Beck Depression Inventory (r=-0.01), Pittsburg Sleep Quality Index (r=-0.001), Tinetti Balance Assessment Tool...
(p<0.028), Leeds Scale (p<0.001) and Berg Balance Scale (p=0.001). BASMI had significant correlation with Beck Depression Inventory (p=0.007), VAS-fear of falling (p=0.011), Leeds Scale (p=0.005) and Berg Balance Scale (p=0.001). BASMI was not correlated with Pittsburg Sleep Quality Index (p=0.124) and Tinetti Balance Assessment Tool (p=0.342). ASQoL had significant correlation with Beck Depression Inventory (p<0.001), Pittsburgh Sleep Quality Index (p=0.005), Tinetti Balance Assessment Tool (p=0.042), Leeds Scale (p=0.001) and Berg Balance Scale (p=0.023).

**Conclusion:** Although disease activity had good correlation with depression and sleep disturbances it had not significant correlation with patients’ balance status. The functional level which shows disease severity had significant correlation with sleep disturbances and balance status in AS. Quality of life was worse in patients with sleep disturbance and low balance status.

**Disclosure:** M. T. Duruoz, None; Z. Sari Surnelli, None; E. Topcu, None.

**1575**

**The Impact of Targeted Exercise Intervention On Health Outcomes in Rheumatoid Arthritis.** Laura J. Durcan1, Fiona Wilson2, Finbar (Barry) D. O’Shea2 and Gaye Cunnane1. 1St James’s Hospital, Dublin, Ireland, 2Trinity College, Dublin, Ireland

**Background/Purpose:** Increased morbidity and mortality are recognized consequences of rheumatoid arthritis (RA). In addition to chronic inflammation, reduced physical activity may contribute to adverse outcomes in these patients. This study was undertaken to assess the impact of a targeted, exercise intervention on health outcomes in RA.

**Methods:** Patients with established, well-controlled RA were recruited. Baseline assessments relating to cardiovascular risk factors, body composition, disability, sleep quality and physical activity were ascertained using standardized measures. Exercise was then prescribed in order to a) target individual functional limitations as identified by the Health Assessment Questionnaire (HAQ) and b) increase each patients’ physical activity according to the American College of Sports Medicine recommendations.

Patients were assessed every 3 weeks for 12 weeks by a rheumatologist and physical therapist. Compliance was aided by the provision of an exercise diary and a pedometer. All parameters were re-measured at the completion of the 12 week program. Ethical approval was obtained from the St James’s Hospital Ethics Committee. Statistical analysis was undertaken using SPSS 18.

**Results:** Forty patients with RA (mean age 46 years) (SD=0.0) and mean disease duration of 15.6 years (SD=10.9) were included. Thirty (75%) were seropositive and 38 (95%) had evidence of erosive disease. All fulfilled the ACR diagnostic criteria for RA. Twenty nine (72.5%) were current/ex-smokers. All (100%) were taking disease-modifying treatment; 10 (25%) were on biologic agents. Mean body mass index was 27.1 (SD=5.2). At baseline, only 2 (5%) were involved in any form of exercise.

<table>
<thead>
<tr>
<th>HAQ</th>
<th>Pre-intervention</th>
<th>Post intervention</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.81 (SD 0.38)</td>
<td>0.53 (SD 0.54)</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Grip (lbs pressure) (R)</td>
<td>28.87 (SD 18.29)</td>
<td>16.32 (SD 18.19)</td>
<td>0.000</td>
</tr>
<tr>
<td>Grip (lbs pressure) (L)</td>
<td>20.15 (SD 15.83)</td>
<td>20.73 (SD 16.54)</td>
<td>0.000</td>
</tr>
<tr>
<td>Pain (VAS)</td>
<td>20.86 (SD 21.79)</td>
<td>10.94 (SD 18.03)</td>
<td>0.000</td>
</tr>
<tr>
<td>Stiffness (VAS)</td>
<td>31.71 (SD 22.77)</td>
<td>23.83 (SD 23.82)</td>
<td>0.000</td>
</tr>
<tr>
<td>EBBs (range 43-172)</td>
<td>125.9 (SD 5.5)</td>
<td>128.7 (SD 9.4)</td>
<td>0.000</td>
</tr>
<tr>
<td>PSQI (range 0-21)</td>
<td>7.21 (SD 4.45)</td>
<td>6.22 (SD 3.58)</td>
<td>0.000</td>
</tr>
<tr>
<td>FSS (range 1-81)</td>
<td>37.89 (SD 25.58)</td>
<td>36.26 (SD 21.88)</td>
<td>0.000</td>
</tr>
<tr>
<td>FFQ (kg/m²)</td>
<td>24.76 (SD 9.38)</td>
<td>24.40 (SD 9.22)</td>
<td>0.005</td>
</tr>
<tr>
<td>BMI</td>
<td>27.15 (SD 5.23)</td>
<td>26.97 (SD 4.93)</td>
<td>0.016</td>
</tr>
</tbody>
</table>

**Conclusion:** A 12 week targeted exercise program yielded significant improvements in strength, pain, joint stiffness, sleep, fatigue and lipid profile, impacting on both health and quality of life in patients with RA. Although fat free mass measurements improved significantly, there was no major change in BMI suggesting that dietary adjustments may be a necessary accompaniment to a sustained exercise program in order to effect weight loss in overweight patients with RA.

**Disclosure:** L. J. Durcan, None; F. Wilson, None; F. D. O’Shea, None; G. Cunnane, None.

**1576**

**Identifying Subgroups of Rheumatoid Arthritis Patients Based On Levels of Pain, Disability, and Depression.** Taylor Draper1, Sarah R. Ormseth1, M. Custodio1, M.H. Weisman1, M.R. Irwin1 and Perry M. Nicassio1. 1Loma Linda University, Loma Linda, CA, 2UCLA, Los Angeles, CA, 3Cedars-Sinai Medical Center, Los Angeles, CA

**Background/Purpose:** Pain, disability, and depression are present in various degrees in patients with Rheumatoid Arthritis (RA). In spite of meeting the same diagnostic criteria, some patients with RA report much less pain, disability, and little or no psychological distress than others. The current study seeks to ascertain potential subgroups of patients in a RA sample based on levels of pain, disability, and depression and to identify factors associated with patient clustering.

**Methods:** The sample included 100 patients with confirmed RA participated in an assessment of their disease activity, pain, depression during an evaluation prior to participating in a randomized controlled trial. Self-report measures included the Rapid Assessment of Disease Activity in Rheumatology (RADAR), the SF-36 social functioning Scale, the Helplessness and Internality Subscales of the Arthritis Helplessness Index (AHI), the Active and Passive Pain Coping Scales of the Pain Management Inventory (PMI), the Center for Epidemiological Studies Depression Scale (CES-D), the Pittsburgh Sleep Quality Index (PSQI), Perceived Stress Scale (PSS), and the Health Assessment Questionnaire (HAQ). Cluster analysis was used in this research to ascertain the existence of subgroups of patients in a Rheumatoid Arthritis sample based on these variables.

**Results:** Two clusters were defined: a low-functioning group characterized by high levels of pain, disability, and depression (n = 73) and a high-functioning group characterized by low levels of pain, disability, and depression (n = 27). Analysis of Variance (ANOVA) confirmed differences between clusters on these health status factors, except disability. A second series of ANOVAs revealed that the high-functioning subgroup had greater social functioning, better sleep quality, and less passive coping and perceived stress than the low-functioning group. Hierarchical multiple regressions indicated that the best discriminators of subgroup membership were sleep quality and perceived stress.

**Conclusion:** These results indicate significant heterogeneity in RA patients. The data also suggest that different approaches to patient management, particularly intervention strategies aimed at reducing perceived stress and improving sleep quality, may be beneficial for patients who are functioning poorly in the face of this condition.

**Disclosure:** T. Draper, None; S. R. Ormseth, None; M. Custodio, None; M. H. Weisman, None; M. R. Irwin, None; P. M. Nicassio, None.

**1577**

**Barriers to Recruit Unaffected Family Members of Patients with Rheumatoid Arthritis.** Axel Finckh1, A. Debost-Logrand2, Martin Soubrier3, I. von Muhlenen4, I. Creveaux2, Martin Soubrier3, M.R. Irwin1, P. M. Nicassio2. 1Loma Linda University, Loma Linda, CA, 2UCLA, Los Angeles, CA, 3Cedars-Sinai Medical Center, Los Angeles, CA

**Background/Purpose:** Prospective studies are needed to answer key questions on rheumatoid arthritis (RA) screening in at risk populations: (1) How accurately does risk factor assessment identify persons who will later develop RA? (2) Does screening and subsequent early treatment improve long-term outcomes in RA? Such studies could focus on first degree relatives of RA patients (FDR-RA), as they have up to a 10 fold increase of RA incidence compared to the general population. The number of potential FDR of RA patients (FDR-RA), as they have up to a 10 fold increase of RA incidence compared to the general population. The number of potential FDR per RA patient has been measured to be 6.9 per RA patient (J Rheumatol 2008;35:790–6).

The aim of this report is to describe the barriers encountered recruiting healthy FDRs-RA, without clinical evidence of synovitis at inclusion, in a prospective cohort study of individuals at increased risk of developing RA.

**Methods:** The initial recruitment strategy for this prospective cohort of individuals at increased risk of developing RA relied on the diseased relatives with RA. Patients with RA were informed of the possibility of an acute screening test of RA susceptibility for their unaffected family members. We report the rate of FDR-RA enrollment into the study resulting from direct promotional efforts targeted to RA patients.
How Disease Activity Trajectories Affect the Willingness to Change Treatment. Paul Falzer1 and Liana Fraenkel2. 1VA Connecticut Healthcare System, New Haven, CT, 2Yale University School of Medicine, Veterans Affairs Connecticut Healthcare System, New Haven, CT

Background/Purpose: Disease activity (DA) can change markedly over a short period, for a variety of reasons. The changes influence clinical practice and affect the willingness of patients to change their current treatment (WCT). However, impact cannot be examined in a cross-sectional study and is difficult to explore when DA is measured at only two points. This study measured DA at multiple points, distinguished observation-level DA from its patient-level trajectory, and examined the influence of both on WCT.

Methods: RA patients who were taking at least one DMARD and currently experiencing at least moderate pain were recruited from community-based rheumatology practices. They participated in four interviews over a six month period. DA was measured at each interview, using the Rapid-4. Scores were rounded up to single points. Patient-level trajectories and observation-level DA were created, consistent with the rules described in Table 1, and each trajectory was coded as a nominal category. WCT was measured at each interview on a 10-point scale. Patient-level trajectory and observation-level Rapid-4 were examined by linear mixed models and were compared using AIC, a lower-is-better goodness of fit test.

<table>
<thead>
<tr>
<th>Trajectory</th>
<th>Rule</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>All scores are within 1 full point on the Rapid-4</td>
<td>65</td>
<td>46</td>
</tr>
<tr>
<td>Better</td>
<td>&gt;1 point difference between highest and lowest score, low score occurs later</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>Worse</td>
<td>&gt;1 point difference between highest and lowest score; high score occurs later</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Fluctuating</td>
<td>First and last scores are within 1 point; interim scores are &gt;1 higher or lower</td>
<td>25</td>
<td>18</td>
</tr>
</tbody>
</table>

Results: N=142 patients participated. Their mean age was 59, mean duration of RA was 12.8 years; 86% were female and 81% were Caucasian. As the table indicates, 46% of patients were stable, 20% were getting better, 17% were getting worse, and 18% were fluctuating. Observation-level Rapid-4 was significantly associated with WCT (F=5.42, df= 3/433, p=0.001). Its interaction with the patient-level trajectory was also significant (F=2.55, df=15/354, p=0.001) and offered the best fit (AIC is about 2% lower). Trajectory alone was non-significant and provided the worst fit of the 3 models. The figure shows estimated WCT at each Rapid-4 category for the stable and fluctuating trajectories. One exhibits a small variation from mild to moderate; the other increases markedly at mild, then levels out.

Conclusion: Patient- and observation-level DA have a combined influence on WCT. Despite marked differences, stable and fluctuating trajectories would not be distinguished if DA were assessed at only two points.

Disclosure: P. Falzer, None; L. Fraenkel, None.

ACR/ARHP Poster Session B
Rehabilitation Sciences
Monday, November 12, 2012, 9:00 AM–6:00 PM

1579
Why Do We Need to Pilot Interventions? Essential Refinements Identified During Pilots of a Fatigue Intervention. Emma Dures1, Nicholas Ambler2, Debbie Fletcher3, Denise Pope3, Frances Robinson3, Royston Rooke4 and Sarah Hewlett1. 1University of the West of England, Bristol, United Kingdom, 2Frenchay Hospital, Bristol, United Kingdom, 3University Hospitals Bristol, United Kingdom, 4University of the West of England, Bristol, United Kingdom

Background/Purpose: An RCT showed a 6 week group cognitive-behavioural (CB) intervention for RA fatigue self-management was effective, when delivered by a clinical psychologist.1 Few rheumatology teams have clinical psychologists; therefore the intervention was re-formatted for delivery by the rheumatology team, in preparation for a multi-centre RCT. We piloted the feasibility of the materials, training, and support for clinicians, plus the acceptability of the intervention for patients.

Methods: The clinical psychologist from the original intervention worked with researchers, patient partners and clinicians to re-format a clinician-led version. A clinician’s programme manual was developed with timetables, session aims, example scripts and patient handouts. A 2-day training for the rheumatology nurse and occupational therapist was developed, focusing on CB approaches (eg Socratic questioning, goal setting), managing groups, and using the session tools (eg activity diaries). They then co-delivered the intervention to 2 patient cohorts, first supervised by the clinical psychologist, then independently with supervised debriefing. On-going refinements were made, based on a cycle of feedback, review and de-briefing during all stages of the piloting.

Results: Materials for non-CB specialists: Some material has been re-written to be more suitable for non-CB specialists to deliver (eg ‘ sabotage’ re-written as ‘self-defeating behaviours’); links between sessions, explaining how they build on each other and relate to CB theory, have been made more explicit.

Training: Clinicians expressed anxiety about using new CB skills, and the need to respond rapidly to differences in session discussions that inevitably occur between different patient groups. Thus training will be increased to 4 days, with more focus on CB theory (eg formulating helpful questions) and more practice delivering sessions (eg explaining metaphors).

Support: An increased emphasis on the use of supervised debrief/reflection emerged; thus a guide to debriefing has been added to the manual, and extra time allocated. Proposed clinical supervision quality control has
been increased by adding supervision of any sessions that clinicians find challenging in their second pilot.

Acceptability: Feedback from the 10 patients was positive. Mean scores on rating scales (0–10, higher scores representing greater acceptability) were: satisfaction 8.8, encouragement from clinicians 9.0, sessions well-run 9.0, helpfulness of handouts 8.4, and recommendation of the intervention to other patients 8.8.

Conclusion: Piloting interventions prior to RCT is recommended but there is little evidence about how it influences development. Iterative feedback during piloting led to essential refinements, particularly in training and support, when re-formating the CBT intervention for delivery by non-CB specialists. It is now ready for formal testing in an RCT.


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1580


Background/Purpose: There is an increased appreciation of the burden of cognitive impairment in persons with rheumatoid arthritis (RA). Research shows a gap between perceived cognitive dysfunction and objective neuropsychological performance in persons with chronic diseases. This study explored this relationship in persons with RA.

Methods: Individuals from a longitudinal cohort study of RA participated in a study visit that included physical, psychosocial, and biological metrics. Subjective cognitive dysfunction was assessed using the Perceived Deficits Questionnaire (PDQ; range 0–20, higher score = greater impairment). Objective cognitive impairment was assessed using a battery of 12 standardized neuropsychological measures yielding 16 indices. On each test, subjects were classified as ‘impaired’ if they performed 1 SD below age-based population norms. A total cognitive impairment score (range 0–16) was calculated by summing the transformed scores (higher score = worst impairment). Multiple regression analyses controlling for gender, race, marital status, income, education, disease duration, disease severity, depression, and fatigue were conducted to identify the relationship between subjective and objective cognitive measures.

Results: 120 subjects with mean (±SD) age of 58.5 (±11.0) years were included. Sixty four percent were female, 52% were white, and 7% met criteria for major depressive disorder. Mean educational level was 15.3 (±2.2) years and disease duration was 19.9 (±11.1) years. Mean total cognitive impairment score was 2.5 (±2.2, range 0–10). The proportion of persons classified as cognitively impaired on each test ranged from 8% (semantic fluency test) to 28% (design fluency test). Mean PDQ score was 5.8 (±3.8, range 0–16). In the multivariate analysis, there was no significant relationship between PDQ score and total cognitive impairment score. However, depression and fatigue (β = 0.31, p < 0.001; β = 0.32, p < 0.001) were significantly associated with the PDQ score.

Conclusion: There was no significant relationship between perceived cognitive dysfunction and objective neuropsychological performance in this cohort. Depression and fatigue were significantly associated with perceived cognitive dysfunction. Findings emphasize the gap between subjective and objective measures of cognitive impairment and the importance of considering psychological factors in the context of cognitive complaints in clinical settings.


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The Association Between Symptoms, Pain Coping Strategies, and Physical Activity Among People with Symptomatic Knee and Hip Osteoarthritis. Susan L. Murphy1, Anna Kratz2, David A. Williams3 and Michael E. Geisser4. 1University of Michigan, Ann Arbor, MI, 2Univ of MI Hlth System-Lobby M, Ann Arbor, MI

Background/Purpose: Effective use of coping strategies by people with chronic pain conditions is associated with better functioning and adjustment to chronic disease. Although the effects of coping on pain have been well studied, less is known about how specific coping strategies relate to actual physical activity patterns in daily life. The purpose of this study was to evaluate the effects of different coping strategies on symptoms and physical activity patterns in a sample of adults with knee and hip osteoarthritis (N = 44).

Methods: Physical activity was assessed by wrist-worn accelerometry; coping strategy use was assessed by the Chronic Pain Coping Inventory. We hypothesized that the use of coping strategies that reflect approach behaviors (e.g., Task Persistence), would be associated with higher average levels of physical activity, whereas avoidance coping behaviors (e.g., Resting, Asking for Assistance, Guarding) and Pacing would be associated with lower average levels of physical activity. We also evaluated whether coping strategies moderated the association between momentary symptoms (pain and fatigue) and activity. We hypothesized that higher levels of approach coping would be associated with a weaker association between symptoms and activity compared to lower levels of this type of coping. Multilevel modeling was used to analyze the momentary association between coping and physical activity.

Results: We found that higher body mass index, fatigue, and the use of Guarding were significantly related to lower activity levels, whereas Asking for Assistance was significantly related to higher activity levels. Only Resting moderated the association between pain and activity. Guarding, Resting, Task Persistence, and Pacing moderated the association between fatigue and activity.

Conclusion: This study provides an initial understanding of how people with osteoarthritis cope with symptoms as they engage in daily life activities using ecological momentary assessment and objective physical activity measurement.

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1582

Long Term Costs and Cost-Effectiveness of an Integrated Rehabilitation Programme for Chronic Knee Pain. Mike Hurley5 and Dr Nicola E. Wallace6. 1St George’s University of London, London, United Kingdom, 2University of the West of England Bristol, Bristol, United Kingdom

Background/Purpose: Management of chronic knee pain incurs enormous direct and indirect healthcare costs. Enabling Self-management and Coping with Arthritic Knee Pain through Exercise (ESCAPE-knee pain) is an integrated rehabilitation programme that, in the short term at least, is more clinically and cost-effectiveness than usual primary care. Unfortunately, the long term costs and cost-effectiveness of the programme is unknown and need to be evaluated. We continued to follow ESCAPE-knee pain participants for 2½ years after completing the programme, to establish the long term knee pain-related costs and cost-effectiveness of the programme.

Methods: 418 participants were randomised to remain on usual primary care or receive the ESCAPE-knee pain programme (individually or groups of 8 participants). Physical function (using WOMAC function sub-score) and knee pain-related health and personal costs (using Client Services Resources Inventory) were assessed at regular time points for 2½ years after completing the programme. Missing data were imputed using multiple imputation. Mean differences in total cost (95% confidence interval) were obtained from non-parametric bootstrapped linear regression (1000 replications). Costs were estimated from a health and social care perspective in 2003/2004 prices. Costs were discounted at 3.5%.

Cost-effectiveness acceptability curves (CEAC) estimated the probability ESCAPE-knee pain had of greater net monetary benefit compared with usual care, over a range of monetary values a healthcare provider might be prepared to pay for a sustained, clinically meaningful, improvement in function (defined as ≥15% increase from baseline WOMAC-function score) after 2½ years.

Results: 250 participants (60%) were followed-up for 2½ years. Participating on ESCAPE-knee pain cost £224/person (£184–£262). Compared to those who remained on usual care, 2½ years after completing the ESCAPE-knee pain programme a significantly higher proportion (4 ± 14%) of participants maintained clinically meaningful improvement in function, and lower health and social care costs. CEAC showed there was a high probability (80–100%) ESCAPE-knee pain was more cost-effective than usual care in producing sustained clinically meaningful improvement in function.

Conclusion: ESCAPE-knee pain is a low-cost intervention with sustained clinical and economic benefits compared to than usual primary care. These conclusions need to be considered given the trial’s high attrition rate and low power. Attrition rates are always high in trials with long term follow-up, and economic outcomes are rarely, if ever, used to power studies. Moreover, given
that large-scale, long-term trials are very expensive and complex, few similar studies will be performed and will suffer similar limitations. These results, therefore, are a good estimation of long term clinical and economic outcomes, and contribute to the pool of data from other trials of this chronic condition.

Disclosure: M. Hurley, None; D. N. E. Walsh, None.

1583

Therapist and Patient Perspectives On Exercise Adherence: Are We On the Same Page? Jill R. Blitz1, Talitha Cox2 and Amber Richards3. 1Children’s Hospital Los Angeles, Los Angeles, CA, 2Children’s Hospital of Los Angeles, Los Angeles, CA, 3Children’s Hospital, Los Angeles California, Los Angeles, CA

Background/Purpose: Exercise is essential to the health and function of children with chronic diseases. Patient adherence to home exercise programs has long been an obstacle for physical and occupational therapists.

Objectives: 1.To compare the perceptions of patient adherence to home exercise programs between therapists and patients. 2. To compare differences between the perceptions of rheumatology patients and patients with other diagnoses. 3. To gain a better understanding of the barriers to exercise and tools used to overcome these barriers in a pediatric physical and occupational therapy setting.

Methods: A survey was administered to physical and occupational therapists who work at a pediatric tertiary care facility. A similar survey was given to outpatients receiving physical and/or occupational therapy at the same facility, and patients seen in the Rheumatology clinic. The surveys included demographic information, frequency of exercise and a list of barriers and facilitators to choose from. Fisher’s exact statistical analysis was used to compare responses of rheumatology patients versus non-rheumatology patients.

Results: 70 patients were surveyed; 36 from the outpatient physical and occupational therapy department and 34 from the Rheumatology clinic. The average age was 13.5 (SD 3.8). 31 therapists completed the survey. 67% of therapists recommend that patients do their exercises every day, 20% 5x/week and 10% 3x/week. 40% of patients reported being nonadherent, 30% reported doing their exercises 5–7x/week, 20% reported 3–4x/week and 10% 1–2x/week.

The top cited barriers that therapists reported were patients’ lack of interest, forgetting to do their exercises and lack of family support. Top cited barriers for patients included pain, forgetting to do their exercises and boredom. For facilitators, therapists felt that making exercise and developmentally appropriate exercises, a written home exercise program and family/community based activities were most helpful. Patients chose participating in sports or dance, integrating exercise into daily life and exercising with family as the most important facilitators of adherence.

There were no statistically significant differences in responses between rheumatology and non-rheumatology patients (p>0.05).

Conclusion: Therapists and patients have different perspectives on adherence to exercise, but also agree on some aspects. The reasons for adherence or nonadherence were not dependent on diagnosis. Consideration of patients’ perceived barriers and facilitators when planning home exercise programs may improve patients’ adherence.

Disclosure: J. R. Blitz, None; T. Cox, None; A. Richards, None.

1584

Validity of the Nurses Health Study II Physical Activity Questionnaire (NHSPAQ) in Estimating Physical Activity in Adults with Rheumatoid Arthritis (RA). Maura D. Iversen1, Thomas Quinn2 and Michelle A. Frits3. 1Northeastern University, Department of Physical Therapy, and Brigham & Women’s Hospital, Harvard Medical School, Boston, MA, 2Northeastern University, Boston, MA, 3Brigham and Women’s Hospital, Boston, MA

Background/Purpose: An accurate assessment of physical activity (PA) is critical to manage rheumatoid arthritis (RA). Accelerometry is an objective measure of PA but is not widely used clinically. The Nurses Health Study Physical Activity Questionnaire (NHSPAQ) is a brief, simple self-report measure used extensively to assess PA in adults with cancer and other chronic illnesses. Validity of the NHSPAQ has not been determined for estimation of PA in RA. This study examines the validity of the NHSPAQ for adults with RA when compared to accelerometry estimates and data from performance tests.

Methods: 32 adults with RA were sampled from a large tertiary care hospital-based arthritis clinic registry, consented and participated in a 1 week accelerometry trial. Medical and demographic data were collected including: age, gender, disease duration, disease activity (RADAI and DAS-CRP3), education, medications, and co-morbidities. At intake, participants completed the NHSPAQ, performed a self-paced 20-m Walk Test and Timed Step Test. Subjects were given an accelerometer to wear for 7 consecutive days and completed a second NHSPAQ at the end of the week. Descriptive statistics characterized the sample. Metabolic equivalents (METs) were derived from the NHSPAQ, accelerometers and the Timed Step Test using standardized algorithms. NHSPAQ validity was assessed by correlating NHSPAQ METs, accelerometer METs and METs derived from performance tests. Bland-Altman plots compared METs derived from the NHSPAQ and accelerometers. Posthoc power calculations were conducted.

Results: 78% of subjects were female (mean age=62.1 years (SD=11.2). The mean disease duration of 21 years (SD=10). On average, RA disease was moderately active at intake (mean RADAI = 2.6 (SD=2) and 74% of subjects were taking biologics. The mean timed walk was 16.2 s (SD=3.9) and Timed Step Test METs was 4.7 (SD=0.9). Average weekly physical activity as determined by accelerometer was 33.3 METs (SD=23). A moderate correlation existed between NHSPAQ METs at one week and accelerometer METs (r = .67, p =.0001). Timed Step Test METs and a low correlation with self-reported physical activity levels (NHSPAQ METs) at one week (r = .42, p =.033). No significant correlation was found between disease activity, step test performance and NHSPAQ METs at intake. Bland-altman plots revealed METs derived from the NHSPAQ are more reliable among subjects with moderate to high physical activity levels. Posthoc power calculations suggested the study was appropriately powered.

Conclusion: In this sample of adults with long standing relatively well controlled RA, the NHSPAQ appears to be a valid, simple and cost effective method of assessing PA. General fitness measures had a low correlation with weekly self-reported physical activity. Performance of the NHSPAQ appeared more stable among persons with low levels of physical activity. The NHSPAQ appears to be a valid method of assessing physical activity in adults with RA. However, the NHSPAQ may be less useful among persons engaged in low levels of physical activity.

Disclosure: M. D. Iversen, None; T. Quinn, None; M. A. Frits, None.

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Physical Activity and Timing of Discharge From Physical Therapy Following Total Knee Replacement. Carol A. Oatis1, Wenjun Li2, Milagros Rosal2, David Ayers2 and Patricia D. Franklin2. 1Arcadia University, Glenside, PA, 2University of Massachusetts Medical School, Worcester, MA

Background/Purpose: In 2009 over 620,000 total knee replacement (TKR) surgeries were performed. That number is expected to increase to 3.5 million annually by 2030. Post-operative functional gain is variable. On average physical activity and functional ability remain diminished one year post TKR when compared to age matched controls. The purpose of this study was to examine the recovery pattern of physical activity from TKR to 6 months post surgery and its relation to the timing of physical therapy (PT) service received.

Methods: Subjects were 179 participants in an NIH funded RCT of telephone support interventions following unilateral, primary TKR. We requested the PT records from the first 102 participants who completed their TKR rehabilitation in outpatient PT and the first 40 participants who completed their PT rehabilitation in homecare and used no outpatient PT services. We received 90 outpatient and 27 homecare PT records. Participants were asked to wear an accelerometer (Step Activity Monitor™) at the ankle for four consecutive days (2 weekday and 2 weekend) before surgery and at 8 weeks and 6 months after surgery. Valid wear days required a minimum of 10 hours of wear time. Time from surgery to discharge from PT was extracted from PT records.

Results: Participants included 68% female, with a mean (SD) age of 65.1 (8.61). Mean (SD) age was 64 (8.4) and 66 (7.7) years for those completing rehabilitation in outpatient and home care respectively. All participants wore the accelerometer preoperatively with a mean of 3.3 days worn. 174, 168 participants had at least one valid wear day at baseline, 8 weeks and 6 months after surgery respectively. Mean (SD) steps/day were 7472 (3156), 6658 (3074) and 8295 (3531) at baseline, 8 weeks and 6 months respectively (Figure). Average
Conclusion: Although average physical activity at 8 weeks post TKR as measured by daily step counts was lower than pre-operative levels, almost one-third of patients had stopped receiving post TKR rehabilitation by that time. Increased functional ability and physical activity are frequent goals of TKR surgery. Our data show that many patients discontinue post TKR rehabilitation when their physical activity is still below pre-operative levels. Further research is needed to understand the association between recovery of physical activity and the timing of PT services post TKR.

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1586 Resistance Exercise Training for Fibromyalgia: A Systematic Review.
Angela J. Busch1, Sandra Webber1, Rachel Richards2, Julia Bidonde1, Candice Schachter1, Laurel Schafer3, Adrienne Danyliw4, Anuradha Savant1, Vanina Dal Bello Haas5 and Tamara Rader1. 1University of Saskatchewan, Saskatoon, SK, 2North Vancouver, BC, 3Central Avenue Physiotherapy, Ottawa, ON, 4McMaster University, Hamilton, ON, 5University of Ottawa, Ottawa, ON

Background/Purpose: This systematic review investigated the effects of resistance exercise training on signs and symptoms, and physical fitness in people with fibromyalgia. Fibromyalgia, a condition of chronic pain, is frequently associated with poor physical fitness and low levels participation in physical activity.

Methods: We searched 8 electronic data bases (eg, Medline, CINAHL, EMBASE) to 01/2012. Inclusion criteria were randomized controlled trials, adults a fibromyalgia diagnosis based on published criteria, and between group data comparing resistance exercise to a control or other intervention. Study screening and data extraction were done by two independent reviewers. We extracted and analyzed data on symptoms, global rating of disease, health-related quality of life, functional ability, psychological health, and adverse effects using Cochrane collaboration procedures. Studies were evaluated for risk of bias and congruence with the American College of Sports Medicine guidelines. We used the GRADE approach to evaluate the body of evidence.

Results: After removing duplicate entries, we found 1661 citations – only four studies met the selection criteria and were included in the review. The studies fell into two categories in which resistance exercise training was compared to: a) a control group (2 studies), and b) to other exercise interventions (one aerobic, one flexibility exercise). A total of 61 participants (all were women) were assigned to resistance training. The two randomized trials in the first category were 21 week moderate to high intensity progressive resistance interventions using isokinetic exercise equipment. In the second category, 8 weeks of progressive treadmill walking was compared to low to moderate intensity progressive free weight or body weight resistance exercise, and 12 weeks of flexibility exercise was compared to low intensity resistance training using light hand weights and elastic tubing. Large differences were found in pain, patient rated global, tender points, depression, fatigue, muscle strength and muscle power favoring the resistance training group when compared to the control group. Few significant differences were found when resistance exercise was compared to aerobic exercise: large effects were found in pain, sleep quality favoring the aerobics group. When compared to flexibility exercise, large differences were found in fatigue and sleep resistance training favoring the resistance training group. No injuries were observed in any of the studies.

Conclusion: There is moderate evidence that 21 weeks of medium to vigorous intensity resistance training exercise improves muscle strength, pain, and patient rated global well-being in women with fibromyalgia. There is moderate evidence that eight weeks of aerobic exercise is superior to moderate intensity resistance exercise training for reducing pain and improving sleep. There is low quality evidence that 12 weeks of low intensity resistance training is superior to flexibility exercise in women with fibromyalgia for reducing pain and fatigue and improving sleep. Furthermore, it appears that women with fibromyalgia perform resistance exercise training without adverse effects.

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1587 Despite Low Disease Activity Patients with Poly- and Dermatomyositis Perceive Activity Limitation, Reduced Grip Force and Quality of Life Longitudinally. Malin Regard1, Marie-Louise Schultz2, Ingrid E. Lundberg3 and Elisabet MBWelin Henriksson1. 1Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden, 2Department of Clinical Sciences, Danderyd Hospital, Karolinska Institutet., Stockholm, Sweden, 3Karolinska Institutet, Stockholm, Sweden, 4Karolinska Institutet Rheum, Stockholm, Sweden

Background/Purpose: Polymyositis (PM) and dermatomyositis (DM) are characterized by proximal muscle weakness. A recent study has shown that patients with PM and DM have reduced grip force compared to reference values. Although patients with PM/DM respond with clinical improvement to treatment several develop a sustained disability. Clinical data from most of the patients with PM and DM in Sweden are registered annually in the Swedish Myositis Network (SWE MYONET) registry. The aim of this study was to investigate how grip force, activity limitation and health related quality of life (HRQoL) change over time in a cohort of patients with PM/DM.

Methods: A multi-center longitudinal registry study following patients from disease onset and to 1, 2, 3, 4, 5, and 6 years follow-ups. Data were collected from the SWE MYONET registry on patients with PM/DM that had values on either grip force using Grippit, activity limitation measured by Myositis Activities Profile (MAP) or HRQoL measured with Short Form-36 (SF-36) on at least one time-point between disease onset and the 6 years follow-up during the years 2003–2012. A total of 88 patients were included (53 with PM (33 women and 20 men) and 35 with DM (19 women and 16 men)). Median age for the cohort at disease onset was 59.5 years. Disease activity was measured by Physician Global Assessment of disease activity (PGA). Patients were treated with conventional immunosuppressive treatment according to the choice of the treating physician.

Results: Both women and men had reduced grip force from disease onset and over time (compared to reference values), women up to 4 years follow-up from disease onset in right and left hand (p<0.02) and men up to 4 years follow-up in the right hand and 3 years in the left hand (p<0.05). At disease onset, both women and men rated their activities as moderately difficult to perform. Over time women improved at some time-points from disease onset and at the most to 3 years in all except two sub-groups of MAP (avoid overexertion and work/school). Men improved in four out of eight of MAP’s sub-groups (movement, moving around, personal care and leisure) at some time-points from disease onset and at the most to 3 years. The women had lower values on HRQoL in all eight dimensions of SF-36 compared to reference values from the Swedish population (0.001<p<0.047). At disease onset the difference was present up to 6 years follow-up for women. Men also rated their HRQoL less than the reference values in all dimensions of SF-36 (0.001<p<0.047), but the difference was most frequent at disease onset.
Disease activity measured by PGA was lower for both women and men with PM/DM compared to disease onset and at all time-points up to 6 years (p<0.05).

Conclusion: Even though disease activity decreases over time, patients with PM/DM still have reduced grip force and HRQoL compared to reference values. They also perceive activity limitation over time. The women with PM/DM seem to be more affected over time by the disease than men in grip force, activity limitation and HRQoL.

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Relationship Over Time Between Beliefs, Motivation, and Worries about Physical Activity and Physical Activity Participation in Persons with Knee Osteoarthritis. Linda S. Ehrlich-Jones¹, Jungwha Lee², Dorothy D. Dunlop², Pamela A. Semanik², Min-Woong Sohn², Jing Song² and Rowland W. Chang¹. 1Rehabilitation Institute Chicago, Chicago, IL, 2Northwestern University, Chicago, IL

Background/Purpose: To determine the relationship over time between beliefs, motivation, and worries about physical activity and physical activity participation in persons with knee osteoarthritis (KOA).

Methods: Longitudinal data from 155 adults with KOA enrolled in a randomized clinical trial to assess the effectiveness of a behavioral intervention to promote physical activity were analyzed. Data included participant self-reported beliefs that physical activity can be beneficial for their disease, motivation for physical activity participation, worries about physical activity participation, and objective average daily accelerometer counts over a week’s time at baseline, 3 months, 6 months, and 12 months. The relationships of physical activity with beliefs, motivation and worries about physical activity were examined by multiple regression models using general estimating equations adjusting for age, gender, body mass index, disease activity, and treatment group.

Results: Results from the adjusted analyses showed a strong significant concurrent relationship between beliefs and physical activity, as well as between motivation and physical activity (Figure 1). The predictive relationships of beliefs, motivation, and worries with subsequent physical activity were each not significant.

Figure 1. Adjusted* average daily activity counts for dynamic variables† (N=155)

*Modeling average daily activity counts on concurrent dynamic variables adjusted for age, gender, body mass index, disease activity, and treatment group.
†Belief score: not strong 0, strong 22; Motivation score: not strong 6, strong 20; Worry score: not strong ~7~0, strong 1~7.

**P-value comparing not strong versus strong.

Conclusion:
• Higher levels of physical activity participation in persons with KOA were concurrently related to stronger beliefs that physical activity can be helpful for managing disease and to greater motivation for being active.
• Prior beliefs, motivation, and worries did not predict subsequent physical activity.

• These findings suggest that persistent attention to motivation and beliefs are needed to sustain higher levels of physical activity.

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Obesity and Rehabilitation Outcomes After Lower Extremity Arthroplasty. Soham Al Snih, Amol Karmarkar, Timothy A. Reistetter, Jinhyung Lee, Amit Kumar, James E. Graham and Kenneth J. Ottenbacher. University of Texas Medical Branch, Galveston, TX

Background/Purpose: To examine the effect of obesity on inpatient rehabilitation outcomes after lower extremity arthroplasty procedures (hip and knee) among Medicare Beneficiaries aged 65 years and older.

Methods: We conducted a retrospective analysis in a cohort of 103,445 Medicare Part A Beneficiaries with osteoarthritis who underwent primary total hip arthroplasty (THA) (N=32,671) or total knee arthroplasty (TKA) (N=70,774) between 2007 and 2009. Patients were identified using a combination of International Classification of Diseases, Ninth Revision and diagnosis related groups codes for primary THA or TKA, osteoarthritis, overweight/obesity, and morbid obesity. Data for rehabilitation outcomes were obtained using the Inpatient Rehabilitation Facilities Patient-Assessment Instrument file. Patients were grouped in three categories (normal weight, overweight/obesity, and morbid obesity). Rehabilitation outcomes included: Functional status information (FIM scores at admission and discharge, and FIM score change) and length of stay (LOS).

Results: The prevalence of overweight/obesity and morbid obesity was 11.4% vs. 4.7% among patients with THA, and 16.8% vs. 8.1% among patients with TKA. LOS was higher among morbid obesity for both THA and TKA [4.2, (Standard Deviation=2.7) vs. 4.2 (2.7)]. Mean FIM total score change was 29.4 (1.5) vs. 29.5 (12.3) for overweight/obesity and morbid obesity among those with THA, and 30.1 (11.5) vs. 31.3 (12.2) among those with TKA. Multivariable analysis for LOS controlled for age, gender, race/ethnicity, year of discharge, and discharge destination showed that LOS in morbid obesity in both THA and TKA was higher than those with normal weight or overweight/obesity (β = 0.18, p-value 0.0037 vs. 0.20, p-value < 0.0001). Multivariable analysis for FIM total score change showed that the highest change was observed among morbid obesity with TKA (β = 2.25, p-value < 0.0001) followed by morbid obesity with THA (β = 0.91, p-value = 0.0018), overweight/obesity with TKA (β = 0.89, p-value < 0.0001), and overweight/obesity with THA (β = 0.43, p-value = 0.0236) when compared with normal weight.

Conclusion: Patients with overweight/obesity and morbid obesity experience functional gains during inpatient rehabilitation, with those in the morbid obesity group experiencing the greatest gains. LOS for those with morbid obesity was greater than the other groups, providing support to the Center for Medicare and Medicaid Services tier comorbidity system for inpatient rehabilitation following THA or TKA. Our results suggest that obesity has an impact on LOS and functional status gains during rehabilitation. Future research is needed to explore the tier-based comorbidity reimbursement system and examine the impact of obesity on other rehabilitation impairment groups.

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Post-Operative Rehabilitation Provides Unmet Need for Better Patient Support and Advice Following Lumbar Spinal Fusion. Michael V. Hurley¹, James Greenwood² and Dr Nicola E. Walsh³. ¹St George’s University of London, London, United Kingdom, ²University College Hospital London, London, United Kingdom, ³University of the West of England Bristol, Bristol, United Kingdom

Background/Purpose: In the absence of evidence-based post-operative rehabilitation, following fusion surgery for severe persistent low back pain, people receive advice to rest for 3 months then progressively resume normal function. Such unclear, generic advice is unhelpful, and post-operative recovery may be delayed or suboptimal. We introduced a structured post-operative rehabilitation program of individualised progressive exercise and self-management advice for people who had undergone
lumbar fusion. We wanted to evaluate how helpful participants found the program.

Methods: 15 patients attending follow-up appointments were asked about their concerns, experiences, perceptions and needs. 4 patients on the program (small group, once a week for 10 weeks) were asked if and how the program helped them. The main themes that emerged were documented.

Results: Patients primarily reported concerns about musculoskeletal or psychosocial issues rather than technical surgical problems, e.g. residual pain and disability, how to reduce analgesia, when to resume certain activities, etc, but complained of a lack of advice and support. The program enabled access to a healthcare professional who could fully address people’s concerns “... my GP said to ask my consultant but I never get to see him, so it is great that I can ask you ...”.

Four areas raised most concerns:
Residual symptoms: People didn’t know what to expect and presence of residual symptoms concerned them “... if the operation was a success why do I still have pain ...”.

Prognosis: They wanted to know what would happen “... will this metalwork wear out ... will it have to come out ...”. The program allowed them to ask questions and learn from others “... I am glad to hear that exercise will not cause my spine to wear out. The others in the class have helped me see that I can get better ...”.

Physical function: People were keen to return to more normal physical function but were unsure what to do, how and when “... they told me to gradually increase my activity, but which activity and when ...”.

-Co-morbidity: People were unclear how co-morbidity might affect outcome “... how does my diabetes affect exercise ...” “... my neck hurts as well ...” but advice was lacking, unhelpful or impractical. The program gave individuals specific advice and they experienced benefits first-hand “... the consultant just kept telling me to walk, but my knee hurt and I was scared. It is so helpful that you can help me manage all of these problems.”

Conclusion: There is a need for better support to answer concerns that cause distress, anxiety and may impede post-operative recovery. Surgeons are primarily concerned about infection, implant failure, etc. Our post-operative rehabilitation program improved access to healthcare professionals who gave advice and support that might improve outcome “... how does my diabetes affect exercise ...” “... my neck hurts as well ...” but advice was lacking, unhelpful or impractical. The program gave individuals specific advice and they experienced benefits first-hand “... the consultant just kept telling me to walk, but my knee hurt and I was scared. It is so helpful that you can help me manage all of these problems.”

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A Novel Approach to the Early Detection of Axial Spondyloarthritis in Patients with Inflammatory Bowel Disease: The Implementation of an Advanced Practice Physiotherapist Led Screening Program

Wolman4, Mark Silverberg5, A. Hillary Steinhart5 and Robert D. Inman3.

1Allied Health, Toronto Western Hospital, Toronto, ON, 2Toronto Western Hospital, Toronto, ON, 3Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON, 4Toronto General Hospital, Toronto, ON, 5Zane Cohen Centre for Digestive Diseases, Mount Sinai Hospital, Toronto, ON.

Background/Purpose: The prevalence of SpA in patients with inflammatory bowel disease (IBD) ranges from 3.1 – 10%, compared to <1% in the general population, defining IBD patients as high risk for developing SpA. Traditional referral pathways to rheumatologists are associated with lengthy wait times for patients with suspected inflammatory arthritis. In order to address the need to improve access to care, there has been interest in traditional role expansion using non-physician models of care. One such model has been to train advanced practice physiotherapists (APPs) in the assessment/treatment of patients with inflammatory arthritis. The purpose of this study was to implement and evaluate a unique screening program for IBD patients with suspected SpA, led by an APP.

Methods: Patients attending gastroenterology clinics with a diagnosis of IBD and pain were referred to the program. Patients who demonstrated signs and symptoms indicative of inflammatory back pain (i.e. positive screen) were referred to the Rheumatology Clinic for diagnosis. Patients who screened negative, were provided with education on appropriate back care. Descriptive statistics described clinical characteristics and wait times. Kappa coefficient (k) measured interobserver agreement and Pearson’s Correlation compared confidence of the screening results of the APP and the rheumatologists. Bivariate analyses were based on “paper patients” reviewed by the rheumatologists that included clinical and investigative results of patients previously screened by the APP.

Results: A total of 20 patients were referred to the screening program. Most patients were men (55%), and the mean age was 40.9 years ± 11.8. The average duration of back pain was 9.8 years; 65% reported insidious onset. The mean Oswestry disability index was 20.3 ± 13.5, indicating minimal disability resulting from back pain. The median wait time was 13 days. The APP agreed with the rheumatologists’ screening results on an average of 71.4% (k = 0.5; CI: 0.07–0.87) of patients. The APP agreed with the rheumatologists to recommend MRI for further assessment on an average of 66.7% (k = 0.6; CI: 0.23–0.94) of patients screened. Comparison of confidence of screening results was 6.8/10 (higher values indicating higher level of confidence) for the APP versus an average confidence level of 6.4/10 for the rheumatologists (Pearson’s r = 0.3).

Conclusion: The utilization of the APP to screen for inflammatory back pain in patients with IBD demonstrates clinical judgement that is aligned with that of rheumatologists with expertise in SpA. The level of
confidence of the APP was similar to the rheumatologists’. Wait times to be screened by the APP are shorter than traditional referral pathways. This screening strategy has the potential to improve access to care and act as a model of care for patients at high risk for SpA.

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ACR Plenary Session II: Discovery 2012
Monday, November 12, 2012, 11:00 AM–12:30 PM

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The Risk of Lymphoma in Patients Receiving Anti-Tumor Necrosis Factor Therapy for Rheumatoid Arthritis: Results From the British Society for Rheumatology Biologics Register-Rheumatoid Arthritis. Louise K. Mercer1, Mark Lunt1, Audrey S. Low2, James B. Galloway1, Kath Watson1, William G. Dixon1, BSRRR Control Centre Consortium2, Deborah P. Symmons1, Kimme L. Hyrich3 and On behalf of the BSRRR.1Arthritis Research UK Epidemiology Unit, The University of Manchester, Manchester, United Kingdom, 2Arthritis Research UK Epidemiology Unit, Manchester, United Kingdom, 3British Society for Rheumatology Biologics Register - Rheumatoid Arthritis.

Background/Purpose: The aim of this study was to determine whether anti-TNF influences the risk of lymphoma when used in routine UK clinical practice. Anti-TNF therapy is now widely used to treat RA, especially severe RA. The first 6 months of follow-up were excluded. There were too few Hodgkin lymphoma: N 4 9 and NHL: Age and gender adjusted HR (95% CI) Referent 0.79 (0.44, 1.40) to include baseline age, gender, DAS score, HAQ, disease duration, use of steroids, current/previous cyclophosphamide, smoking and registration date. Incidence rates of lymphoma when used in routine UK clinical practice. Anti-TNF therapy is now widely used to treat RA, especially severe RA. The first 6 months of follow-up were excluded. There were too few Hodgkin lymphoma: N 4 9 and NHL: Age and gender adjusted HR (95% CI) Referent 0.79 (0.44, 1.40) to include baseline age, gender, DAS score, HAQ, disease duration, use of steroids, current/previous cyclophosphamide, smoking and registration date. The rates of lymphoma and non-Hodgkin lymphoma (NHL) in the nbDMARD cohort and in patients ever exposed to anti-TNF were compared using Cox proportional hazards models adjusted using deciles of propensity score (DP) which included baseline age, gender, DAS score, HAQ, disease duration, use of steroids, current/previous cyclophosphamide, smoking and registration date. The first 6 months of follow-up were excluded. There were too few Hodgkin lymphoma (HL) to compare rates. Results: 84 incident lymphomas were confirmed: 20 in 3465 nbDMARD-treated subjects and 64 in 11987 anti-TNF (152 versus 96 per 100000 person-years (pyrs); Table). After adjusting using DP there was no difference in risk of lymphoma between the cohorts; hazard ratio (HR) for anti-TNF 1.13 (95% CI 0.55, 2.31). There were 5 (22%) HL in the nbDMARD cohort and 9 (13%) in anti-TNF. Among 71 NHL, the most frequent subtype was diffuse large B cell lymphoma: N 20 64. Between patients ever exposed to anti-TNF were compared using Cox proportional hazards models adjusted using deciles of propensity score (DP) which included baseline age, gender, DAS score, HAQ, disease duration, use of steroids, current/previous cyclophosphamide, smoking and registration date. The first 6 months of follow-up were excluded. There were too few Hodgkin lymphoma (HL) to compare rates. Results: 84 incident lymphomas were confirmed: 20 in 3465 nbDMARD-treated subjects and 64 in 11987 anti-TNF (152 versus 96 per 100000 person-years (pyrs); Table). After adjusting using DP there was no difference in risk of lymphoma between the cohorts; hazard ratio (HR) for anti-TNF 1.13 (95% CI 0.55, 2.31). There were 5 (22%) HL in the nbDMARD cohort and 9 (13%) in anti-TNF. Among 71 NHL, the most frequent subtype was diffuse large B cell lymphoma: N 20 64. Between patients ever exposed to anti-TNF were compared using Cox proportional hazards models adjusted using deciles of propensity score (DP) which included baseline age, gender, DAS score, HAQ, disease duration, use of steroids, current/previous cyclophosphamide, smoking and registration date. The first 6 months of follow-up were excluded. There were too few Hodgkin lymphoma (HL) to compare rates. Results: 84 incident lymphomas were confirmed: 20 in 3465 nbDMARD-treated subjects and 64 in 11987 anti-TNF (152 versus 96 per 100000 person-years (pyrs); Table). After adjusting using DP there was no difference in risk of lymphoma between the cohorts; hazard ratio (HR) for anti-TNF 1.13 (95% CI 0.55, 2.31). There were 5 (22%) HL in the nbDMARD cohort and 9 (13%) in anti-TNF. Among 71 NHL, the most frequent subtype was diffuse large B cell lymphoma: N 20 64.
Background/Purpose: Deriving therapeutic targets from human genetics linked with biological alterations of risk alleles may provide a more successful approach to drug development than traditional efforts that focus on biological insight alone. Here, we successfully translate a SNP association from a genome-wide association study (GWAS) in rheumatoid arthritis (RA) into a high-throughput screen (HTS) based on cellular phenotype in a human B cell line to identify inhibitors of CD40-mediated NF-κB signaling.

Methods: We fine-map the CD40 risk locus in 7,222 seropositive RA patients and 15,870 controls genotyped on the Immunochip, together with deep sequencing of CD40 coding exons in 500 RA cases and 650 controls. We use flow cytometry to measure CD40 protein levels on the surface of primary CD19+ from 90 healthy control individuals. We use gene expression arrays to measure CD40 RNA levels in peripheral blood mononuclear cells from 1,469 healthy control individuals. We use retroviral shRNA infection to perturb the amount of CD40 on the surface of a human B lymphocyte cell line (BL2) and develop a high-throughput NF-κB luciferase reporter assay in BL2 cells activated with trimerized CD40 ligand (tCD40L), and conduct an HTS of 1,982 chemical compounds and FDA-approved drugs. Counter-screens of the top “hit” compounds were performed in the BL2 line activated with both tCD40L and LPS, and in an additional B cell line, Ramos, activated with tCD40L and TNF. Two known and two novel compounds were tested for inhibition of tCD40-NFκB signaling in primary human CD19+ B cells by measuring CD86 expression with flow cytometry.

Results: A single common SNP at the CD40 locus explains the entire signal of association (rs4810485, P = 1.4 × 10^{-10}), without any evidence for independent rare variants contributing to RA risk. Subjects homozygous for the common RA risk allele have ≥3% more CD40 on the surface of primary human CD19+ B lymphocytes than subjects homozygous for the non-risk allele (P = 10^{-9}), a finding corroborated by expression quantitative trait loci (eQTL) analysis in PBMC’s (P = 10^{-17}). We observe a direct correlation between amount of CD40 protein and phosphorylation of RelA (p65), a subunit of the NF-κB transcription factor. Using our luciferase reporter assay, we identify three “hit” compounds out of 1,982 that consistently inhibit luciferase activity following tCD40L activation. After a series of counter-screens and testing in primary human CD19+ B cells, we identify 2 “known” and 2 “novel” chemical inhibitors not previously implicated in inflammation or CD40-mediated NF-κB signaling. One known inhibitor is tramulast, a drug currently in a phase II clinical trial of RA; the other is a corticosteroid derivative. The two novel compounds represent promising tool compounds to develop new therapies to treat RA.

Conclusion: Our study demonstrates proof-of-concept that human genetics can be used to guide the development of phenotype-based, high-throughput small-molecule screens to identify potential novel therapies in complex traits such as RA.

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Strontium Ranelate in Knee Osteoarthritis Trial (SEKOIA): A Structural and Symptomatic Efficacy. Jean-Yves Reginster, R. Chapurlat, Claus Christensen, H. Gennet, N. Bellamy, W. Bensen, F. Navarro, E. Badurski, E. Nasonov, X. Chevalier, P. Sambrook, T. Spector, and C. Cooper. University of Liege, Liege, Belgium, INSERM UMR 1033 and Université de Lyon, Hôpital Edouard Herriot, Lyon, France, CCBR, Ballerup, Denmark, Radiology, Medicine and Orthopaedic Surgery University of California and Synarc, El Paso, CA, CONROD, The University of Queensland, Royal Brisbane and Women’s Hospital, Herston, Brisbane, Australia, St. Joseph’s Hospital and McMaster University, Hamilton, ON, H. Universitario Virgen de la Macarena, Sevilla, Spain, Center of Osteoporosis and Osteo-articular Diseases, Białystok, Poland, State Institute of Rheumatology, the Russian Academy of Medical Sciences, Moscow, Critical Hern-Maffei Hospital, France, Royal North Shore Hospital, Sydney, Australia, King’s College London, St. Thomas’ Hospital, London, UK, University of Oxford; Southampton General Hospital, Southampton, United Kingdom

Background/Purpose: Treatments for osteoarthritis focus on improving symptoms through non-pharmacological and pharmacological approaches. Strontium ranelate (SrRan), a treatment for osteoporosis, was shown to stimulate cartilage matrix formation in vitro, and to reduce radiographic spinal OA progression in osteoporotic women with spinal OA.

Methods: The SEKOIA phase III study was conducted to determine the efficacy of SrRan with placebo for reducing radiologic progression of knee OA.

Results: Six hundred and seventy patients from 42 centers were randomized. There were less radiologic and radiological improvements with SrRan 1 and 2 g/day:

- SrRan 1 g/day: 32% more CD40 on the surface of a human B lymphocyte cell line
- SrRan 2 g/day: 43% more CD40 on the surface of a human B lymphocyte cell line

Conclusion: SrRan 1 and 2 g/day delayed radiographic progression of knee OA, evidencing a structure-modifying effect. This structural effect is translated clinically into a lower number of patients having a radiological progression over thresholds known to be predictive of OA-related surgery suggesting that SrRan could reduce the number of patients needing knee surgery in the long-term. The structural effect was accompanied by symptom improvement at the dose of 2 g/day.

References
1 Bruyere et al, ARD 2005–6:1727–1730

Disclosures: J. Y. Reginster, Servier, Novartis, Nega, Lilly, Wyeth, Amgen, GlaxoSmithKline, Roche, Merckle, Nycomed, NPS, Theramex, UCB, M. Sharp and Dohme, Lilly, Rottapharm, JBA, Servier, Roche, GlaxoSmithKline, Teijin, Teva, Ebeewa Pharma, Zoick, Anaiz, Theranex, Nycomed, Novo Nordisk, Bristol Myers Squibb, Merck Sharp and Dohme, Rottapharm, Teva, Lilly, Novartis, Roche, GlaxoSmithKline, Amgen, Servier, 2; R. Chapurlat, Merck, Amgen, Servier, Lilly, Roche, Novartis, 2; C. Christiansen, Nordic, Biocare AB, CCBR, Synarc, 9, Roche, Eli Lilly, Novartis, Novo Nordisk, Proctor and Gamble, Group Fournier, Besins EsoCo, Merck Sharp and Dohme, Chiesi, Boehringer Mannheim, Pfizer, GlaxoSmithKline, Amgen, 5; H. Gennet, Servier, Novartis, Lilly, Pfizer, GSK, Roche, Genentech, Lilly, Amgen, Merck, ONG, Bristol Myers Squibb, Synarc, Inc, 1; N. Bellamy, Servier, 5; W. Bensen, Abbott, Amgen, Bristol Myers Squibb, Janssen, Novo Nordisk, Bristol Myers Squibb, Merck Sharp and Dohme, Janssen, Pfizer, E. Badurski, Servier, 5; E. Nasonov, Servier, 5; X. Chevalier, Servier, 5; P. Sambrook, Servier, 5; T. Spector, Servier, 5; C. Cooper, Servier, 5; O. BABB, Novartis, Pfizer, Merck Sharp and Dohme, Eli Lilly, Servier, 5.

Monday, November 12

S681
Efficacy and Safety of Tocilizumab in Patients with Polyarticular Juvenile Idiopathic Arthritis: Data From a Phase 3 Trial. Hernine Brunner1, Nicolino Ruperto2, Zbigniew Zuber3, Caroline Keane4, Olivier Harari5, Andreas Kenwreg6, Ruben I. Cuttica7, Vladimir Kelten8, Ruzao Ye9 and extended oligoarticular JIA; systemic JIA was excluded in the CHERISH study.

Methods: CHERISH is a 104-wk study in pts age 2–17 yrs with active pcJIA for ≥6 mo who failed MTX. In the first 16 wks, all pts received open-label (OL) TCZ every 4 wks (if body weight [BW] ≥30 kg, 8 mg/kg [n = 119]; if BW <30 kg, pts were randomly assigned to 8 mg/kg [n = 34] or 10 mg/kg [n = 35]). At wk 16, eligible pts (with ≥JIA ACR30 response) entered a 24-wk randomized (pts were assigned [1:1] to placebo [PBO] or to continue TCZ at the same dose), double-blind (DB) withdrawal period for evaluation of the primary endpoint (JIA ACR30 flare relative to wk 16). Pts who failed or completed the DB period entered an OL extension in which they received the same TCZ dose as in the lead-in period. Efficacy data (until wk 40) are presented for the ITT population; safety data are presented for the safety population to the cut date.

Results: 188 pts entered the initial lead-in period (77% girls; 79% and 46% ≤30 kg, pts were randomly assigned to 8 mg/kg [n = 34] or 30 kg BW group compared with the other 2 groups (TCZ 10 mg/kg <30 kg BW and TCZ 8 mg/kg ≥30 kg BW) (Table). At the time of the safety data cut, there were 184 pt-yrs (PY) of follow-up lead-in period at wk 16 are shown (Table). The degree of improvement was lower with TCZ compared to PBO at wk 40 (Table). Efficacy responses for the initial lead-in period (at wk 16: ITT population)

TCZ 10 mg/kg <30 kg BW
TCZ 8 mg/kg ≥30 kg BW

JIA ACR responses at wk 16, n (%)

JIA ACR30 31 (88.6) 26 (78.8) 111 (93.3) 148 (49.4)
JIA ACR50 28 (80.0) 24 (70.6) 104 (97.4) 156 (50.5)
JIA ACR70 22 (66.7) 14 (41.2) 81 (70.8) 117 (37.2)
JIA ACR90 11 (31.4) 8 (23.5) 30 (25.2) 49 (16.1)

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Conclusion: TCZ treatment in pcJIA was efficacious, with a sustained clinically meaningful improvement using a monthly regimen at doses of 8 mg/kg if BW ≥30 kg and 10 mg/kg if BW <30 kg. The safety profile is consistent with that in other TCZ-treated pts (eg, systemic JIA).

References


Disclosure: H. Brunner, None; N. Ruperto, BMS, Abbott, Novartis, Roche Pharmaceuticals, Centocor, ACRAF, Pfizer, Xoma, 2, BMS, Roche Pharmaceuticals, 8; Z. Zuber, None; C. Keane, Roche Pharmaceuticals, 5; O. Harari, Roche Pharmaceuticals, 5; A. Kenwreg, Roche Pharmaceuticals, 3; R. J. Cuttica, None; V. Kelten, None; R. Xavier, Roche Pharmaceuticals, BMS, Tousseau, Genentech, Pfizer, S. I. Calo Penades, None; L. Nikishina, None; N. Rubio-Perez, None; E. Alekseeva, None; V. Chesnak, None; J. Chavez, None; G. Hornett, Abbott, Pfizer, 2, Abbott, Novartis, Roche Pharmaceuticals, Chugai, 8; V. Opoka-Winiarska, None; P. Quartier, Abbott, Novartis, 2, Abbott, Novartis, Pfizer, Roche Pharmaceuticals, BMS; 5; C. A. Silva, Roche Pharmaceuticals, 2; E. D. Silverman, None; A. Spindler, None; D. J. Lovell, National Institutes of Health, 2, Astra-Zeneca, Centocor, Wyeth, Amgen, BMS, Abbott, Pfizer, Regeneron, Hoffmal-La Roche, Roche Pharmaceuticals, Centocor, ACRAF, Pfizer, 2, Novartis, Roche Pharmaceuticals, 5, B. S. F. De Benedetti, Abbott, BMS, Pfizer, SOBI, Innovimmune, Roche Pharmaceuticals, Novartis, 2, BMS, Pfizer, Roche Pharmaceuticals, 5.

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Clinical and Serologic Predictors of Response in Rituximab-Treated Refractory Adult and Juvenile Dermatomyositis (DM) and Adult Poly-myositis (PM) – the RIM Study. Rohit Aggarwal1, Ann M. Reed2, Dana P. Ascherman3, Richard J. Barohn4, Brian M. Feldman5, Frederick W. Miller6, De Benedetti7, C. Keane7, Roche Pharmaceuticals, 5; O. Harari7, Roche Pharmaceuticals, 5; A. Kenwreg7, Roche Pharmaceuticals, 3; R. J. Cuttica7, None; V. Kelten7, None; R. Xavier7, Roche Pharmaceuticals, BMS, Tousseau, Genentech, Pfizer, S. I. Calo Penades7, None; L. Nikishina7, None; N. Rubio-Perez7, None; E. Alekseeva7, None; V. Chesnak7, None; J. Chavez7, None; G. Hornett7, Abbott, Pfizer, 2, Abbott, Novartis, Roche Pharmaceuticals, Chugai, 8; V. Opoka-Winiarska7, None; P. Quartier7, Abbott, Novartis, 2, Abbott, Novartis, Pfizer, Roche Pharmaceuticals, BMS; 5; C. A. Silva7, Roche Pharmaceuticals, 2; E. D. Silverman7, None; A. Spindler7, None; D. J. Lovell7, National Institutes of Health, 2, Astra-Zeneca, Centocor, Wyeth, Amgen, BMS, Abbott, Pfizer, Regeneron, Hoffmal-La Roche, Roche Pharmaceuticals, Centocor, ACRAF, Pfizer, Xoma, 2, BMS, Roche Pharmaceuticals, 5, B. S. F. De Benedetti7, Abbott, BMS, Pfizer, SOBI, Innovimmune, Roche Pharmaceuticals, Novartis, 2, BMS, Pfizer, Roche Pharmaceuticals, 5.

Background/Purpose: The Rituximab in Myositis (RIM) Study evaluated 200 refractory myositis patients treated with rituximab, 33% of whom met the definition of improvement (DOI). The aim of this study was to identify the clinical and laboratory predictors of response in this cohort.

Methods: All patients failed corticosteroids and at least 1 other immunosuppressive (IS) agent and received rituximab at weeks 0/1 (Early) or 8/9 (Late). The first endpoint in this 44-week trial was time to achieve DOI ≥20% improvement in 3 of 6 core set measures (CSM) (includes manual muscle testing (MMT), muscle enzymes, HAQ, patient/parent global, physician global disease activity and extramuscular disease activity) with no ≥2 CSM worsening by ≥25% (excluding MMT) at 2 consecutive visits. We analyzed the effect of the following baseline variables on the time to DOI: myositis subtype, demographics, laboratory [IGM, IgG, myositis-associated autoantibodies (MAA), CBC, creatinine], damage measures (global, muscle damage and atrophy and organ-related), disease activity and other clinical parameters (skeletal/GI/pulmonary/muscle disease activity, Raynaud, calcinosis, mechanic hands), CSM, medication (early vs. late rituximab, IS agents and corticosteroids) and MAA subset [anti-synthetase (anti-Syn), Mi-2, SRP, TIF-1γ, M/J, other autoantibodies and those without an MAA]. The Wilcoxon test was used to univariately evaluate the association of baseline with the time to DOI. A multivariate time-dependent proportional hazard model was built using forward selection (α =0.05) based on univariate variables with p<0.1.

Background/Preference: The RIM Study was analyzed (96 Early/104 Late). Table 1 lists the baseline variables which predicted time to DOI univariate. The multivariate model included autoantibodies (anti-Syn was the best DOI predictor followed by Mi-2 as compared to the “no
NF-kB Inducing Kinase (NIK) Is a Key Regulator of Inflammation-Induced Angiogenesis. A.R. Noort1, K.P.M. van Zoest1, P. Koelwij1, D.V. Novack2, M.J. Siemerink3, P. P. Tak4 and S.W. Tas5. 1Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands, 2Institute for Cardiovascular Research (ICaR-VU)/VU University Medical Center, Amsterdam, Netherlands, 3Washington University School of Medicine, St. Louis, MO, 4Academic Medical Center/University of Amsterdam and GlaxoSMMKline, Amsterdam, Netherlands

Background/Purpose: In rheumatoid arthritis (RA) synovial tissue (ST) angiogenesis can be observed already in the earliest phase of disease, which may be critical in the switch from acute to chronic inflammation. The chemokine CXCL12, which is induced via the non-canonical nuclear factor-kB (NF-kB) pathway, plays an important role in angiogenesis, lymphocyte transendothelial migration, and the homing of endothelial progenitor cells. Therefore, the non-canonical pathway, with its key mediator NF-kB inducing kinase (NIK), may play an important role in pathological angiogenesis and the perpetuation of synovial inflammation in RA.

Objectives: To study the role of non-canonical NF-kB signaling in pathological angiogenesis in RA.

Methods: Expression of NIK and CXCL12 in RA ST was evaluated using immunofluorescence microscopy (IF). The angiogenic potential of endothelial cells (EC) was studied in vitro using the tube formation assay and siRNA-mediated gene silencing. Microvessel outgrowth was studied ex vivo by comparing WT and NIK−/− mice in the aortic ring assay. Physiological (developmental) angiogenesis was evaluated in these mice by isolecitin B4 staining of the retina followed by confocal microscopy. Finally, the contribution of NIK to synovial angiogenesis was studied in vivo in antigen-induced arthritis (AIA).

Results: NIK was highly expressed in EC in RA ST and co-localized with the EC marker vWF in small (newly formed) blood vessels. NIK, p52 and CXCL12 were expressed both in EC in small blood vessels and in PNA+ high endothelial venules. In vitro, EC treated with stimuli that induce non-canonical NF-kB signaling (i.e. lymphotoxin, LIGHT, CD40L) significantly enhanced tube formation 2.5-fold (p<0.05), which could be completely blocked by siRNA targeting NIK or IKKz, but not completely by I KKβ (canonical NF-kB pathway). Aortic rings from WT and NIK−/− mice showed normal TNF- and VEGF-induced microvessel outgrowth. In contrast, whereas non-canonical NF-kB stimuli induced microvessel outgrowth in WT mice (unstim 29.94 ± 6.08 vs. LT 159.1 ± 50.24 vs. LIGHT 110.3 ± 17.68 (mm²) p<0.05), no microvessel outgrowth was observed in aortic rings from NIK−/− mice (unstim 28.74 ± 15.89 vs. LT 45.9 ± 16.71 vs. LIGHT 43.41 ± 15.73 (mm²)). In line with this, NIK−/− mice exhibited normal developmental angiogenesis in the retina, but a 50% reduction in pathological angiogenesis in synovial inflammation (blood vessels in synovial tissue WT 20 ± 5.07 vs. NIK−/− 10.2 ± 3.02).

Conclusion: NIK is preferentially expressed in EC in RA ST. Induction of non-canonical NF-kB signaling in EC resulted in enhanced angiogenesis in vitro, and siRNA-mediated selective blockade of this pathway abrogated these effects. Moreover, NIK−/− mice exhibited normal developmental and VEGF-induced angiogenesis, but reduced pathological angiogenesis in AIA. These findings point towards an important role of the non-canonical NF-kB pathway in pathological angiogenesis associated with chronic (synovial) inflammation. This could be exploited for the development of future new therapies for RA.

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of multiple cytokines and chemokines were measured by Lumines. In vitro, IIC-specific proliferative response of lymphocytes from the draining lymph nodes (LN) was analyzed by ^3^H-thymidine incorporation assay. CD4^+^ T cells were purified from splenocytes by MACS, and costimulatory response (CD3 plus fibronectin and CD3 plus CD28) were analyzed by the same assay. Furthermore, we made bone marrow chimera with WT (graft)/KO (host) and KO (graft)/WT (host), then challenged with collagen-induced arthritis.

**Results:** Although the overall incidence of arthritis was similar between KO and WT, the onset of the disease was retarded in KO, and the severity of arthritis was significantly reduced in KO compared to WT. By immunohistochemical analysis, the hindlimbs from WT showed more severe infiltration of inflammatory cells, bone destruction, inflammatory changes, and synovial thickening compared to KO. In WT, inflammatory cytokines such as TNF-α, IL-17, IL-6 showed higher levels compared to KO. On the contrary, the level of anti-inflammatory cytokine IL-10 was lower than KO mice. Lymphocytes proliferative response against IIC was reduced in KO. Furthermore, costimulatory response of CD4^+^ T cells to CD3 plus fibronectin was reduced in KO, in contrast, the response to CD3 plus CD28 was higher in KO compared to WT. Finally, bone marrow chimera revealed that the severity of CIA was lower in KO (graft)/WT (host) than WT (graft)/KO (host).

**Conclusion:** Gene-targeting of Cas-L conferred the resistance against CIA with altered balance of the pro-inflammatory and anti-inflammatory cytokines. The costimulatory response of the T cells and IIC-specific response of lymphocytes were also altered. It seems that hematopoietic cells were more responsible for the gene-targeting effect of Cas-L based on the bone marrow chimera experiment. Taken together, Cas-L may play a pivotal role in the pathophysiology of collagen-induced arthritis. It is thus suggested that Cas-L may be a potential molecular target for the treatment of RA.

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1602

**Role of Focal Adhesion Kinase in Synovial Fibroblast Invasion and Arthritis.** Miriam A. Shelef, David Bennin and Anna Huttenlocher. Univ of Wisconsin Scill of Med, Madison, WI

**Background/Purpose:** Rheumatoid arthritis is an inflammatory arthritis characterized by joint erosions and destruction. This damage is mediated in part by invasion of synovial fibroblasts into cartilage and bone. Cellular invasion has been extensively studied in cancer cells, but we are just beginning to understand the elements necessary for synovial fibroblast invasion. Focal adhesion kinase (FAK) is a protein scaffold and tyrosine kinase important for cancer cell migration and invasion. FAK may also play a role in synovial fibroblast invasion and arthritis. Phosphorylated FAK is increased in rheumatoid synovial tissue and localizes to focal adhesions in rheumatoid synovial fibroblasts. Also, FAK mediates IL-6 induction and is expressed in endothelial and immune cells. FAK inhibitors are in clinical trials for cancer, so if FAK were important for synovial fibroblast invasion and arthritis, FAK inhibitors might also be of benefit for treating rheumatoid arthritis.

**Methods:** Synovial fibroblasts derived from the synovial fluid of patients with rheumatoid arthritis were treated with vehicle control or two different FAK inhibitors, PF 562271 and PF 573228, and plated on Matrigel invasion chambers to assess the role of FAK in invasion. To dissect which steps of invasion require FAK activity, we assessed migration using fibronectin coated transwells and focal matrix degradation by plating synovial fibroblasts on coverslips coated with fluorescent gelatin. To determine the role of FAK in arthritis, we crossed established lines of mice to generate mice that overexpress TNFα, express tamoxifen inducible Cre recombinase, and carry FAK flanked by LoxP sites. These TNF^−/Cre^ FAK^−/−^ mice spontaneously get arthritis due to overexpression of TNFα and can be induced to delete FAK by treatment with tamoxifen. Western blots were done to assess loss of FAK protein in splenocytes after tamoxifen treatment. Arthritis was assessed in FAK deficient and control arthritic mice by scoring paw swelling and protein in splenocytes after tamoxifen treatment. Arthritis was assessed in treatment with tamoxifen. Western blots were done to assess loss of FAK vehicle control. Focal degradation of gelatin still occurs when FAK is decreased migration through fibronectin coated transwells compared to vehicle control. Focal degradation of gelatin still occurs when FAK is inhibited. TNF^−/Cre^ FAK^−/−^ mice treated with tamoxifen were found to have good deletion of FAK in splenocytes. Arthritic mice deficient in FAK did not have significant alterations in arthritis by clinical scoring compared to arthritic mice without FAK deletion.

**Conclusion:** Consistent with findings in cancer cells, activated FAK is an important component of synovial fibroblast migration and the migratory component of invasion, but not focal matrix degradation. According to clinical arthritis scores, FAK does not appear to play a critical role in arthritis. Studies are ongoing to address if loss of FAK protein, as opposed to FAK kinase activity, alters focal gelatin degradation and if joint erosions are altered in arthritis in the absence of FAK, which may be a more specific sign of synovial fibroblast dysfunction than clinical scores.

Disclosure: M. A. Shelef, None; D. Bennin, None; A. Huttenlocher, None.

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**Tie2 Signalling Induces a Pro-Inflammatory and Pro-Angiogenic Phenotype in Differentiated Macrophages, Independently of Macrophage Polarization Conditions, and Contributes to Production of Cytokines Elevated in Early Rheumatoid Arthritis.** Samuel Garcia1, Sarah Krausz2, Carmen A. Ambaruss2, Bea Malvar Fernandez2, Dominique L. Baeten3, Paul P. Tak4 and Kris A. Reeedquist1,1,1 Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands, 2Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands, 3Academic Medical Center, University of Amsterdam and GlaxoSmithKline, Amsterdam, Netherlands

**Background/Purpose:** Angiopoietin (Ang) –1 and –2 signalling to the Tie2 tyrosine kinase receptor has an essential role in blood vessel remodeling and angiogenesis. Ang-1, Ang-2 and Tie2 signalling to the Tie2 tyrosine kinase receptor has an essential role in blood vessel remodeling and angiogenesis. Ang-1, Ang-2 and Tie2 are all expressed in rheumatoid arthritis (RA) synovial tissue. Activated Tie2 is prominently observed in RA synovial macrophages, both Ang-1 and Ang-2 can cooperate with TNF to induce macrophage IL-6 production, and Ang-1 signaling to Tie2 promotes disease persistence and progression in early RA. Here, we examined how macrophage differentiation regulates expression of Tie2 and macrophage responses to Ang-1 and Ang-2, as well as the impact of Tie2 signalling on macrophage production of secreted products elevated in the synovial fluid (SF) of early RA patients.

**Methods:** Human healthy donor peripheral blood mononuclear cells were isolated from buffy coats and differentiated into macrophages in the presence of Ang-1 and Ang-2, the pro-inflammatory/classically activating cytokines GM-CSF and IFN-γ, or in the presence of the anti-inflammatory/alternatively activating cytokines M-CSF or IL-10. The expression of macrophage polarization markers and Tie2 was analyzed by flow cytometry and quantitative (q)-PCR. Macrophages were stimulated with TNF in the presence or absence of Ang-1 or Ang-2 and effects on gene expression assessed using low density q-PCR arrays, ELISA and luminesce. Monocyte chemotactic responses were assessed using 96-well transwell systems.

**Results:** Macrophage Tie2 protein and mRNA expression was observed under all conditions, but failed to correspond to pro- or anti-inflammatory phenotypes, as it was highest in macrophages differentiated in IL-10 and IFN-γ. Ang-1 and Ang-2 failed to induce macrophage polarization. Each polarization condition displayed a distinct expression profile of angiogenic factors. Ang-1 and Ang-2 alone failed to influence gene expression. Ang-1, and to a lesser extent Ang-2, synergized with TNF to stimulate expression of similar gene profiles regardless of macrophage polarization conditions. Significantly enhanced TNF-induced CXCL2, CXCL-3, CXCL-9, IL-6 mRNA expression was observed. Neither Ang-1 nor Ang-2 stimulated monocyte chemotaxis. However, conditioned medium from macrophages stimulated with TNF in combination with Ang-1 or Ang-2 demonstrated significantly enhanced chemotactic activity for monocytes, compared to conditioned medium from macrophages stimulated with TNF alone. Ang-1, but not Ang-2, significantly cooperated with TNF to induce macrophage production of cytokines elevated in the SF of early RA patients, including TGFα/β, FGF2, and IL-12B.

**Conclusion:** Our results demonstrate that Tie2 is functionally expressed in macrophages, regardless of macrophage polarization conditions. Stimulation of macrophage Tie2 with Ang-1, and to a lesser extent Ang-2, enhances TNF induced pro-inflammatory cytokine and chemokine expression. These results suggest that Tie2 signaling, in combination with TNF, induce a pro-inflammatory and pro-angiogenic profile in differentiated macrophages, and provide a molecular basis for the role of Tie2 in promoting disease progression in both early and established RA.

Disclosure: S. Garcia, None; S. Krausz, None; C. A. Ambaruss, None; B. Malvar Fernandez, None; D. L. Baeten, None; P. P. Tak, Employee of GlaxoSmithKline; 1K. A. Reeedquist, None.
Inhibitor of DNA Binding 1 As a Secreted Angiogenic Transcription Factor in Rheumatoid Arthritis. Takeo Isozaki1, M. Asf Amin1, Alisa E. Koch2, Ali Arbabi3, Stephanie A. Shuman1, Christine M. Hal4, G. Kenneth Haines III5 and Jeffrey H. Ruth1. 1University of Michigan, Ann Arbor, MI, 2University of Michigan Medical School, Ann Arbor, MI, 3Henry Ford Hospital and Medical Centers, Detroit MI 48202, Detroit, MI, 4Yale University, New Haven, CT

Background/Purpose: Rheumatoid arthritis (RA) is characterized by enhanced blood vessel development in joint synovium. This involves the recruitment of endothelial progenitor cells (EPCs), allowing for de novo vessel formation and pro-inflammatory cell infiltration. Inhibitor of DNA Binding 1 (Id1) is a transcription factor unique to EPCs that influences cell maturation. We hypothesized that Id1 could be secreted and expressed in RA, and influence blood vessel growth. We also wanted to define the contribution of this transcription factor in RA, and correlate it with CXCL16 expression, as EPCs also prominently express the only known CXCL16 receptor, CXCR6.

Methods: Enzyme Linked Immunosorbent Assay (ELISA) and Polymerase Chain Reaction (PCR) was used to examine Id1 levels in synovial fluids (SFs) and endothelial cells (ECs) respectively. Immunohistochemistry and immunofluorescence (IF) histology was used to determine the expression of Id1 in RA compared to osteoarthritis (OA) and normal (NL) synovial tissues (STs). We used Matrigel angiogenesis and human dermal microvascular EC (HMVEC) migration assays to determine if recombinant human (rhuId1) and/or RA SF immunodepleted of Id1 alters angiogenic activity. Finally, CXCR6 deficient (CXCR6−/−) and wild-type (wt) C57BL/6 mice were primed to develop K/BxN serum induced arthritis and evaluated for joint swelling. Joint tissues from these mice were examined for Id1 and correlated with CXCR6 expression and arthritis development.

Results: ST samples immunostained for Id1 showed heightened expression in RA compared to OA and NL ST. By IF staining, we found significantly more Id1 in RA compared to OA and NL vasculature, showing that Id1 expressing cells, therefore EPCs, are most active in vascular remodeling in the RA synovium. We also detected significantly more Id1 in RA compared to OA and other arthritis SFs by ELISA that highly correlated with CXCL16 levels (p<0.05, n=10, f=0.64 Pearson’s Correlation). In vitro chemotaxis assays also showed that Id1 is highly chemotactic for HMVECs. Using in vitro Matrigel assays, we found that HMVECs form tubes in response to rhuId1 and sham depleted RA SF, and that Id1 immunodepleted from RA SF profoundly decreases tube formation. PCR showed that Id1 mRNA could be upregulated in both HMVECs and EPCs with tumor necrosis factor-α (TNF-α) or CXCL16, with highest amounts seen in EPCs in response to CXCL16. Finally, using the K/BxN serum induced arthritis model, we correlated EC CXCR6 with Id1 expression by immunohistochemistry. These findings were further validated by highly significant reductions in blood vessels and hemoglobin (Hb) content in joint tissues from K/BxN serum induced CXCR6−/− mice.

Conclusion: Our data indicates that Id1 correlates with CXCL16 in RA SF and that CXCR6−/− articular mice have notable reductions in Id1 expression and arthritis development, correlating with profound declines in vasculature and joint Hb content. We also found that Id1 is potently angiogenic, and can be upregulated in HMVECs and EPCs by TNF-α and especially CXCL16. These results indicate that CXCL16 and its receptor CXCR6 may be a central ligand-receptor pair that can be highly correlated with Id1 expression, EPC recruitment, and blood vessel formation in the RA joint.

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ACR Concurrent Abstract Session

Epidemiology and Health Services Research II: Epidemiologic Risk Factors in the Development of Rheumatic Disease

Monday, November 12, 2012, 2:30 pm–4:00 pm

1604

Parity and the Risk of Developing Rheumatoid Arthritis: Results From the Swedish Epidemiological Investigation of Rheumatoid Arthritis Study. Cecilia Oestharm1, Lars Kräkso2, Alfredsson3 and Camilla Bengtsson1. 1Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, 2Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden

Background/Purpose: The hypothesis that maternal parity may influence the risk of rheumatoid arthritis (RA) was tested in the Swedish Epidemiological Investigation of Rheumatoid Arthritis (EIRA) study, a population-based case-control study performed in Sweden in the 1960s and 1970s. We confirmed 196 incident RA cases (NHS: 139; 1976–2008, NHSII: 57; 1989–2009) with blood collected prior to RA symptoms by medical record review. Three controls were matched to each case on year of birth, race, menopausal status and post-menopausal hormone use, time of day, fasting status

References


Monday, November 12
at blood draw and timing in the menstrual cycle (pre-menopausal women in NHSII only). Sixteen ACPA antigens previously identified by protein mass spectrometry were coupled to spectrally distinct beads for analysis using the BioPlex platform using a Luminex 200 instrument. These peptides included epitopes derived from clustatin, enolase, fibrinogen, histone 2A and vimentin. Cutpoints for positivity were defined by ROC analyses. Conditional logistic regression models were used to estimate risk ratios and 95% confidence intervals (RR, 95% CI) in each cohort separately and combined using meta-analysis. Random effects models for 13 of the ACPAs. Multivariable-adjusted models included alcohol intake and pack-years smoking, collected by questionnaire before blood draw. We adjusted for multiple comparisons using Bonferroni adjustment. Spearman correlation was used to determine whether the number of positive ACPA reactivities was associated with the time between blood draw and diagnosis (4 mo–14 yr) among cases only.

Results: Mean time (±SD) from blood draw to diagnosis among cases was 8.4 (±4.8) years in NHS and 5.0 (±2.7) in NHSII. Mean age (±SD) at RA diagnosis was 64.1 (±8.0) and 49.2 (±5.1) years in NHS and NHSII. In NHS, 57.9% and, in NHSII, 53.0% of cases were seropositive at diagnosis. In diagnosis was 64.1 (±7.9) and 53.0% of cases were seropositive at diagnosis. In NHSII, 53.0% of cases were seropositive at diagnosis. In diagnosis, which suggests that epitope spreading occurs within 4 years of diagnosis, the number of ACPAs recognized is associated with time to future RA. The number of ACPAs recognized was associated with the time between blood draw and diagnosis (4 mo–14 yr) among cases only.

Results: Mean time (±SD) from blood draw to diagnosis among cases was 8.4 (±4.8) years in NHS and 5.0 (±2.7) in NHSII. Mean age (±SD) at RA diagnosis was 64.1 (±8.0) and 49.2 (±5.1) years in NHS and NHSII. In NHS, 57.9% and, in NHSII, 53.0% of cases were seropositive at diagnosis. In diagnosis, which suggests that epitope spreading occurs within 4 years of diagnosis, the number of ACPAs recognized is associated with time to future RA. The number of ACPAs recognized was associated with the time between blood draw and diagnosis (4 mo–14 yr) among cases only.

Conclusion: We have demonstrated that several of a panel of ACPAs targeted to the rheumatoid synovium are strongly associated with risk of rheumatoid arthritis (RA, ICD9 code 714.0) was preliminary analysis with rheumatoid arthritis (RA, ICD9 code 714.0) was performed. Following logistic regression modeling, SLE was found to be associated with high exposure (OR 4.81, 95% CI 1.38–16.75, p = 0.043). There was no association between low or moderate uranium exposure and SLE. In the FCC overall, RA occurs at the expected frequency, while SLE is increased by 5-fold over the expected frequency.

Methods: A nested case control study was performed with data from the FCC. The FCC is comprised of voluntarily enrolled individuals who lived during plant operation within 5 miles of a uranium ore processing facility in Fernald, OH and followed from 1990 to 2008, which was after the plant ceased operations. No uranium plant workers are included in this study. Potential SLE cases were identified with searches for ICD9 codes associated with lupus (710.0 and 695.4) and a medication code search for hydroxychloroquine. Sera from potential cases were screened for autoantibodies using the BioPlex 2200 multiplex assay and anti-cardiolipin antibodies using ELISA. Cases were confirmed using an operational definition that included American College of Rheumatology classification criteria and medical record documentation. Four age-, race-, and sex-matched controls were selected for every case. Cumulative uranium exposure was calculated for each individual with a dosimetry model developed by the Centers for Disease Control and Prevention. Covariates in the analysis included smoking history, alcohol intake history, and family history of SLE. Logistic regression was used to calculate odds ratios (OR) with 95% confidence intervals (CI). For comparison, preliminary analysis with rheumatoid arthritis (RA, ICD9 code 714.0) was also performed.

Results: The FCC includes 4,187 individuals with low uranium exposure, 1,273 with moderate exposure, and 2,756 with high exposure. SLE was confirmed in 20 of 26 cases with an ICD9 code of 710.0, in 2 of 5 cases with an ICD9 code of 695.4, and in 2 of 43 other cases prescribed hydroxychloroquine. The female to male ratio among cases was 5:1. Of the SLE cases, 5 were in the low exposure group, 7 in the moderate exposure group, and 12 in the high exposure group. Following logistic regression modeling, SLE was found to be associated with high exposure (OR 4.81, 95% CI 1.38–16.75, p = 0.043). There was no association between low or moderate uranium exposure and SLE. In the FCC overall, RA occurs at the expected frequency, while SLE is increased by 5-fold over the expected frequency.

Conclusion: High uranium exposure is associated with SLE relative to matched controls in this sample of uranium exposed individuals, suggesting that our hypothesis is correct. Potential explanations for this relationship include the estrogen effects of uranium, somatic mutation from ionizing radiation, or effects of some other unidentified accompanying exposure. Whatever the cause for this association, understanding the basis of this relationship is likely to provide important fundamental insight into SLE pathogenesis.

Disclosure: P. Y. Lu, None; L. C. Kottyan, None; S. M. Pinney, None; J. A. James, None; C. Xie, None; J. M. Buckholz, None; J. B. Harley, None.

1607 The Association Between Thyroid Substance and Rheumatoid Arthritis: Results From the Swedish EIRA Study. Camilla Bengtsson1, Henrik Källberg2, Leond Polyakov2 and Saeid Saevardottir2. 1Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, 2Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden. "Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden.

Background/Purpose: Hypothyroidism is usually of autoimmune nature, in areas with sufficient iodine, and leads to chronic substitution treatment with thyroxin. The disease shares some risk factors with ACPA-positive rheumatoid arthritis (RA), i.e. smoking and the PTPN22 risk allele, while different alleles of the HLA-DRB1 locus are associated with these diseases (RA: *01, *04 and *10 (shared epitope, SE); hypothyroidism: *03). We asked whether thyroid substitution was associated with RA overall, the ACPA-positive or ACPA-negative subset, and whether an interaction with SE alleles was present.

Methods: Data from the Swedish population-based EIRA (Epidemiological Investigation of Rheumatoid Arthritis) case-control study was analysed. In total, 1947 incident cases and 2246 randomly selected controls (matched on age, sex, residency), aged 18–70 years, participated in the study. Those who started treatment with thyroxin before the year of onset were compared those without treatment. Participants who reported a history of thyroid cancer (1 case and 1 control) were excluded from the analyses. We calculated odds
Overweight and obesity increase risk of rheumatoid arthritis in women in a large prospective study. Bing Lu1, Chia-Yen Chen2, Linda T. Hiraki1, Jing Cui2, Susan Malspeis3, Karen H. Costenbader4 and Elizabeth W. Karlson1. 1Brigham and Women’s Hospital, Harvard School of Public Health, Boston, MA, 2Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 3Brigham and Women’s Hospital, Harvard School of Public Health, Boston, MA, 4Brigham and Women’s Hospital, Boston, MA, 5Brigham and Women’s Hospital, Boston, MA.

Background/Purpose: Vitamin D has demonstrated immunomodulatory properties with potential etiologic implications for autoimmune diseases including rheumatoid arthritis (RA). However, a causal association between decreased vitamin D levels and increased RA risk has yet to be definitively demonstrated. Cross-sectional studies are not able to rule out reverse causation. We examined the relationship between circulating 25-hydroxyvitamin D (25(OH)D) and incident RA in 2 nested case-control studies, in the Nurses’ Health Study (NHS) and Nurses’ Health Study II (NHSII) cohorts.

Methods: We conducted a nested case-control investigation of incident RA in prospective cohorts the NHS and NHSII. We included 170 cases with blood samples collected from at least 3 months to 14 years prior to RA diagnosis, each matched to 3 controls on age, menopausal status, postmenopausal hormone use, date, time and fasting status of blood draw. 25(OH)D levels measured by chemiluminescence immunoassay. We used conditional logistic regression to calculate the odds ratio (OR) and 95% confidence intervals for incident RA for continuous 25(OH)D, dichotomous levels categorized as insufficient (<20ng/ml) versus sufficient (20–30ng/ml) and quartile cutoffs of 25(OH)D, using age-adjusted and multivariable adjusted models. We repeated the analyses stratified by categories of time between the blood draw and RA diagnosis (3 months < 4 years, 4 years to < 8 years and >8 years). Random effects models were used to meta-analyze estimates of association from the two cohorts.

Results: Incident RA was confirmed in 123 NHS and 47 NHSII participants. Mean age at RA diagnosis was 64.3 ± 7.9 years for NHS and 49.4 ± 5.2 years for NHSII, 60% were rheumatoid factor positive. Mean time from blood draw to RA diagnosis was 8.3 ± 4.8 years for NHS and 5.0 ± 2.7 years for NHSII. Meta-analysis of crude and multivariable-adjusted conditional logistic models did not show significant associations between circulating 25(OH)D levels (continuously, dichotomously or in quartiles) and odds of RA. However, there was a 25% increased odds of developing RA with every 1ng/ml decrease in circulating 25(OH)D [OR 1.25 (95% CI 1.01, 1.54)] among those NHSII women who had blood analyzed between 3 months and ≤4 years prior to RA diagnosis (Table). There was no association between 25(OH)D levels and RA in longer time intervals to diagnosis.

Table. Odds ratios and 95% confidence intervals for rheumatoid arthritis associated with a 1ng/ml decrease in 25-hydroxyvitamin D

<table>
<thead>
<tr>
<th>Continuous</th>
<th>OR (95% CI)</th>
<th>p-value</th>
<th>p-value phototherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>0.94 (0.89, 1.00)</td>
<td>0.02</td>
<td>0.10 (0.05, 0.20)</td>
</tr>
<tr>
<td>Serum</td>
<td>0.96 (0.91, 1.01)</td>
<td>0.03</td>
<td>0.09 (0.04, 0.20)</td>
</tr>
<tr>
<td>Neck-c/ly</td>
<td>0.93 (0.88, 1.00)</td>
<td>0.04</td>
<td>0.02 (0.01, 0.42)</td>
</tr>
</tbody>
</table>

Note: The table above shows the odds ratios and 95% confidence intervals for rheumatoid arthritis associated with a 1ng/ml decrease in 25-hydroxyvitamin D, stratified by serum and neck-c/ly concentration.
1610
The DNA Methylation Signature in Fibroblast-Like Synoviocytes (FLS) Defines Critical Pathogenic Pathways in Rheumatoid Arthritis (RA).
UCSD School of Medicine, La Jolla, CA, NexDX, Inc., San Diego, CA.

Background/Purpose: A DNA methylation signature has been characterized that distinguishes RA FLS from osteoarthritis (OA) and normal (NL) FLS. The presence of epigenetic changes in these cells suggest that rheumatoid FLS imprinting might contribute to pathogenic behaviour. Differentially methylated loci (DML) RA FLS are located in the promoters of numerous genes implicated in RA, including validated therapeutic targets like TNF, CXCL10, and IL-1Ra. To understand how methylated genes might participate in the pathogenesis of RA, we evaluated how DML in RA FLS cluster in the Kyoto Encyclopedia of Genes and Genomes (KEGG) pathways.

Methods: Genomic DNA was isolated from fifth passage RA (n=11), OA (n=11) and normal (NL) (n=6) FLS lines obtained at the time of joint replacement (OA, RA) or from the tissue bank (NL). Methylation was evaluated using the Illumina HumanMethylation450 chip. A Welch’s t-test identified RA vs. OA and RA vs. NL DML using a false discovery rate q-value, cut off of 0.05. Genes containing DML within their promoter regions (-2.5 kb, 500 bp of TSS) were labeled as differentially methylated genes (DMG). The significance of DMG in KEGG human pathways was determined and resulting p-values represented the fraction of randomly selected background gene sets that were at least as enriched in genes found in the tested pathway as the DMG set. A q-value threshold of 0.01 determined significance.

Results: 2019 DMGs in RA FLS were identified for KEGG analysis. 20 out of 252 KEGG pathways were significantly altered with q < 0.01 for RA compared with OA or NL FLS. The greatest differences were in the Focal Adhesion pathway (q=10e-4), with 34 DMG, including key matrix genes (COL1A1,2), signaling genes (MAPK10, PIK3CG and AKT2), and integrins (ITGA4, ITGA7, ITGA10). The Cell Adhesion pathway (26 DMG; q=10e-4), differentially methylated, suggesting that RA FLS imprinted abnormalities could affect adhesion and migration. Additional critical pro-inflammatory pathways implicated in RA were also differentially methylated, including Toll-like Receptors and Complement Cascade. The former encompassed 17 DMG, including differential methylation of TLR1, TLR4, and TLR5 as well as RPK1 and MAP kinases (q=10e-3). The latter included CIQB, C3, C1R1, C4A, C4B, C4BP, and C8A (18 DMG; q=10e-4). Perhaps most intriguing, the pre-defined KEGG “Rheumatoid Arthritis” pathway was significantly different in RA FLS compared to the controls (20 DMG; q=10e-4), while the “Systemic Lupus Erythematosus” pathway was not differentially methylated.

Conclusion: KEGG pathway analysis demonstrates non-random imprinting of RA FLS. The pathways include anomalies in key cell adhesion genes (integrins, focal adhesion) and inflammation genes (signalling and innate immunity). These persistent epigenetic alterations could contribute to the aggressive phenotype of RA synoviocytes and identify potential therapeutic targets that could modulate the pathogenic behaviour.

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ACR Concurrent Abstract Session Genetics and Genomics of Rheumatic Diseases
Monday, November 12, 2012, 2:30 PM–4:00 PM

1611
Targeted Deep Re-Sequencing Implicates Rare and Low Frequency Coding Variants in IL23R, MEFV, TLR4, and NOD2 in Behcet’s Disease.
Yohi Kirino, Qing Zhai, Yoshihiko Ishigatsuho, Nobuhisa Mizuki, Ikunn Tugal-Tutkun, Emrence, Suhiro Takeno, Michael J. Ombrello, Colleen Satorius, Baishali Maskeri, Jim Mullikin, Hong-Wei Sun, Gustavo Gutierrez-Cruz, Younhee Kim, Ahmet Guli, Daniel L. Kastner and Elaine F. Remmers.
National Human Genome Research Institute, National Institutes of Health, Bethesda, MD; Yokohama City University Graduate School of Medicine, Yokohama, Japan; Istanbul, Turkey; Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey; Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey; Institute for Experimental Medicine, Istanbul University, Istanbul, Turkey; National Human Genome Research Institute, National Institutes of Health, Rockville, MD; National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health, Bethesda, MD; National Human Genome Research Institute, National Institutes of Health, Baltimore, MD; Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey.

Background/Purpose: Genome-wide association studies (GWAS) have successfully identified common variants that contribute to Behçet’s disease (BD) susceptibility. However, associations due to rare and low-frequency variants have not been evaluated. It has long been debated whether the innate immune system is involved in the pathogenesis of BD. Clinical manifestations such as episodic inflammation and neutrophil recruitment to the sites of inflammation strongly suggest that the innate immune response plays an important role, although genetic evidence to support this hypothesis is sparse. Recent advances in sequencing technology allow investigators to re-sequence targeted genes to discover novel variants in large collections of cases with complex genetic traits and genetically matched controls.

Methods: We performed de novo re-sequencing of two GWAS-identified genes (IL23R and IL10) and eleven genes known to have roles in innate immunity (IL1B, IL1R1, IL1RN, NLRP3, MEFV, TNFRSF1A, PSTPIP1, CASP1, PYCARD, NOD2, and TLR4) in 382 cases and 384 controls in Japanese population and 384 cases and 384 controls in Turkish population. Non-synonymous variants identified by deep exonic re-sequencing were validated by individual genotyping of 4955 samples. For statistical analyses, we performed C-alpha test, adaptive sum test and step-up methods to identify the roles of rare and low-frequency variants associated with BD.

Results: We found a non-random distribution of rare and low-frequency variants in cases and controls implicating IL23R, MEFV, TLR4, and NOD2 in BD susceptibility. Adaptive sum test and step-up methods corroborated the results for IL23R in both populations and for TLR4 in the Turkish population. Carriage of MEFV-M694V, known to cause recessively inherited familial Mediterranean fever; conferred BD risk in Turkish samples (Cochran-Mantel-Haenszel meta analysis p=1.79×10^-17). These findings support an innate immune and bacterial sensing mechanisms in BD pathogenesis. We are currently extending our re-sequencing efforts to CCR1, KLK1, KLRC1-4, STAT4, and ERAP1, common variants of which we recently identified by GWAS.

Disclosure: Y. Kirino, None; Q. Zhai, None; Y. Ishigatsuho, None; N. Mizuki, None; I. Tugal-Tutkun, None; E. Seyahi, None; O. Yozaygan, None; F. S. Saci, None; B. Erer, None; Z. Emrence, None; A. Cakar, None; D. Ustek, None; A. Meguro, None; A. Ueda, None; M. Takeno, None; J. M. Ombrello, None; C. Satorius, None; B. Maskeri, None; J. Mullikin, None; H. W. Sun, None; G. Gutierrez-Cruz, None; Y. Kim, None; A. Guli, None; D. L. Kastner, None; E. F. Remmers, None.

1612
Ankylosing Spondylitis is Associated with Single Nucleotide Polymorphisms in Loci Implicating Four Aminopeptidases. Philip Robinson, Adrian Cortes, Paul Leo, Australian-Anglo-American Spondylitis Consortium (TASC), Wellcome Trust Case Control Consortium (WTCCC), International Genetics of Ankylosing Spondylitis Consortium (IGAS), David Evans and Matthew A. Brown. University of Queensland Diamantina Institute, Brisbane, Australia; Brisbane, Australia; Wellcome Trust Case Control Consortium, Wellcome Trust Case Control Consortium, United Kingdom; IGAS, Igsa, Australia; Bristol University, Bristol, United Kingdom

Background/Purpose: The aim of the study was to examine regions implicated in autoimmune diseases for association with AS. A previous association with AS has been described in the aminopeptidase ERAP1.
Methods: 9074 European and 1550 east Asian AS cases (defined by the modified New York Criteria), and 13607 European and 1567 Asian controls were studied. Samples were genotyped on the Illumina Infinium Immunochip (196,524 SNVs), clustering performed using OptiCall, and analysis performed using linear mixed modelling (FaST-LMM) to control for population stratification.

Results: 9074 European and 1550 east Asian AS cases (defined by the modified New York Criteria), and 13607 European and 1567 Asian controls were studied. Samples were genotyped on the Illumina Infinium Immunochip (196,524 SNVs), clustering performed using OptiCall, and analysis performed using linear mixed modelling (FaST-LMM) to control for population stratification.

Results: After QC and removal of non-polymorphic variants, 129,030 SNPs remained. The two previously described independent associations in ERAP1 were replicated in the European cohort (rs30187, OR=0.77, p=1.3×10⁻⁴¹; rs10050860, OR=0.77, p=3.2×10⁻³²), and suggestive association was noted with rs30187 in the Asian cohort (OR=0.81, p=2.1×10⁻⁵). rs10050860 was found to have low MAF (0.037) in the Asian cohort and therefore for this SNP in this ethnic group, the study had low power. In the European cohort, controlling for the association with ERAP1, SNPs in ERAP2 and LNPEP were also associated with AS (lead SNP: rs2910686, OR=1.17, p=1.3×10⁻¹⁶). We have previously demonstrated that at ERAP1, GeneX-protective variants are associated with reduced aminopeptidase function. At ERAP2, the AS-protective G allele of rs2248374 causes a complete loss of ERAP2 mRNA and no expression of ERAP2 protein. In HLA-B27 negative AS cases association was observed with the ERAP2 SNP also associated with Crotul’s disease (rs549794, OR=1.2, p=8×10⁻⁷). Genomewide significant association was noted at chromosome 17q22. In a locus encoding the aminopeptidase NPEPPS (rs9801986, p=3.2×10⁻¹⁰) and OR=0.88, a further aminopeptidase involved in peptide trimming prior to HLA Class I presentation.

Conclusion: This study identifies robust association with three loci housing four aminopeptidases, ERAP1, ERAP2, LNPEP and NPEPPS. At ERAP1 and ERAP2, protective genetic associations are associated with reduced aminopeptidase function. This implicates peptide handling as a major mechanism in the aetiology of both HLA-B27 positive and negative AS.

Disclosure: P. Robinson, None; A. Cortes, None; P. Leo, None; W. T. C. C. C., None; I. G. O. A. S. C. (IGAS), None; D. Evans, None; M. A. Brown, None.

1613

The SLE-Associated TLR7 Variant Confers Differential Gene Expression Modulated by Microrna-3148

Yun Deng1, Jian Zhao2, Daisuke Sakurai1, Kenneth M. Kaufman3, Jeffrey C. Edberg4, Robert P. Kimberly5, Diane L. Kamen6, Gary S. Gilkeson7, Chaim O. Jacob8, Robert H. Scofield9, Bevra H. Hahn1, Elizabeth E. Brown3 on behalf of PROFILE and Betty P. Salem, NC, Oklahoma Medical Research Foundation, Oklahoma City, OK, Program, Oklahoma Medical Research Foundation, Oklahoma City, OK, University of Southern California, Los Angeles, CA, 7Arthritis & Clinical Immunology Program, Oklahoma Medical Research Center, Oklahoma City, OK, Charleston, SC, Medical University of South Carolina, Charleston, SC, 3Department of Medicine, University of Virginia, Charlottesville, VA, 3Department of Medicine, University of Oklahoma Health Science Center, Oklahoma City, OK, 10Centro de Genómica e Investigación Oncológica (GENYO) Pfizer-Universidad de Granada-Junta de Andalucia, Granada, Spain, 11Divisions of Genetics and Molecular Medicine and Immunology, King’s College London, London, United Kingdom, 12Department of Internal Medicine, Wake Forest School of Medicine, Winston-Salem, NC, 13Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Oklahoma City, OK, 14Section of Rheumatology and Gwenn Knapp Center for Lupus and Immunology Research University of Chicago, Chicago, IL, 15Department of Human Genetics, University of California Los Angeles, Los Angeles, CA

Background/ Purpose: We established an X-linked TLR7 3’UTR SNP (rs3853839) as a risk locus for SLE in 9,274 Eastern Asians (Pcombined = 6.5×10⁻⁹). Risk-allele carriers have increased TLR7 transcripts and more pronounced IFN signature than non-risk-allele carriers. The current study sought replication of SLE-associated SNP(s) in non-Asian ancestries and explored the molecular mechanism underlying the identified genetic variant that affects TLR7 expression.

Methods: We conducted genotyping and imputation for 67-115 SNPs (varying among different ancestral backgrounds) covering 80kb of TLR7-TLR8 region in European Americans (EA), African Americans (AA) and Hispanics enriched for the Amerindian-European admixture (HS). Each SNP was assessed for the association with SLE. Haploype-based conditional testing was conducted to distinguish independent signals from associated SNPs and Mantel-Haenszel testing was used in the trans-ancestral meta-analysis. Association of genotype and TLR7 expression was examined using the RT-PCR, flow cytometry and reporter assays. Pyrosequencing was used to measure allelic variations in TLR7 transcript level.

Results: Our trans-ancestral fine-mapping confirmed the TLR7 3’UTR SNP rs3853839 as the only variant in TLR7-TLR8 region exhibiting consistent and independent association with SLE (Pcombined = 1.7×10⁻¹⁰ OR [95%CI] = [1.18–1.34]) in 13,339 subjects of EA (3,936 cases vs. 3,491 controls), AA (1,679 vs. 1,534) and HS (1,492 vs. 807) ancestries. The risk allele conferred elevated TLR7 expression in PBMCs from healthy individuals at both mRNA (P = 0.01 in men and 0.02 in women) and protein (P = 0.009 in men and 0.038 in women) levels. PBMCs from heterozygous women exhibited higher G/C allele ratios in TLR7 transcripts 4 hours after incubation with actinomycin D (inhibitor of transcription initiation) than with vehicle control (P = 0.04), indicating a slower degradation of the G allele-containing transcripts. The non-risk allele, but not risk-allele, was predicted to match microRNA-3148 (mir-3148) at the second base in the binding site. Transcript levels of mir-3148 and TLR7 in PBMCs from 16 SLE patients and 21 normal controls were inversely correlated (R² = 0.255, P = 0.001), suggesting modulation of TLR7 expression by mir-3148. Overexpression of mir-3148 via transient transfection into HEK 293 cells led to more than 2-fold reduction in luciferase activity driven by the TLR7 3’UTR segment containing the non-risk allele compared to that containing the risk allele (P = 0.002).

Conclusion: We identified and confirmed a genome-wide significant association between the TLR7 3’UTR SNP and SLE susceptibility in 22,613 subjects of Eastern Asian, European American, African American and Hispanic ancestries (Pcombined = 6.4×10⁻⁹ OR [95%CI] = [1.20–1.32]). Reduced modulation by mir-3148 conferred a slower degradation of the risk allele containing TLR7 transcripts, resulting in elevated levels of gene products and more robust type 1 IFN signature.

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Analysis of the Immunochip in a Large Cohort of Juvenile Idiopathic Arthritis Cases Identifies 17 Loci At Genome-Wide Significance.

Anne Hinkes1, Joanna Cobb2, Miranda C. Marion3, Marc Stidman4, John Bowes1, Kathryn J. A. Steel1, Mehdi Keddache1, John F. Bohnsack1, Stephen Guthery2, Lucy R. Wedderburn3, Johannes Peter Haas,4 David N. Glass,5 Sampath Prahalad6, Carl D. Langefeld7, Wendy Thompson1 and Susan D. Thompson1, 1Arthritis Research UK Epidemiology Unit, University of Manchester, Manchester, United Kingdom, 2Wake Forest School of Medicine, Winston-Salem, NC, 3Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 4Division of Human Genetics, Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 5University of Utah, Salt Lake City, UT, 6University College London (UCL), London, United Kingdom, 7German Center for Pediatric and Adolescent Rheumatology, Garmisch-Partenkirchen, Germany, 8Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 9Emory Children’s Center, Atlanta, GA

Background/ Purpose: Genome-wide (GW) association studies have been hugely successful in the identification of susceptibility loci for autoimmune diseases, involving millions of markers and millions of cases. These diseases are caused by complex genetic variations and the regions identified now require more detailed fine-mapping to localize the associated signal and identify putative functional variants. The Immunochip consortium was established to pool over 180 loci from 12 diseases to include in a custom
genotyping chip. Juvenile idiopathic arthritis (JIA) is the most common arthritic disease of childhood. Candidate gene studies have identified a number of common autoimmune genes that confer susceptibility to JIA. However, JIA has been less well studied using large-scale approaches. This study aimed to perform genotyping on the Immunochip to allow fine-mapping of previously associated regions and to identify novel loci for JIA.

Methods: Genotyping was performed using the Immunochip in a large cohort from the UK, US and Germany comprising a total of 2816 JIA oligoarthritis and RF- polyarthritis cases and 13056 controls. Standard SNP and sample QC was performed, including removing samples with call rate <98%, outliers of mean heterozygosity and ancestral outliers. Each SNP was assessed for departure from an additive genetic model, and analyzed under the most appropriate model (either additive, dominant or recessive) using SNPGWA version 4.0 and adjusting for the top 5 principal components. Within regions reaching the GW significance threshold (P<5×10^{-8}), conditional logistic regression was used to test for independent effects.

Results: This analysis has confirmed loci previously associated with JIA at P<5×10^{-8} (HLA, PTPN22, PTPN12), has strengthened the association of previously other investigated regions (STAT4, ILL2R, IL2RA, SH2B3) and has identified novel regions (ANKRD55, TYK2, IRF1, UBE2L3, LNPED, IL2RB, RUNX1, IL6R, ZFP36LI/RAD51B, FAS) such that all 17 now reach GW significance. The STAT4, PTPN22, IL2RA regions show evidence for multiple independent effects, some of which are low-frequency variants. A further 9 novel loci have been identified at a suggestive level of significance (P<1×10^{-5}). Some showed weak evidence previously (COG6, CCR5) and others have not been associated with JIA to date (RUNX3, LTB, PRM1). The dense-mapping of some loci on the Immunochip along with bioinformatic analysis has refined the association to a single gene for 7 regions.

Conclusion: The Immunochip project enables cost-effective fine-mapping of autoimmune loci in diseases such as JIA. This analysis has confirmed and strengthened the association of previously associated genes as well as identified novel susceptibility loci for JIA. It highlights several crucial pathways, such as the IL2 pathway in JIA disease pathogenesis. Analysis of the Immunochip in this dataset, the largest cohort of JIA cases investigated to date, has greatly increased our knowledge of the genetic basis of susceptibility for JIA.

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1616

Comparison of Conventional and Wholebody Magnetic Resonance Imaging for Assessing Inflammation and Structural Damage in Psoriatic Arthritis and Axial Spondyloarthritis, René Panduro Poggenborg1, Susanne Juhl Pedersen2, Iris Eshed3, Inge Juul Sorensen4, Ole Rintek Madsen5, J.M. Möller6 and Mikkel Østergaard6. 1Copenhagen University Hospital in Glostrup, Copenhagen, Denmark, 2Glostrup Hospital, Copenhagen, Denmark, 3Sheba Medical Center, Tel Hashomer, Israel, 4Copenhagen University Hospital in Gentofte, Copenhagen, Denmark, 5Copenhagen University Hospital in Herlev, Copenhagen, Denmark, 6Copenhagen University Hospital Glostrup, Glostrup, Denmark

Background/Purpose: Wholebody magnetic resonance imaging (WBMRI) is a new imaging modality where patients are scanned from “head to toe” in one single scan, but with a lower resolution than conventional MRI (cMRI). The purpose was to investigate the ability of WBMRI for detection of inflammation and structural damage in psoriatic arthritis (PsA) and spondyloarthritis (SpA), and to compare findings with dedicated cMRI.

Methods: Patients with clinically active peripheral PsA (Moll and Wright, n=19) or axial SpA (ESSG, n=19) and healthy subjects (HS, n=12) were included. WBMRI was assessed for synovitis, bone marrow oedema (BME), and bone erosions at sites included in the 78-tender joint count (TJC). Furthermore, WBMRI fat infiltration, BME and bone erosions were evaluated in 23 discovertebral units (DVUs) and in sacroilitic joints (SIJ) (8 quadrants). Wholebody imaging was performed using 3 Tesla MRI units with the built-in bodycoil (sagittal and coronal T1-weighted pre/post-contrast and STIR sequences), and 1½ Tesla cMRI (SpA and HS: of spine and SIJ; PsA and HS: unilateral) were performed using T1w pre/post-contrast and STIR sequences. The PsAMRIS-hand method (1) was used for scoring synovitis in finger joints in PsA and HS.

Results: Characteristics median (range): PsA/SpA/HS age 49 (23–79)/42 (26–61)/32 (20–61) yrs; PsA/SpA disease duration: 4(0–34)/17(5–48) yrs; 78-TJC: 11 (3–65)/3 (0–17), 76-swollen joint count: 5 (0–20)/1 (0–5), and BASDAI score 45 (9–85)/55 (2–93) mm.

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By WBMRI more than 97% of spinal DVUs and SIJ quadrants could be evaluated, whereas evaluation of peripheral joints for synovitis and BME was possible in 66% and 55% of joints, respectively. It was possible to evaluate 56% of the finger joints with WBMRI. BME assessed in 78 joints by WBMRI was significantly more frequent in PsA/SpA than in HS (p < 0.005, see table). We found no statistically significant difference between groups in WBMRI synovitis assessed in all 78 joints, or only assessed in hand joints. In contrast, PsAMRIS-hand synovitis (scored 0–36) assessed by cMRI was higher in PsA than HS (p < 0.0005).

The table shows median (range) scores of WBMRI and cMRI findings in joints, DVUs, and SIJ quadrants.

<table>
<thead>
<tr>
<th>Joint</th>
<th>WBMRI</th>
<th>cMRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist</td>
<td>2 (0–8)</td>
<td>1 (0–4)</td>
</tr>
<tr>
<td>Forearm</td>
<td>1 (0–2)</td>
<td>1 (0–2)</td>
</tr>
<tr>
<td>Elbow</td>
<td>1 (0–2)</td>
<td>1 (0–2)</td>
</tr>
<tr>
<td>Hand</td>
<td>2 (0–4)</td>
<td>1 (0–2)</td>
</tr>
</tbody>
</table>

Synovitis was most frequent in 1-carpometacarpal joints (CMC), the tarsometatarsal (TMT) and shoulder joints (92%, 67%, 63% and 61%, respectively). BME was most frequently present in CMC, wrist, shoulder and the acromioclavicular joints (65%, 45%, 33% and 35%, respectively). Erosions were seen primarily in the wrist, MTP, CMC, shoulder and TMT joints (19%, 18%, 16%, 10% and 10%, respectively).

In the spine abnormal findings were less frequent. BME was seen in all cervical disko-vertebral units (DVUs) (7%) of evaluated cervical DVUs), and in a few DVUs in the thoracolumbar spine (3% of evaluated thoracic- and lumbar DVUs). Fat infiltrations were found in the cervical and lumbar (but not thoracic) spine (3% of evaluated cervical and lumbar DVUs), and erosions were only seen in a single patient in the lumbar spine.

The most frequently involved entheses were those at greater trochanter, calcaneus, greater tuberosity of the humerus, medial condyle of the femur, and upper patella (60%, 26%, 26% and 13%, respectively, readability 75–100%). The entheses at costo-sternal joints 1 and 7, elbow, lower patella and ulna were only seen in 40%, 10%, 25–35%, 5% and 0% of cases, respectively.

MRI findings (synovitis and BME) and clinical findings (tenderness and swelling) were not correlated, neither on the patient level (counts of involved joints) nor consistently on the level of individual joints.

**Conclusion: Inflammation (synovitis and BME) in peripheral and axial joints could be identified by WBMRI, and was more frequent than detected clinically. 3T WB-MRI is a promising tool for evaluation of disease manifestations in RA patients. Optimization of positioning of the feet and hands and acquisition of images is needed.**

**Methods:** This study was performed on 186 patients suffering from IBD now the prevalence of sacroiliitis in this same population was studied only on Monday, November 12.

**Background/Purpose:** To investigate the ability of whole-body magnetic resonance imaging (WBMRI) to visualize synovitis, bone marrow edema and erosions in patients with rheumatoid arthritis (RA). WBMRI was performed in 20 patients with RA (14/6 women/men, median age 54 [range 21–76] years, disease duration 6 [1–20] years) and at least 1 swollen or tender joint. Imaging time was 1 hour 25 min. STIR and pre- and post contrast T1-weighted images were defined according to ASAS (Assessment of SpondyloArthritis international Society) criteria. The secondary objective was to study the association between sacroiliitis and clinic-biologic parameters in IBD.

Methods: This study was performed on 186 patients suffering from IBD followed in a gastroenterology department between 2004 and 2011: 131 with Crohn’s disease (CD) (70.4%) and 55 with ulcerative colitis (UC) (29.6%). Clinico-biological and endoscopic data were collected and MR enterography or colonography was performed to assess IBD.

Two injected T1-weighted sequences with fat saturation (FS) were used for the whole population: a coronal LAVA (liver acquisition with volume acceleration) sequence and an axial SPGR (spoiled gradient recalled) sequence. An additional injected axial LAVA sequence with FS was performed in 138 patients. On digestive MRI, sacroiliitis was scored blindly by two independent readers, a rheumatologist and a radiologist, according to ASAS criteria. The SIJ were graded bilateral, unilateral, normal and doubtful. In cases of discordance, the final diagnosis was obtained by consensus. The association between sacroiliitis and the clinico-biologic and radiological parameters of the digestive disease was analyzed by Fisher’s exact test or the chi-square test (qualitative variables) and by Wilcoxon’s test (quantitative variables) with a p value < 0.05 as significant.
Results: The prevalence of inflammatory sacroiliitis was 16.7% (31 patients). SJIs were considered as normal in 144 cases (77.4%) and doubtful in 11 cases (5.9%). Female gender in CD (p=0.01) and advanced age in both diseases (p=0.03) were associated with sacroiliitis on MRI. Disease duration tended to be associated with sacroiliitis (p=0.06), while other parameters such as the type of IBD, localization and extension of IBD, surgical history, biological inflammation, digestive activity, and type of treatment were not associated with sacroiliitis on digestive MRI.

Conclusion: This study demonstrated for the first time the feasibility of using digestive MRI to establish the diagnosis of inflammatory sacroiliitis according to the ASAS criteria. Inflammatory sacroiliitis was evidenced by MRI in 1/6 patients suffering from IBD. This prevalence of sacroiliitis is probably underestimated due to technical and clinical factors evidenced by MRI in 1/6 patients suffering from IBD. This prevalence of inflammatory sacroiliitis by MRI in 1/6 patients suffering from IBD. However, when a clinical or laboratory parameter for neck pain or cervical spine mobility was added, only 3 patients (15.8%) had BME in the corpus. In the more detailed analysis of the total of 240 evaluated vertebral bodies, 27 (11.3%) vertebral bodies had degeneration and in 129 vertebral bodies had degeneration and in the processus spinosus (45.8%). Degenerative changes were seen in 21/40 patients (52.5%). Of those 21 patients, all (100%) had also signs of BME in the corpus, while from the 19 patients without degenerative changes, the correlation between the amount or the extension of BME and clinical or laboratory parameters for neck pain or cervical spine mobility by MRI at different locations in the cervical spine. Assessment of the presence of BME in the atlantoaxial region is important in clinical practice, in addition to degenerative changes, its presence seems to influence the intensity of neck pain reported by these patients.

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Background/Purpose: Despite the differences in the pathogenesis of rheumatoid arthritis (RA) and ankylosing spondylitis (AS), neck pain is a frequent clinical symptom in both diseases that was recently shown to correlate with disease activity. In this study, we evaluated the correlation between subjective reports of neck pain and objective signs of inflammation by quantification of bone marrow edema (BME) as detected by MRI in patients with RA and AS.

Methods: MR images (STIR sequence) of the cervical spine were acquired together with clinical and laboratory data of 40 patients (34 RA, 6 AS) who had participated in the recently presented CASSANDRA trial. MRI were assessed by two readers who were blinded for clinical data using a recently published MRI scoring system, with quantification of the extent of BME in the atlantoaxial region, corpus, facet joints and processus spinosus of all cervical vertebrae, ranging from 0–57 points. In addition, presence or absence of degenerative changes was also recorded.

Results: Baseline characteristics, neck pain and MRI scores did not differ between RA and AS patients. The mean age was 57.5±11.8 years, 33/40 patients (82.5%) were female, the mean symptom duration for neck pain was 10.6±8.8 years, cervical rotation 51.0±17.2 degrees, CRP 0.9±2.1 mg/dl, ESR 19.8±26.6 mm/1h, FFbH 58.1±26.3 and the Northwick Park score was 46.0±17.5. BME was detected in 24/40 patients (60%), 5 of which (20.8%) had atlantoaxial involvement, 18 had BME in the vertebral body (75%), 7 in the facet joints (29.2%) and 11 in the processus spinosus (45.8%). Degenerative changes were seen in 21/40 patients (52.5%). Of those 21 patients, all (100%) had also signs of BME in the corpus, while from the 19 patients without degenerative changes, only 3 patients (15.8%) had BME in the corpus. In the more detailed analysis of the total of 240 evaluated vertebral bodies, 27 (11.3%) vertebral bodies had degeneration and in 129 vertebral bodies had degeneration and in the processus spinosus (45.8%). Degenerative changes were seen in 21/40 patients (52.5%). Of those 21 patients, all (100%) had also signs of BME in the corpus, while from the 19 patients without degenerative changes, only 3 patients (15.8%) had BME in the corpus. In the more detailed analysis of the total of 240 evaluated vertebral bodies, 27 (11.3%) vertebral bodies had degeneration and in parallel inflammation in the corpus, while 24 (10%) had only degeneration, 11 (4.6%) had only inflammation in the corpus, and 178 (74.2%) had neither lesion. There was no correlation between the amount or the extension of BME and clinical or laboratory parameters for neck pain or cervical spine mobility. However, a significant difference (p=0.038) was found for BME scores of patients with a pain intensity (0–10 NRS) of ≥ (5.8±6.5 scoring points) vs. < 5 (5.8±6.5 scoring points). This was partly dependent on scores for the atlantoaxial region, although the mean number of scoring points did not differ. The correlation between readers was excellent (regression coefficient 0.942).

Conclusion: This study shows that the majority of patients with RA and AS had objective signs of BME but also degenerative changes as assessed by MRI at different locations in the cervical spine. Assessment of the presence of BME in the atlantoaxial region is important in clinical practice, in addition to degenerative changes, its presence seems to influence the intensity of neck pain reported by these patients.

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Background/Purpose: Early predictors of progression in structural joint damage in RA are lacking. We evaluated if early MRI measures of inflammation and erosion at baseline, 12 and 24wks could predict subsequent progression in structural damage as measured by standard x-ray at 1 and 2 yrs of follow-up among 256 pts from GO-BEFORE, a large randomized trial of golimumab + MTX vs MTX alone in RA pts who were MTX-naïve.

Methods: Methods and results of the original trial have been published 1. MRI (contrast-enhanced; 1.5T) of the wrist and the 2nd-5th metacarpal phalanges of the dominant hand at baseline and wks 12, 24, 52, and 104 were obtained. MRI were scored by 2 independent, blinded readers using the RA MRI Scoring (RAMRIS) system. X-rays (hands, wrists, forefoot at baseline, wks2, and104) were scored by 2 other, blinded readers using vdHS system. X-ray progression was defined as a change in vdhS score > 0.5 at week 52 when it was part of the original trial. MRI synovitis and bone edema scores were evaluated as continuous variables (per unit difference or change). Change in RAMRIS bone erosion scores was highly skewed, and was therefore dichotomized at >0.5. Multivariable logistic regression was used to determine if baseline and early measures of change in component RAMRIS scores predicted x-ray progression independent of clinical disease activity [DAS28(CRP), change in DAS28(CRP), age, sex, baseline vdhS score, and treatment group.

Results: Higher baseline synovitis scores and less improvement in synovitis over the first 24 wks of follow up were both significantly and independently associated with a greater risk of x-ray progression at 1- and 2yrs (Table). Higher baseline bone edema and less improvement in bone edema were independently associated with a greater risk of x-ray progression at 1yr, and tended to be associated with progression at 2yrs. An increase in RAMRIS bone erosion score >0.5 at wk 24 significantly predicted x-ray progression at 1- and 2 yrs. Baseline and wk12 changes in MRI scores all significantly predicted x-ray progression at wk 52 (all p<0.05), and tended to be associated with x-ray progression at wk 104 (p=0.004–0.2).

Table. Multivariable-adjusted risk of x-ray progression at 1- and 2 years of follow-up based on early MRI measures at 24 wks (per 1 unit difference or change in respective RAMRIS score)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>vdhS Score Progression at Wk 24</td>
<td>1.14 (1.04–1.24)</td>
<td>0.003</td>
</tr>
<tr>
<td>vdhS Score Progression at Wk 24</td>
<td>1.19 (1.06–1.33)</td>
<td>0.002</td>
</tr>
<tr>
<td>Model 1*</td>
<td>0.105 (1.01–1.09)</td>
<td>0.02</td>
</tr>
<tr>
<td>Model 2*</td>
<td>1.12 (1.05–1.19)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*adjusted for age, sex, DAS28(CRP) at baseline, change in DAS28(CRP) over the first 24wks, vdhS score at baseline, and treatment group.

Conclusion: Early MRI measures at 12 and 24 wks independently predict x-ray changes at 1 and 2yrs of follow-up. These data support the use of MRI in clinical trials for early identification of pts with (OR who will develop) structural joint damage progression during follow up. This is the first study to show synovial metabolic activity and inflammation quantified by MR/PET are associated with in vivo hypoxia, cellular and molecular biomarkers in RA and PsA patients in response to biologic therapy. MR/PET may represent an important new imaging modality in assessing response to biologic therapy.

Disclosure: L. C. Harty, None; J. Ryan, None; C. T. Ng, None; M. Biniecka, None; A. Kennedy, None; E. J. Heffernan, None; U. Fearon, None; D. J. Veale, Roche Pharmaceuticals, 5, Pfizer Inc, MSD, Bayer, 5, Pfizer Inc, MSD, Medimmune, 8.

ACR Concurrent Abstract Session
Infection-related Rheumatic Disease
Monday, November 12, 2012, 2:30 pm–4:00 pm

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In Vivo Synovial Oxygen Levels Are Inversely Related to Metabolic Turnover and Disease Activity in Rheumatoid and Psoriatic Arthritis

Biologic Responders: Leonard C. Harty1, John Ryan2, Chin Teck Ng3, Monika Biniecka4, Aisling Kennedy5, Eric J. Heffernan4, Ursula Fearon5 and Douglas J. Veale1. 1Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland, 2Ziltron, Unit 4, Castletroy Business Park, Plassey, Limerick, Ireland, 3Translation Rheumatology Research Group, Dublin, Ireland, 4St. Vincent’s University Hospital, Dublin, Ireland, 5Translation Research Group, Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: Hypoxia, leukocyte infiltration and dysfunctional vascularity play a key role in the pathogenesis of inflammatory arthritis (IA). We examine the relationship of metabolic turnover with synovial vascularity/invansion in IA patients.

Methods: RA and PsA patients with active knee joint synovitis were recruited and assessed clinically prior to contiguous MR and PET/CT imaging followed by arthroscopy, biopsy and pO2 measurement pre-and post-TNFÎ± therapy. Imaging protocols were standardised for MRI, and Fluorodeoxyglucose (18FDG) PET and image-data intensity resolution was optimised for microscopic measures of disease. Furthermore pO2 levels in non-responders were similar pre/post therapy (22mmHG vs 25mmHG). Figure 1 shows reduction of DAS28 ≥1.2 and, gender 6F:15M) were recruited. At baseline in vivo synovial pO2 levels inversely correlated with PET (r=-0.6, p=0.03), DAS28 (r=-0.5, p=0.05) and was inversely associated with macroscopic synovitis. Furthermore, MRI correlated with macroscopic synovitis (r=-0.5, p=0.04) and sub-lining CD68 expression (r=-0.7, p=0.001). Lining layer and sub-lining GAPDH expression inversely correlated with synovial pO2 (r=-0.8, p=0.03). Biologic responders showed significant reduction in PET quantification (p<0.018) which was paralleled by corresponding decreases in MRI (p<0.012), macroscopic synovitis (p=0.005), vascularity (p=0.005) and CD68sI expression (p=0.01) and an increase in pO2 levels from 22mmHG to 37mmHG. In contrast PET quantification in non-responders was not associated with significant reductions in MRI or macroscopic/microscopic measures of disease. Furthermore pO2 levels in non-responders were similar pre/post therapy (22mmHG vs 25mmHG), Figure 1 shows representative PET/MRI hybrid images in a responder patient pre/post TNFi demonstrating close association between metabolic turnover and site of inflammation.

Figure 1. Hybrid PET/MRI images from the same patient before and after successful therapy demonstrating reduced inflammation and metabolism within the synovium of the knee joint.

Objectives: To analyze the features of patients with infectious mixed CryoVas in the absence of HCV infection included in the French CryoVas survey. The objective of this survey is to describe the presentation and to evaluate efficacy and tolerance of treatments in patients with CryoVas. The 18 patients presented with infectious mixed CryoVas. Demographical, clinical and biological features of patients with infectious mixed CryoVas in the absence of HCV infection.

Methods: Eighty-one French centers of Internal Medicine, Nephrology, Rheumatology, Hematology, Dermatology and Neurology from University and general hospitals have included 260 patients with non-HCV mixed CryoVas diagnosed between January, 1995 and July, 2010. Among them, 18 patients presented with infectious mixed CryoVas. Demographical, clinical and biological data, as well as therapy and outcome, were assessed.

Results: 11 women and 7 men (sex ratio F/M 1.3), mean age 57.9 ±13.5 years, were analyzed. Infectious causes were: virus infection in 8 patients [hepatitis B virus (HBV) in 4, and cytomegalovirus, Epstein Barr virus, parvovirus B19 and human immunodeficiency virus in one case each], pyogenic bacterial infection in 6 patients, parasitic infection in 2 patients (ascariasis and leishmaniosis in one case each), and leprosy and candidiasis in one case each.

Baseline manifestations were: purpura (78%), glomerulonephritis (28%), arthralgia/arthritis (28%), peripheral neuropathy (22%), necrosis (22%), cutaneous ulcers (17%), and myalgia (11%). No gastrointestinal, central nervous system or pulmonary involvement was observed. Cryoglobulinemia was type II in 12 patients (67%) and type III in 6 (33%). Histological confirmation of vasculitis was available in 72%. As first-line therapy, 6 patients received corticosteroids, 1 cyclophosphamide and none rituximab, but 14 patients received anti-infectious specific therapy. Among the latter, 10 were in sustained remission of the disease, 2 died of the underlying infectious disease (bacterial septicaemia and Candida pneumonia), and 2 had refractory or relapsing disease related to HBV infection treated with rituximab in addition to anti-viral therapy, leading to complete remission. The 4 remaining patients who did not receive specific therapy had cytomegalovirus, Epstein Barr virus, parvovirus B19 and HBV infection, and remained in remission of the CryoVas.
**Conclusion:** In patients with infectious mixed cryoglobulinemia vasculitis in the absence of HCV infection, virus and pyogenic bacterial infections represent the main causes. Anti-infectious specific therapy is most frequently associated with sustained remission of the disease. Thus, immunosuppressive agents should be considered only in second-line in patients with refractory and/or life-threatening vasculitis.

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**1623**

**Serum Biomarkers Signature Identifies Patients with Overt B-Cell Non-Hodgkin Lymphoma Associated with Mixed Cryoglobulinemia in Chronic HCV Infection.** Benjamin Terrier Sr.1, Wahiba Chaara2,3, Guillaume Geri3, David Saadoun4, Michelle Rosenzwajg Sr.3, Damien Sene Sr.6, Adrien Six2, David Klatzmann Sr.5 and Patrice Cacoub Sr.7.

1Cochin Hospital, Paris, France, 2Laboratory I3 “Immunology, Immunopathology, Immunotherapy”, UMR CNRS 7211, INSERM U959, Groupe Hospitalier Pitié-Salpêtrière, Paris, France, 3CHU Pitié-Salpêtrière, Paris, France, 4Department of Internal Medicine and Laboratory I3 “Immunology, Immunopathology, Immunotherapy”, UMR CNRS 7211, INSERM U959, Groupe Hospitalier Pitié-Salpêtrière, Université Pierre et Marie Curie, Paris 6, Paris, France, 5Laboratory I3 “Immunology, Immunopathology, Immunotherapy”, UMR CNRS 7211, INSERM U959, Groupe Hospitalier Pitié-Salpêtrière, Université Pierre et Marie Curie, Paris 6, Paris, France, 7Groupe Hospitalier Pitié-Salpêtrière, Université Pierre et Marie Curie, Paris, France

**Background/Purpose:** Hepatitis C virus (HCV) is associated with B-cell disorders, including mixed cryoglobulinemia (MC) and B-cell non-Hodgkin lymphoma (B-NHL). Early diagnosis of B-NHL in HCV-infected patients, in particular those with MC vasculitis, is critical to determine the optimal therapeutic management.

**Aim:** We hypothesized that combination of serum biomarkers could be used to identify B-NHL associated with MC in patients with chronic HCV infection.

**Methods:** 155 HCV infected patients have been included [median age 62 (31–85) years, M/F 70/85], with and without MC and/or B-NHL [57 patients without MC, 17 patients with asymptomatic MC, 62 patients with MC vasculitis, and 19 patients with MC and B-NHL]. We measured serum levels of 8 markers previously described to be increased in patients with B-NHL i.e. soluble CD22, soluble CD27, soluble IL-2Ra, soluble CD137, free-light chains of immunoglobulins, heavy chains of immunoglobulins, gammaglobulins and C4 complement fraction. We used a multiparametric analysis in order to determine a signature that identifies patients with overt B-NHL associated with MC in chronic HCV infection.

**Results:** Serum levels were significantly different between patients without MC, patients with asymptomatic MC, patients with MC vasculitis and those with MC vasculitis and B-NHL: soluble CD22 (6.7 vs. 11.9 vs. 20.8 vs. 36.4 ng/ml, P<0.0001), soluble CD27 (71.9 vs. 75.7 vs. 122.9 vs. 263.9 ng/ml, P<0.0001), soluble IL-2Ra (877 vs. 935 vs. 2206 vs. 4044 pg/ml, P<0.0001), soluble CD137 (296 vs. 426 vs. 539 vs. 763 pg/ml, P<0.0001), free-light chains of immunoglobulins (ratio k/λ 1.13 vs. 1.08 vs. 1.79 vs. 3.01, P<0.0001), heavy chains of immunoglobulins (ratio IgMk/IgMl 1.90 vs. 1.85 vs. 4.85 vs. 31.3, P<0.0001), gammaglobulins (14.1 vs. 17.0 vs. 12.1 vs. 6.0 g/l, P<0.0001) and C4 complement fraction (0.23 vs. 0.16 vs. 0.07 vs. 0.04 g/l, P<0.0001).

Using multiparametric analysis, we identified a signature involving soluble CD27, soluble IL-2Ra, gammaglobulins and C4 levels associated with the presence of overt B-NHL in HCV-infected patients. This signature had a sensitivity of 100%, a specificity of 63%, and positive and negative predictive values of 94 and 100% for discriminating patients with overt B-NHL and those without B-NHL.

**Conclusion:** Overall, our data indicate that serum biomarkers signature allows identifying patients presenting with overt B-NHL associated with mixed cryoglobulinemia vasculitis in chronic HCV infection, and requiring invasive explorations in order to demonstrate the presence of malignant lymphoma.

**Disclosure:** B. Terrier Sr., None; W. Chaara, None; G. Geri, None; D. Saadoun, None; M. Rosenzwajg Sr., None; B. Sene Sr., None; A. Sis, None; D. Klatzmann Sr., None; P. Cacoub Sr., None.
Methods: Clodronate liposomes (CL) were used to deplete peritoneal macrophages with PBS-liposomes (PL) acting as the control. Clodronate did not affect neutrophil or lymphocyte populations. Subsequent to macrophage depletion mice were infected IP with 107 IU Chlamydia muridarum for either 7 or 14 days. Spleens, peritoneal lavage, peritoneal membranes and blood were harvested for analysis of immune response and Chlamydia load.

Results: There was no mortality, nor signs of systemic disease associated with Chlamydia challenge in macrophage-depleted mice. Inspection of peritoneal cavity cells at day 7 demonstrated depletion of CD11b+ F4/80+ macrophages (PL: 50% of cells; CL: 5% of cells) and a significant increase in CD11b+Ly6G+ neutrophils (PL: 10% of cells; CL: 60% of cells) was seen in the mice treated with clodronate liposomes. This was coupled with a 5-fold increase in Chlamydia 16sRNA load of these cells as assessed by qPCR. 16sRNA was only detected in blood samples only in the macrophage-depleted mice, reflecting dissemination of the organism beyond the site of local challenge. At day 14 post Chlamydia infection, depletion of macrophages was associated with a significant alteration of the adaptive immune response profile, with reduced numbers of Th1 cells and activated IFNγ+, CD8+ cells. This was coupled with a 20-fold increase chlamydial load compared to control mice.

Conclusion: These data indicate that macrophages are crucial in defining effective host innate immune response to Chlamydia and thereby limiting dissemination of the organism. In addition, macrophages orchestrate the development of effective adaptive host response to the organism. These studies suggest that quantitative or qualitative alteration in macrophages may play a key role in the development of post-Chlamydia sequelae such as reactive arthritis.

Disclosure: E. Gracey, None; R. D. Inman, None.

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New Insights Into the Presentation and the Management of Hepatitis B Reactivation in Patients with Autoimmune Diseases and Inflammatory Arthritis. Nina Droz4, Laurent Gilarin4, Patrice Cacoub Sr.3, Francis Berenbaum4, Daniel Wendling5, Bertrand Godeau1, Anne-Marie Piette2, Marionneau Dennis1, Mikhail Ebb3, Bruno Fauriel9, Arsinee Meikinian1, Aude Rigolet12, Sophie Riviere13, Stanislas Pol1, Loic Guivelvin14, Luc Mouthon Sr.15 and Benjamin Terrier Sr.1. 1Cochin Hospital, Paris, France, 2Saint Antoine Hospital, Paris, France, 3CHU Pitie-Salpetriere, Paris, France, 4AP-HP, St Antoine Hospital, Paris, France, 5Minjoz University Hospital, Besancon, France, 6Service de medicine interne, Universite´ Paris Est Creteil, AP-HP, Hˆopital M¨ondor Creteil, France, Creteil, France, 7Fo¨ch Hospital, Suresnes, France, 8Centre Hospitalier, Le Mans, France, 9Conception Hospital, Marseille, France, 10APHP-Pitie Salpetriere Hospital/UPMC, Paris, France, 11Jean Verdier Hospital, Bondy, France, 12Pitie-Salpetriere Hospital, APHP, UPMC Paris VI, Paris, France, 13Lapeyronie, Montpellier, France, 14Department of Internal Medicine, Referral Center for Rare Autoimmune and Systemic Diseases, Hˆopital Cochin, AP-HP, Universite´ Paris Descartes, Paris, France, Paris, France, 15Hospital Cochin, Paris, France

Background/Purpose: In patients with autoimmune diseases and inflammatory arthritis, immunosuppressive therapy may trigger Hepatitis B virus (HBV) reactivation, leading to significant morbidity and mortality.

Objective. To describe presentation, management and outcome of HBV reactivation occurring in patients treated for autoimmune diseases and inflammatory arthritis, and to evaluate predefined algorithm for its prevention.

Methods: French centers of Internal Medicine, Rheumatology and Hepatology have included 35 patients with HBV reactivation diagnosed between January, 2002 and March, 2012. HBV reactivation was defined as an increase >1 log IU/mL of HBV DNA levels or DNA reappearance in negative patients. Hepatitis was defined as an increase >3-fold the baseline value of alanine transaminase (ALT). We further performed an extensive literature review and provided a global analysis of 138 cases of HBV reactivations.

Results: Personal cases were treated for rheumatoid arthritis (RA, n=14), connective tissue disease (n=7), vasculitis (n=5), ankylosing spondylitis (n=4) or other diseases (n=5). At baseline, 23 (66%) patients were hepatitis B surface antigen (HBsAg) carriers, 11 had previous history of HBV infection (including 7 with HBs antibodies), and 1 patient had occult HBV infection. Reactivation occurred after a median time of 39 wk after initiation of corticosteroid (CS) and/or immunosuppressive (IS) therapy. At the time of reactivation, 30 (86%) patients were receiving CS, 11 (31%) methotrexate, 7 (20%) TNF-α blockers, 6 (17%) cyclophosphamide, 4 (11%) rituximab, 4 (11%) azathioprine, and tocilizumab and abatacept in 1 case each (3%). Median HBV DNA and ALT levels were 4.2 log IU/mL and 2-fold the baseline value, respectively, and were correlated (r=0.49, P=0.004). Patients were clinically asymptomatic in 31 (89%) cases, while hepatitis occurred in 17 (49%), including severe hepatitis (>10-fold the baseline value) in 9 (26%). Management consisted in antiviral therapy in 32 (91%) patients, associated with discontinuation or decrease of CS/IS in 16 (46%). Neither fulminant hepatitis was noted, but one patient died of hepatocellular carcinoma.

After global analysis of HBV reactivations, reported patients were clinically asymptomatic in 102 (74%) cases, with severe hepatitis in 46 (33%) and death and/or fulminant hepatitis in 17 (12%). Reactivation kinetics differed according to the treatments used and baseline HBV status, with earlier reactivation occurring under rituximab or cyclophosphamide and in HBsAg+/HBV DNA+ patients. The use of predefined algorithm could have prevented 108 (78%) reactivations. Two reactivations occurred despite appropriate preemptive antiviral therapy. Finally, according to the algorithm, 28 patients would not have received preemptive therapy, including 2 HBcAb+/HBsAb+ Asian patients with RA receiving methotrexate or adalimumab who died of fulminant hepatitis.

Conclusion: This study provides new insights into HBV reactivations in patients with autoimmune diseases and inflammatory arthritis. Predefined algorithm seems to be effective to reduce the risk of HBV reactivation, but care is warranted using monitoring of HBV markers.

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Epistatic Interaction Between Solute Carrier 249 Genotype and Sugar-Sweetened Beverage Consumption in the Determination of Gout Risk.

Tony R. Merriman1, Nicolas Dahmb, Peter J. Gow3, Andrew Harrison4, John E. Morrison5, Peter B. B. Jones3, Lisa K. Stamp3, Murray Cadzow3, Marilyn E. Merriman1, Ruth Topless1, Michael A. Black1, Amanda Phipps-Green1, and Caitlin M. Bitt1.

1University of Otago, Dunedin, New Zealand, 2University of Auckland, Auckland, New Zealand, 3Middlemore Hospital, Auckland, New Zealand, 4Hutt Hospital, Lower Hutt, New Zealand, 5University of Otago Med Sch, Dunedin, New Zealand, 6Waikato Clinical School, Waikato Hospital, Hamilton, New Zealand, 7University of Otago, Christchurch, Christchurch, New Zealand

Background/Purpose: Consumption of drinks sweetened with sugar or high fructose corn syrup increases both serum urate levels and the risk for gout.

SLC249 encodes a renal urate transporter that exchanges uric acid for glucose and fructose. Genetic variants in SLC249 explain 3.5% of the variation in serum urate levels in European Caucasian (EC) populations and are strongly associated with gout in EC and New Zealand (NZ) Maori and Pacific Island (Polynesian) people. Because SLC249 transports both uric acid and simple hexose sugars we tested the hypothesis that SLC249 genotype and sugar-sweetened beverage (SSB) consumption interact to determine the risk for gout.

Methods: NZ survey data from 1623 people with and without gout were used. Gout was defined as a can or large glass. Data from the Atherosclerosis Risk in Communities (ARIC) study were also used (6003 EC controls and 153 primary gout cases determined by self-report). Two ancestral groups were studied: EC (NZ and ARIC) and NZ Polynesian. The NZ samples were genotyped for SLC249 single nucleotide polymorphism (SNP) rs11942223 using Taqman® technology. The ARIC samples had previously been genotyped for surrogate marker rs6440173.

STATA v8.0 statistical software was used, with an interaction term included in the logistic regression analysis, derived from the ratio of the estimated odds ratio (OR) comparing exposed (≥4 SSB/day) and unexposed (<4 SSB/day) rs11942223 risk allele (T) homozygotes with the estimated OR comparing exposed and unexposed people positive for the rs11942223 protective allele (C).

Results: The risk of gout associated with consuming ≥4 SSB/day without stratification by genotype was similar to the increased genetic risk observed in the T-allele homozygous groups (Table). However the normally protective C-allele conferred a considerable increase in risk for gout in individuals exposed to ≥4 SSB/day (for example OR increased from 0.51 to 4.93 in Polynesian. The genotype by interaction term (ORI) was significant in Polynesian (ORI = 5.31, P = 0.043) but not in EC (ORI = 5.31, P = 0.087) (all adjusted by sample set, age, sex, BMI). Combining the two groups revealed significant evidence for interaction (ORI=4.74, P = 0.003).

Table. Risk of gout for ≥4 SSB/day stratified by genotype at SLC249

<table>
<thead>
<tr>
<th>European Caucasian</th>
<th>Polynesian (Maori/Pacific Island)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohs OR</td>
<td>P</td>
</tr>
<tr>
<td>≥4 SSB/day group unstratified</td>
<td>6735</td>
</tr>
<tr>
<td>C-allele homozygous, &lt;4 SSB/day</td>
<td>6655</td>
</tr>
<tr>
<td>C-allele positive, &lt;4 SSB/day</td>
<td>0.63 [0.28–1.37]</td>
</tr>
<tr>
<td>C-allele homozygous, ≥4 SSB/day</td>
<td>1.18 [0.46–2.93]</td>
</tr>
<tr>
<td>C-allele positive, ≥4 SSB/day</td>
<td>3.91 [1.04–20.70]</td>
</tr>
</tbody>
</table>

1. ORs were adjusted by BMI, age, sex, data set.

Conclusion: When exposed to high SSB consumption individuals with the normally gout-protective allele at rs11942223 have a considerably elevated risk of gout. Our data suggest that SLC249-mediated uric acid transport is physiologically influenced by excess simple sugars derived from SSB, with excess SSB consumption negating the gout-risk discrimination normally mediated by rs11942223.

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1Baylor Institute for Immunology Research, Dallas, TX, 2Arthritis Care and Research Center, Dallas, TX, 3Baylor Research Institute, Dallas, TX

Background/Purpose: We aimed to identify the immune mechanism underlying gouty inflammation using microarrays analysis and modular gene expression signatures.

Methods: Whole blood along with clinical and treatment data were collected from out-patients with gout. A total of 28 samples from 20 patients (18 males and 2 females; median age 53.5 years [range 39–82]; median disease duration 2.2 years [range 0–29.11]) and from 16 matched healthy controls were obtained. Thirteen patients had active disease at their first visit, and 7 had quiescent (intercritical) disease. Whole blood RNA was extracted using standard technologies and was hybridized to Illumina HT-12 chips. Genes differentially expressed (unpaired Student’s t-test) in the first visit of all gout or active gout fold change ≥ 2 and a p < 0.05, were selected for further consideration. Ingenuity Pathways Analysis was performed and we also adopted a module based data mining strategy, which can facilitate biomarker and biological knowledge discovery.

Results: Two hundred and four genes were found differentially expressed in gout patients at their first visit regardless of clinical activity. When active patients were selected, 184 transcripts were found dysregulated. Inmate immune genes related to the interleukin-1 (IL1) signaling pathway were up-regulated (ORI/ ORM2, BNIP3L, EPB49, defensins, myeloperoxidase, elastase), whereas genes involved in adaptive immune were down-regulated (CD79A, CD79B, CBR complex). Modular analysis permitted us to visualize alterations in 174-260 pre-defined modules. Of those, transcripts related to innate immune cells, including neutrophils, were increased. Those related to B cells, T cells, NK cytotoxic and plasma cells were decreased. Interestingly, transcripts related to an early erythrocyte cell population previously described in other IL1-mediated diseases such as systemic onset Juvenile Idiopathic Arthritis (sJIA)/Still’s disease and S. aureus infections were upregulated. In addition, modules related to inflammation and cell death were up-regulated, while those of proliferation, cell cycle, and mitochondrion stress were down-regulated. This modular pattern might represent a biomarker of innate immunity/IL1-related diseases.

Conclusion: Patients with gout display a blood transcriptional profile similar to that seen in IL-1 dominant or autoinflammatory diseases. This fits with the current knowledge about the involvement of the inflammasome in gout and patients response to IL-1 blockade. This profile is easily interpreted using our previously described modular analysis framework. Although larger, prospective studies including newly diagnosed patients on no treatment are needed to confirm these findings, our data suggest that it is possible to use blood gene expression analysis to identify molecular and cellular pathways linked to dysregulation of innate immunity.

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Genetic Variants of Serum Uric Acid and Gout: An Analysis of >170,000 Individuals. Hyon Choi1, Robert M. Plenge2, Anna Kottgen3, Veronique Vitar4, Murielle Bochud5, Christian Gieger6, Mark Caulfield7, Marina Ciullo8, Eva Albrecht9, Alexander Teunzer10, Gary Curry11, Jan Krumrieck12, Conall O’Seaghdha13, Caroline Fox13 and The Global Urate Genetics Consortium (GUGC).14

12Department of Medicine, Boston University School of Medicine, Boston, MA, 13Brigham and Women’s Hospital, Boston, MA, 14Revised Division, Freeburg University Hospital, Freeburg, Germany, 1Western General Hospital, Edinburgh, United Kingdom, 2Lasseux University Hospital, Switzerland, 3Heuberg, Germany, 4Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom, 5“A. Buzzati-Traverso”, Italy, 6Ernst-Moritz-Arndt-University Greifswald, Greifswald, Germany, 7Harvard Medical School, Boston, 8German Research Center for Environmental Health, Neuberg, Germany, 9NHBLI’s Framingham Heart Study and Center for Population Studies, Neuberg, 10NHBLI’s Framingham Heart Study and Center for Population Studies, MA, 11Boston

Background/Purpose: Gout is a common and excruciatingly painful inflammatory arthritis caused by hyperuricemia. In addition to various lifestyle risk factors, a substantial genetic predisposition to gout has long been
recognized. The Global Urate Genetics Consortium (GUGC) has aimed to comprehensively investigate the genetics of serum uric acid and gout using data from > 140,000 individuals of European-ancestry, 8,340 individuals of Indian ancestry, 5,820 African-Americans, and 15,286 Japanese.

Methods: We performed discovery GWAS meta-analyses of serum urate levels (n=110,347 individuals) followed by replication analyses (n=32,813 different individuals). Our gout analysis involved 3,151 cases and 68,350 controls, including 1,036 incident gout cases that met the American College of Rheumatology Criteria. We also examined the association of gout with fractional excretion of uric acid (n=6,799). A weighted genetic urate score was constructed based on the number of risk alleles across urate-associated loci, and their association with the risk of gout was evaluated. Furthermore, we examined implicated transcript expression in cis (expression quantitative trait loci databases) for potential insights into the gene underlying the association signal. Finally, in order to further identify urate-associated genomic regions, we performed functional network analyses that incorporated prior knowledge on molecular interactions in which the gene products of implicated genes operate.

Results: We identified and replicated 28 genome-wide significant loci in association with serum urate (P ≤ 5×10^{-8}), including all previously-reported loci as well as 18 novel genetic loci. Unlike the majority of previously-identified loci, none of the novel loci appeared to be obvious candidates for urate transport. Rather, they were mapped to genes that encode for purine, production, transcription, or growth factors with broad downstream responses. Besides SLC2A9 and ABCG2, no additional regions contained increasing alleles were associated with an increased risk of gout for all loci. The urate genetic risk score (ranging from 10 to 45) was significantly associated with an increased odds of prevalent gout (OR per unit increase, 1.11; 95% CI, 1.09–1.14) and incident gout (OR, 1.10; 95% CI, 1.08–1.13). Associations for many of the loci were of similar magnitude in individuals of non-European ancestry. Detailed characterization of the loci revealed associations with transcript expression and the fractional excretion of urate. Network analyses implicated the inhibins-activins signaling pathways and glucose metabolism in systemic urate control.

Conclusion: The novel genetic candidates identified in this urate/gout consortium study, the largest to date, highlight the importance of metabolic control of urate production and urate excretion. The modulation by signaling processes that influence metabolic pathways such as glycolysis and the pentose phosphate pathway appear to be central mechanisms underpinned by the novel GWAS candidates. These findings may have implications for further research into urate-lowering drugs to treat and prevent gout.

Disclosure: H. Choi, None; R. M. Plenge, None; A. Kötten, None; V. Vitart, None; M. Bochud, None; C. Gieger, None; M. Caulfield, None; M. Ciullo, None; E. Albrecht, None; A. Teumer, None; G. Curhan, None; J. Kruminsie, None; C. O’Seaghdha, None; C. Fox, None.

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Osteoarthritis-Associated Basic Calcium Phosphate Crystals Induce IL-1β, IL-18 and S100A8 Production in a Tyrosine Kinase Dependent Manner. Geraldine M. McCarthy¹, Evanna Mills², Kingston Mills² and Aisling Dunne². Mater Misericordiae University Hospital, Dublin 7, Ireland, Trinity College Dublin, Dublin 2, Ireland

Background/Purpose: Intraarticular basic calcium phosphate (BCP) crystals are present in the majority of osteoarthritic (OA) joints and are associated with severe degeneration. In vitro, BCP promote pro-inflammatory cytokine production and matrix metalloprotease (MMP) expression, suggesting a pathogenic role in OA. Recently it has been demonstrated that BCP crystals drive IL-1β and IL-18 production following activation of the NOD-like receptor, NLRP3. Here, we sought to determine whether uptake of BCP crystals leads to the activation of the membrane proximal kinases, Syk and PI3 kinase and to further characterise events downstream of Syk activation in order to identify novel molecular targets for the treatment of BCP-induced arthropathies.

Methods: Murine macrophages were stimulated with BCP crystals, with or without priming with a Toll-like receptor (TLR) agonist and IL-1β and IL-18 production was quantified by enzyme linked immunosorbent assay (ELISA). A role for Syk and PI3 kinase was determined with the use of the inhibitors, piceatannol and LY294002, respectively. Activation of the kinases was confirmed by western blotting using phospho-specific antibodies to Syk and PI3 kinase following treatment of cells with the crystals over a 30 minute time course. Finally, activation of the downstream kinase, ERK, and production of the damage associated molecule, S100A8, was assessed in the presence of piceatannol in order to determine if these events are associated with BCP dependent Syk activation.

Results: Physiological concentrations of BCP crystals (50mg/ml) induced robust IL-1β and IL-18 production in a Syk and PI3 kinase dependent manner. Treatment with the inhibitors piceatannol and LY294002 led to a significant reduction in cytokine levels (>80%) and activation of Syk and PI3 kinase was apparent after approximately 5 minutes treatment with the inhibitor. Phosphorylation of the downstream kinase, ERK, was prevented following treatment with the Syk inhibitor, piceatannol, thus identifying Syk kinase activation as a proximal event in BCP induced pro-inflammatory cytokine production. Finally, treatment of cells with BCP crystals led directly to the production of the danger-associated molecule, S100A8 and this was also dependent on activation of Syk.

Conclusion: Since S100A8 is considered a TLR 4 ligand, we propose a model whereby BCP crystals drive the production of S100A8 which in turn leads to the expression of pro-IL-1β and pro-IL-18 (Signal 1). In macrophages, BCP crystals can also induce the activation of the NLRP3 inflammasome (Signal 2) leading to the production of the mature forms of these cytokines. These events are dependent on tyrosine phosphorylation and we identify Syk kinase as a potential target for the treatment of BCP related pathologies.

Disclosure: G. M. McCarthy, None; E. Mills, None; K. Mills, None; A. Dunne, None.

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Background/Purpose: In most patients with gout, elevated serum urate is linked to excess uric acid reabsorption in the proximal renal tubule by anion transporters/exchangers, including URAT1, OAT4 and OAT10. It is also known that initiation of serum urate lowering therapy (ULT) in gout patients significantly increases the risk of flares, a process that is believed to be mediated by mono sodium urate (MSU) crystal activation of the inflammasome with subsequent release of pro-inflammatory mediators, including IL-1β. Arhalofenate is an investigational drug which has completed phase 2a development for the treatment of gout patients with hyperuricemia that are at risk for flares. The dual action of arhalofenate was studied for inhibition of uric acid uptake by renal urate transporters and for suppression of MSU crystal stimulation of IL-1β production in isolated mouse macrophages and in a murine air pouch model.

Methods: The activities against the human urate transporters URAT1, OAT4 and OAT10 were determined using the uptake of 32-C-uric acid into human HEK293 cells transiently expressing the relevant transporter and compared to uptake into parental HEK293 cells. The anti-inflammatory response was evaluated following acute MSU crystal treatment of (1) mouse macrophages and (2) mouse in an air pouch model, in both cases measuring the elaboration of pro-inflammatory mediators including IL-1β.

Results: Arhalofenate inhibited uric acid uptake by all three transporters with IC50's of 92 μM for URAT1, 3 μM for OAT4 and 55 μM for OAT10. These results are pharmacologically relevant for inhibition of urate reabsorption because arhalofenate acid levels in human urine were found to be 116 ± 25 μM (Mean ± SEM) at a 600 mg dose. In thioglycolate-elicited intraperitoneal macrophages, arhalofenate acid (150 μM) suppressed IL-1β levels by 77% which was indistinguishable from dexamethasone (75%, p<0.05 by one-way ANOVA). In the murine air pouch model, arhalofenate treatment (3.5 mg/kg for 3 days prior to MSU crystal induction resulted in 76% reduction in the elaboration of IL-1β in response to MSU. This response was again similar to that observed for dexamethasone. The anti-inflammatory concentrations of arhalofenate acid are relevant to the human clinical exposures.

Conclusion: Arhalofenate is a novel anti-inflammatory uricosuric agent with the potential to target both serum uric acid reduction and the painful flares that accompany gout. The data from this study suggest that arhalofenate acts by mediating inhibition of renal transporters/exchangers of uric acid and by suppression of the production of IL-1β in response to MSU crystals in both in vitro and in vivo models of MSU crystal induced inflammation. These properties strongly support the continued clinical development of arhalofenate for treating elevated serum urate and lowering the risk of flares.

Ulodesine (BCX4208) Add-On Therapy to Allopurinol 300mg Lowers Hypoxanthine and Xanthine Plasma Levels in a Dose-Dependent Fashion: Results From a 12-Week Randomized Controlled Trial in Patients with Gout. Shanta Bantia, Leigh Harman, Cynthia Parker, Damon Maspupa, Andreas Maetzel, Brian Taubenheim and Alan C. Hollister. 1 BioCryst Pharmaceuticals, Inc., Durham, NC, 2 Southern Research Institute, Birmingham, AL.

Background/Purpose: Ulodesine (BCX4208) is an oral, once-daily, purine nucleoside phosphorylase (PNP) inhibitor in clinical development as an add-on therapy for the chronic management of hyperuricemia in patients with gout. Based on the role of PNP in purine catabolism, inhibition of PNP should reduce hypoxanthine (HX), xanthine (X) and uric acid levels. Ulodesine has demonstrated dose-dependent decreases in serum uric acid (sUA) in multiple clinical trials both as a single agent and in combination with allopurinol1. Plasma X and HX concentrations are significantly higher in untreated gout patients compared to hyperuricemic and normal subjects2. Elevated plasma X and HX concentrations are also associated with kidney stones, as seen in xanthine oxidase (XO)-deficient patients and mice3,4. Moreover, HX and X are implicated in the production of reactive oxygen species leading to oxidative stress, cell damage and cardiovascular effects5. The objective of the study is to measure plasma X and HX concentrations in gout patients receiving 300 mg/d allopurinol plus either placebo or ulodesine.

Methods: Two hundred seventy eight subjects with gout and sUA ≥6.0 mg/dL on allopurinol 300 mg/d for at least 8 weeks were randomized to receive oral ulodesine 5, 10, 20, or 40 mg/d or placebo for 12 weeks while continuing allopurinol 300 mg/d. Blood samples were collected at baseline and day 85 into heparin tubes containing BCX34 (PNP inhibitor) to prevent purine metabolism during collection and processing. Plasma concentrations of X and HX were analyzed by LC/MS/MS. [15N2] xanthine and [D2] hypoxanthine were used to generate surrogate standard curves for quantification of plasma X and HX concentrations. In normal healthy subjects, the mean (+ SD) concentrations of plasma X and HX were 56 ± 13 ng/mL and < 25 ng/mL, respectively.

Results: Ulodesine combined with allopurinol produced significant reductions in plasma X and HX concentrations from baseline, compared to placebo (Table). At baseline (subjects on allopurinol 300 mg/d), the mean (+ SD) concentrations of the plasma X and HX were 500 ± 408 ng/mL and 301 ± 293 ng/mL, respectively. The reduction in mean plasma X and HX concentrations with BCX4208 treatment in gout subjects was dose-dependent.

Table. Mean Change from baseline of Day 85 Plasma Xanthine and Hypoxanthine levels BCX4208–203 Study

<table>
<thead>
<tr>
<th>Metabolite</th>
<th>Placebo</th>
<th>5 mg/day</th>
<th>10 mg/day</th>
<th>20 mg/day</th>
<th>40 mg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xanthine (ng/mL)</td>
<td>124.8 (76.33)</td>
<td>46.6 (77.46)</td>
<td><strong>114.6 (77.46)</strong></td>
<td><strong>138.5 (69.03)</strong></td>
<td><strong>183.3 (75.19)</strong></td>
</tr>
<tr>
<td>Hypoxanthine (ng/mL)</td>
<td>22.7 (70.94)</td>
<td>4.9 (71.25)</td>
<td><strong>12.6 (68.21)</strong></td>
<td><strong>16.5 (63.09)</strong></td>
<td><strong>20.5 (68.07)</strong></td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.005, ***p<0.001 vs placebo

Conclusion: Using a robust LC/MS/MS method and stabilization of plasma X and HX during blood collection and processing, oral ulodesine administration demonstrated dose-dependent mean reductions in plasma X and HX concentrations in gout patients while under treatment with allopurinol. These results confirm the mechanism of action of ulodesine.


1634

Delivering Mesenchymal Stem Cells to Arthritic Joints with Nano-Fiber Scaffold Resulted in Inhibition of Arthritis and Joint Damage in Arthritis Models. Xiangmei Zhang1, Kunhiro Yamaoka2, Koshiro Sonomoto3, Masahiro Kondo3, Shunshuke Fukuyu2, Makoto Satake2, Hiroaki Kaneko2, Kazuhiya Nakano1, Shingo Nakayamada1, Yosuke Okada1 and Yoshiya Tanaka1. 1 University of Occupational and Environmental Health, Japan, 2 Kitakyushu, Japan, 3 Integrative Technology Research Institute, Tenjin Limited, Tokyo, Japan

Background/Purpose: Even though treatment of rheumatoid arthritis (RA) has emerged, aiming bone repair is still a challenge. Mesenchymal stem cells (MSCs) possess immunoregulatory function with pluripotency and efficacy on arthritis animal models has been reported by intra-venous or intra-peritoneal administration. Herein we have utilized nano-fiber poly-lactic-co-glycolic acid (PLGA) scaffold known for controlled biodegradability with less immunogenicity as an effective delivery system of MSCs to the arthritic joint.

Methods: MSCs were simply injected intra-articularly (IA) or intra-peritoneally (IP) or seeded on nano-fiber PLGA scaffold and implanted into bilateral ankles (IMP) of collagen-induced arthritis (CIA) rats at the time of immunization. Efficacy was evaluated clinically (arthritis score, body weight and hind paw thickness), radiologically (X-ray and micro-CT) and histologically (Hematoxin-Eosin staining).

Results: Treatment of CIA with IMP significantly decreased the severity of arthritis while IA and IP showed less or no effect. Radiologic evaluation of bone destruction was also suppressed by IMP, but not by IA or IP. Histological analysis of the ankles indicated less inflammatory cell infiltration, synovial hyperplasia, pannus formation, resulting in less destruction of the cartilage and bone by IMP compared to IA and IP. Interestingly, size and weight of the spleen, draining lymph nodes in rats treated with IMP were significantly smaller than those treated with IA and IP. These phenomena were observed at both early phase (2 weeks after immunization) and late phase (6 weeks after immunization) of the disease course. Histological analysis of the draining lymph nodes revealed less or no chronic inflammation in the early phase and reduced germinal center formation at the late phase in rats treated with IMP compared to IA and IP treatment.

Conclusion: Local delivery of MSCs with nano-fiber PLGA scaffold significantly suppress arthritis and bone destruction with decreased immune response in the draining lymph node, while IA or IP had less or no effect. The amount of MSCs that we utilized in our study was far lower compared to the studies reported previously. Therefore, our results suggest the importance of MSCs to reside at the local inflammatory site for suppressing the inflammation and moreover regenerating the destructed bone sequentially.


1635

Polyarthritis Caused by TIARp (TNFAIP9) Deficiency Critically Dependent on Deregulated STAT3, NF-kappaB Signaling, and Intercellular Contact in Macrophages. Asuka Inoue1, Isao Matsumoto1, Naoto Umeda1, Yuki Tanaka2, Satoru Takahashi2 and Takayuki Sumida2. 1 University of Tsukuba, Tsukuba city, Ibaraki, Japan, 2 Department of Anatomy and Embryology, Faculty of Medicine, University of Tsukuba, Tsukuba city, Ibaraki, Japan

Background/Purpose: TNFα-induced adipose-related protein (TIARP) is a six-transmembrane protein induced by TNFα and IL-6 in adipose tissue. Recently, we found that TIARP is dominantly expressed in splenic macrophages and joints of two arthritis mouse models (collagen induced arthritis;
CIA and glucose-6-phosphate isomerase (G6Pase) induced arthritis. In human, TIARP is also observed in human joints from patients with rheumatoid arthritis and clearly upregulated by TNFα stimulation, although the pathogenic mechanisms of arthritis remain unclear. In this study, to elucidate the role of TIARP in the development of arthritis, we have generated TIARP-deficient (TIARP−/−) mice.

Methods: (1) We generated TIARP−/− mice in C57BL/6 (B6) background and investigated several organs in aged (12-month-old) TIARP−/− mice. The levels of cytokines in the serum was measured by ELISA. (2) Peritoneal macrophages (PEM) were isolated and cultured with LPS or TNFα. Then, the production of IL-6 in culture supernatant was measured by ELISA. (3) We examined the role of TIARP in NF-κB pathway and apoptosis. PEM were cultured with TNFα, then fluctuation of NF-κB inhibitor molecule IkBα expression was detected by Western blotting. Apoptotic cells were detected by flowcytometry using anti-Annexin V antibodies. (4) We also examined the susceptibility of young (8–12-week-old) TIARP−/− mice to CIA. CIA was induced by immunization with 200μg of chicken type II collagen (CII) emulsified in CFA to B6 mice, followed by boost immunization on day 21. The severity of arthritis was monitored by clinical score. (5) The level of anti-CII antibodies in the serum on day 30 and boosted immunization on day 21. The severity of arthritis was monitored by clinical score. (6) The level of IL-6 and TNFα in the serum on day 60 after CII immunization was measured. (7) We examined the effects of anti-IL-6 receptor mAb (MR16-1) on the development of arthritis in TIARP−/−−/− CIA mice. We injected 2mg of MR16-1 intraperitoneally on day 21 after CII immunization. (8) PEM were isolated with IL-6 for 1 h. The expression of STAT3, phosphorylated-STAT3 (p-STAT3) and SOCS3 were detected by Western blotting.

Results: (1) 80% of aged TIARP−/− mice spontaneously developed arthritis. The levels of IL-6 in the serum from TIARP−/− mice were significantly higher than WT mice (2) PEM from TIARP−/− mice produced high amount of IL-6 with LPS or TNFα stimulation. (3) PEM from TIARP−/− mice showed sustained degradation of IkBα compared with WT by TNFα stimulation. TNFα-induced apoptotic cells were increased in WT but unchanged in TIARP−/− mice. (4) The severity of arthritis in TIARP−/− was higher than that in WT. (5) The level of anti-CII antibodies was comparable between WT and TIARP−/−. (6) The serum IL-6 was significantly increased in TIARP−/− mice, whereas serum TNFα was not detected. (7) Administration of MR16-1 on day 21 significantly suppressed the progression of arthritis in TIARP−/− CIA mice. (8) P-STAT3 expression was enhanced in TIARP−/− compared with WT, whereas SOCS3 expression was comparable between WT and TIARP−/−.

Conclusion: These findings suggest that TIARP is a negative regulator in autoimmune arthritis through the suppression of IL-6 production, NF-κB, STAT3 signaling, and the induction of apoptosis.

Disclosure: A. Inoue, None; I. Matsumoto, None; N. Umeda, None; Y. Tanaka, None; S. Takahashi, None; T. Sumida, None.

1637
A Novel Peptide Inhibiting the Binding Between C1q and Immunoglobulin Ameliorates Joint Destruction in Rats with Collagen-Induced Arthritis, Yu Moriguchi and Tetsuya Tomita. Osaka University Graduate School of Medicine, Suita, Japan

Background/Purpose: C1q is the major subcomponent of the first component of complement protein. The activation of the complement is triggered by binding of C1q to the Fc fragment of immunoglobulin G (IgG). It has been reported that rheumatoid arthritis (RA) patients with high concentrations of C1q in their blood will suffer from joint destruction in the future. Since the activation of C1q is thought to be involved in this joint destruction, binding inhibitor between C1q and IgG will be one of the candidates of new anti-RA drug. The purpose of the present study is to identify the sequence essential for binding between C1q and IgG, to confirm the inhibitory capacity of the peptide with the same sequence, and to verify in a rat collagen-induced arthritis (CIA) model that the peptide has possibility to be a new therapeutic agent for RA.

Methods: To find the binding inhibitor, we constructed peptide array to identify amino acid sequences of C1q that is crucial for binding between C1q and IgG. Some sequences based on this peptide array analysis were subsequently confirmed to inhibit the binding between C1q and IgG, and the peptide with the most inhibitory sequence (R1 peptide) was determined. For in vivo application, rats with CIA were intraperitoneally injected with R1 peptide or methotrexate (MTX) starting after the onset of arthritis. Disease activity scores, radiographic scores, and histologic scores were quantified on day 36. Cytokine expressions in the tissue were assessed by realtime RT-PCR. Spleen cell proliferation ex vivo in response to mitogens was examined. Osteoclast formation ex vivo induced by soluble receptor activator of nuclear factor κB ligand (sRANKL) and M-CSF was examined. Immunohistochemistry was performed to verify the deposition of IgG and C1q in ankle joints.

Results: R1 peptide as well as MTX significantly decreased the disease activity scores of CIA. The mean radiographic and histologic scores were significantly lower in the R1-treated rats than in untreated rats. Steady state mRNA levels of TNF-α and IL-1b in ankle joints were decreased in R1-treated rats. There was a significant reduction in phytohemagglutinin-stimulated proliferation of spleen cells in R1-treated rats with the dose of 100 mg/kg day compared to the untreated. Furthermore the osteoclast-like cell differentiation induced by both sRANKL and M-CSF was significantly inhibited in R1-treated rats compared to untreated and even MTX-treated rats. Lastly, immunohistochemistry revealed that the deposition of local C1q and was significantly suppressed in R1-treated rats.

Conclusion: The present study demonstrated that R1 peptide sequence could be essential for binding between C1q and IgG. Furthermore, R1 peptide suppresses the progression of joint destruction in a rat CIA model equivalently to MTX treatment, suggesting the peptide is a potential therapeutic agent for rheumatoid arthritis.

Disclosure: Y. Moriguchi, None; T. Tomita, None.

1636
Commensal Gut-Derived Bacteria As Therapy for Systemic Autoimmune Disease. David Luckey1, Eric Marietta, Harvinder S. Luthra1, Robin Patel1, Joseph A. Murray2, Ashutosh Mangalam3 and Veena Taneja1.

1Mayo Clinic, Rochester, MN, 2Mayo Clinic, Rochester

Background/Purpose: Rheumatoid arthritis (RA) is an autoimmune disease that leads to destruction of joints. Although etiology of RA is unknown, both genetic and environmental factors are involved in predisposition to develop RA. Genome wide association studies have shown that among the genetic factors, the strongest association of RA is with HLA class II genes. However, the role of the intestinal bacteria is yet to be determined. It is known that certain species of gut bacteria have positive effect on health and well-being of the host, whereas others cause disease. In the present study, we investigated the role of gut bacteria in the pathogenesis of RA.

Methods: We have generated a mouse model of rheumatoid arthritis using HLA transgenic mice expressing RA-susceptible gene, HLA-DQ8 in the background of transgenic mice. Recently, we isolated Prevotella histicola, a commensal bacterium from RA patients and have shown that it possesses anti-inflammatory activity.

Results: In this study we have tested our hypothesis if systemic disease like RA can be modulated via gut. HLA-DQ8 transgenic mice develop collagen-induced arthritis (CIA) following immunization with type II collagen (CII). We have used these transgenic mice to test if gut-derived commensal bacteria can regulate immune response and modulate arthritis. Treatment with P. histicola did not lead to any pathology in the gut. Transgenic mice immunized with CII and treated with P. histicola showed suppression of antigen-specific cellular immune response with a significant reduction in production of inflammatory cytokines. Treatment with P. histicola led to the generation of regulatory T cells in the gut and increased production of IL-10 in treated group compared to controls. Treatment of mice induced for arthritis in a therapeutic protocol led to a significant decrease in incidence (40% in treated versus 80% of control) and severity of arthritis.

Conclusion: P. histicola modulated immune responses in the gut thereby modulating systemic immune response and suppression of arthritis suggesting this treatment can induce tolerance in periphery leading to systemic immune suppression. Since bacteria being used for treatment is a gut-derived commensal, there are less likely to be significant side effects.

Disclosure: D. Luckey, None; E. Marietta, None; H. S. Luthra, None; R. Patel, None; J. A. Murray, None; A. Mangalam, None; V. Taneja, None.
Results: Similar to the Flipf/f, LysMcre+/+ mice reported earlier, Flipf/f, LysMcre+/+ mice exhibited a significant increase of circulating neutrophils and monocytes, multi-organ neutrophil infiltration, and significantly reduced mature macrophages in multi-effectors organs, such as peritoneal cavity, although it was less severe. The Flipf/f LysMcre+/+ developed a significantly more severe of acute phase arthritis on days 2 and 4 post-induction compared to the controls. The development of arthritis stopped after day 4 and began to improve in Flipf/f, LysMcre+/+ mice, while the controls continued to progressive, peaking at day 9. The arthritis was significantly reduced in the Flipf/f, LysMcre+/+ mice between days 7 to 14 compared with the controls. Histological analysis demonstrated more articular and extra-articular inflammation and neutrophils in the Flipf/f, LysMcre+/+ ankles collected in day 2 and 4. In contrast, inflammation, cartilage destruction, erosion and pannus were significantly reduced on day 10 and/or 14 in the Flipf/f, LysMcre+/+ mice. Further, IL-1β in the ankle joints was significantly higher in Flipf/f, LysMcre+/+ ankles collected in day 0, 2 and 4, but not day 10 of arthritis compared with the controls. However, IL-1β in the ankle ankles positively correlated with arthritis in the control group, but no correlation was observed in the Flipf/f, LysMcre+/+ mice. In preliminary experiments, the infusion of wild type macrophages into the Flipf/f, LysMcre+/+ mice just after the injection of the anti-GPI serum resulted in less severe arthritis initially but more severe arthritis later in the course.

Conclusion: These studies demonstrate that FLIP in macrophages is essential for regulating neutrophil homeostasis and acute inflammation and that it promotes the progression of the effector phase of arthritis. The lack of association between inflammation and IL-1β in the Flipf/f, LysMcre+/+ mice is consistent with diminished IL-1β signaling. These observations suggest that FLIP in macrophages is a potential target for the therapy in patients with rheumatoid arthritis.

Disclosure: Q. Q. Huang, None; R. Birkett, None; R. E. Koessler, None; G. K. Haines III, None; H. R. Perlman, None; R. M. Pope, None.

1640
Long-Term Safety of Tocilizumab in Patients with Rheumatoid Arthritis and a Mean Treatment Duration of 3.7 Years. Mark C. Genovese1, Anthony Sebba2, Andrea Rubberth-Roth3, Juan José Scal1, Rieke Aalen4, Joel M. Kremer5, Laura Pitts6, Emma Vernon7 and Ronald F. van Vollenhoven8. 1Stanford University Medical Center, Palo Alto, CA, 2University of South Florida, Tampa, FL, 3University of Cologne, Cologne, Germany, 4Durand University Hospital, Buenos Aires, Argentina, 5Schlosspark Klinik, University Medicine Berlin, Berlin, Germany, 6Albany Medical College, Albany, NY, 7Roche, Welwyn Garden City, United Kingdom, 8Karolinska Institute, Stockholm, Sweden

Background/Purpose: Tocilizumab (TCZ)—an IL-6 receptor inhibitor—has demonstrated efficacy in improving signs/symptoms, reducing joint damage, and improving physical function in rheumatoid arthritis (RA) patients (pts). This analysis assessed the long-term safety of TCZ (up to 5.8 y of exposure) in adult RA pts.

Methods: Analysis was performed in all pts who received ≥1 TCZ dose in 5 placebo-controlled trials (OPTION, TOWARD, RADIATE, AMBITION, LITHE), a clinical pharmacology study, or long-term extension studies. Data were pooled and analyzed from initial TCZ exposure to April 1, 2011 (cutoff).

Results: 4009 pts were included. Mean (median [range]) duration was 3.7 (4.6 [0.0–5.8]) y; total observation time was 14,994 pt-y (PY). Rates of serious adverse events (SAEs), serious infections, myocardial infarction (MI) SAEs, stroke SAEs, hepatic SAEs, and gastrointestinal (GI) perforations were stable over time (Table). The overall rate of AEs leading to withdrawal was 5.0/100PY (95% CI: 4.7, 5.4). Infections, laboratory abnormalities, and neoplasms were the most common AEs leading to withdrawal (0.97/100PY, 0.89/100PY, and 0.80/100PY). 8 pts withdrew because of anaphylaxis events; these were previously reported. Rates/100PY (95% CI) were 14.6 (14.0, 15.3) for SAEs and 0.5 (0.45, 0.70) for deaths. The most common SAEs were infections, which occurred at a rate of 4.5/100PY (95% CI: 4.1, 4.8); the most common serious infection was pneumonia (0.95/100 PY; 95% CI: 0.80, 1.12). Overall rates/100PY (95% CI) of MI SAEs, stroke SAEs, and hepatic

ACR Concurrent Abstract Session
Rheumatoid Arthritis Treatment - Small Molecules, Biologicals and Gene Therapy: Safety I
Monday, November 12, 2012, 2:30 pm–4:00 pm
Results: Twenty-seven patients (15 female, mean age 56.7 ± 15.1 years) reintitated biological therapy after withdrawal due to TI. Diagnoses were: 14 rheumatoid arthritis; 6 ankylosing spondylitis; 3 psoriatic arthritis; 2 juvenile idiopathic arthritis; 1 undifferentiated spondyloarthropathy and 1 Behcet’s disease. Mean disease duration was 18.8 ± 9.4 years. The type of TI was: pulmonary in 14 patients; disseminated tuberculosis in 12; cutaneous in 1. The TNF blocker received at TI diagnosis was: 6 patients infliximab, 2 certolizumab, 1 adalimumab, 3 etanercept in group 1; and 14 infliximab, 3 adalimumab, and 1 etanercept in group 2; with a median of treatment of 13 months. Biological therapy was reintitated while patients were receiving TI treatment in 9 out of 28 patients (group 1), with a mean TI treatment of 2.25 ± 0.9 months. Fifty-six patients were 1 group 1 patients reintitated with the same biological agent, whereas in group 2 only 27.7% resumed the previous treatment. The underlying inflammatory condition improved in all patients. No patient of both groups had a relapse of TI after a follow-up of 49.2 ± 28.8 months (42 ± 30.7 in group 1 and 53.2 ± 27.8 in group 2).

Conclusion: Active TI in patients receiving TNF antagonists may not be a contraindication for the reintitation of biological therapy before completion of TI treatment, especially in patients who experience a relapse of the underlying inflammatory disease, who have a favourable outcome of TI and who have received at least 2 months of tuberculostatic therapy.

Reference:

Disclosure: M. V. Hernández; None; M. A. Descalzo; None; J. D. Cañete; None; R. Sammarti; None.

1642

Biologics and Mortality Risk in Rheumatoid Arthritis - Results of a Population Based Study. Diane Lacaille1, Michal Abramowicz2, Eric C. Sayre2 and John Esdaile1. 1Arthritis Research Centre of Canada, University of British Columbia, Vancouver, BC; 2McGill University, Montreal, QC; 3Arthritis Research Centre of Canada, Vancouver, BC.

Background/Purpose: Biologic agents, due to their effect on disease activity, may reduce the risk of premature mortality in rheumatoid arthritis (RA). We evaluated the association between exposure to biologics and risk of mortality in RA, using a population-based RA cohort with administrative health data.

Methods: Using administrative billing data from the Ministry of Health, we assembled a population-based cohort including all RA cases in the province who received care for RA between 01/1996 and 03/2006, using previously published RA criteria, with follow-up until 03/2010. Administrative data was obtained on all medications since 01/1996; MD visits, hospitalizations, and tests since 01/1990. For this study we identified all RA cases who used a biologic agent (anti-TNF, rituximab, anakinra or abatacept) during follow-up. Each biologic user was matched with one RA control who never used a biologic but used at least 3 DMARDs (to mimic coverage requirements) and with a recent (within 6 mos) change in DMARD. Controls were also matched on age, sex, calendar year of inclusion and closest propensity score, using a greedy matching technique. Matched controls were given the date of initiation of first biologic of the user they were matched to. A propensity score (PS) was calculated at time of initiation using markers of RA severity, as well as co-morbidities increasing risk of death. Despite selecting controls with the closest PS, matching was imperfect; therefore PS quintiles were added to the final multivariable model. Cox proportional hazard model (PHM) was used to estimate risk of death associated with biologic exposure, evaluated as a time dependent variable representing current or recent use of anti-TNF, where cases were considered exposed for up to 3 months after discontinuation. Time analyzed was from date of initiation to death or end of follow-up. PHM analysis was also adjusted for age, sex, RA duration, Charlson co-morbidity score, PS quintiles and the variables included in the PS model that were not balanced. Sensitivity analyses were carried out to test the robustness of results.

Results: Our sample includes 2156 biologic users and 2156 matched controls (mean (SD) age: 56.3(14.6), 74.7% females). We observed 573 deaths (326 in controls; 247 in biologic users). Exposure to biologics was associated with a reduced risk of death (aHR (95% CI)): 0.26 (0.18; 0.36), p < 0.0001. Another sensitivity analysis, without use of PS, but where the PS variables were allowed to enter the PHM and controls were only required prior use of one DMARD, yielded similar results (aHR (95% CI): 0.31 (0.22; 0.45), p < 0.0001). Limitations of
our study are those inherent to observational study, including possible effect of residual or unmeasured confounding, and selection bias from non-random allocation of treatment.

**Conclusion:** In a population-based cohort, exposure to biologics was associated with a significant reduction in mortality. Given the increased mortality risk of RA, this has important implications for health policy makers, health care providers and people with arthritis.

**Disclosure:** D. Lacaille, None; M. Abrahomovich, None; E. C. Sayre, None; J. Esdaile, None.

### 1643

**Outcomes of Pregnancy in Subjects Exposed to Certolizumab Pegol.**

Megan Clowse1, Douglas C. Wolf2, Christian Stach3, Gordana Kosutic4, S. Williams5, Ido Terpstra6 and Uma Mahadevan6. 1Duke University Medical Center, Durham, NC, 2Atlanta Gastroenterology Associates, Atlanta, GA, 3UCB Pharma, Monheim, Germany, 4UCB Pharma, Raleigh, NC, 5UCB Pharma, Brussels, Belgium, 6University of California, San Francisco, San Francisco, CA

**Background/Purpose:**Certolizumab pegol (CZP) is an Fc-free, anti-TNFf approved in the US for the treatment of Crohn’s disease (CD) and rheumatoid arthritis (RA). Pre-clinical and clinical data suggest a lack of active neonatal Fc receptor-dependent placental transfer of CZP [1, 2]. There are few reports of pregnancy outcomes following exposure to CZP. This work provides additional information regarding the primary pregnancy outcomes in women exposed to CZP.

**Methods:** The global CZP safety database was searched for all medically confirmed cases of pregnancy through March 6, 2012. The proportion of live births, spontaneous miscarriages, and elective terminations for women directly exposed to CZP before or during confirmed pregnancy were compared to those expected for the general US population of pregnant women.

**Results:** Of 294 reported pregnancy events, 152 had known outcomes, 89 had unknown outcomes and 53 were ongoing. Of the 152 events with known outcomes, 139 were cases in which the mother had direct exposure to CZP, with 57 from the clinical trial program and 82 from post-marketing reports. The remaining 13 were cases with the father exposed to CZP resulting in 10 live births, 2 miscarriages and 1 elective termination. Of the 139 direct exposure cases with known outcomes, the underlying conditions were CD (N=107), RA (N=17) and healthy subjects (N=2) with 13 cases classified as other or having missing data. 91 of 139 cases were from the US. 103 of 139 pregnancies resulted in live births (see table) and the median gestational age was 38.3 weeks (data available for 40 births). 21 pregnancies ended in spontaneous miscarriage and 15 pregnancies resulted in elective termination. These results are similar to those reported in the general population in the US (see table). In 103 live births there were 2 reported cases of congenital disorder (Rate in the US general population is 4%) [4]; 1 baby had mild, unilateral hydronephrosis on antenatal ultrasound and was described as healthy upon birth. The other baby had vesicoureteric reflux.

<table>
<thead>
<tr>
<th>Population</th>
<th>Number of pregnancy events (N)</th>
<th>Live births</th>
<th>Miscarriages</th>
<th>Elective termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct exposure to CZP from global safety database (Nacional Vital Statistics Data - 1990 to 2004) [3]</td>
<td>6 390 000</td>
<td>64.3%</td>
<td>16.6%</td>
<td>19.1%</td>
</tr>
</tbody>
</table>

**Conclusion:** Currently available data from 139 pregnant women exposed to CZP, report outcomes consistent with the US National Vital Statistics data. Additional data from larger numbers of pregnant women exposed to CZP are required to validate acceptable safety and tolerability of CZP in pregnancy.

**References**

4. CDC MMWR 2008; 57(01):1-5

**Disclosure:** M. Clowse, UCB, 5; D. C. Wolf, UCB, 5; C. Stach, UCB, 3; UC, 1; G. Kosutic, UCB, 3; UC, 1; S. Williams, UC, 3; I. Terpstra, UC, 1, UCB, 3; U. Mahadevan, UCB, 5.

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**1644**

**Enhanced Pharmacovigilance Reporting of Malignancies in Children and Young Adults Taking Etanercept,** Michele Hooper1, Deborah Wenker1, Bojena Bitman1, Virgil C. Dias1, Yessinia Bartley2, Julie Wang3 and George A. Karpouzas3. 1Harbor-UCLA Medical Center, Torrance, CA, 2Placentia, CA

**Background/Purpose:** Recent reports suggest an increased rate of malignancy in children with juvenile idiopathic arthritis (JIA) (Simard, A&R 2010;62:3776; Beukelman A&R 2012;64:1263). In 2011, the U.S. FDA required TNF-blocker sponsors to initiate a 10-year postmarketing reporting commitment of all malignancies in children and young adults. We present the results for data to date on etanercept (ETN).

**Methods:** We reviewed all malignancies reported in patients <30 years (yrs) of age from clinical trials (CTs) and ARGUS (postmarketing cases, observational studies). Cases were included regardless of latency period, time on ETN, lack of tumor histology, reporting source (consumer, investigator, healthcare provider, regulatory agency, literature), or confounding factors. CT malignancy rates in ETN arms were compared with placebo/comparator arms. Exposure data used to generate ARGUS reporting rates were determined from the total mg of ETN dispensed from Nov 1998 through 31 Dec 2011 and from US market research-determined age distribution (birth-30 yrs, birth-11 yrs, 12–17 yrs, 18–30 yrs) extrapolated to the global market. Confidence intervals were not calculated for ARGUS rates as the ETN exposure data are estimates. Age-specific rates were generated from the Surveillance Epidemiology and End Results (SEER) database v7.0.9. ARGUS reporting rates and SEER rates for all malignancies and malignancy types with >3 cases are shown.

**Results:** In CTs, 1 malignancy each in ETN and placebo/comparator arms has been reported. ETN exposure was 231,404 patient-years (PY) (24,820 PY in birth-11 yrs; 38,099 PY in 12–17 yrs; 168,485 PY in 18–30 yrs). Rates observed per 100,000 PY in ARGUS and SEER, respectively for all malignancies were: age-birth-30 yrs: 44.5 and 26.4; birth-11 yrs: 24.2 and 15.3; 12–17 yrs: 34.1 and 17.0; and 18–30 yrs: 40.6 and 42.1. Five or more cases of leukemia, lymphoma, melanoma, thyroid, and cervical cancers were reported. Rates for melanoma, thyroid, and cervical cancers seemed similar in ARGUS and SEER. Overall ARGUS leukemia rates seemed similar to SEER except for patients birth-11 yrs (12.1 and 5.4 per 100,000 PY, respectively) based on 3 cases. There were 23 cases of lymphoma. ARGUS rates of non-Hodgkin lymphoma seemed similar to SEER. Rates per 100,000 PY for Hodgkin disease (HD) in ARGUS and SEER were: birth-30 yrs: 3.9 and 2.2; birth-11 yrs: 12.1 and 0.4; 12–17 yrs 7.9 and 2.1; 18–30 yrs: 1.8 and 4.1.

**Conclusion:** In the ARGUS database, overall malignancy rates seemed higher than in the general pediatric population (SEER). Stratification by age suggests higher rates for those younger than 18 years old compared to SEER rate, consistent with a report of increased malignancy in all JIA patients (standardized rate = 79.3 per 100,000 PY), and untreated JIA patients (106.5 per 100,000 PY) (Beukelman 2012). No increased malignancy rate seemed to occur in the young adult age group. The overall lymphoma reporting rate was not increased; however, there was more HD in younger patients, most with long-standing disease and multiple immunosuppressive exposures.

**Disclosure:** M. Hooper, Amgen Inc., 3; Amgen, 1; D. Wenker, Amgen, 1; A. Bartley, Amgen, 1; V. C. Dias, Amgen, 1; A. Karpouzas, 1; Harbor-UCLA Medical Center, Torrance, CA, 2Placentia, CA

**Background/Purpose:** Patients with rheumatic diseases (RD) are typically treated with conventional and/or biologic disease modifying anti-rheumatic drugs (DMARD’s) including tumor necrosis factor inhibitors (TNFi). Prior to biologic initiation subjects are typically screened for latent tuberculosis infection (LTBI) with tuberculin skin test (TST) or QuantiFeron-TB Gold in Tube (QFN) assay (QFN) and chest x-ray. In children, patients are treated with Isoniazid (INH) for 9 months in addition to their standard therapy. Since both INH and DMARDs may be individually hepatotoxic, there is a concern for enhanced liver toxicity when those are
combined. We investigated the incidence of liver toxicity upon combination of traditional and/or biologic DMARDs with INH in pts with RD.

Methods: One hundred and eighty patients with RD and a positive TST (≥ 5 mm induration) and/or QFN result, from a single institution were evaluated. Liver function tests (LFTs) including aspartate (AST), alanine aminotransferase (ALT), alkaline phosphatase (AP), and total bilirubin (TB) were tested at baseline and every 8–12 weeks while on therapy. Subjects with normal LFTs over 6 months prior to INH initiation were used as controls for incident liver toxicity while on therapy. Results were expressed as -fold increases from upper limit of normal (x-fold ULN).

Results: Average duration of INH therapy was 8.8± 3.2 months. 180 patients underwent a mean of 4.2 tests while on INH; 177 baseline samples were collected, followed by 580 additional samples during INH treatment.

The latter were compared to 259 samples serially collected from the respective subjects within 6 months prior to INH therapy (table). Patients received 1.85±0.83 DMARDs, 88% of which was methotrexate at a dose of 19.2±2.6 mg.

A hundred forty seven (82%) subjects were on concomitant treatment with corticosteroids. The former were compared to 259 samples serially collected from the respective subjects within 6 months prior to INH therapy (table). Patients received 1.85±0.83 DMARDs, 88% of which was methotrexate at a dose of 19.2±2.6 mg. One hundred forty seven (82%) subjects were on concomitant treatment with corticosteroids.

The latter were compared to 259 samples serially collected from the respective subjects within 6 months prior to INH therapy (table). Patients received 1.85±0.83 DMARDs, 88% of which was methotrexate at a dose of 19.2±2.6 mg. One hundred forty seven (82%) subjects were on concomitant treatment with corticosteroids.

Conclusion: Despite the heightened concern for significant heptoordial toxicity, the combination of traditional and/or biologic DMARDs with INH is clinically well tolerated; the incidence of significant LFT elevations is uncommon in compliant and regularly monitored patients.

Disclosure: D. Cooray, None; S. A. Warche, None; A. Phan, None; R. C. Moran, None; G. A. Karpouzas, None.

ACR Concurrent Abstract Session
Systemic Lupus Erythematosus - Clinical Aspects and Treatment II: Clinical Aspects - Pregnancy
Monday, November 12, 2012, 2:30 PM–4:00 PM

1646
The Mechanism of Umbilical Cord Mesenchymal Stem Cells in the Upregulation of Regulatory T Cells by TGF-β1 in Systemic Lupus Erythematosus.

Lingyun Sun, Dandan Wang, Lin Lu and Xia Li. Department of Rheumatology and Immunology, The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China

Background/Purpose: Umbilical cord (UC) derived mesenchymal stem cells (MSCs) have shown immunoregulation on various immune cells. The aim of this study is to investigate the mechanism of UC-MSCs in the upregulation of peripheral regulatory T cells in patients with systemic lupus erythematosus (SLE).

Methods: Peripheral blood mononuclear cells (PBMC) from 20 SLE patients and normal controls were co-cultured with UC-MSCs at the ratios of 1:1, 10:1 and 50:1 respectively for 72 hours, and the proportions of CD4+CD25\(^*\)Foxp3\(^*\) regulatory T cells were analyzed by flowcytometry. PBMC and serum from active SLE patients and normal controls were used to stimulate UC-MSCs, TGF-β1 mRNA expression on UC-MSCs were detected by real-time PCR. Supernatant TGF-β1 levels were determined by ELISA. The TGF-β1 small interfering RNA (siRNA) was used to interfere TGF-β1 expression on UC-MSCs, then to determine its effect on the regulation of SLE Treg cells. TGF-β1 inhibitor was added in the culture system of UC-MSCs and PBMC from active SLE patients to observe its role in the upregulation of Treg cells by UC-MSCs.

Results: UC-MSCs could dose-dependently upregulate peripheral CD4+CD25\(^*\)Foxp3\(^*\) Treg proportion in SLE patients, which was not dependent on cell-cell contact. UC-MSCs had no regulatory effect on Treg cells in normal controls. Compared with the non-stimulated group and normal PBMC stimulated group, PBMC from SLE patients significantly promoted TGF-β1 mRNA expression on UC-MSCs (relative gene expression was 1.00 ± 0.09, 1.95 ± 0.62, 4.20 ± 2.34, respectively, both P<0.05). Supernatant TGF-β1 levels were significantly elevated in the presence of SLE PBMC. Serum of SLE patients (5%) enhanced TGF-β1 mRNA expression on UC-MSCs (12.19 ± 4.49), remarkably higher than fetal bovine serum control group (1.33 ± 0.06, P<0.01) and normal control serum control group (2.53 ± 0.72, P<0.01). Additionally, TGF-β1 siRNA interfered UC-MSCs failed to upregulate Treg cells in SLE patients (SLE PBMC + TGF-β1 siRNA UC-MSCs group 2.33% ± 0.99% vs. SLE PBMC group 1.80% ± 0.65%, P>0.05).

Furthermore, in the presence of TCR stimulation, TGF-β1 specific inhibitor SB431542 significantly inhibited the regulatory role of UC-MSCs on Treg cells in SLE patients (SLE PBMC+UC-MSCs+SB431542 group 4.58%±2.10% vs. SLE PBMC+UC-MSCs group 7.85%±3.54%, P<0.05).

Conclusion: Immune microenvironment in SLE patients can significantly stimulate TGF-β1 expression on UC-MSCs, which plays an important role in the upregulation of Treg cells in patients. This study provides a new mechanism for the regulation of Treg cells by UC-MSCs in SLE.

Disclosure: L. Sun, None; D. Wang, None; L. Lu, None; X. Li, None.

1647
Critical Management Decisions in Cardiac Neonatal Lupus: The Role of Fluorinated Steroids, Peter M. Izmirly1, Sara Sahl2, Amit Saxena3, Nathalie Costedoat-Chalumeau4, Jean-Charles Piette5, Munther A. Khamashta4, Cecilia Pisoni6, Deborah Friedman6 and Jill P. Buyon1. 1New York University School of Medicine, New York, NY, 2Assistance Publique-Hôpitaux de Paris, Hopital Pitie-Salpetriere, Paris, France, 3CHU Pitie-Salpetriere, Paris, France, 4Lupus Research Unit, The Rayne Institute, Kings College London School of Medicine, London, United Kingdom, 5Medica e Investigaciones Clinicas (CEMIC), Buenos Aires, Argentina, 6New York Medical College, Valhalla, NY

Background/Purpose: Life-threatening cardiac manifestations of neonatal lupus (cardiac-NL) include complete block, endocardial fibroelastosis (EFE) and dilated cardiomyopathy (DCM), all supportive of intense fibrosis (EFE) and dilated cardiomyopathy (DCM), all supportive of intense fibrosis. In 276 cases of cardiac-NL, sufficient data were available at the AV node and beyond. The overall case fatality rate is 17.5% but ranges from 7.8% for isolated block to 46.7% which is the block is accompanied by more extensive disease. Both prevention and treatment with fluorinated steroids (FS) have been considered but results are inconclusive and even conflicting, a disconcerting situation given the potential for maternal toxicity. Accordingly, we reviewed the records from the U.S. Research Registry for Neonatal Lupus (RRNL), and the French and U.K. Registries to ascertain whether the use of FS conferred a survival benefit for fetuses with cardiac-NL or prevented the recurrence of cardiac-NL.

Methods: Data from the RRNL were analyzed to determine whether the use of FS affected survival at six months. Isolated third degree block and risk factors associated with a poor prognosis for cardiac-NL (HR<50, DCM and EFE) were evaluated individually or in combination given the likelihood of more than one poor prognostic factor being present. The effect of FS on survival once hydrops was detected was also addressed. The efficacy of prophylactic FS was assessed in an international historical cohort.

Results: In 276 cases of cardiac-NL, sufficient data were available regarding medications used during pregnancy; 150 were treated with FS. Not unexpectedly, FS were most often used when disease extended beyond the AV node. Neither maternal race/ethnicity nor health status influenced the use of FS.

Conclusion: None of the patients with cardiac-NL died without a maternal diagnosis of SLE. Among the 276 cases of cardiac-NL, 150 were treated with FS, and none died of cardiac disease. Among those with cardiac disease, however, 36% died in utero, and the median survival was only 3 weeks (range: 0-30 weeks). The RRNL data indicate that FS are ineffective in preventing the recurrence of cardiac-NL.
of FS. In isolated 3rd degree block, 2.6% (2/78) died by 6 months postpartum despite the use of FS compared to 0/74, in those never given FS, p = 0.50. In those with HR < 50 bpm, 0 of 25 exposed to FS died compared to 0 of 18 unexposed to FS. In the 12 cases with EFE (present or absent block) all received FS and only 1 died (9.9%) which was an elective termination. In cases where DCM was present (with or without block) 25% (1/4) died by 6 months postpartum despite the use of FS compared to 20.0% (1/5) never given FS. In cases with ≥ 2 risk factors, 16.7% (1/6) exposed to FS died by 6 months postpartum compared to 33.3% (2/6) unexposed. In fetuses with hydrops, 55.6% (15/27) receiving FS died compared to 81.8% (9/11) who did not receive FS, p = 0.016. When terbutaline was added to FS for hydrops, 50.0% (5/10) died compared to 58.8% (10/17) not receiving terbutaline. With regard to prophylaxis, recurrent cardiac-NL occurred in 14.3% (2/14) of pregnancies of mothers given FS compared to 19.3% (2/17) in those not treated with FS, p = 0.58.

Conclusion: These data suggest that fetuses with isolated 3rd degree block, even those who develop severe bradycardia in absence of other risk factors, do well and the addition of FS does not improve the 6 month survival rate. FS may be beneficial in cardiac-NL cases which develop hydrops or have multiple poor prognostic factors. Available evidence does not support the use of FS to reduce the recurrence rate of cardiac-NL.

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1648
Lupus Anticoagulant At First Pregnancy Visit Is Predictive of Pregnancy Loss. Michelle Petri1, Anil Mankee1, Ehtisham Akhter1, Hong Fang1 and Laurence S. Magder2.

Background/Purpose: Multiple factors, including proteinuria, antiphospholipid syndrome, thrombocytopenia and hypertension, are predictive of pregnancy loss in SLE. In the PROMISSE study of mediators of pregnancy loss, only a battery of lupus anticoagulant tests (Dil PT, dRVVT, PTT LA, and KCT) were predictive of adverse pregnancy outcomes (including pregnancy loss, preterm birth, pre-eclampsia, and small for gestational age). We examined the predictive value of one baseline lupus anticoagulant test (dRVVT) with pregnancy loss alone in women with SLE.

Methods: This analysis is based on pregnancies that were observed from 1987 to 2011. After excluding twin pregnancies, there were 402 pregnancies from 326 different women. We determined the percentage of women who had a pregnancy loss in groups defined by potential risk factors. Generalized Estimating Equations were used to calculate p-values, accounting for repeated pregnancies of the same woman.

Results: The age at pregnancy was <20 years (3%), 20–29 (50%), 30–39 (43%), and over 40 (3%). 59% were Caucasian and 34% African-American. Predictors of pregnancy loss are shown in the table. Lupus anticoagulant at the 1st visit was highly predictive of pregnancy loss (and ever being positive was also associated, although less so).

Table 1. Proportion with Pregnancy Loss, by characteristics of the patients.

<table>
<thead>
<tr>
<th>Patient Characteristic</th>
<th>Proportion (%) with miscarriage</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>1/13 (8%)</td>
<td>0.38</td>
</tr>
<tr>
<td>20–29</td>
<td>2/20 (10%)</td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td>19/172 (11%)</td>
<td></td>
</tr>
<tr>
<td>40+</td>
<td>6/12 (50%)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>28/233 (12%)</td>
<td>0.77</td>
</tr>
<tr>
<td>African American</td>
<td>14/153 (10%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4/31 (13%)</td>
<td></td>
</tr>
<tr>
<td>Year of conception</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986–1994</td>
<td>14/155 (12%)</td>
<td>0.32</td>
</tr>
<tr>
<td>1995–1999</td>
<td>13/83 (16%)</td>
<td></td>
</tr>
<tr>
<td>2000–2004</td>
<td>10/83 (13%)</td>
<td></td>
</tr>
<tr>
<td>2005+</td>
<td>9/122 (7%)</td>
<td></td>
</tr>
<tr>
<td>RVVT measured in first trimester1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>16/187 (9%)</td>
<td>0.0022</td>
</tr>
<tr>
<td>High (≥45)</td>
<td>6/15 (40%)</td>
<td></td>
</tr>
<tr>
<td>No first-trimester measure</td>
<td>24/200 (12%)</td>
<td></td>
</tr>
<tr>
<td>Ever positive for high RVVT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>26/278 (9%)</td>
<td>0.030</td>
</tr>
<tr>
<td>Yes</td>
<td>20/117 (17%)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>0/7 (0%)</td>
<td></td>
</tr>
</tbody>
</table>

1Based on the average of the measures during the first trimester or prior to miscarriage if miscarriage occurred in first trimester.

Conclusion: The strongest predictor of pregnancy loss in SLE is the lupus anticoagulant in the first trimester by dRVVT testing. In contrast to the PROMISSE study, 3 lupus anticoagulant assays were not necessary. In addition, moderate disease activity by the physician global assessment was also predictive of pregnancy loss, but not low complement, anti-dsDNA, or anticardiolipin. These data suggest that treatment of the lupus anticoagulant should be considered, even in the absence of prior history of miscarriage.

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1649
French Cohort Study of 141 Cases of Autoimmune Congenital Heart Block. Kateri Levesque1, Alice Malter2, Mohamed Hamidou1, Moez Jaliloul1, Jean Louis Pennaforte1, Pauline Orquevaux5, Jean-Charles Piette, Zahir Amoura4, Francois Barriere1, Jerome Le Bidois5, Laurent Fermon7, Laurence Cohen3, Olivier Meyer4, Olivier Fain1, Arnaud Theulin11, Hugues Lucron2, Francois Sassolas13, Hazel Bezanzahary4, Gaëlle Guettrot-Imbert6, Pascal Seve15, Elizabeth Diot16, Nathalie Morel17, Christophe Deligny18, Elisabeth Villain2 and Nathalie Costedoat-Chalumeau18.

Background/Purpose: Cardiac neonatal lupus manifestations mainly include congenital heart block (CHB), endocardial fibroelastosis and dilated cardiomyopathy. We report the preliminary results of the French registry of neonatal lupus.

Methods: This French registry was established in 2000 and includes foetuses or children with neonatal lupus, born to mothers with anti-SSA or anti-SSB antibodies. This database has Institutional Review Board approval. Here, we report data on CHB.

Results: 141 cases of CHB born to 124 mothers were included. When the first CHB was diagnosed, 45 mothers (36 %) had an autoimmune disease: 16 had systemic lupus erythematosus (1 with an antiphospholipid syndrome), 15 had Sjögren syndrome, and 14 had another connective tissue disease (CTD). After a median follow-up period of 3.6 years, [0.03–36.5], 85 women (60%) had a diagnosis of autoimmune disease (Sjögren syndrome in 33, systemic lupus erythematosus in 32, and other CTD in 20).

At the time of the CHB diagnosis, 24 (17%) of the pregnant women were treated with corticosteroids, 13 (9.2%) with hydroxychloroquine, and 21
(14.9%) with acetylsalicylic acid. The median term at diagnosis of CHB was 22 WG [16–37 WG]. Twenty-two foetuses (15.6%) were also diagnosed with endocardial fibroelastosis. Among the 141 fetuses with CHB, there were 9 intrauterine deaths, 10 elective terminations of pregnancy, and 122 (86.5%) children born alive at a median term of 37 WG [28–40]. After a median follow-up period of 5.6 years, [0.03–36.5], 11 children (9%) had died. Three died in the neonatal period (2 from complication of CHB and one from prematurity) and 8 later on at a median age of 10 months [2–60]. Of those 8 children, 7 deaths were attributed to a cardiomyopathy associated with CHB, and one to a nosocomial infection.

Ninety five children (77.8%) had a pacemaker, implanted at a median age of 3.7 months [0.01–14.4]. Fifteen children (12.5%) developed a cardiomyopathy requiring a medical treatment and 9 of those 15 children died from complications of this cardiomyopathy. There was no cardiac transplantation.

After a first pregnancy complicated with a CHB, 57 women had a total of 84 subsequent pregnancies. The following pregnancies were complicated by a CHB in 20.2% of cases (n=17). There were 14 cases of CHB in the 53 pregnancies non-exposed to hydroxychloroquine (26.9%) versus 3 cases in the 32 pregnancies exposed to hydroxychloroquine (9.4%); p=0.052.

Conclusion: 87% of foetuses diagnosed with CHB were alive at birth, and 9% died during a median follow up of 5.6 years. A pacemaker was inserted in 77.8% of the cases. Our data confirm that the use of hydroxychloroquine may protect against recurrence of CHB in a subsequent pregnancy (Izmery et al, Circulation. 2012 May 24. [Epub ahead of print]). An international prospective study is ongoing to confirm this point (PATCH [Izmery et al, Circulation. 2012 May 24. [Epub ahead of print]]). An international prospective study is ongoing to confirm this point (PATCH). An international prospective study is ongoing to confirm this point (PATCH).

Disclosure: K. Levesque, None; A. Malret, None; M. Hamidou, None; M. Jallioul, None; J. L. Peanaforte, None; P. Orquevaz, None; J. C. Pette, None; Z. Amoura, None; E. Barriere, None; J. Le Bidois, None; L. Fournet-Nouvelle, None; Cohen, None; O. Meyer, None; O. Fain, None; A. Theulin, None; H. Lucron, None; F. Sassolas, None; H. Bezanahary, None; G. Guettrot-Imbert, None; P. Seve, None; E. Diot, None; N. Morel, None; C. Deligny, None; E. Villain, None; N. Costedoat-Chalumeau, None.

1650

Abnormal Serologies in the Absence of Clinical Activity Do Not Predict New or Recurrent Lupus Nephritis During Pregnancy. Jill Buyon1, Aamam Aslam2, Marta M. Guerra3, Michael D. Lockshin4, Carl A. Laskin1, Ware Branch1, Lisa R. Sammaritano4, Michelle Petri5, Joan T. Merrill6, Allen D. Sawitzke1 and Jane E. Salmon1. 1New York University School of Medicine, New York, NY, 2Hospital for Special Surgery, New York, NY, 3University of Toronto and LiFeQuest Centre for Reproductive Medicine, Toronto, ON, 4Univ of Utah, Salt Lake City, UT, 5Johns Hopkins University School of Medicine, Baltimore, MD, 6Oklahoma Medical Research Foundation, Oklahoma City, OK, 7University of Utah Medical Ctr, Salt Lake City, UT

Background/Purpose: Renal disease is a critical concern of physicians counseling lupus patients regarding pregnancy. In patients without a history of kidney disease, does pregnancy increase the risk of first time involvement? In patients with previous renal disease, does pregnancy raise the likelihood of a renal flare? In both cases, prediction of outcome is challenging in a clinically stable patient with serologic activity (abnormal anti-dsDNA antibodies coupled with low complements). Accordingly, our objective was to assess serologic activity as a predictor of renal flares during pregnancy in patients with less than 1 gram of protein at enrollment in a large, prospective, multicenter, mutiethnic study.

Methods: The PROMISSE Study (Predictors of rPregnancy Outcome: BioMarkers In antiphospholipid antibody Syndrome and Systemic Lupus Erythematosus) prospectively evaluated 391 pregnant SLE patients. Exclusion criteria were multi-fetal pregnancy, predosine >20mg/d, proteinuria >1gm/24hr, and creatinine >1.2mg/dL. A renal flare was defined by proteinuria increase of >500mg/m with or without hematuria and/or red blood cell casts. Of the 391 patients, 121 (31.1%) had preexisting renal disease as defined by ACR SLE criteria and/or a renal biopsy in 53 of whom 4% were Class I or II, 62% were Class III or IV, 13% were Class III/IV & V, and 21% were Class V. Overall at enrollment, 17% had only positive anti-dsDNA, 12% had only hypocomplementemia, 20% had both, and 51% were normal for both parameters.

Results: 16 renal flares occurred in 121 patients with previous renal disease. All had proteinuria, 5 (31%) had hematuria, and 1 (6%) had red blood cell casts. There were no differences between biopsy classes for patients with and without renal flares. Of the 29 patients with a history of renal disease and both anti-dsDNA and hypocomplementemia, 5 (17%) had a renal flare. In 44 patients with either serology alone, 7 (16%) had renal flares. In 48 patients with neither serology, 4 (8%) had renal flares. 5 patients were treated with increased prednisone. 3 treated patients and 2 untreated patients developed pre-eclampsia. Other adverse pregnancy outcomes included 3 (1%) fetal/neonatal deaths and 2 (13%) with SGA <5th %ile in the 16 patients with renal flares. In 270 patients with no history of kidney disease, only 3 renal flares occurred. Of the 50 patients with no history of renal disease and both anti-dsDNA and hypocomplementemia, 2 (4%) had new onset proteinuria; one was treated and developed pre-eclampsia. In 150 patients with neither serology, 1 had new onset proteinuria which was treated and had SGA <5th %ile. None of 70 with either serology alone had renal flares.

Conclusion: These data provide evidence that clinical quiescence or stability at the time of conception favors good renal outcomes during pregnancy regardless of serologic activity. Increased proteinuria (not uniformly requiring prednisone) occurred in 13% of patients with previous renal disease and 1% of those without a history of kidney disease. Thus, in counseling women with lupus who are contemplating pregnancy, abnormal serology alone should not lead to advising against pregnancy even in patients with previous renal disease.

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1651

Higher Corticosteroid Doses Early in Disease Have A Long-Term Influence On Metabolic Syndrome in Systemic Lupus Erythematosus: Data from an International Inception Cohort. Ben Parker1, Murray B. Urowitz2, Dafna D. Gladman Gladman3, Mark Lunt4, Ian N. Bruce3 and Systemic Lupus International Collaborating Clinic (SLICC)5. 1University of Manchester, Manchester, United Kingdom, 2Toronto Western Hospital and University of Toronto, Toronto, ON, 3Arthritis Research UK Epidemiology Unit, The University of Manchester, Manchester, United Kingdom, 4Arthritis Research UK Epidemiology Unit and NIHR Manchester Musculoskeletal Biomedical Research Unit, Manchester, United Kingdom, 5Toronto

Background/Purpose: The Metabolic Syndrome (MetS) is a clustering of metabolic abnormalities associated with an increased risk of developing diabetes and atherosclerosis, and may add to the increased cardiovascular (CV) risk seen in SLE. We examined the potential impact of markers of inflammation and corticosteroid exposure over time on the prevalence of MetS during the first 2 years of follow-up in an international inception SLE cohort.

Methods: Recently diagnosed (<15 months) SLE patients from 30 centres across 11 countries were enrolled into The Systemic Lupus International Collaborating Clinics Registry for Atherosclerosis (SLICC-RAS) inception cohort from 2000 onwards. Baseline and annual assessments recorded clinical and laboratory data, and therapeutic exposures. MetS was defined according to the 2009 International Diabetes Federation Consensus Statement. A longitudinal analysis of the first 2 years of follow-up was performed using random effects logistic regression which was time-adjusted and took into account multiple visits. The analysis examined the association between MetS and disease activity, disease phenotype and corticosteroid exposure over the first 2 years of follow-up. Variables representing exposure at baseline and follow-up, as well as over-time, were assessed. Significant factors in regression analyses, adjusted for age, sex, ethnicity, and time, were included in the final model.

Results: We recruited 1494 patients with a mean (SD) age at enrolment and disease duration of 35.2 (13.4) years and 24.1 (18.0) weeks respectively. The prevalence of MetS was 239/1494 (16%) at enrolment, 193/1065 (12.6%) at year 1 and 207/894 (13.5%) at year 2. The highest prevalence at enrolment was in patients of Korean (30.1%) and Hispanic (25.3%) ethnicity. In multiple regression analyses current corticosteroid use (odds ratio (95% confidence interval) 1.97 (1.35, 2.87)); daily average prednisolone dose (mg) (1.03 (1.02, 1.05)); peak oral prednisolone dose (mg) (1.03 (1.02, 1.04)); immunosuppressant use (1.69 (1.25, 2.28)); SLICC/ACR-DI ≥1 (3.14 (2.01, 4.89); preceding MetS status (7.94 (5.52, 11.42)); active renal disease (2.76 (1.89, 4.03)) and higher SLEDAI-2K (1.89, 4.03)) were associated with higher MetS. Anti-malarial use was protective (0.45 (0.32, 0.63)). In the final model preceding MetS status, higher peak corticosteroid dose (mg) at enrolment, elevated anti-dsDNA at enrolment, increasing age, and Hispanic ethnicity were all independently associated with MetS over time (Table 1).
Conclusion: The risk of developing MetS can be determined early in the SLE disease course, with subsets of patients more prone to MetS. Higher doses of steroids in very early disease influence the development of MetS over the subsequent 2 years. Therefore even from disease onset, steroid doses should be individually tailored in order to minimize longer-term CV risk.

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ACR Concurrent Abstract Session
Vasculitis: Clinical Trials
Monday, November 12, 2012, 2:30 PM–4:00 PM

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Background/Purpose: Once ANCA-associated vasculitis (AAV) remission has been achieved with Cs and cyclophosphamide (CYC), maintenance therapy usually relies on azathioprine (AZA) or methotrexate. However, 18- and 28-month relapse rates remain high, 15% and 28%, respectively. Although rituximab (RTX) has been demonstrated to be as effective as CYC for induction of complete remission by 6 months, some retrospective studies showed that more than half of the patients without maintenance relapsed within 2 years. The results of a prospective, randomized, controlled trial of RTX vs AZA to maintain AAV remission are reported (MAINRTSIN, NCT 00748644). (Sponsor: Assistance publique Hôpitaux de Paris, Grants: Programme Hospitalier de Recherche Clinique, Rituximab was provided in part by Roche.)

Methods: Once remission was obtained with a conventional regimen, patients with newly diagnosed (2/3 of the enrollments) or relapsing (1/3) AAV were randomly assigned to receive a 500-mg RTX infusion on D1, D15, 5.5 months later, then every 6 months for a total of 5 infusions over 18 months, or AZA for 22 months at the initial dose of 2 mg/kg/d. The primary endpoint was the major relapse rate (EULAR/ACR criteria) at 28 months. Other outcome measures were the severe adverse event (SAE) rate (WHO definition) associated with each maintenance regimen. We hypothesized that the RTX arm would have a 50% lower relapse rate than that of AZA, and a similar safety profile.

Results: Among the 114 patients (50 men/64 women; mean age, 55±13 years; 91 newly diagnosed and 23 relapers) participating in the study (59 in the AZA arm, 55 in the RTX arm): 86 had granulomatosis with polyangiitis, 23 microscopic polyangiitis and 5 kidney-limited diseases. The main clinical manifestations at diagnosis or last relapse included ENT involvement in 88 (77.2%), lung in 69 (60.5%) and kidney in 82 (71.9%). Eighty-four (73.7%) patients have already completed their 28 months of follow-up, the last patient visit and trial closure are scheduled in 10/2012. So far, major relapses have occurred in 18 (15.7%) patients: 2 (3.6%) in the RTX arm and 16 (27.1%) in the AZA arm, with 3 AZA-arm deaths (1 sepsis, 1 pancreatic cancer, 1 mesenteric ischemia). Thirty-three experienced SAE: 18 related to AZA, 15 to RTX. In the AZA arm, 12 infections (1 fatal) and 1 skin cancer were observed vs 11 infections (none fatal) in the RTX arm.

Conclusion: The results of this study demonstrated that 500 mg of RTX every 6 months was superior to AZA to maintain AAV remission. The infection frequencies were comparable in the 2 arms, and other SAE were infrequent and resolved in most patients.

Disclosure: L. Guillaumin, None; C. Pannouz, None; A. Karras, None; C. Khoutra, None; O. Amaintre, None; P. Cohen, None; F. Maurier, None; O. Deuax, None; H. Desmurs-Clavel, None; P. Gobert, None; T. Queuernue, None; C. Blanchard-Delaunay, None; P. Godmer, None; X. Puechel, Pfizer Inc, 5, Roche Pharmaceuticals, 5, P. L. Carron, None; P. Y. Hatron, None; N. Limal, None; M. Hamidou, None; M. Ducret, None; F. Vende, None; E. Pasqualoni, None; B. Bonnotte, None; P. Ravaud, None; L. Mouthon Sr., None.

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Outcomes in Patients with Granulomatosis with Polyangiitis (Wegener’s) Treated with Short Vs. Long-Term Maintenance Therapy, Jason Springer, Benjamin Nutter, Carol A. Langford, Gary S. Hoffman and Alexandra Villa-Forte. Cleveland Clinic Foundation, Cleveland, OH.

Background/Purpose: Disease remission can be successfully achieved in the majority of patients (pts) with Granulomatosis with polyangiitis (Wegener’s) (GPA). After remission (rem) is achieved continued treatment with immunosuppressive agents is used to maintain rem. There is limited data on long term outcomes for pts continuing maintenance therapy beyond 18 months (mo). The aim of this study was to determine rem maintenance outcomes in pts treated long term (>18 mo) vs. short term (<18 mo). The primary outcome was relapse rate.

Methods: A retrospective chart review was performed of pts with GPA from a single Vasculitis Center from 1992 to 2010. Inclusion criteria: 1) 1990 ACR criteria for GPA, 2) induction therapy provided with daily cyclophosphamide (CYC) or weekly methotrexate (MTX); 3) rem achieved; 4) maintenance therapy initiated immediately following discontinuation of induction therapy; 5) maintenance therapy with either MTX or azathioprine (AZA); 6) duration of remission ≥18 mon; 7) chronicologic documentation of rem and relapse. Rem was defined as a BVAS/WG score of 0 and relapse defined as a score that changed from 0 to ≥ 1 following a period of rem.

Results: 157 pts were included out of 797 screened. Median age at diagnosis was 46. Follow-up ranged from 18 mo to 16.8 years (mean 3.1 yr). Induction therapy with CYC was used for severe disease (78% cases) and MTX (22% cases) for mild to moderate disease. Mean starting doses of maintenance medications were prednisone (pred) 19 mg/d, MTX 16.5mg/wk and AZA 112mg/d. There was no difference between groups in regards to initial organ manifestations, pred dose at rem, maintenance drug used or pulse dose methylprednisolone (MP) at diagnosis. When duration of treatment was compared using a univariate model the long term group showed a 29% reduction in hazard ratio for relapse (HR0.71 [95%CI 0.43, 1.18], p=0.18). Treatment for >36 mo showed 66% reduction in hazard ratio for relapse (HR0.34 [95%CI 0.15, 0.76], p=0.008). When length of treatment was considered as a continuous factor, longer courses had an inverse relationship with the risk of relapse (HR0.77 [95%CI 0.65, 0.92]; p= 0.003). After adjusting for pred dose, length of maintenance therapy continued to show a significant inverse relationship with risk of relapse (HR0.58 [95%CI 0.4, 0.83]; p=0.003). Univariate analysis revealed no association with risk of relapse and BVAS at diagnosis, ANCA status or pulse MP. When relapse characteristics were compared between groups there was no difference in severity of relapse as measured by BVAS/WG, but a higher rate of relapse with peripheral neuropathy (15% vs 1.43%, p=0.033) occurred in the short term group. Relapses in the long-term group occurred in 88.9% after stopping therapy. Of pts on therapy at relapse 52% were on < 15mg/wk MTX and 75% on ≤ 50mg/d AZA. No differences between the two groups in overall adverse events or GPA related morbidity.

Table 1. Random effects model of MetS predictors over time in SLICC-RAS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceding MetS (y/n)</td>
<td>4.83 (2.93, 7.87)</td>
</tr>
<tr>
<td>Peak prednisolone dose at enrolment (mg)</td>
<td>1.02 (1.01, 1.03)</td>
</tr>
<tr>
<td>Elevated anti-dsDNA at enrolment (y/n)</td>
<td>1.16 (1.19, 2.81)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>1.03 (1.01, 1.05)</td>
</tr>
<tr>
<td>Hispanic ethnicity</td>
<td>3.47 (1.76, 6.86)</td>
</tr>
</tbody>
</table>

S706
Conclusion: Our data demonstrate that pts receiving long term maintenance therapy have fewer relapses and have a similar adverse events profile as pts treated for < 18 mos. Discontinuation and low doses of maintenance therapy are associated with a high relapse rate.

Disclosure: J. Springer, None; B. Nutter, None; C. A. Langford, None; G. S. Hoffman, None; A. Villa-Forte, None;

Primary Endpoint Failure in the Rituximab in ANCA-Associated Vasculitis Trial. Eli Milošlavský1, Ulrich Specks2, John H. Stone3 and RAVE/ITN Research Group4, 1Massachusetts General Hospital, Boston, MA, particularly those in the RTX group. ability and ANCA titers correlated poorly with flares in the first 6 months, improved following a treatment intervention according to best medical causes was similar between groups. ETFs and pts who flared typically the Vasculitis Clinical Research Consortium. 3Cleveland Clinic, Cleveland, OH, University of South Florida, Tampa, FL, 3University of Pennsylvania, Philadelphia, PA, Boston University, Boston, MA, 3Johns Hopkins Vasculitis Center, Baltimore, MD, 5Mayo Clinic, Rochester, MN

Background/Purpose: The RAVE trial demonstrated that rituximab (RTX) is non-inferior to cyclophosphamide (CYC) for remission induction in severe ANCA-associated vasculitis. The primary endpoint was a disease activity score (Birmingham Vasculitis Activity Score/Wegener’s granulomatosis; BVAS/WG) of 0 and a prednisone dose of 0 mg/d at month 6. We explored the reasons for primary endpoint failure (PEF) in RAVE.

Methods: PEFs were classified according to one of the following hierarchical reasons: early treatment failure (ETF) (advance of disease in one or more organs or failure to respond to treatment by BVAS/WG reduction in the first month); severe flare; limited flare; adverse event (AE); BVAS/WG > 0 at 6 months; prednisone > 0 mg/d at 6 months despite BVAS/WG of 0; or other.

Results: Eighty-two of 197 pts (42%) were ETFs: 36 (36%) in the RTX group, 46 (47%) in CYC (P = 0.09). Nine were ETFs (7 RTX, 2 CYC; P = 0.17). Baseline characteristics of pts classified as ETFs did not differ from those of other pts in age, sex, ANCA type, disease, new diagnosis vs relapse, baseline BVAS/WG, or creatinine. Most ETFs were due to progressive glomerulonephritis (5/9: 4 RTX, 1 CYC) or recurrent pulmonary hemorrhage (3/9). All ETFs were treated with CYC. One ETF (RTX) died from sepsis/respiratory failure. All other ETFs improved, with resolution of pulmonary disease and improvement of renal function.

Fifteen RTX pts were ETFs because of disease flares (4 severe, 11 limited), compared with 23 CYC pts (9 severe, 14 limited). Neither B cell detectability nor ANCA titer predicted disease flare well in the first 6 months, and the correlation was particularly poor among RTX-treated pts. B cells remained undetectable in 65% of flares (50% CYC, 92% RTX). Among disease flares, only 24% had rises in ANCA titers at the time of flare (36% CYC, 0% RTX).

Of the 13 severe flares, 11 were treated by blinded crossover. None of 11 blinded crossovers achieved remission (BVAS of 0 and prednisone dose of 0mg) within 6 months after crossover. Limited flares were typically controlled by an increase in prednisone dose. Among pts with limited flares, the mean BVAS/WG at 6 months was 0.9 and the mean prednisone dose 9.3 mg/d. Six pts were ETFs because of BVAS/WG > 0 at 6 months (2 RTX, 4 CYC; mean 2.0), and 11 were ETFs because of failure to taper prednisone to 0 mg/d (7 RTX, 4 CYC; mean 9.3 mg/d). Twelve pts (9 CYC, 3 RTX) discontinued because of AEs.

Table 1 Reasons for primary endpoint failure in RAVE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value at Study Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (range)</td>
<td>45 years (17–73)</td>
</tr>
<tr>
<td>Female/Male</td>
<td>9/11</td>
</tr>
<tr>
<td>PR3-cANCA</td>
<td>80%</td>
</tr>
<tr>
<td>MPO-cANCA</td>
<td>10%</td>
</tr>
<tr>
<td>GPA duration (range)</td>
<td>100 months (5–326)</td>
</tr>
<tr>
<td>BVAS/WG mean (range)</td>
<td>3.1 (1–6)</td>
</tr>
<tr>
<td>VDI mean (range)</td>
<td>2.5 (0–7)</td>
</tr>
</tbody>
</table>

Of the 20 patients, 14 (70%) were on either MTX (N = 7), AZA (N = 3), or MMF (N = 4). 14 patients had taken prednisone during the 12 months prior to enrollment, 13 were on at the time of enrollment, and 15 (75%) received prednisone during the first 2 months of study treatment. The maximum prednisone doses were 30 mg (N = 3), 20 mg (N = 3), 12–15 mg (N = 2), 10 mg (N = 4), 7.5 mg (N = 1), 5 mg (N = 2) with only 5 having a dose increase at trial entry. During the study, 11 of the 15 patients on prednisone reached a dose of 0 mg of 10 of the 14 patients who had been on long-term prednisone were able to discontinue prednisone and 7 of these remained off the drug until common closing. Of the 20 patients, 18 (90%) had disease improvement, 16 (80%) achieved remission (BVAS/WG = 0) at a median of 3.75 months (range 1–19), and 14 (70%) reached common closing. 6 (30%) met criteria for early termination due to increased disease activity but none had severe disease; 3 of 6 achieved remission and relapsed at a median of 8.33 months (range 6–10). The median duration of remission before common closing was 12 months (range 4–21). 9 serious adverse events occurred in 7 patients, including 7 infections that were successfully treated.

Conclusion: In this population of patients with mild relapsing GPA, abatacept was well tolerated and was associated with disease remission and discontinuation of prednisone in a high percentage of patients. These findings suggest that abatacept warrants further study as a possible treatment option for patients who have non-severe, relapsing GPA.

Disclosure: C. A. Langford, Bristol-Myers Squibb, 9; D. Cuthbertson, None; G. S. Hoffman, None; J. Krischer, None; C. McAlear, None; P. A. Monach, None; P. Seo, None; U. Specks, None; S. R. Ytterberg, None; P. A. Merkel, None;
Background/Purpose: To optimize the therapeutic strategy for the elderly with systemic necrotizing vasculitides (SNV; polyarteritis nodosa (PAN), granulomatosis with polyangiitis (GPA), microscopic polyangiitis (MPA) or eosinophilic GPA (EGPA)).

Hypothesis: We conducted a multicenter randomized controlled trial on patients ≥65 years old with newly diagnosed SNV to compare conventional therapy (based on Five-Factor Score-assessed disease severity; for all, ≥28 mo of corticosteroids (CS) alone or combined with 500-mg/m² cyclophosphamide (CYC) IV pulses every 2–3 wk until remission for EGPA or PAN with FFS=1 and GPA or MPA, then switched to maintenance arathioprine (AZA) or methotrexate (MTX)) and an experimental regimen, specifically designed for faster CS dose-tapering and systematic but reduced CYC exposure (for all, ≤9 mo of CS and 500-mg fixed-dose IV CYC pulse, given every 2–3 wk, and switched after a maximum of 6 pulses to maintenance AZA or MTX). Trial follow-up closure was scheduled 3 yr after enrollment of the last patient.

Results: Between July 2005 and February 2008, 108 patients were randomly assigned (early protocol withdrawal, wrong diagnosis, protocol violations). Mean age at diagnosis of the analyzed patients (52 in each arm; 55 males, 49 females; 8 PAN, 13 EGPA, 37 GPA, 46 MPA; 91 ANCA-positive) was 75.2±6.3 yr, with a maximum of 92 yr for 1 MPA patient. FFS=1 for 7 PAN (4 in the conventional arm, 3 in the experimental arm) and 10 EGPA patients (5 in each arm). Baseline clinical features were evenly distributed between arms (fever, 33%; arthralgias, 38%; lung, 64%; ENT, 40%; kidney, 69%; heart, 20%; skin, 35%; peripheral nervous system, 25%; central nervous system, 3%); mean serum creatinine level at diagnosis was 234±199 μmol/l and C-reactive protein 102±87 mg/l. Mean follow-up was 28.1±11.8 mo. Hazard ratio for first SAE (primary endpoint) for experimental vs conventional treatment was 0.61 [95% CI, 0.38–0.97], i.e., 39% lower SAE rate (3-yr event-free survival: 37.6% [95% CI, 26.4–53.7] in conventional vs 19.2% [95% CI, 10.9–34.1] in conventional treatment arms; p=0.04). Ninety-one (88%) patients achieved remission with their assigned treatment (47 in experimental treatment arm vs 44 in conventional; p=0.37).

Conclusions: Treating SNV in the elderly with a specific regimen limiting exposure to CS and fixed low-dose IV CYC pulses could become the standard of care because of its lower SAE risk, and similar 3-yr remission and relapse rates, compared to conventional therapy.
Methods: Phospho-STAT3 (p-STAT3) expression in synovial tissue was quantified by immunohistostaining and Western blot. Notch-1 IC, HIF1a, p-STAT3 and total-STAT3 protein levels were assessed in synovial fibroblasts under normoxic and hypoxic (3%) conditions by Western Blot. In parallel gene expression of the Notch-1 receptor, its ligand DLL-4 and downstream target genes (hrt-1, hrt-2) were quantified by Real-time PCR. Synovial fibroblast migration, invasion, matrigel network formation, MMP2/9 in-gel zymography were quantified under normoxic and hypoxic (3%) conditions in the presence of STAT3 inhibitor (WP1066). Using RA synovial explants ex vivo, the effect of the STAT3 inhibitor (WP1066) on IL-6, IL-8 and IL-10 expression were assessed by ELISA.

Results: Nuclear expression of p-STAT3 was demonstrated in RA synovial tissue, localized to the sub-lining and lining layer regions. p-STAT3 expression was significantly higher in inflamed synovial tissue compared to normal synovial tissue. Hypoxia (3%) induced p-STAT3, Notch-1 IC, HIF1a protein expression in synovial fibroblasts, an effect that was inhibited by the presence of WP1066. Similarly hypoxia-induced Notch-1 receptor, DLL-4 and hrt-1, hrt-2 gene expression were inhibited in the presence of WP1066. Functionally hypoxia-induced synovial fibroblast invasion, matrigel network formation, migration, and pro-MMP-2/9 activities, were inhibited in the presence of STAT3 inhibitor. Finally, we demonstrated in RA synovial explants ex vivo that WP1066 significantly decreased IL-6, IL-8 expression and significantly increased anti-inflammatory cytokine IL-10 expression.

Conclusion: p-STAT3 is increased in RA synovial tissue and mediates synovial fibroblast migrational and invasive processes. Furthermore these effects may in part be mediated through Notch-1/HIF1a interactions.

Disclosure: W. Gao, None; D. J. Veale, Abbott Laboratories, 2, MSD, 2, Opsona, 2, Pfizer Inc, 2, Roche Pharmaceuticals, 2; U. Fearon, None.

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Ptpome Profile of Rheumatoid Arthritis Fibroblast-Like Synoviocytes: A Novel Role for the Tyrosine Phosphatase SHP-2 As a Modulator of Invasion and Survival. Stephanie Stanford1, Michael Maestre2, Beatrix Bartok2, David L. Boyle4, Heather Arnett2, Tomas Mustelin2, Gary S. Firestein2 and Nunzio Bottini1. 1La Jolla Institute for Allergy and Immunology, La Jolla, CA, 2UCSD School of Medicine, La Jolla, CA, 3Amgen, Inc, Seattle, 4Sanford-Burnham Institute for Medical Research, La Jolla, CA.

Background/Purpose: Fibroblast-like synoviocytes (FLS) in the synovial intimal lining are key mediators of inflammation and joint destruction in rheumatoid arthritis (RA). These cells assume a tumor-like phenotype in RA, aggressively invading the extracellular matrix and producing cartilage-degrading proteases and inflammatory cytokines. The behavior of synovial fibroblasts is controlled by multiple interconnected signal transduction pathways involving reversible protein phosphorylation. However, little is known about the role of the protein tyrosine phosphatases (PTPs) in FLS function. The objective of this study was to define all of the PTP genes (PTPome) expression in FLS from patients with RA or osteoarthritis (OA) by qPCR. Cell permeable anti-sense oligonucleotides were used to suppress PTPs, such as SHP-2, and achieved 90% knockdown. Transwell FLS invasion assays were performed using Matrigel-coated inserts. FCS or PDGF were used as chemoattractants, and invasion was quantified by propidium iodide (PI) staining of insert membranes. Transwell FLS migration assays were carried out using FCS as a chemoattractant, and migration was quantified by staining cells with CellTracker green. FLS apoptosis was quantified by flow cytometry staining with PI and Annexin V. MMP and cytokine gene induction after TNF stimulation were quantified by qPCR. Western blotting of cell lysates using phosphospecific antibodies was used to assess activation of signaling pathways.

Methods: Comparative screening was conducted of the PTPome expressed in FLS and determine if any play a role in the rheumatoid synoviocyte phenotype

Results: FLS display abundant expression of genes belonging to all of the known subfamilies of PTPs. Of these, only PTPRK, PTPN11, PTPN14 and DUSP3 expression were increased in RA (n=11) compared to OA (n=10) FLS (p<0.05). Subsequent studies focused on PTPN11, which encodes SHP-2, because it is a well-documented proto-oncogene. SHP-2 knockdown in RA FLS with anti-shRNA led to increased basal apoptosis (162% increase, p<0.05) and impaired invasion (71% decrease, p<0.05) and migration (44% decrease, p<0.05) in response to FCS or PDGF. SHP-2-deficient RA FLS displayed decreased activation of focal adhesion kinase and mitogen-activated protein kinases, such as JNK, in response to PDGF. Knockdown of SHP-2 also significantly surpressed TNF-mediated induction of MMPs and adhesion molecules, including MMP-1 (79% decrease, p<0.05), MMP-2 (64% decrease, p<0.05), VCAM-1 (93% decrease, p<0.05), and Cadherin-11 (77% decrease, p<0.05). Decreased gene expression correlated with a dramatically reduced induction of JNK phosphorylation in cell lysates.

Conclusion: These findings demonstrate a novel role for the proto-oncogene SHP-2 as a key mediator of FLS function. SHP-2 promotes the invasion and survival of RA FLS and, due to its higher expression in RA compared with OA FLS, could contribute to the unique aggressive phenotype of the rheumatoid cells. Therefore, SHP-2 could be a novel therapeutic target for RA.

Disclosure: S. Stanford, None; M. Maestre, None; B. Bartok, None; D. L. Boyle, None; H. Arnett, Amgen, Inc., 1, Amgen, Inc., 3; T. Mustelin, None; G. S. Firestein, None; N. Bottini, Amgen, Inc., 2.

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Development of a Bruton’s Tyrosine Kinase (Btk) Inhibitor, ONO-4059: Efficacy in a Collagen Induced Arthritis (CIA) Model Indicates Potential Treatment for Rheumatoid Arthritis (RA). Toshio Yoshizawa, Yuko Ariza, Yoshiko Ueda, Shingo Hotta, Masami Narita and Kazuhiro Kawabata. Ono Pharmaceutical Co., Ltd., Osaka, Japan

Background/Purpose: Rheumatoid arthritis (RA) is characterized by leukocyte infiltration, synoviocyte hyperplasia and osteoclastogenesis, and tyrosine kinases have key roles in the signaling pathways that regulate these processes. Bruton’s tyrosine kinase (Btk) is a key regulator of B-cell receptor (BCR) function. B-cell receptors play a central role in signal transduction pathways regulating survival, activation, proliferation, and differentiation of B-lineage lymphoid cells. Furthermore, Btk mutations in humans cause X-linked agammaglobulinemia, an inherited disorder characterized by severe B-cell specific defects, including the complete absence of B-cells in the periphery. The effectiveness of B-cell targeted therapy in the treatment of RA (e.g., Rituximab), further supports the role of B-cells in RA. ONO-4059 is a highly potent and selective Btk inhibitor with an IC50 in the sub-nmol/L range. The activity of ONO-4059 was evaluated in a mouse collagen induced arthritis (CIA) model.

Methods: Male DBA/1J mice were immunized on days 0 and 21 with Freund’s Complete Adjuvant containing bovine type II collagen. Mice were randomized to three treatment groups starting from day 22 to 36 and received oral ONO-4059, once daily at doses of 1 mg/kg, 3 mg/kg and 10 mg/kg respectively. The mice were weighed weekly and scored daily for signs of arthritis. Each paw was scored and the sum of all four scores was recorded using the arthritis index (AI). Only mice with an AI score of 16. The histology on day 36 was evaluated for cartilage damage, bone damage, extra-articular inflammation and pannus. To further characterize the effect of ONO-4059 in the CIA model, human monocytes were stimulated with immobilized hlgG or TLR-9 ligand (Cpg-B) for 18 hr. TNFα and IL-6 production was determined by Luminox.

Results: Treatment with ONO-4059 resulted in a dose-dependent inhibition of arthritis severity and bone damage in the CIA model. The mean disease score of the ONO-4059-treated animals was 10.9, 5.3 and 2.3 for the 1, 3 and 10 mg/kg dose groups respectively. In comparison, the mean score in the vehicle-treated animals was 13. In a cell-based assay, ONO-4059 prevented FcγR-induced TNFα and IL-6 production in monocytes with IC50 values of 5.66 nM and 22.4 nM, respectively. ONO-4059 also suppressed TLR9-induced TNFα and IL-6 production in monocytes with IC50 values of 4.45 nM and 12.4 nM, respectively. Furthermore, ONO-4059 prevented B-cell activation in the 10 nM range but it had no effects on T-cell activation.

Conclusion: ONO-4059 is a highly potent and selective oral Btk inhibitor. We have demonstrated that ONO-4059 potently and dose-dependently reversed clinical arthritis and prevented bone damage in the CIA model. The cellular and molecular mechanisms by which Btk mediates inflammation are not fully understood. This data supports that ONO-4059 inhibits immune-receptor signaling in multiple cells through Btk inhibition and these preliminary results suggest that ONO-4059 may be a promising therapeutic approach for patients with rheumatoid arthritis and warrants further investigation.

Disclosure: T. Yoshizawa, None; Y. Ariza, None; Y. Ueda, None; S. Hotta, None; M. Narita, None; K. Kawabata, None.
CCR1 Potentiates Gouty Inflammation Following Initial CXCR2-Dependent Neutrophil Recruitment to Sites of Monosodium Urate Crystal Deposition in Mice. Robert P. Friday1, Terry K. Means2, Melissa Tai3, Christian D. Sadik4 and Andrew D. Luster4. Massachusetts General Hospital, Boston, MA, 2Massachusetts General Hospital, Charlestown, MA

Background/Purpose: During attacks of acute gouty arthritis, monosodium urate (MSU) crystals elicit a potent neutrophilic inflammatory response in the affected joint, causing exquisite pain and often signs of systemic inflammation. CCR1, a low affinity receptor for IL-1β, plays a critical role in the development of gouty arthritis, as demonstrated by studies of IL-1β and NLRP3 knockout mice and the effectiveness of IL-1 blockade in treating or preventing gouty arthritis in humans. However, mechanisms of neutrophil trafficking to sites of MSU crystal deposition during gouty inflammation have not been fully characterized, and our understanding of these pathways depends upon knowledge of the chemokine responses elicited by MSU crystals and their interface with chemotactic receptors on neutrophils. Deletion of the chemokine receptor CXCR2 in mice has been shown to impair initiation of MSU crystal-induced inflammation in the air pouch model of gouty arthritis, but the other major murine neutrophil chemotactic receptors — CCR1, BLT1 and C5a — have not been systematically studied.

Methods: Using the murine air pouch model of gouty arthritis, we have: (1) characterized the chemokine and cytokine profile of MSU-crystal-induced inflammation using a multiplex bead immunoassay and (2) probed the time course of chemokine and cytokine production and neutrophil recruitment in CCR1-null, CXCR2-null, and CCR1-CXCR2 double knockout mice.

Results: While our findings confirm that CXCR2 is critical for the initiation of neutrophilic inflammation in MSU-crystal-challenged air pouches, mice lacking CCR1 also fail to achieve the expected maximal neutrophilic response to MSU crystal challenge (at 8 hours post crystal challenge). Although CXCR2-null mice generate a very high level of KC and LIX (ligands for CXCR2) in the air pouch within 2 hours of MSU crystal challenge, MIP-1α and MIP-1β (ligands for CCR1), which typically appear 3–4 hours after crystal challenge, are not produced in these mice.

Conclusion: We propose that CXCR2 and CCR1 act sequentially to initiate and potentiate neutrophil infiltration during gouty inflammation, with CCR1 chemokine ligand generation being dependent upon neutrophils entering the inflammatory site in response to CXCR2 chemokine signals. These data broaden our understanding of coordinate chemokine-mediated neutrophil recruitment in a model of MSU crystal-induced arthritis and suggest that there may be a role for chemokine receptor modulation in the management of acute gouty arthritis in humans.

Disclosure: R. P. Friday, None; T. K. Means, None; M. Tai, None; C. D. Sadik, None; A. D. Luster, None.

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Anti-IL-6 Therapy Impairs Intestinal Repair Through Inhibition of Epithelial Proliferation After Injury. Kristine Kuhn, Hiroyuki Miyoshi, Nicholas A. Manieri, Nicole P. Malvin, Vinieth Bijanki, Paul Allen and Thaddeus S. Stappenbeck. Washington University School of Medicine, St. Louis, MO

Background/Purpose: Inhibition of IL-6 is used for treatment of rheumatoid arthritis and now being investigated as biologic therapy for a wide variety of autoimmune conditions, including systemic lupus erythematosus, spondyloarthritides, vasculitides, and inflammatory bowel disease. Many of these conditions are complicated by intestinal inflammation. Yet little is known about the role of IL-6 in the bowel. Animal models have suggested that IL-6 signaling protects intestinal epithelial cells from apoptosis during toxin mediated injury with oral dextran sodium sulfate and C. rodentium infection.

Methods: We have begun to investigate the role of IL-6 in the intestine using two in vivo models of intestinal disease. First, we utilized the dnKO murine model of spontaneous colitis. These mice are transgenic for a dominant negative Tgfb2+ on T cells and are deficient in the IL10rb gene; both of these signaling pathways contain genes with risk alleles for autoimmunity. Antibiotics can inhibit spontaneous colitis that develops in these mice, and colitis can be induced by intracellular bacteria to colitis within days. We then utilized a biopsy wound model in which a colonoscope is used to introduce forces which biopsy the colonic mucosa and make a wound which can then be evaluated as the tissue repairs itself.

Results: We found that treatment of dnKO mice with an inhibitory antibody for IL-6 at the time of colouasing led to more severe colitis as observed by increased inflammatory infiltrates and crypt drop-out when compared to control antibody treated mice. Evaluation of the intestinal epithelium with BrdU staining demonstrated significantly increased epithelial proliferation in dnKO mice treated with control antibody but nearly absent staining in the anti-IL-6 treated mice. After biopsy wound injury of wild type mice, IL-6 levels peak early, within the first 24 hours, and decline to undetectable levels by day 6. Mice deficient for IL-6 demonstrate impaired intestinal wound healing due to a severe epithelial proliferative defect. By in situ hybridization, we identify intestinal epithelial cells and endothelial cells as significant producers of IL-6 in both models. In order to further define the mechanism by which IL-6 could be controlling intestinal epithelial proliferation and repair, we evaluated its role in primary 3D cultures of intestinal crypt organoids. In these cultures, cellular proliferation was significantly inhibited when the inflammatory cytokines TNF-α and IFN-γ were added. However, the addition of IL-6 to the cultures resulted in the restoration of cellular proliferation, even in the presence of TNF-α and IFN-γ.

Conclusion: These data demonstrate the importance of IL-6 for intestinal epithelial proliferation after injury. The absence of IL-6 early after injury in the intestine, such as the case when anti-IL-6 therapy is used, may lead to severe defects in healing, increasing the risk for adverse events.

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G Protein Signaling Modulator 3 Is a Key Regulator of Monocyte-Driven Inflammatory Arthritis. Matthew J. Billard, Patrick M. Giguère, Brian J. Wood, Marcus W. McGinnis, Roman Timoshenko, Peng Liu, Daniel P. Siderovsky and Teresa K. Tarrant. University of North Carolina, Chapel Hill, Chapel Hill, NC

Background/Purpose: Monocytes are critical to rheumatoid arthritis (RA) disease pathogenesis and are recruited to the inflamed synovium by inflammation-driven chemokines. G protein signaling modulator 3 (GPM3) is a newly discovered member of the novel family of GoLoco motif proteins known to regulate G protein heterotrimer assembly and function, a mechanism by which chemokine receptors signal. GPM3 is selectively expressed in monocytes and may regulate monocyte function through chemokine G protein coupled receptor (GPCR) interactions, which in turn may affect inflammatory arthritis disease expression.

Methods:

• GPM3−/− deficient monocytes were generated from the parental THP-1 cell line and a GPM3−/− deficient mouse was created.

• A monoclonal antibody to GPM3 (mAb 35.5.1) was developed and GPM3 expression was analyzed by immunoblotting lysates from hematopoietic lineage-derived human cell lines.

• Migration studies of Ly6C+ splenocytes were conducted using Transwell inserts (5 μm pore size) and analyzed for chemotaxis by flow cytometry.

• Monocytic subsets in the spleen were enumerated using multicolor flow cytometry.

• Collagen Antibody Induced Arthritis (CAIA) was induced using the 5 clone Chondrex antibody cocktail and LPS booster on GPM3−/− and wild type mice per manufacturer’s instructions.

• The levels of various intra-articular proinflammatory chemokine receptors and cytokines known to be important to RA and CIA disease pathogenesis were evaluated by quantitative PCR.

Results: GPM3 expression is predominantly restricted to the monocyte lineage and modulated during monocyte differentiation. Data with GPM3−/− show that CAIA, is blunted clinically and histopathologically with specifically reduced intra-articular IL-6, IL-1β, CCR2 and CXCR1 expression. Ex vivo results show a GPM3-dependent decrease in ligand-specific migration of Ly6C+ CD11b+ splenocytes to the proinflammatory monocyte chemokines CCL2, CX3CL1, and chemerin.

Conclusion: Proinflammatory functions of monocytes critical to RA development are reliant on GPSM3 function. Having a single protein target for RA therapeutic intervention that appears to selectively affect proinflammatory monocyte infiltration into the joint represents a paradigm shift from previous therapeutic attempts at single cytokine or chemokine neutralization.

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S710
Autoantibodies Are Associated with Subclinical Atherosclerosis and Cardiovascular Endpoints in Caucasian and African American Women in a Prospective Study: the Multi-Ethnic Study of Atherosclerosis (MESA). Darcy S. Majka, Rowland W. Chang, Richard M. Pope, Marius C. Teodorescu, Elizabeth W. Karlson, TH Uyen T. Vu, Joseph Kang and Kiang Liu. Northwestern University, Chicago, IL, Northwestern University Med School, Chicago, IL, TheraTest Laboratories Inc, Lombard, IL, Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, Northwestern University, Feinberg School of Medicine, Chicago, IL

Background/Purpose: Although the association between rheumatoid arthritis (RA) and cardiovascular disease (CVD) is established, the exact mechanism is not known. Subjects who later develop RA were shown to have increased risk of myocardial infarction (MI) in the preclinical period prior to RA symptoms indicating that autoimmunity might be a risk factor for CVD. Therefore, we tested the hypothesis that RA-related autoantibodies are independent risk factors for subclinical atherosclerosis and subsequent clinical CVD events.

Methods: MESA is a multicenter population based study cohort prospectively collecting CVD outcome and risk factor data in 6814 middle-aged to elderly multi-ethnic participants since 2000. At MESA baseline, rheumatoid arthritis (RA) prevalence was 1.8% and 0.4% in Caucasians and African-American women, respectively. RA-related autoantibodies were determined using commercial assays. The results for RF, RF IgM, RF IgA, and anti-CCP were 2.4 (1.2–5.0) vs. CAC < 100, p = 0.001, anti-CCP: p < 0.003. RF and anti-CCP were associated with CAC in Caucasian and AA women after adjustment for traditional risk factors. Table 1. Table 2 demonstrates strong associations between RA-related autoantibodies and clinical CVD events in AA women. There were no clear associations in Hispanic and Chinese participants.

Table 1. Adjusted* Odds Ratios (95% CI) of Having Degrees of CAC by Autoantibody Positivity in Caucasian Women and AA Women

Table 2. Adjusted* Hazard Ratios (95% CI) of the Incidence of Clinical Cardiovascular Events over 7.1 Years Follow Up by Autoantibody Positivity

Conclusion: This study demonstrates that RA-related autoantibodies are associated with subclinical and clinical atherosclerosis in a population based cohort. These findings indicate autoimmune factors may play a role in the pathogenesis of atherosclerosis, even in individuals without RA.

Disclosure: D. S. Majka, None; R. W. Chang, None; R. M. Pope, None; M. C. Teodorescu, TheraTest Laboratories, 1, TheraTest Laboratories, 3; E. W. Karlson, None; T. H. T. Vu, None; J. Kang, None; K. Liu, None.

Associations of Race and Ethnicity with Overall Mortality and Cardiovascular Events Among Patients with End-Stage Renal Disease Due to Lupus Nephritis. Jose A. Gomez-Puerta, Sushrut Waikar, Graciela S. Alarcon, Jun Liu, Daniel H. Solomon, Wolfgang C. Winkelmayer and Karen H. Costenbader. Division of Rheumatology, Immunology, and Allergy, Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, Division of Nephrology, Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, University of Alabama at Birmingham, Birmingham, AL, Division of Rheumatology and Pharmacoeconomics, Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, Stanford University School of Medicine, Stanford, CA

Background/Purpose: Patients with SLE and lupus nephritis (LN) are at elevated risks of cardiovascular disease. Past studies have suggested that African American patients with SLE may be at higher cardiovascular risk than White patients. A large retrospective study of individuals with end-stage renal disease (ESRD) of any cause showed effect modification of the race-mortality association by age and demonstrated increased mortality among young African American compared to White patients. However, there is little information about mortality and cardiovascular risks among patients with ESRD due to LN, differentiated by race and ethnicity. We tested for differences in mortality and cardiovascular event rates in patients with ESRD due to LN, by race and ethnic group.

Methods: Individuals age ≥18 years with incident LN ESRD (ICD-9 code 710.0) between 1995 and 2008 were identified in the US Renal Data System (URDS). Covariates at baseline were ascertained from the Medical Evidence Report (a standardized form including sociodemographics, clinical data and laboratory measures collected at dialysis initiation). LN was considered as primary cause of renal failure according to the attending nephrologist. Multiple imputation was used for missing baseline data [albumin, body mass index and estimated glomerular filtration rate (eGFR)]. The hazard ratios (HR) for mortality and cardiovascular events (myocardial infarction, heart failure, hemorrhagic and ischemic stroke) during follow-up through December 31, 2008 were estimated using multivariable-adjusted Cox regression.

Results: We identified 12,533 patients with ESRD due to LN. Mean age at ESRD onset was 40.7 ± 14.9 years; 81.6% were women and 49% were African American. The total number of deaths, cardiovascular events and their incident rates are shown in Table. Compared to Whites, African Americans had higher risk of death (1.30 [95%CI 1.21–1.39]) and heart failure (1.35 [95%CI 1.24–1.47]). Conversely, Asian patients had lower risk of mortality 0.68 [95%CI 0.65–0.92] and heart failure (0.67 [0.50–0.90]).
Hispanic patients had lower rates of mortality (0.74 [95%CI 0.66–0.82]), heart failure (0.82 [95%CI 0.71–0.97]), myocardial infarction (0.69 [95%CI 0.49–0.98]), and ischemic stroke (0.68; 95%CI 0.48–0.85) than non-Hispanics.

### Table. Hazard Ratios for Mortality and Cardiovascular Events in 12,533 patients with ESRD due to Lupus Nephritis, US patients 1995–2008

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Fully-Adjusted HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic</td>
<td>1.0 (Ref)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.74 (0.63–0.82)</td>
</tr>
<tr>
<td>White</td>
<td>1.17 (0.86–1.58)</td>
</tr>
<tr>
<td>African-American</td>
<td>1.20 (0.97–1.51)</td>
</tr>
<tr>
<td>Asian</td>
<td>0.81 (0.46–1.45)</td>
</tr>
</tbody>
</table>

**Conclusion:** Race and ethnicity are associated with mortality and cardiovascular outcomes among LN ESRD patients. While African American patients had significantly higher rates of death and heart failure than Whites, Asian and Hispanic patients had lower rates of these outcomes. The causes of these disparities are not understood, but are likely multifactorial, including genetic, socioeconomic, and environmental factors. Moreover, lower than expected mortality among Hispanic patients has been observed in other studies as well and may be due to people returning to their native countries for end of life care (Borrell LN, Am J Public Health, 2012).

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### 1666

#### Short Term Use of Glucocorticoids Is Not Associated with Acute Risk of Myocardial Infarction

**Background/Purpose:** Observational studies of both chronic and short term glucocorticoid (GC) use have suggested an elevated risk of acute myocardial infarction (MI). However this could be a result of confounding by indication; i.e. some condition for which a GC is prescribed is also a risk factor for MI. This study’s aim was to examine whether ‘burst’ GC use serves as a trigger for acute MI or whether any effect is likely to be the result of confounding by indication.

**Methods:** We used national Veterans Administration (VA) data from fiscal year 1998 through 2008 to compare the risk for MI during and around periods of GC use compared to periods of non-use using the self-controlled case series study design, a case only design which compares risks within persons, thus limiting confounding. Based on prescription records we first developed a cohort of subjects who had only used ‘burst’ GCs, defined as dispensed oral prescriptions of 30 days with at least 42 days between consecutive prescriptions; we excluded persons who received GCs during their first 60 days of follow-up or those who could have received GCs during a prior hospitalization. From this, we selected those persons who had a first MI requiring hospitalization (cases) using validated ICD-9 codes; we excluded cases who had an MI within the first year of follow-up (to limit the number with possible recurrence). We focused on the period in which each subject was using GCs, as well as 42 days before and after to account for confounding by indication and any residual GC effects. The risk of MI in each of these periods was compared to that in the remaining follow up time period. We controlled for age in 5 year bands (18–24, 25–29, 30–34, > 30).

**Results:** There were 1632 cases of MI among burst GC users, 97.5% were men. Mean age at MI was 66.8 (SD 11.4) years; 66.9 (11.4) in men, 59.5 (12.9) in women. 75.4% of subjects were white, 10.1% African American, 5.0% Hispanic, 10.0% other. All cases had only 1 GC prescription for a median duration of 6 (Q1, Q3: 6, 10) days and median average daily prednisone equivalent dose of 17.5 (17.5, 22.0) mg. The incidence rate ratio (IRR) of MI rose over the 42 days prior to the GC prescription from baseline to 7.5, and then dropped while the GC was being used. The risk essentially returned to baseline after GC was discontinued. See table.

**Conclusion:** Our results suggest that any elevated risk of MI from GC use could be due to confounding by indication: in this study the risk rose before the GC prescription was issued, suggesting that the MI was associated with some other factor for which the GC might also have been prescribed at a later time.

Disclosure: S. C. Vlad, None; D. T. Felson, None; D. R. Miller, None; Y. Zhang, URL, 2.

### 1667

#### Impact of Rheumatoid Arthritis On Recognition of Hypertension in a Medically Homed Population

**Background/Purpose:** Numerous studies report increased cardiovascular disease (CVD) events and others describe increased arterial stiffness in patients with rheumatoid arthritis (RA). Still, hypertension diagnosis rates in RA reports are often lower than expected by age. We tested the hypothesis that RA is a risk factor for missed hypertension diagnosis, given the importance of hypertension for CVD risk.

**Methods:** Using a cohort design we studied all medically homed adult patients from a large multispecialty practice who met Joint National Committee-7 (JNC-7) hypertension diagnostic criteria but lacked baseline diagnosis or treatment to compare new recognition of hypertension in patients with and without RA. “Medically homed” definitions required ≥12 months (2009–11), and RA/inflammatory arthritis algorithms required two ICD-9 claims of 714 in 24 months. Cox proportional hazard modeling was used to examine the impact of RA on hypertension recognition.

**Results:** Among 33,947 medically homed patients with baseline undiagnosed and untreated hypertension, 575 patients had RA codes. After an average of 14 months follow up, 49% of RA patients compared to 42% without RA remained undiagnosed. RA patients had equal annual primary care visits (mean 1.5 v. 1.6), more total provider visits (mean 7.5 v. 4.6) and longer mean observation time, yet were less often diagnosed. In multivariate modeling controlling for socio-demographic factors, comorbidity, and utilization factors, the presence of rheumatoid arthritis decreased the likelihood of hypertension diagnosis or treatment by 21% [Hazard Ratio 0.79, Confidence Interval 0.71–0.89].

Hypertension recognition was lower in RA than other comorbidities (Table 1), and contrasted with increased hypertension recognition in patients with diabetes or kidney disease. RA patients were older (mean 62 v. 57 years), more female, weighed less, and were more likely to see an internist for primary care, and in the final adjusted model, younger age, white race, Medicaid, and non-internal medicine primary care provider predicted lower hypertension recognition.
Conclusion: In this sample of medically homed patients meeting JNC-7 criteria for hypertension those with RA were 21% less likely to be diagnosed or treated despite more total visits, compared to those without RA. Given that both hypertension and RA increase cardiovascular risk, rheumatologists may need to actively help to improve hypertension recognition to modify CVD risk.

Disclosure: C. M. Bartels, None; H. Johnson, None; K. Voelker, None; P. Mc Bride, None; M. Smith, None.

1668

Improving the Accuracy of Cardiovascular Risk Prediction in Rheumatoid Arthritis with a New Predictive Model Using the 10-Year Prospective Carre-Study. Alper M. van Sijl1, Inge A.M. van den Oever1, Mike J.L. Peters2, Vokko P. van Halm1, Alexandre E. Voskuyl1, Yvo M. Smulders1 and Mike T. Nurmohamed1. 1Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands, 2VU University Medical Center, Amsterdam, Netherlands, 3Academic Medical Centre, Amsterdam, Netherlands

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory joint disease which is associated with an increased cardiovascular (CV) risk. Traditional CV risk factors do not fully explain the increased CV risk and prediction of future CV disease in RA by CV risk estimates (Framingham and Reynolds) has shown to be inadequate. The present study investigated whether future CV disease in RA can be accurately predicted by demographic factors, CV risk factors, RA-related factors, CV risk estimates and surrogate markers of CV disease, or a combination of all.

Methods: 10-year incidence rate of CV disease was determined in a prospective cohort of 353 RA-patients. CV risk factors, RA-related factors and surrogate markers of CV disease were assessed at baseline. Predictive models of separate variables or in combinations were created using stepwise backward logistic regression analyses and areas under the curve (AUC) were calculated using receiver operating curves (ROC) analyses.

Results: After 10 years, there were 58 events over 2361 patient years of follow-up. CV disease incidence was 16.4%, while 10-year CV risk estimates (Framingham and Reynolds) has shown to be inadequate. The present study investigated whether future CV disease in RA can be accurately predicted by demographic factors, CV risk factors, RA-related factors, CV risk estimates and surrogate markers of CV disease, or a combination of all.

Conclusion: 10-year CV risk estimates did not accurately predict the actual CV risk in a population of RA patients. A combined model of demographic factors, CV risk factors and RA related factors more accurately predicted the actual CV risk. Future studies should corroborate these findings and consider whether modification of pre-existing risk models will improve the CV risk assessment in RA patients.

Disclosure: A. M. van Sijl, None; I. A. M. van den Oever, None; M. J. L. Peters, None; V. P. van Halm, None; A. E. Voskuyl, None; Y. M. Smulders, None; M. T. Nurmohamed, None.

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Infection Risk After Orthopaedic Surgery in Patients with Inflammatory Rheumatic Diseases, with Focus on Discontinuation of TNF-Alpha-Inhibitors. Catrina B. Scherrer1, Anne AF Mannion1, Diego Kyburtz2, Markus Vogt3 and Ines A. Kramers-de Quervain1. 1Schulthess Clinic, Zürich, Switzerland, 2Center of Exp. Rheumatology, Zurich, Switzerland, 3Cantonal Hospital Zug, Baar, Switzerland

Background/Purpose: Infections after orthopaedic surgeries are feared complications, leading to costly treatments and successive interventions. A higher postoperative infection risk is discussed in patients with inflammatory rheumatic diseases (IRDs). This is especially relevant since patients with aggressive diseases frequently need orthopaedic surgery. In a retrospective study of a large cohort of orthopaedic surgeries the risk of postoperative infections was examined in relation to diagnosis, type of surgery and preoperative management and influence on the infection rate was analyzed. The study aimed to determine the risk factors for infection. Odds ratios (OR) together with the corresponding 95% confidence intervals (95%CI) were provided.

Methods: 37’137 patients (50’359 surgeries) were followed in the hospital’s surgery registry over 8 years. Diagnoses were categorized as inflammatory or degenerative/posttraumatic and operation-related infections were registered. In a subgroup with known medication prior to surgery the preoperative management and influence on the infection rate was analyzed. The study aimed to determine the risk factors for infection. Odds ratios (OR) together with the corresponding 95% confidence intervals (95%CI) were provided.

Results: Among the 50’359 surgeries 422 (0.8%) surgery-related infections were identified, 373/47’887 (0.8%) cases in the degenerative group and 49/2’472 (2.0%) in the IRD group, indicating a significantly higher infection rate in the IRD group (OR = 2.576, 95%CI 1.907, 3.479; p = 0.001). Complete information on medication use and its discontinuation or otherwise prior to surgery was available for 1’329/2472 (54%) cases in the IRD group. The use of TNF-α-inhibitors was documented in 171/1’329 (13%) cases. In 49/171 (29%) cases, TNF-α-inhibitors were discontinued more than three adminis-
miR-10a plays an important role in regulation of NFκB pathway: decreased miR-10a lowers NFκB degradation and promotes inflammatory biomarker gene expression. Further investigation showed that inflammatory biomarker genes, IL-6 and VCAM-1, were significantly elevated in JDM compared with controls: IL-6 and VCAM-1 gene expression levels were increased by 2.81±2.16 and 2.93±1.45 fold respectively (p<0.01).

**Conclusion:** Profiling identified 20 differentially expressed miRNAs in JDM compared to controls. Decreased miR-10a expression and increased miR-10b and miR-142p expression demonstrated that specific miRNAs, miR-10a and 10b may play a role in the regulation of the inflammatory pathway in JDM. We speculate that miRNA-10a may be associated with the vasculopathy characteristic of JDM and that their mimics may be of value in therapy.

**Disclosure:** D. Xu, None; A. Kachaochana, None; G. A. Morgan, None; E. F. Vanin, None; M. B. Soares, None; L. M. Pachman, NIH- R0-1, Education grant from Behring for $5,000, 2.

**1671**

**Characterization of Jo-1 Autoantibodies in Patients with Inflammatory Myopathy and Interstitial Lung Disease**

Kyle P. Chiang1, Varun Gauba1, Darin Lee1, Minh-Ha T. Do1, Jie J. Zhou1, Feng Wang2, Ying Buechler2, Leslie Nangle1, Zhiven Xu1, John Mendlein1, Melissa Ashlock1 and Jeffrey M. Greve1, aTyr Pharma, San Diego, CA. aTyr Pharma, San Diego, CA, 2Hong Kong University of Science and Technology, Kowloon, Hong Kong

**Background:** Anti-Jo-1 autoantibodies (Jo-1 Abs), directed against histidine tRNA synthetase (HisRS1), are detected in a high proportion of patients with both autoimmune inflammatory myopathy (IM) and interstitial lung disease (ILD), progressive and debilitating conditions for which no drugs are specifically approved. Jo-1 Abs are inappropriately immunoreactive and immunosuppressive therapy which can be needed on a chronic basis to control their symptoms. In some individuals continued respiratory deterioration may occur despite immunosuppressive treatment, and may lead to fatal outcomes. Several lines of evidence indicate that Jo-1 Ab may have pathogenic roles in IM and ILD. We and others have demonstrated that HisRS1 and HisRS1-derived proteins possess immune-regulatory activities in addition to their roles in protein synthesis. As a key element of our effort to develop novel therapies for IM and ILD, we performed a detailed characterization of the Jo-1 Abs present in diverse populations of patients.

**Methods:** A large panel of sera from healthy volunteers, IM patients with and without Jo-1 Abs, and patients with Jo-1 Abs for which the formal clinical diagnoses were unknown was obtained from a commercial vendor. Plate-based immunassays were developed to determine: i) the Jo-1 Ab titers by ELISA; (ii) Jo-1 Ab isotypes; (iii) the absolute concentration of IgM and IgG Jo-1 Ab; iv) epitopes recognized by Jo-1 Abs using a panel of recombinant human HisRS1 protein fragments and alternatively-spliced forms (including those expressed in muscle and lung); v) Jo-1 Ab affinity (by surface plasmon resonance); and vi) circulating levels of HisRS1.

**Results:** A wide range of Jo-1 Ab titers and concentrations exhibited a broad range, with higher concentrations found in patients diagnosed with IM compared to those without a formal clinical diagnosis. Jo-1 Ab IgM was detected in some patients. The specific epitopes recognized by Jo-1 Abs were distributed across the entire HisRS1 protein and were interpreted in reference to the recently determined 3-D structure of human HisRS. The epitopes recognized varied considerably among subjects. Jo-1 Ab affinities measured were in the range of 10–0.01 nM. Circulating levels of HisRS1 protein were detected in some individuals.

**Conclusion:** This molecular characterization of Jo-1 Abs provides deeper insight into the human autoimmune response to HisRS1 that occurs in a population of human subjects with autoimmune diseases. Ongoing serial analysis of individual patients will provide greater insight into the progression of Jo-1 Abs with respect to isotypes, affinities, recognized epitopes, and their relationship to disease status. These data provide a framework for developing strategies to address the impact of Jo-1 Abs in IM and ILD.

**Disclosure:** K. P. Chiang, aTyr Pharma, 1, aTyr Pharma, 3; G. A. Gauba, aTyr Pharma, 3; aTyr Pharma, 3; B. Lee, aTyr Pharma, 1, aTyr Pharma, 3; M. H. T. Do, aTyr Pharma, 3; aTyr Pharma, 3; J. J. Zhou, Pangu BioPharma, 2; F. Wang, Pangu BioPharma, 2; Y. Buechler, aTyr Pharma, 3, aTyr Pharma, 1; L. Nangle, aTyr Pharma, 1, aTyr Pharma, 3; Z. Xu, Pangu BioPharma, 2; J. Mendlein, aTyr Pharma, 1, aTyr Pharma, 3; M. Ashlock, aTyr Pharma, 1, aTyr Pharma, 3; J. M. Greve, aTyr Pharma, 3, aTyr Pharma, 1.
Background/Purpose: Myositis is associated with an inflammatory process that results in pronounced muscle weakness and is observed in some regulatory T cell (Treg) deficient mouse models. Autoimmune pathogenesis has been strongly implicated in myositis and is the focus of both standardized and emerging therapeutics. It has been shown that patients with dermatomyositis have decreased numbers of Tregs in peripheral blood and at skin lesions when compared to healthy controls. Scurfy (forkhead box P3, FOXP3-/-) mice lack Tregs and display autoimmune inflammation of multiple organs, but exhibit very little evidence of myositis. In contrast, Syt7 (Synaptotagmin 7) mice which have no Treg defects develop an inflammatory involving the muscles. We hypothesized that Treg deficient myositis could be induced by myosin protein and that muscle-specific inflammatory effector cells could be suppressed through Treg supplementation.

Methods: We crossed scurfy mice with Syt7 mice, which results in a double knockout that is deficient in Treg cells and membrane resealing. Lymph node preparations of these double knockout mice or scurfy mice were adaptively transferred into Rag2-/- males with or without Tregs isolated using Dynabeads from wild-type mice or with purified myosin protein. Histology of muscle tissue was examined four weeks post-injection. Immunohistochemistry was performed on flash frozen and/or paraffin embedded tissue. Myositis was assessed using standard scoring systems.

Results: Scurfy lymph node preparations injected into Rag2-/- males intraperitoneally in conjunction with purified myosin protein induced robust skeletal muscle inflammation. The infiltrates consisted predominantly of CD4+ and CD8+ T cells, limited macrophages, but no B cells. Even more robust myositis was seen in similar experiments using lymph node preparations from Syt7/FOXP3 double knockout mice. However, myositis was not seen in adoptive transfers using single knockout mice. This myositis was completely suppressed with the co-transfer of purified Treg cells from wild type mice.

Conclusion: Taken together, these data demonstrate the critical role of the muscle antigen, myosin, in the pathogenesis of myositis. Hence, myosin could serve as a target antigen of the immune response. We also demonstrate the roles of Treg deficiency and aberrant muscle antigen release in the induction of myositis and the role of Treg as a therapeutic tool to treat myositis.

This novel model has the potential of examining the interplay between chemical injury and inflammatory pathogenesis in myositis. Ongoing work will use this model to examine the myopathy associated with statins and will examine the role of other endogenous muscle tissue antigens in this disease.

Disclosure: N. Young, None; R. Sharma, None; A. Friedman, None; B. Kaffenberger, None; W. N. Jarjour, None.

1673

Clinical Phenotypes of Caucasian Adult and Juvenile Dermatomyositis Patients with Anti-MDA5 Autoantibodies. Zoe Betteridge1, Sarah Tansley1, Harsha Gunawardena2, Lucy R. Wedderburn3, Hector Chinoy4, Robert G. Cooper5, Jin Vencovsky6, Lenka Plestilova7, Katalin Jarjour3. 1The Ohio State University Medical Center, Columbus, OH, 2University of Virginia Health System, Charlottesville, VA, 3Ohio State University, Columbus, OH

Background/Purpose: Myositis is associated with an inflammatory process that results in pronounced muscle weakness and is observed in some regulatory T cell (Treg) deficient mouse models. Autoimmune pathogenesis has been strongly implicated in myositis and is the focus of both standardized and emerging therapeutics. It has been shown that patients with dermatomyositis have decreased numbers of Tregs in peripheral blood and at skin lesions when compared to healthy controls. Scurfy (forkhead box P3, FOXP3-/-) mice lack Tregs and display autoimmune inflammation of multiple organs, but exhibit very little evidence of myositis. In contrast, Syt7 (Synaptotagmin 7) mice which have no Treg defects develop an inflammatory involving the muscles. We hypothesized that Treg deficient myositis could be induced by myosin protein and that muscle-specific inflammatory effector cells could be suppressed through Treg supplementation.

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Conclusion: Taken together, these data demonstrate the critical role of the muscle antigen, myosin, in the pathogenesis of myositis. Hence, myosin could serve as a target antigen of the immune response. We also demonstrate the roles of Treg deficiency and aberrant muscle antigen release in the induction of myositis and the role of Treg as a therapeutic tool to treat myositis.

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Disclosure: N. Young, None; R. Sharma, None; A. Friedman, None; B. Kaffenberger, None; W. N. Jarjour, None.

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Myeloid Related Proteins Induce Muscle Derived Inflammatory Mediators in Juvenile Dermatomyositis. Kiran Nistala1, Hemlata Varansi2, Helmut Witkowski3, Thomas Vogl4, Petra Krobl5, Vanita Shah6, Kamel Mabrouk2, Paul Brogan7, Johannes Roth8 and Iwona W. Nowok1. 1University College London (UCL), London, United Kingdom, 2Institute of Rheumatology, Prague, Czech Republic, 3University College London, UCL, London, United Kingdom, 4The University of Manchester, Manchester, United Kingdom, 5Hope Hospital, Salford, United Kingdom, 6Institute of Rheumatology, Prague, Czech Republic, 7Institute of Rheumatology, Prague, Czech Republic, 8Karolinska Institutet, Stockholm, Sweden, 9University of Debrecen, Debrecen, Hungary, Debrecen, Hungary, 10London, United Kingdom, 11Stockholm, Sweden

Background/Purpose: The etiopathogenesis of Juvenile Dermatomyositis (JDM) remains poorly understood. In particular the contribution of monocytes or macrophages, which are frequently observed to be an infiltrate within muscle tissue very early in the disease process, is unknown. We hypothesised that these cells secrete the pro-inflammatory S100 proteins myeloid related peptide (MRP)8/14 which may then contribute to muscle pathology in JDM.

Methods: In this study of 75 JDM patients, serum MR8/14 levels were compared with clinical measures of disease activity. Muscle biopsies taken early in disease were assessed by immunohistochemistry to determine the frequency and identity of MRP-expressing cells. The effects of MRP stimulation and ER stress on muscle were tested in vitro. Serum or supernatant levels of cytokines were analysed by multiplex immunoassay.

Results: Serum MR8/14 correlated with physician’s global assessment of disease activity in JDM (r=0.26, p=0.006), functional assessment (CHAQ, r=0.31, p=0.0498), and strength/stamina (CMAS, r=0.28, p=0.028). MR8/14 was widely expressed by CD68+ macrophages in muscle tissue. When cultured with human myoblasts, MRP led to the secretion of MCP-1 and IL-6, which was enhanced by ER stress. Both inflammatory mediators were detected in significantly higher levels in the serum of JDM patients compared to healthy controls.
Conclusion: This study is the first to identify serum MP8/14 as a biomarker for disease activity in JDM. We propose that tissue infiltrating macrophages secreting MP8/14 may contribute to myositis, by driving the local production of cytokines directly from muscle.

Disclosure: K. Nistala, None; H. Varsani, None; H. Wittkowski, None; T. Vogl, None; P. Krol, None; V. Shah, None; K. Mamchaoui, None; P. Brogan, None; I. Roth, None; L. R. Wedderburn, None.

1675

Myositis Autoimmunity and Muscle Weakness Are Linked to TNF-Alpha Suppression of Micrornas-1, 133, and 206 in Myoblasts and Myocytes.

Robert Georgantas III1, Katie Streicher1, Steven A. Greenberg1, Lydia Greenlees1, V1, Wei Zhu2, Philip Brohawn3, Brandon W. Higgs4, Megan Czajiga1, Chris Morehouse1, Laura Richman1, Bahia Jallal2, Koostubh Ranade3 and Yihong Yao3.
1MedImmune, Inc, Gaithersburg, MD, 2Bingham Women’s Hospital, Harvard Medical School, Boston, MA, 3MedImmune, Gaithersburg, MD, 4MedImmune, LLC, Gaithersburg, MD.

Background/Purpose: The molecular basis of myopathies such as dermatomyositis, polymyositis and inclusion-body myositis, which are characterized by chronic muscle inflammation followed by long term skeletal muscle wasting, are poorly understood.

Methods: We compared expression levels of inflammatory cytokines and microRNAs to identify those differentially expressed between muscle biopsies from myositis patients (N = 24) and healthy donors (N = 17). We then used human and mouse in vitro myoblast-to-myocyte differentiation models to determine those differentially expressed cytokines and microRNAs that affect myoblast differentiation.

Results: We observed increased expression of inflammatory cytokines including TNF-alpha (fold change = 3.8 to 8.8-fold, P-values < 0.005), and decreased expression of microRNAs miR-1 (fold changes = -2.8 to -8.7, P-values < 2.0x10^-5), miR-133a (fold changes = -3.9 to -5.0, P-values < 4.0x10^-5), miR-133b (fold changes = -2.7 to -7.8, P-values < 4.2x10^-5), and miR-206 (DM = -2.8-fold, P = 0.012) which are known to be critical to adult skeletal muscle differentiation. TNF-alpha inhibited expression of miR-1, 133a/b, and 206 and suppressed differentiation of C2C12 myoblasts to myocytes/myotubes in an NF-kb dependent manner. This block in differentiation by TNF-alpha was relieved by overexpression of miR-1, miR-206 or miR-133.

Conclusion: Taken together these results provide a new mechanistic link between a pro-inflammatory cytokine and the degenerative pathology of myositis, and suggest new therapeutic approaches for this disease.

Disclosure: R. Georgantas III, MedImmune, Inc, 3; AstraZeneca, 1; K. Streicher, MedImmune, Inc, 3; S. A. Greenberg, MedImmune, Inc, 3; L. Greenlees, MedImmune, Inc, 3; V. Zhu, AstraZeneca, 1; M. Czajiga, MedImmune, Inc, 3; C. Morehouse, AstraZeneca, 1; L. Richman, MedImmune, Inc, 3; R. Jallal, AstraZeneca, 1; K. Ranade, AstraZeneca, 1; Y. Yao, AstraZeneca, 1; E. Denisova, None; I. Nikishina, None; F. Zulian, None.

S716

ACR Concurrent Abstract Session
Pediatric Rheumatology: Clinical and Therapeutic Disease II: Juvenile Idiopathic Arthritis II

Monday, November 12, 2012, 4:30 pm–6:00 pm

1676

Abatacept As First Line Biological Treatment for Severe Juvenile Idiopathic Arthritis-Related Uveitis. A Multi-centered Study.

Carolina Birolo1, Maria Elisabetta Zulian1, Stilvena Arsenyeva2, Rolando Cimaz1, Svetlana Arsenyeva1, Anthony B. Morlandt, Suwat Teerawattanapong, Daniel Young, Peter D. Waite and Randy Q. Cron.
1University of Alabama at Birmingham, Birmingham, AL.

Background/Purpose: Anterior uveitis is a serious complication of Juvenile Idiopathic Arthritis (JIA). Recently, Abatacept (ABA) has been used in children with JIA-uveitis who had failed previous anti-TNF agents but little is known about its efficacy as first-line biological agent in severe JIA-related uveitis. Aim of the present study was to compare safety and efficacy of ABA used as first biological agent (ABA1st) with ABA used after one or more anti-TNF agents (ABA2nd), in patients with severe JIA-related uveitis.

Methods: A retrospective multicenter collection of data of patients with severe, MTX-resistant JIA-related uveitis treated with ABA at a monthly dosage of 10 mg/kg, administered intravenously as first line or second line biological agent, was performed. Absolute frequency of uveitis flares before and after ABA treatment, changes in ocular complications and ABA-related side effects have been recorded. The number of active joints was also assessed at each visit.

Results: Thirty-five JIA patients (33 females, 2 males) with a mean 12.5 years of age, and 7.7 years of uveitis duration have been treated with ABA for 19.6 months (range 5–42). Twenty-seven patients with MTX-refractory uveitis and at least 12 months follow-up entered study. 11 were included in the ABA1st group and 16 in the ABA2nd group. Age at uveitis onset, number of uveitis flares during 12 months before ABA and number of complicated uveitis were comparable in the two groups. The mean uveitis duration was significantly shorter in ABA1st (5.1 versus 9.5 years, p = 0.009). The mean frequency of uveitis flares during the 12 months before and after ABA decreased from 4.1 to 1.0 in ABA1st (p = 0.001) and from 3.5 to 1.1 in ABA2nd (p = 0.001). The efficacy was comparable in both groups and in all ABA showed a better performance after the first six months of treatment as 21/30 (70%) uveitis flares occurred during the first semester. Pre-existing ocular complications improved or remained stable in all but 2 patients. 15/22 patients (68.2%) with active arthritis at baseline were in remission at 12 months follow-up; in the others, the mean number of active joints decreased from 10.1 to 7.0. In this regard, no significant difference was observed between the two ABA treatment modalities. Two patients (7.4%) experienced adverse events (1 post-infusion headache, 1 weight gain) but no serious events were observed. Two patients (7.4%) withdrew from the study (after 5 and 9 months) because of ABA inefficacy on both ocular and articular symptoms.

Conclusion: Abatacept, used as first-line biological treatment or after one or more anti-TNF agents, induced a comparable sustained improvement of refractory JIA-related uveitis. Efficacy was more evident during the second semester in both groups. Abatacept represents a treatment of choice in patients failing standard immunosuppressive treatment and/or anti-TNF agents for severe JIA-related uveitis.

Disclosure: C. Birolo, None; M. E. Zulian, None; S. Arsenyeva, None; R. Cimaz, None; E. Miserochi, None; M. Dubko, None; C. Desandre, None; F. Falcini, None; M. Alessio, None; F. La Torre, None; E. Denisova, None; I. Nikishina, None; F. Zulian, None.

1677

Safety and Efficacy of Intra-Articular Infliximab Therapy for Treatment Resistant Temporomandibular Joint Arthritis in Children.

Matthew L. Stoll, Anthony B. Morlandt, Suwat Teerawattanapong, Daniel Young, Peter D. Waite and Randy Q. Cron.
University of Alabama at Birmingham, Birmingham, AL.

Background/Purpose: Temporomandibular joint (TMJ) arthritis occurs in as much as 80% of children with juvenile idiopathic arthritis (JIA) and can result in substantial facial deformity. TMJ arthritis often responds poorly to systemic immunosuppressive therapy. Intra-articular corticosteroid injections (IACI) are of benefit in approximately 50% of JIA patients with TMJ arthritis, but repeated injections are often ineffective. Multiple studies have shown benefit of IA infliximab injections (IAIL) in treating chronic arthritis, including to the TMJ in one case report, so we used IAIL of the TMJs in JIA patients with TMJ arthritis refractory to both repeated IACI and to systemic arthritis therapy.

Methods: Chart review was performed for all children with JIA treated at a single center who received one or more IAIL (5–10 mg/injection) to the TMJ. Outcomes assessed were maximal incisal opening (MIO) measurements and pre- and post-contrast magnetic resonance imaging (MRI) findings. Specifically, we compared pre- versus post-IACI and pre- versus post-IAIL MRI studies for changes in the acute (synovial fluid, synovial enhancement, narrow edema) and chronic (synovial hypertrophy, condylar head flattening and erosion, disc displacement) phases. IAIL, which was associated with TMJ arthritis.

Conclusions: Assessments of improved, unchanged, or worsened were made by two independent reviewers based upon the official reports, and adjudicated by a radiologist based upon the actual films in instances of disagreement. Institu-
Results: 24 children with JIA and treatment-refractory TMJ arthritis underwent bilateral IAI of the TMJs, of whom 23 had MRIs at all three timepoints (pre-IACI, post-IACI, post-IAI). 23/24 (96%) were on a biologic, with or without concurrent conventional disease-modifying agents; 1 child received methotrexate as monotherapy. Their MIQs (mean ± SEM; in mm) were unchanged before and after both IACI (44.0 ± 1.3 versus 44.6 ± 0.7, p = 0.813) and IAI (44.6 ± 0.7 versus 44.5 ± 0.9, p = 0.840.) However, MRIs revealed improved or halted progression of acute changes in 31 out of 46 TMJs (67%) and of chronic changes in 29 out of 46 TMJs (63%), compared to 15/46 (33%) and 19/46 (41%), respectively, with repeated use of IACI (p = 0.002 and 0.052, respectively). No side effects (infections, nerve damage, cosmetic alterations, prolonged discomfort) were noted after 7.4 person-years of follow-up among 22 patients.

Conclusion: IAI halted or reversed the progression of TMJ arthritis in the majority of JIA patients who were refractory to systemic arthritis therapy and repeated IACI TMJ injections. The IAI TMJ injections were safe in the short term. It remains unknown whether repeated injections of IAI will be of benefit to treatment refractory TMJ arthritis in children with JIA. Future studies will evaluate the efficacy of infliximab versus long-acting corticosteroid injections as initial therapy for TMJ arthritis in children with JIA.

Disclosure: M. L. Stoll, None; A. B. Moriland, None; S. Teerawattanapong, None; D. Young, None; P. D. Waite, None; R. Q. Cron, None.

1678
Safety and Efficacy of Adalimumab in Children with Active Polyarticular Juvenile Idiopathic Arthritis Aged 2 to <4 Years Weighing <15 Kg. Daniel J. Kingsbury, Pierre Quartier, Gina Patel, Vipin Arora, Hartmut Kupper and Neelufar Mozaffarian. 1Legacy Emmanuel Children’s Hospital, Portland, OR, 2Unite d’Immun o-Hematologie et Rhumatologie Pédiatriques, Paris, France, 3Abbott, Abbott Park, IL, 4Abbott Gmb H and Co. KG, Ludwigsafen, Germany.

Background/Purpose: Adalimumab (ADA) is approved for use in moderate to severe JIA in patients (pts) ≥4 yrs old in the US, EU, and Japan. ADA has not been studied in pts <4 yrs old, and limited data are available in pts ≥4 yrs old weighing <15 kg. The primary objective of this study was to assess the safety of ADA in pts 2 to <4 yrs old or ≥4 yrs old weighing <15 kg with moderately to severely active JIA in the US and EU. ADA was given subcutaneously every other wk, 24 mg/m2 BSA up to 20 mg/dose, for a minimum of 24 wks and continued until pts reached 4 yrs old and weighed 15 kg. Concomitant methotrexate use was allowed. Adverse events (AE) were collected throughout the treatment period and include safety data up to 96 wks. Serum trough concentrations of ADA were determined for each subject using validated methods. Key effectiveness endpoints were the proportion of pts achieving PedACR30/50/70/90 at wk 24. Other outcomes included tender joint count (TJC), swollen joint count (SJC), Pain (VAS 0–100 mm), Physical Function (DICEQ) b, Psychological Function (DICEQ) b, Active Joint Count (AJC73) b, Limitation on Passive Motion (POM75) b, Limitation on Passive Motion (LOM69) b, Active Joint Count (AJC73) b, Child Health Assessment Questionnaire (DI CHAQ) b, PhGa of Disease Activity b (VAS 0–100 mm), PaGa of Disease Activity b (VAS 0–100 mm), PaGa of Pain b (VAS 0–100 mm), CRP (mg/dL) b.

Methods: This is an interim analysis of the multicenter, open-label, phase III ADA study in pts 2 to <4 yrs old or ≥4 yrs weighing <15 kg with moderately to severely active JIA in the US and EU. ADA was given subcutaneously every other wk, 24 mg/m2 BSA up to 20 mg/dose, for a minimum of 24 wks and continued until pts reached 4 yrs old and weighed 15 kg. Concomitant methotrexate use was allowed. Adverse events (AE) were collected throughout the treatment period and include safety data up to 96 wks. Serum trough concentrations of ADA were determined for each subject using validated methods. Key effectiveness endpoints were the proportion of pts achieving PedACR30/50/70/90 at wk 24. Other outcomes included tender joint count (TJC), swollen joint count (SJC), Pain on Passive Motion (POM75), Limitation on Passive Motion (L O M 6 9) b, Active Joint Count (A JC73) b, Child Health Assessment Questionnaire (D I C H A Q) b, and Physician’s and Parent’s Global Assessment of Disease (PhGa and PaGa). Results: 150 patients entered the ADA trial, with 153 entering the LTE (58/60 patients from the DB ADA group, 59/62 from the DB PBO group, and 36/47 NR patients from the open-label phase). Cumulative exposure was 606.2 years. At the start of the LTE, 46/58 (79%, ADA) and 31/59 (53%, PBO) had achieved an ACR Pediatric 50 response. Mean response of those who received PBO during the DB phase recovered completely within 6 months after re-instating ADA therapy in the LTE and these results were combined with those of patients in the ADA group starting from LTE Month 6 (Figure). ACR Pediatric 50, 70 and inactive disease rates are shown. Of the open-label responders, 32/110 (29%, Day 169) to 36/79

Table 1. PedACR Response at Week 24

<table>
<thead>
<tr>
<th>Response Ratea</th>
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<tbody>
<tr>
<td>PedACR30, n (%)</td>
</tr>
<tr>
<td>PedACR50, n (%)</td>
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<tr>
<td>PedACR70, n (%)</td>
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<tr>
<td>PedACR90, n (%)</td>
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</tbody>
</table>

aObserved data. bNonresponder imputation.

Table 2. JIA Outcomes at Week 24a

<table>
<thead>
<tr>
<th>Mean Change (SD) from Baseline</th>
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<tbody>
<tr>
<td>Tender Joint count (TJC75)b</td>
</tr>
<tr>
<td>Swollen Joint count (SJC60)b</td>
</tr>
<tr>
<td>Pain on Passive Motion (POM75)b</td>
</tr>
<tr>
<td>Limitation on Passive Motion (L O M 6 9)b</td>
</tr>
<tr>
<td>Active Joint Count (A JC73) b</td>
</tr>
<tr>
<td>Child Health Assessment Questionnaire (D I C H A Q) b</td>
</tr>
<tr>
<td>PhGa of Disease Activity b (VAS 0–100 mm)</td>
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<tr>
<td>PaGa of Disease Activity b (VAS 0–100 mm)</td>
</tr>
<tr>
<td>PaGa of Pain b (VAS 0–100 mm)</td>
</tr>
<tr>
<td>CRP (mg/dL) b</td>
</tr>
</tbody>
</table>

aObserved data. bNonresponder imputation.
(46%, Day 1177) had inactive disease status. Of the NR, 4/13 (31%) achieved inactive disease at the end of the trial. There was one death (accidental), unrelated. The major reason for discontinuation in the LTE was lack of efficacy in 24 patients (15.7%, 11 were NR); 6 discontinuations due to AEs (3/6 due to serious AEs); 13, loss to follow-up; 10, withdrawal of consent; and 18 “other” (not efficacy or safety). Thirty patients (19.6%) had serious AEs; most were unrelated and were primarily musculoskeletal or infectious events. Incidence rate (per 100 patient-years [pt-yrs]) of SAEs in the LTE (5.6/100 pt-yrs) did not increase versus the 6-month DB rate (6.8/100 pt-yrs). No malignancy was reported. Of the 153 patients entering the LTE, 69 patients completed the trial (29, 27 and 13 in the original ABA, PBO and NR groups, respectively).

Conclusion: These data demonstrate the sustained efficacy of abatacept in JIA patients. Additional exposure of 30 months did not change the safety profile of abatacept in these patients when compared to prior LTE experience.2

Table 1.

Additional data: 97.6% patients were HLAB27 positive, 19.4% had hip disease and 28.2% of SI joint MIRs were positive. A further 12 patients developed new onset inflammatory back pain over the observation period of 3 years.

**Disclosure:** AstraZeneca, Centocor, Bristol-Myers Squibb, Abbott, Pfizer, Regeneron, Hoffmann-La Roche, Novartis, UBC, Xoma, Genentech, Wyeth.

**Funding:** Pfizer, Regeneron, Hoffman La-Roche, Novartis, UBC, Xoma, Genentech, Wyeth.

**Competing Interests:** D. J. Lovell, Astra-Zeneca, Centocor, Bristol-Myers Squibb, Abbott, Pfizer, Regeneron, Hoffman La-Roche, Novartis, UBC, Xoma, Genentech, 5, Wyeth Pharmaceuticals, 8, Amgen, Forest Research, 9, Arthritis & Rheumatism, 9; Pfizer, Regeneron, Hoffman La-Roche, Novartis, UBC, Xoma, Genentech, 5, Wyeth.

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**Diagnostic Value of the Assessment of Spondyloarthropathy International Society (ASAS) Criteria for Children with Enthesitis Related Arthritis (ERA): A Single Center Study of 124 Patients.** Mehul Jarivala, Manjari Agarwal and Sujata Sawhney. Sir Ganga Ram Hospital, New Delhi, India

**Background/Purpose:** Enthesitis Related Arthritis (ERA) is a common subtype (36%) of Juvenile Idiopathic Arthritis (JIA) seen in India. These criteria do not distinguish between axial and peripheral arthritis. The new ASAS criteria should be peripheral and not axial disease. This has important implications for deciding therapeutic pathways in children with axial or peripheral disease and gives an opportunity to children with SpA to be recruited into clinical trials with same diagnostic criteria as for adults. We plan to expand the application of these criteria to the undifferentiated and psoriatic arthritis categories of JIA as well.

**Methods:** Data on JIA patients at our centre is collected on detailed proformas at onset and thereafter quarterly. All ERA patients seen over a three year period from May 2009–12 were included. ASAS axial and peripheral spondyloarthropathy (SpA) criteria were retrospectively applied to this cohort, taking all features within 6 months of disease onset.

**Results:** ERA: 124 children were identified, 102 were boys. Median age of onset was 10.9 years; median delay to diagnosis 5 months. ERA features: 64 had arthritis and enthesitis; 60 had Enthesitis or Arthritis with ≥ 2 of the following: SI tenderness and/or inflammatory spinal pain 28%, HLA-B27 97.6%, Family history of medically confirmed HLA-B27-associated disease 9.7%, Anterior uveitis 16.1%, Onset of arthritis in a boy after 6 yr of age 83.8%.

**ASAS criteria:** All 124 ERA patients could be classified per the ASAS criteria. The prevalence of each item is Table 1. No patient in this cohort had isolated inflammatory back pain (IBP) without any other feature of SpA. Thirty five children had axial and 89 peripheral SpA. Only 1 patient had imaging evidence of sacroiliitis with no back pain. All children in this study with axial complaints had IBP.

**Conclusion:** The ASAS axial and peripheral SpA criteria can be applied to all children with ERA and have a sensitivity of 100%, peripheral SpA is 2.5 times as common as the axial SpA. Thus in the pediatric population the entry criteria should be peripheral and not axial disease. This has important implications for deciding therapeutic pathways in children with axial or peripheral disease and gives an opportunity to children with SpA to be recruited into clinical trials with same diagnostic criteria as for adults. We plan to expand the application of these criteria to the undifferentiated and psoriatic arthritis categories of JIA as well.

**Disclosure:** J. Kivitz, None; A. Martini, None; A. Flores Nunez, None; K. Minden, None; A. J. Block, Bristol-Myers Squibb, 3, Bristol-Myers Squibb, 8.

**Funding:** AstraZeneca, Centocor, Bristol-Myers Squibb, Abbott, Pfizer, Regeneron, Hoffman La-Roche, Novartis, UBC, Xoma, Genentech, 5, Wyeth Pharmaceuticals, 8, Amgen, Forest Research, 9, Arthritis & Rheumatism, 9; Pfizer, Regeneron, Hoffman La-Roche, Novartis, UBC, Xoma, Genentech, 5, Wyeth.

**Competing Interests:** D. J. Lovell, Astra-Zeneca, Centocor, Bristol-Myers Squibb, Abbott, Pfizer, Regeneron, Hoffmann-La Roche, Novartis, UBC, Xoma, Genentech, 5, Wyeth Pharmaceuticals, 8, Amgen, Forest Research, 9, Arthritis & Rheumatism, 9; Pfizer, Regeneron, Hoffman La-Roche, Novartis, UBC, Xoma, Genentech, 5, Wyeth.

**Disclosure:** A. Martini, None; A. Flores Nunez, None; K. Minden, None; A. J. Block, Bristol-Myers Squibb, 3, Bristol-Myers Squibb, 8.

1861

**Increased Arterial Stiffness in Juvenile Idiopathic Arthritis (JIA) Patients Compared with Matched Controls - a Pilot Study, Hanne Aulie1, Mette-Elise Extensen2, Anne Marit Selvaag1, Patrick Segers1, Oyvind Mollberg1, Vibeke Lillevy7, Syend Aakhus1 and Berit Flato3. 1Department of Rheumatology, Oslo University hospital, Rikshospitalet, Oslo, Norway, 2Department of Cardiology, Oslo University Hospital, Rikshospitalet, Oslo, Norway, 3HBItech-bioMMea, Ghent University, Ghent, Belgium**

**Background/Purpose:** Systemic arterial properties in adult patients with JIA are not well described. The aim of this study was to evaluate arterial properties in young adults with JIA compared with age- and sex-matched controls.

**Methods:** Nineteen patients (37.7±3.4 years) were randomly selected from a cohort of 88 JIA-patients who were followed from their first referral to Oslo University Hospital in 1980 – 85 and had active disease more than 14 years after disease onset. Of the 19 patients, 2 had systemic JIA, 3 polyarticular RF negative, 1 polyarticular RF positive, 3 oligoarticular persistent, 5 oligoarticular extended, 3 enthesitis related, 1 psoriasis arthritis and 1 undifferentiated arthritis. The patients were investigated after a mean disease duration of 29.2 ±1.3 years and compared with 19 age- and sex-matched controls.

**Aortic root pressure and flow data were obtained non invasively by brachial arterial blood pressure, calibrated carotid arterial pulse trace and aortic annular Doppler flow recordings. The systemic arterial properties were described by the total arterial compliance (C), characteristic aortic impedance**
(Z₀), and peripheral arterial resistance (R) obtained from estimation of 3-element windkessel model (WK) parameters (C, Z₀, R), by Fourier analyses of central arterial pressure and flow data (Z₀).

Results: (table)

Table.

<table>
<thead>
<tr>
<th>Variables</th>
<th>JIA-patients (Mean ± SD)</th>
<th>Controls (Mean ± SD)</th>
<th>P-value (unpaired t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>25.7 ± 4.9</td>
<td>25.3 ± 4.0</td>
<td>0.785</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>117 ± 15</td>
<td>114 ± 11</td>
<td>0.443</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>69 ± 9</td>
<td>68 ± 9</td>
<td>0.535</td>
</tr>
<tr>
<td>Heart rate (beats/s)</td>
<td>67 ± 11</td>
<td>60 ± 8</td>
<td>0.043</td>
</tr>
<tr>
<td>Cardiac output (1 min−1)</td>
<td>5.3 ± 1.1</td>
<td>5.3 ± 0.9</td>
<td>0.982</td>
</tr>
<tr>
<td>R (mmHg/ml/s)</td>
<td>1.04 ± 0.21</td>
<td>1.00 ± 0.23</td>
<td>0.564</td>
</tr>
<tr>
<td>Z₀ Windkessel Model (WK) (10⁻³ mmHg/ml/s)</td>
<td>77 ± 25</td>
<td>78 ± 20</td>
<td>0.016</td>
</tr>
<tr>
<td>C Pulse pressure method (PPM) (ml/mmHg)</td>
<td>1.21 ± 0.24</td>
<td>1.44 ± 0.34</td>
<td>0.022</td>
</tr>
</tbody>
</table>

The proximal arterial stiffness, evaluated by Z₀, was significantly higher in the JIA-patients compared to the healthy controls (p = 0.016). The patients also had lower total arterial compliance (C) (p = 0.022), but the arterial resistance (R) was not different (p = 0.564). The heart rate was higher in the patients than in the controls (p = 0.043), but the blood pressure did not differ between the groups (p = 0.443, p = 0.535).

Conclusion: In spite of similar blood pressure, JIA patients have stiffer proximal aorta and lower total arterial compliance than matched controls. This indicates that JIA-patients with long term active disease experience significant alteration of arterial function.

Disclosure: H. Aulie, None; M. E. Estensen, None; A. M. Selvaag, None; P. Segers, None; O. Molberg, None; V. Lilley, None; S. Aakhus, None; B. Flato, None.

ACR Concurrent Abstract Session Rheumatoid Arthritis - Clinical Aspects III: Rheumatoid Arthritis and Cardiovascular Disease Monday, November 12, 2012, 4:30 PM–6:00 PM

1682

Sustained Clinical Remission (Disease Activity Score 28 Elle.E.A. Arts¹, Jaap Fransen¹, Alfons A. den Broeder², Calin Popa³ and Piet L.C.M. van Riel¹. ¹Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, ²Sint Maartenskliniek, Nijmegen, Netherlands

Background/Purpose: Chronic inflammation appears to be an independent risk factor for CVD in rheumatoid arthritis (RA), but there is no clear difference in CVD risk between RA patients with low or high disease activity (1-3). Possibly, only if disease activity is very low ('remission') it may protect against CVD. The objective of this study was to investigate the association between clinical remission (DAS28<2.6) and the risk of CVD in patients with RA.

Methods: RA patients from the Nijmegen inception cohort were selected for analysis. Patients were assessed at each visit. Cardiovascular events included myocardial infarction (MI) and stroke, transient ischemic attack, angina pectoris and peripheral arterial disease. Remission was defined as DAS28<2.6. A continuity rewarded score (ConRew) was calculated: a score of 1 was rewarded if DAS28<2.6 and a score of 2 was rewarded if DAS28<2.6 at the previous visit too. The ConRew score was divided by the maximal possible score (100% if always in remission) and this was used in the analysis. The crude data were analysed using Kaplan-Meier survival analysis, divided in two groups according to the median of the ConRew ratio.

Results: A total of 770 RA patients were selected for analysis. Patients had a mean±SD age of 56±13 at baseline, 61% female, 76% RF positive with a mean±SD DAS28 at baseline of 5.1±1.4. In total, 153 CV events were registered. Age, gender, prior CV event, and TC:HDL ratio, medication for CV prevention, HAQ and DAS28 at baseline were included as confounders. Results from the Kaplan-Meier survival analysis in the crude data (figure 1) showed that patients who were less in remission, maximum ConRew score <10%, were more likely to develop CVD than patients who scored ≥10%, (p<0.001). In the Cox proportional hazards model, it was shown that a higher ConRew score had a protective effect for developing CVD (OR 0.48 [95% CI 0.66–0.83]), corrected for confounders.

Conclusion: Sustained remission in patients with RA is significantly associated with a reduced excess risk of CVD. Maintaining tight control of disease activity in RA patients to achieve remission is therefore important for the prevention of CVD events.

References
2Arts et al. [abstract]Arthritis Rheum. 2011;63(supplement 10):2585

1683

Associations Between Lipid and Rheumatoid Arthritis Genetic Factors, and Low Density Lipoprotein Levels in RA Patients. Katherine P. Liao¹, Dorothee Diogo¹, Tianxi Cai², Jing Cui³, Raul N. Guzman P.⁴, Vivian Gainer¹, Shawn N. Murphy⁵, Susanne Churchill⁶, Isaac Kohane¹, Elizabeth W. Karlson⁵ and Robert M. Plenge⁵. ¹Brigham and Women’s Hospital, Boston, MA, ²Harvard School of Public Health, Boston, MA, ³Brigham and Womens Hospital, Boston, MA, ⁴Partners Healthcare Systems, Boston, MA, ⁵Brigham and Women’s Hospital, Harvard Medical School, Boston, MA

Background/Purpose: In epidemiologic studies, low density lipoprotein (LDL), a major risk factor for cardiovascular disease (CVD), is lower in RA patients than the general population; despite this RA patients have a higher risk of CVD. Recently, the genetic determinants of LDL in the general population have been elucidated. We hypothesized that these LDL genetic factors are associated with higher LDL levels in RA and further, that RA genetic factors also influence LDL levels.

Methods: We studied an RA cohort of 1837 subjects based in a large academic center. We genotyped subjects’ blood samples for published alleles associated with higher LDL levels (26 alleles) and RA risk (48 alleles including HLA shared epitope). To study associations between genetic factors and LDL levels, we created LDL and RA composite genetic risks scores (GRS); an aggregate count of the number of LDL and RA alleles for each individual. We selected the 1st LDL measurement in the electronic medical record as the outcome and excluded subjects with ≥1 statin prescription prior to the 1st LDL. We tested the associations between the LDL GRS and LDL, and the RA GRS and LDL levels by fitting separate linear regression models adjusted by age, gender and LDL measurement year. To determine whether RA genetic factors in aggregate were independently associated with LDL, we fitted a linear regression model with both the LDL and RA GRS, adjusted by age, gender and LDL measurement year. We further stratified each model by gender.
Results: 1072 RA subjects had LDL measured prior to a statin prescription. Characteristics: 81% female, 68% ACPA positive, mean LDL 119 mg/dL. We observed a significant association between the LDL GRs and higher LDL (p = 8.0 × 10^-5); carriage of 1 additional LDL allele was associated with a 2.3 mg/dL decrease in LDL. The RA GRs was not associated with LDL in all RA cases, however the association was significant among female RA cases: carriage of 1 additional RA risk allele was associated with a 0.75 mg/dL decrease in LDL (p = 0.03) (FIGURE). Among female RA cases, the RA GRs remained significantly inversely associated with LDL (p = 0.02) when added to a model with LDL GRs.

The cohort was followed for a mean of 4.5 years during which 639 MIs, 867 strokes and 804 cases of AF occurred. The risk of all outcomes was significantly increased in biologically treated RA patients with a 95% excess risk of MI, 31% excess risk of stroke, and 35% excess risk of AF in the fully adjusted analysis (Table 2).

Table 1. Baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Biologically treated RA patients n=3872</th>
<th>Controls n=38720</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>56 (±13) years</td>
<td>56 (±13) years</td>
</tr>
<tr>
<td>Females</td>
<td>2861 (74%)</td>
<td>28610 (74%)</td>
</tr>
<tr>
<td>Follow-up</td>
<td>4.5 years</td>
<td>4.5 years</td>
</tr>
<tr>
<td>Pharmacological treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>403 (10.4%)</td>
<td>3604 (9.3%)</td>
</tr>
<tr>
<td>Beta blockers</td>
<td>462 (11.9%)</td>
<td>3574 (9.2%)</td>
</tr>
<tr>
<td>RAS inhibitors</td>
<td>554 (14.3%)</td>
<td>5057 (13.1%)</td>
</tr>
<tr>
<td>Lipid-lowering drugs</td>
<td>333 (8.6%)</td>
<td>3917 (10.1%)</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>2710 (70.0%)</td>
<td>8691 (22.4%)</td>
</tr>
<tr>
<td>DMARDs</td>
<td>2944 (76.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Charlson co-morbidity index</td>
<td>0.06 (±0.36)</td>
<td>0.06 (±0.39)</td>
</tr>
<tr>
<td>Previous CV disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>107 (2.8%)</td>
<td>704 (1.8%)</td>
</tr>
<tr>
<td>Stroke</td>
<td>68 (1.8%)</td>
<td>795 (2.1%)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>103 (2.7%)</td>
<td>777 (2.0%)</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>2.51 (1.04)</td>
<td>2.50 (1.13)</td>
</tr>
</tbody>
</table>

RA-specific characteristics

<table>
<thead>
<tr>
<th></th>
<th>Risk factors</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA duration</td>
<td>8 (3–16) years</td>
<td></td>
</tr>
<tr>
<td>HAQ score</td>
<td>1.25 (0.73–1.75)</td>
<td></td>
</tr>
<tr>
<td>DAS28crp score</td>
<td>5.1 (4.1–5.9)</td>
<td></td>
</tr>
<tr>
<td>CRP</td>
<td>14 (7–32) mg/l</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: LDL genetic factors were significantly associated with higher LDL levels in female RA cases. Our finding that RA genetic factors were significantly associated with lower LDL levels in female RA cases provides a genetic link to epidemiologic observations of lower LDL levels in RA compared to the general population.

Disclosure: K. P. Liao None; D. Diogo None; T. Cai None; J. Cui None; R. N. Guzman P. None; V. Gainer None; S. N. Murphy None; S. Churchill None; I. Kohane None; E. W. Karlson None; R. M. Penge None.

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Increased Risk of Major Cardiovascular Events in a Nationwide Cohort of Rheumatoid Arthritis Patients Treated with Biological Agents. Signe Abitz Winther, Peter Riis Hansen, Søren Lund Kristensen, Lene Dreyer, Ole Ahlehoff, Louise Linde, Christian Torp-Pedersen and Jesper Lindhardsen. Copenhagen University Hospital Gentofte, Hellerup, Denmark

Background/Purpose: Patients with rheumatoid arthritis (RA) are at increased risk of cardiovascular disease, but in contrast to the well-established risk of myocardial infarction (MI), the results from studies on RA-related risk of stroke have been inconsistent. Also, we recently found an association between RA and atrial fibrillation (AF), which is an important risk factor for stroke. Most of these data, however, stem from more dated cohorts where the RA-specific treatment was less aggressive than today. Consequently, this study examined the incidence of MI, stroke and AF in a large, unslected, nationwide cohort of biologically treated RA patients.

Methods: In Denmark, biological RA treatment is provided at no cost, but patients are required to be registered and followed in the DANBIO registry. All RA patients treated with biological agents during the period 2001–2009 were matched with 10 individuals from the general population by age and sex at the start of biological therapy. Through individual-level linkage to the National Patient Register, the National Register of Medicinal Products (national prescription database) and the National Civil Register, participants were characterized with respect to comorbidity, pharmacotherapy and socioeconomic status and subsequently monitored for the outcomes of interest (MI, stroke, or AF) until emigration, death, or December 31, 2010. Incidence rates were calculated and multivariable proportional hazard models were fitted to estimate risk of outcomes in terms of hazard ratios.

Results: A total of 3872 RA patients and 38720 controls were included. Cohort participants were predominantly women (74%) and had a mean age of 56 years. Cardiovascular and RA-specific characteristics are listed in Table 1.

The risk of cardiovascular events was significantly increased in biologically treated RA patients with a 95% excess risk of MI, 31% excess risk of stroke, and 35% excess risk of AF in the fully adjusted analysis (Table 2).
the general population. Subclinical atherogenesis has been linked to higher risk of future clinical events. However, the independent role of individual CRFs on coronary plaque presence and characteristics in asymptomatic, coronary artery disease (CAD)-naïve subjects with RA is unknown. We evaluated potential differences in the contribution of traditional CRFs on coronary plaque presence, quantitative and qualitative features in asymptomatic subjects with RA compared to controls.

Methods: One hundred and fifty RA subjects and 150 age and sex-matched controls underwent 64-slice coronary computed tomography angiography (CTA), a modality that reliably evaluates plaque presence, severity, burden, and composition as non-calcified (NCP), mixed or partially calcified (MP), or fully calcified (CP). A 15-segment American Heart Association model was used for evaluation. Quantitative plaque characteristics included segment involvement score (SIS- number of affected segments out of 15 evaluated/ patient), segment stenosis score (SSS-degree of luminal stenosis per segment, graded 1–4 and averaged over 15 evaluated segments/ patient), and plaque burden score (PBS-plaque extent per segment, graded 1–3 and averaged over 15 segments/ patient). Logistic and multivariable regression analysis models adjusted for age, gender, and all CRFs were used to assess differences in plaque prevalence and quantitative measures, between groups.

Results: Quantitative plaque measurements were significantly higher in RA; SIS=2.02±2.28 vs. 0.9±1.25, SSS=3.03±4.43 vs. 0.98±1.7, and PBS= 2.75±3.82 vs. 0.98±1.44, all with p<0.0001. Hypertension was significantly and differentially associated with higher risk of plaque prevalence in RA [adjusted OR=4.3 (1.83–10.1)- figure 1a]. Additionally, in the context of RA, the presence of male gender, hypertension and diabetes were associated with higher mean differences in the proportion of involved segments, plaque severity, and burden vs. their absence, compared to those imparted in controls (all with p<0.05- figure 1b, c, d respectively). Importantly, these differences segregated exclusively in MP and CP but not NCP.

Conclusion: Hypertension strongly and differentially associates with coronary plaque presence in CAD-naïve, asymptomatic subjects with RA compared to controls. In RA, male gender, hypertension and diabetes are associated with significant differences in plaque severity, burden and number of involved segments compared to presence of those factors in controls, specifically for MP and CP.

Disclosure: G. A. Karpouzas, None; J. Malpeso, None; T. Y. Choi, None; S. Munoz, None; M. Budoff, None.

Background/Purpose: Osteoporosis and cardiovascular disease (CVD) are major comorbidities and CVD is the leading cause of death among patients with rheumatoid arthritis (RA). Traditional CVD risk prediction tools i.e., Framingham risk score (FRS) under-estimate the risk of CVD in RA. Novel biomarkers and better risk prediction tools are needed. Many RA patients undergo DXA today as part of an osteoporosis assessment, which may include a vertebral fracture assessment (VFA). VFA technology has been shown to reliably detect and quantify abdominal aortic calcification (AAC). VFA-detected AAC is an independent robust marker of CVD in other populations. It is unknown whether VFA-detected AAC is a useful marker of CVD in RA. We aimed to determine whether VFA-detected AAC is independently associated with CVD in RA patients and compared its utility to the FRS for CVD risk assessment in RA patients.

Methods: A cross-sectional study of our RA cohort at a University Hospital. We included RA patients aged ≥40 years who met 1987 ACR criteria for RA, had a DXA and VFA scan available for analysis and access to their medical records to ascertain their CVD risk factors and details. The study was approved by our local I.R.B. Two blinded consultant musculoskeletal radiologists independently reviewed all VFA scans to determine AAC using an established 24-point scale. We determined if AAC was independently associated with prevalent CVD using multivariable logistic regression. The ability of the FRS and AAC for determining the presence of CVD was assessed using ROC curve analyses.

Results: 1330 patients were screened. 603 met the inclusion criteria; mean age 56 years, 74% female, 76% sero-positive and 43% smokers. 230 had documented CVD event. Overall AAC was present in 211 of subjects: 11% was mild (<9 points), 57% moderate (9–16) and 32% severe (>16 points). The proportion of patients with AAC was substantially greater in subjects with CVD than those without (76% Vs 10%, p <0.05). VFA-detected AAC was significantly better than traditional risk factors for determining the presence of CVD. In multivariable analyses both the presence and severity of AAC was significantly and independently associated with prevalent CVD (OR 2.70; 95% CI 1.8 to 3.2). Both the FRS (AUC 0.58) and AAC (AUC 0.85) were significant predictors of CVD events (Fig. 1). The addition of VFA-detected AAC to the FRS significantly enhanced the performance of the FRS for determining CVD (AUCs increased from 0.58 to 0.79, p<0.001).

Conclusion: VFA-detected AAC is an important marker of CVD risk in RA patients, and out-performs traditional risk prediction tools. Further studies are needed to examine the utility of DXA-detected AAC in CVD assessment in RA patients.

Disclosure: A. Mohammad, None; D. Lohan, None; D. Bergin, None; S. Mooney, None; J. Newell, None; M. O'Donnell, None; R. J. Coughlan, None; J. J. Carey, None.

Fig. 1. Additive Effect of AAC on FRS for Predicting CVD in RA Patients*

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Vertebral Fracture Assessment-Detected Abdominal Aortic Calcification Enhances Cardiovascular Disease Risk Stratification of Rheumatoid Arthritis Patients. Ausaf Mohammad1, Derek Lohan1, Diane Bergin1, Sarah Mooney1, John Newell2, Martin O'Donnell2, Robert J. Coughlan3 and John J. Carey1. 1Galway University Hospitals, Galway, Ireland; 2National University of Ireland, Galway, Ireland; 3Department of Radiology, University of Iowa, Iowa, IA, USA.
The Risk of Atrial Fibrillation in Patients with Rheumatoid Arthritis Compared to the General Population: A Large Cohort Study. Seoyoung C. Kim1, Jun Liu2 and Daniel H. Solomon1. Brigham and Women’s Hospital, Boston, MA. 1Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 2Brigham & Women’s Hospital and Harvard Medical School, Boston, MA

Background/Purpose: It is well-known that rheumatoid arthritis (RA) is associated with cardiovascular disease such as myocardial infarction. However, little evidence exists on the risk of atrial fibrillation (AF) in patients with RA. The objective of this study was to estimate the incidence rates (IR) and rate ratios (RR) of AF among patients with RA compared to those without RA.

Methods: We conducted a large population-based cohort study using the US commercial insurance claims data. The RA cohort included adults with at least two diagnoses of RA and at least one prescription for a disease-modifying anti-rheumatic drug (DMARD). Subjects who never had a diagnosis of RA matched on age, sex, and index date with a 5:1 ratio were selected as a comparison cohort. Follow-up began with the first prescription for a DMARD for RA patients and the 2nd physician visit date for non-RA patients after a 12-month baseline period. Patients with history of any cardiac arrhythmia, cardiovascular surgery and anticoagulant users during the baseline period were excluded. Primary outcome was an imputant diagnosis of AF and secondary outcome was an outpatient or inpatient diagnosis combined with a dispensing of anticoagulant within 10 days after the first diagnosis of AF. We calculated IRs and RR of AF with 95% confidence intervals (CI). Multivariable Cox proportional hazards models compared the risk of AF between RA and non-RA patients.

Results: The study population included 20,891 RA and 104,455 non-RA patients. Mean (SD) age was 52 (12) years and 74% were women. During a mean follow-up of 2 years, 0.8% of RA patients and 0.6% non-RA patients developed AF as inpatient. Table shows the IRs for primary outcome and secondary outcome. The RR was 1.4 (95% CI, 1.2-1.7) for primary and 1.3 (95% CI, 1.0-1.6) for secondary outcome in RA patients, compared to age- and sex-matched subjects without RA. After adjusting for comorbidities such as cardiovascular disease, and thyroid disease, various medications and health care utilization characteristics, the risk of AF was not increased in RA (hazard ratio 1.0, 95% CI: 0.8-1.3) compared to non-RA patients.

Table. Incidence rates per 1,000 person-years (95% confidence interval) and rate ratios (95% confidence interval) of atrial fibrillation (AF) in patients with and without rheumatoid arthritis (RA).

<table>
<thead>
<tr>
<th></th>
<th>Inpatient AF</th>
<th>Non-RA</th>
<th>Age- and sex-matched</th>
<th>Fully adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient</td>
<td>4.1 (3.5-4.8)</td>
<td>2.9 (2.7-3.2)</td>
<td>1.4 (1.2-1.7)</td>
<td>1.0 (0.8-1.3)</td>
</tr>
<tr>
<td>Outpatient</td>
<td>2.6 (2.2-3.2)</td>
<td>2.1 (1.9-2.3)</td>
<td>1.3 (1.0-1.6)</td>
<td>1.0 (0.7-1.3)</td>
</tr>
</tbody>
</table>

Conclusion: Our results showed that the incidence of AF was similar in both RA and non-RA patients. The risk of AF was not increased in patients with RA compared to non-RA patients after adjusting for various comorbid conditions and medications.

Disclosure: S. C. Kim, Pfizer Inc, 2, Takeda Pharmaceuticals, 2; J. Liu, None; D. H. Solomon, Amgen & Lilly, 2, Corrona, 5, Pfizer Inc, 2.

Anti-Peptidylarginine Deiminase 3/4 Cross-Reactive Antibodies: A Novel Biomarker with Clinical and Mechanistic Implications in Rheumatoid Arthritis. Erika Darnah1, Jon T. Giles2, Herbert Bull3, Felipe Andrade1 and Antony Rosen1. 1The Johns Hopkins University School of Medicine, Baltimore, MD, 2Columbia University Medical Center, New York, NY, 3Consultant, Westfield, NJ

Background/Purpose: Peptidylarginine deiminases (PADs) have emerged as key participants in the pathogenesis of rheumatoid arthritis (RA) due to their expression in inflamed RA synovium and ability to citrullinate autoantigens. In addition, PAD4 autoantibodies are present in 35% of RA patients. The unexpected expression of PAD3 in neutrophils prompted us to investigate PAD3 as a potential autoantigen in RA.

Methods: Anti-PAD3 antibodies were detected by immunoprecipitation of 35S]Methionine-labeled PAD3. Sera were obtained from 36 healthy controls, 44 RA patients from a convenience sample, and 194 patients from a longitudinal cohort study of subclinical cardiovascular disease in RA (ESCRAPE RA). In ESCRAPE RA, disease activity and severity were assessed at baseline and two additional time points, with the final visit occurring an average of 39±4 months post-baseline. Radiographs of the hands and feet were obtained at the first and third visits and scored according to the ACR/EULAR criteria.

Results: At the baseline visit, 22% FDR had anti-citrullinated protein antibodies (ACPAs) and/or rheumatoid factor (RF). This longitudinally followed cohort had a mean age at study enrollment of 35 ± 13 yrs and 65% were female. Three FDR had definite RA at study entry and were followed as probands. Six FDR met the criteria for new onset IA after a median follow-up of 62 mo. (range 12-73). Of these 6 individuals, 2 were ACPA+ at baseline, one of whom was also RF+. In the period leading up to the development of IA, epitope spreading was evident in the ACPA response, with new targeting of citrullinated epitopes from fibrinogen, vimentin, chlustin, bigyclan. Notably, development of detectable IgM RF in most cases occurred subsequent to ACPA epitope spreading, and was within months of development of IA. An increase in IC levels was also detected in these FDR. A further 4 FDR demonstrated ACPA epitope spreading and had persistent arthralgia but no detectable synovitis at the time of reporting. To date, none of the 16% FDR who were initially RF+ but ACPA- have developed ACPA or IA. The 3 FDR who had RA at study entry were strongly positive for multiple ACPA autoantibodies and did not demonstrate epitope spreading during the follow-up period.

Conclusion: The observations made in this prospectively followed cohort of high-risk NAN FDR who ultimately developed ACPA positive IA are consistent with the hypothesis that the autoimmune responses preceding the development of synovitis exhibit three stages: 1) initial breaking of immunological tolerance to citrullinated antigens; 2) epitope spreading of the ACPA response; and 3) development of RF. The latter event, which is likely associated with the formation of pathogenic immune complexes, may be the most proximal event preceding the development of clinically detectable synovitis. This hypothesis provides the framework for actionable stages of preclinical RA autoimmunity.

Disclosure: H. S. El-Gabalawy, None; D. B. Robinson, None; I. Smolik, None; D. M. Hart, None; E. D. Ferucci, None; M. M. Newkirk, None; M. J. Fritzier, Inova Diagnostics, Inc, 5; C. Cramb, None; J. Sokolov, None; W. H. Robinson, None.
Sharp-van der Heijde (SvdH) method. Recombinant human PAD3 and PAD4 were used for anti-PAD competition assays. The effect of autoantibodies on PAD4 enzymatic activity was assessed by measuring citrullination of benzoyl-arginine ethyl ester (BAEE) and histone H3 following pre-incubation with patient or control IgG.

**Results:** Anti-PAD3 autoantibodies were present in 18% of RA sera in the convenience sample, 12% of ESCAPE RA sera, and 0% of healthy controls. Levels of anti-PAD3 antibodies were only detected in anti-PAD4 positive sera and were found through competition experiments to be PAD3/PAD4 cross-reactive autoantibodies. Analysis of clinical features revealed that patients with PAD3/PAD4 antibodies had a higher baseline SvdH score compared to anti-PAD4 only patients (2.5 fold; P=0.039) and anti-PAD negative patients (4.5 fold; P<0.001), even after adjusting for cohort-specific indicators of radiographic damage. Furthermore, patients with anti-PAD3/PAD4 antibodies had a 50% higher rate of radiographic progression (i.e. any longitudinal increase in SvdH) compared to PAD antibody negative individuals (p=0.004), despite equivalent therapeutic intervention. Strikingly, PAD3/PAD4 autoantibodies increased the catalytic efficiency of PAD4 (160-fold at 0.2mM Ca²⁺) by dramatically decreasing the enzyme’s requirement for calcium from a Kₘ of 3.0 mM to a Kₘ₅ of 0.3 mM, rendering the enzyme responsive to calcium concentrations now within the physiological range (0.2–1mM). This effect was observed with the macromolecular substrates histone H3 but not with the small molecule BAEE, indicating that anti-PAD3/PAD4 antibodies do not affect the fundamental catalytic properties of PAD4. These autoantibodies and the binding of citrullination of histone H3, and achieve activities of PAD4 which normally require supraphysiologic calcium concentrations. It remains to be determined how broadly this property extends to other macromolecular substrates.

**Conclusion:** These studies describe a novel biomarker associated with erosive joint damage in RA. PAD3/PAD4 cross-reactive antibodies may contribute to disease pathogenesis by activating PAD4 enzymatic function and identify a patient subgroup in whom PAD inhibition may be particularly beneficial therapeutically.

**Disclosure:** E. Darrah, None; J. T. Giles, Roche/Genentech, S; H. Bull, None; F. Andrade, None; A. Rosen, None.

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**1690**

Citrullination within the Atherosclerotic Plaque: A New Potential Target for Anti-Citrullinated Protein Antibodies. Jeremy Sokolove1, Orr Share1, Matthew Brennan1, Lauren J. Lahy1, Amy H. Kao2, Eswar Krishman2, Mary Chester Wasko3 and William H. Robinson3. 1VA Palo Alto Health Care System and Stanford University, Palo Alto, CA, 2Allegheny Singer Research Institute, Pittsburgh, PA, 3Stanford University, Stanford, CA. The aims of the current study was to investigate if inflammatory lung changes are present in RA patients early in the disease process and to address the contribution of these changes to disease initiation.

**Methods:** We performed proteomic and immunohistochemical studies of atherosclerotic lesions to identify citrullinated proteins. Lysates were prepared from atherosclerotic segments of human aortic arch obtained at autopsy, subjected to 1 and 2-D PAGE, and probed by western blot for the presence of citrulline modified proteins and fibrinogen. Plaque lysates were immunoprecipitated with anti-citrullinated and anti-fibrinogen antibodies and subjected to micelle-mediated citrullination with anti-modified citrulline antibodies. Paraffin sections of several human coronary artery plaques were examined by immunohistochemistry for the presence of citrullinated proteins, PAD4 enzyme, and fibrinogen. Levels of anti-CCP2, anti-citrullinated vimentin (cVim), and anti-cFb were measured in a cohort of 135 women with RF ≥ anti-CCP2, anti-citrullinated vimentin (cVim), and anti-cFb were measured in the presence of citrullinated proteins, PAD4 enzyme, and fibrinogen. We performed proteomic and immunohistochemical studies of atherosclerotic lesions to identify citrullinated proteins. Lysates were prepared from atherosclerotic segments of human aortic arch obtained at autopsy, subjected to 1 and 2-D PAGE, and probed by western blot for the presence of citrulline modified proteins and fibrinogen. Plaque lysates were immunoprecipitated with anti-citrullinated and anti-fibrinogen antibodies and subjected to micelle-mediated citrullination with anti-modified citrulline antibodies and mass spectrometry. Additionally, immunoprecipitation of plaque lysate with RA patient-derived IgG again identified citrullinated fibrinogen by mass spectrometry. Immunohistochemistry demonstrated co-localization of (i) citrullinated proteins, (ii) PAD4, and (iii) fibrinogen within the coronary artery atherosclerotic plaque. Finally, levels of anti-cFb, anti-cVim, and anti-CCP2 were associated with the increased atherosclerosis as measured by coronary calcium score. In age adjusted models, ACPA titers accounted for approximately 35% of variance in total calcium score and for each standard deviation increase in level of each ACPA, there was an increase in coronary artery calcium score of 400–500 units (anti-cFb P=0.002, anti-cVim P<0.01, anti-CCP2 P=0.01).

**Conclusion:** Citrulline modified proteins including citrullinated fibrinogen are prevalent within the atherosclerotic plaque and levels of ACPA are associated with degree of atherosclerotic burden. This observation suggests that high levels targeting of citrullinated epitopes, specifically cFb, within the atherosclerotic plaque could provide a mechanism for accelerated atherosclerosis observed in patients with ACPA+ RA.

**Disclosure:** J. Sokolove, None; O. Share, None; M. Brennan, None; L. J. Lahy, None; A. H. Kao, None; E. Krishman, None; M. C. Wasko, None; W. H. Robinson, None.

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Early Signs of Subclinical Inflammation and Local Antibody Production in Early Rheumatoid Lungs. Gudrun Reynisdottir2, Reza Karimi2, Jimmy Ytterberg3, Vijay Joshua3, Helga Olsen3, Aase Haj Hensvold4, Anders Harju2, Johan Grunevald5, Sven Nyren5, Anders Eklund5, Lars Klareskog3, Roman Zubarev6, Magnus Skold7 and Anca I. Catrina1. 1Rheumatology Unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2Division of Respiratory Medicine, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 3Rheumatology Unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 4Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 5Karolinska Institute, Stockholm, Sweden, 6Karolinska Institute, Stockholm, Sweden, 7Karolinska Institutet, Stockholm, Sweden.

**Background/Purpose:** The aims of the current study was to investigate if inflammatory lung changes are present in RA patients early in the disease process and to address the contribution of these changes to disease initiation.

**Results:** 105 RA patients with symptom duration less than 1 year at the time of diagnosis and naive to DmARD treatment and 43 non-RA individuals matched for age, smoking and gender were subject to high-resolution computer tomography (HRCT) of the lungs. In a subgroup of patients (n=21) bronchoscopy was performed and BAL samples as well as mucosal large bronchial biopsies were retrieved. Histological analysis for identification of inducible bronchia associated lymphoid tissues (iBALT), PAD enzymes, CD3, and HLA-DR expression were performed. Presence of ACPA was tested by ELISA in the serum and BAL. Mass spectrometry was used for identification of citrullinated epitopes in 6 of the lung biopsies and additional 8 synovial RA biopsies. Contingency tables and chi-square test as well as a generalized linear model were used for analysis of the clinical data. Whitney test was used to analyze differences in immunohistochemistry double-blind semi-quantitative scores between independent groups.

**Results:** A large majority of ACPA+ RA patients (59%, 41/70) presented with HRTC lung abnormalities, as compared to only 34% (12/35) of ACPA- patients and 28% (12/43) of the controls (p<0.05). ACPA positive smokers had increased levels of expression of PAD enzymes in BAL. iBALT formation and higher expression of HLA-DR was observed in bronchial biopsies of ACPA positive RA. A majority of serum ACPA positive RA patients subjected to lung bronchoscopy had detectable levels of ACPA in the BAL fluids both IgA and IgG. IgG from BAL fluids of ACPA-positive patients showed a higher ACPA reactivity as compared to serum IgG from the same patients. Mass spectrometry identified 5 proteins in the synovium (in total 8 sites) and 4 in the lungs (in total 6 sites) containing citrullinated residues. Two vimentin derived citrullinated peptides were present in a majority of both synovial and lung biopsies with slightly higher citrullinated/ unmodified peptides ratios in the smokers as compared to non-smokers.

**Conclusion:** Lung HRTC abnormalities and subclinical inflammation are present already at the earliest visit to a rheumatology specialist early after disease onset in ACPA+ RA patients. These findings suggest that the lungs might be the primary local initiation sites of the anti-citrulline response in RA.

**Disclosure:** G. Reynisdottir, None; R. Karimi, None; J. Ytterberg, None; V. Joshua, None; H. Olsen, None; A. H. Hensvold, None; A. Harju, None; J. Grunevald, None; S. Nyren, None; A. Eklund, None; L. Klareskog, None; R. Zubarev, None; M. Skold, None; A. I. Catrina, None.
Background/Purpose: Emerging data suggest that microorganisms and mucosal inflammation may play a role in the etiology of rheumatoid arthritis (RA). Furthermore, our published findings of inflammatory airways disease in a high proportion of RA-related autoantibodies positive subjects without inflammatory arthritis (IA), some of whom later developed classifiable RA, suggest that the lung may play a role in early RA pathogenesis. Therefore, investigations of the lung microbiome in subjects at risk for future RA may provide insight into RA pathogenesis.

Methods: 13 CCP positive cases without IA and 9 healthy seronegative controls were identified through community screening. Induced sputa was collected from all subjects. DNA extractions for microbiome analysis were performed using Qiagen EZ1 Advanced platform. Established protocols with barcoded PCR primers were used to construct multiplexed amplicon pools and assign sequences to the appropriate subject sample. Microbial prevalence and median relative abundance in sputa were compared using Explicet.

Results: Cases were older and more frequently male than controls (Table), and more cases had been smokers, although they had quit smoking a median of 9 years prior to sputa collection. Bacteria were identified by rRNA pyrosequencing (>1,000 sequences per sample). Good's coverage was >98.9% for all samples. 80 genera were identified across all samples with an average of 30 per sample. Relative abundance of Haemophilus and Neisseria was elevated in cases compared to controls (p=0.04) (Table), and there was a trend toward increased relative abundance of Streptococcus in cases. There was no significant difference in Porphromonas, Prevotella and Mycoplasma between groups.

Conclusion: These results show differences in sputa microbiota between RA-related autoantibody positive cases without IA and controls. This is particularly intriguing because our prior work has shown that 9 of these autoantibody positive cases had inflammatory airways disease on lung imaging, raising the possibility of a mechanistic link between the microbiome, mucosal inflammation and generation of RA-related autoimmunity in the lung. A caveat in this small pilot study is the unknown influence on the lung microbiome of differences in age and sex between groups. Also, differences in smoking history between groups may affect results as smoking is known to alter the lung microbiome. However, smoking is also associated with CCP positivity in established RA patients. As such, it is possible that a mechanism that drives CCP generation is smoking (or other inhaled factor)-related changes in the lung microbiota. Additional study, including speciation of organisms and prospective follow-up of larger numbers of subjects and controls, is needed to determine the biologic relevance of the lung microbiome to the pathogenesis of early RA.

Disclosure: M. K. Demoruelle, None; J. M. Norris, None; V. M. Holers, None; K. D. Deane, None; J. K. Harris, None.

1693

Oncogenic Activation of MAPK in Rheumatoid Arthritis Synovial Fibroblasts. Niloofar L. Farmani1, Keith K. Colburn2, Grace Chan3, Erica Li3, Emil Hanze1, Antonia Rubell3, Robert Nishimura3 and Richard H. Weisbart1. 1Olive View-UCLA Medical Center, Sylmar, CA, 2Loma Linda Univ Medical Center, Loma Linda, CA, 3VAGLAHS, Sepulveda, CA, 4The David Geffen School of Medicine at UCLA, Los Angeles, CA

Background/Purpose: Transformed synovial fibroblasts (SF) mediate joint-specific damage in rheumatoid arthritis (RA) by expressing integrins and metalloproteinase that promote adhesion to and invasion of cartilage. The mechanism of SF transformation is unknown, but is critical for the rational design of specific therapies to prevent joint erosion in RA. We recently identified aberrant BRAF splice variants in synovial fibroblasts from some RA patients and demonstrated their role in RA fibroblast proliferation, results that suggest a primary role for oncogenic transformation of RA SF. The current studies were designed to further evaluate the role of oncogenesis in RA SF transformation.

Methods: Aberrant BRAF splice variants and mutations in KRAS were identified in RA SF by RT-PCR. The function of aberrant BRAF splice variants was evaluated in NIH-3T3 fibroblasts transfected with an expression vector containing cDNA of BRAF splice variants. Mitogen-activated protein kinase (MAPK) activation in transfected NIH-3T3 cells was determined by phosphorylation of MEK and ERK. The role of BRAF and CRaf in SF transformation was determined by RNAi, and Membrane-Type 1 Matrix Metalloproteinase (MT1-MMP) was identified in cells with MT1-MMP-specific antibodies. Collagen invasion by transfected NIH-3T3 cells was evaluated in an in vitro collagen invasion assay.

Results: SF from 6/9 RA patients had kinase “Dead” aberrant BRAF splice variants. NIH-3T3 cells transfected with aberrant BRAF splice variants constitutively activate MAPK, produce MT1-MMP, and invade collagen. We evaluated the role of BRAF in MAPK activation by RNAi. MAPK activation was inhibited by siRNA specific for BRAF and CRaf. Since MAPK activation by “Dead” BRAF also requires activated KRAS we looked for KRAS mutations in RA SF and identified mutations in 7/9 RA patients.

Conclusion: Our results suggest that joint-specific oncogenesis is responsible for synovial fibroblast transformation in some patients with RA.

Disclosure: N. L. Farmani, None; K. K. Colburn, None; G. Chan, None; E. Li, None; E. Hanze, None; A. Rubell, None; R. Nishimura, None; R. H. Weisbart, None.

ACR Concurrent Abstract Session
Rheumatoid Arthritis Treatment - Small Molecules, Biologics and Gene Therapy: Safety II
Monday, November 12, 2012, 4:30 PM–6:00 PM

1694

Infection Risk in Patients with Low Immunoglobulins Following Rituximab Treatment in Rheumatoid Arthritis. Ronald F. van Vollenhoven1, Gregg J. Silverman2, Clifton O. Bingham III1, Patricia Durez4, Patricia B. Lepane1, Nicola Tyson1 and Elena Fisheleva3. 1Karolinska University Hospital, Stockholm, Sweden, 2NYU School of Medicine, New York, NY, 3Johns Hopkins University, Baltimore, MD, 4University Hospital St Luc, UCL, Brussels, Belgium, 5Roche Products Limited, Welwyn Garden City, United Kingdom

Background/Purpose: This study analyzed infection rates in patients (pts) with low immunoglobulin (Ig) serum concentrations following rituximab (RTX) treatment in RA clinical trials.

Methods: Pooled analysis of clinical trial data from the All-Exposure population of all pts exposed to RTX (n=2,169). Subjects who developed low IgM or IgG (defined as below lower limit of normal [LLN] for ≧4 mIU [or consecutive study visits] after ≥1 RTX course. Low IgG/IgM at baseline screening (IgG <5.65 and IgM <0.55 mg/mL) were exclusion
background/Purpose: Disease-modifying therapies for RA have proven efficacy, but these drugs may have selective toxicities, such as malignancy, that may increase with duration of treatment. Periodic re-evaluation of incidence rates (IRs) allows assessment of any cumulative or new events over time. Using the largest pool of integrated abatacept clinical trial data to date, we investigated the long-term (LT) safety of subcutaneous (SC) and intravenous (IV) abatacept.1,2

Methods: Data were pooled from the cumulative (double-blind and open-label short-term [ST] and open-label LT extension) periods of 13 clinical studies, including one Phase II and four Phase III trials with SC abatacept,1 and two Phase II and six Phase III trials with IV abatacept.2 IRs for adverse events (AEs), serious AEs (SAEs), infection, malignancy and autoimmune AEs were calculated as events per 100 patient-years (pt-yrs) of exposure (Poisson 95% CI). IRs for the cumulative period were compared with IRs originally estimated from the pooled ST periods of the eight IV abatacept clinical studies.2

Results: A total of 6028 patients received IV or SC abatacept during the cumulative period, with abatacept exposure of 16,670.56 pt-yrs; 1167 patients received abatacept for >5 yrs. IRs of AEs, SAEs, infections or serious infections did not increase in the cumulative relative to ST periods (Table). The most frequently reported serious infections in the cumulative period were pneumonia (IR: 0.43 [0.34, 0.54]), upper respiratory tract infection (0.18 [0.12, 0.26]) and cellulitis (0.15 [0.10, 0.23]). There was no increase in IRs between the ST and cumulative periods for hospitalized, opportunistic or tuberculosis infections. The IRs of overall malignancy, combined lymphomas and lung cancers did not increase in the cumulative versus the ST periods; the most common malignancies in the cumulative period were basal cell carcinoma (IR: 0.46 [0.36, 0.58]), squamous cell carcinoma (IR: 0.15 [0.09, 0.22]), breast cancer (IR: 0.12 [0.07, 0.19]) and squamous cell carcinoma of the skin (0.08 [0.04, 0.14]). The IR of autoimmune AEs during the cumulative period was comparable to the ST period, the most common event being psoriasis (IR: 0.51 [0.40, 0.63]).

Presented are incidence rates, calculated as events/100 pt-yrs (Poisson 95% CI), unless otherwise stated: includes events occurring up to 56 and 60 days post-last dose for Phase III and II studies, respectively; ST=Short-term; LT=Long-term


Disclosures: M. C. Genovese, Bristol-Myers Squibb, 2, Bristol-Myers Squibb, 5; M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Bioberca S.A., Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma A.G., Pfizer Inc., Stryker LLC, Xoma., 5; R. B. Cohen, Bristol-Myers Squibb, 5; M. E. Weinblatt, Bristol-Myers Squibb, 5, Bristol-Myers Squibb, 8; E. Keystone, Amein, Jansen, Roche, 2, Amein, Jansen, Roche, UCB, Abbott, Lilly, BMS, 5; P. Nash, Bristol-Myers Squibb, 2, Bristol-Myers Squibb, 5, Bristol-Myers Squibb, 8; I. Delaet, Bristol-Myers Squibb, 1, Bristol-Myers Squibb, 3; R. Alten, ABBOTT, BMS, GSK, NOVARTIS, PFIZER, UCB, 2.

1696

Quantitative Evaluation of Dermal Atrophy by High-Resolution Ultrasoundography, Comparing Between Patients Under Long-Term Treatment with Prednisolone or Methylprednisolone. Tim Pottel1, Christoph Schäfer2 and Gernot Keyßer2. 06114 Halle (Saale), Germany, 06120 Halle (Saale), Germany

Background/Purpose: The katabolic effects of a systemic treatment with glucocorticoids can lead to a progressive atrophy of the skin. Clinical observation suggests a more pronounced effect of methylprednisolone compared with prednisolone. Therefore, a study was undertaken to correlate the cumulative doses of the respective steroids with the skin thickness measured by high-resolution sonography, comparing patients with rheumatic disorders...
receiving long-term prednisolone and patients with renal transplants taking methylprednisolone.

**Methods:** The study included 92 patients, 47 of them after renal transplantation and immunosuppressive therapy with methylprednisolone, 45 with rheumatoid arthritis. The cumulative steroid doses were recorded by chart review. Patients were included, if they had at least two years of glucocorticoid treatment, had a complete documentation of their steroid intake at least every three months and were free of relevant dermal diseases. The measurement of dermal thickness was performed by high-resolution ultrasound, using an 18 MHz probe, at three standardized locations at volar and dorsal forearm.

**Results:** There were no differences in the cumulative steroid doses between both groups, after adjusting for equivalent doses. However, patients receiving methylprednisolone revealed a significantly more pronounced dermal atrophy, compared with patients taking prednisolone. (mean dermal thickness 0.77 mm, standard error 0.023 in group with prednisolone treatment; 0.65 mm, standard error 0.018 in methylprednisolone group) (t-test, \(p = 5 \times 10^{-4}\).) Multiple regression analysis revealed, that methylprednisolone had a more pronounced negative influence on skin atrophy than prednisolone (regression coefficient \(\beta = -0.15; p = 2.3 \times 10^{-5}\)). The association between cumulative dose of the last two years and degree of atrophy was significantly reduced by \(\beta = -0.011; p = 0.035\), however only significant for cumulative steroids of last or last half year in methylprednisolone.

**Conclusion:** In our study, the long-term use of methylprednisolone was associated with a more pronounced dermal atrophy compared with prednisolone, particularly prominent in the last half year before data collection by measurement. The katabolic effects of methylprednisolone may be more pronounced than those of prednisolone, even after the adjustment for equivalent doses.

Disclosure: T. Pottel, None; C. Schäfer, None; G. Keyffer, None.

1697

**Meta-Analysis of Malignancies, Serious Infections, and Serious Adverse Events with Tofacitinib or Biologic Treatment in Rheumatoid Arthritis Clinical Trials.** Sima Ahadieh1, Tina Checchio1, Thomas Tensfeldt2, Jonathan French3, Siram Krishnaswami4, Richard Riese5, Sudjata Menon6, Mary G. Boy7 and Jamie L. Geier3. 1Pfizer Inc., Groton, CT, 2Metrum Research Partners, Inc., 3Amgen Inc., 4University of Colorado School of Medicine, 5National Data Bank for Rheumatic Diseases, Wichita, KS, 6Pfizer Inc., 7Pfizer Inc., 3;

**Background/Purpose:** The study included 92 patients, 47 of them after renal transplantation and immunosuppressive therapy with methylprednisolone, 45 with rheumatoid arthritis. The cumulative steroid doses were recorded by chart review. Patients were included, if they had at least two years of glucocorticoid treatment, had a complete documentation of their steroid intake at least every three months and were free of relevant dermal diseases. The measurement of dermal thickness was performed by high-resolution ultrasound, using an 18 MHz probe, at three standardized locations at volar and dorsal forearm.

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**Conclusion:** In our study, the long-term use of methylprednisolone was associated with a more pronounced dermal atrophy compared with prednisolone, particularly prominent in the last half year before data collection by measurement. The katabolic effects of methylprednisolone may be more pronounced than those of prednisolone, even after the adjustment for equivalent doses.

Disclosure: T. Pottel, None; C. Schäfer, None; G. Keyffer, None.

1698

**Predictors of Discontinuation of Biologics in 2,281 US Patients with Rheumatoid Arthritis.** Sofia Ramiro1, Frederick Wolfe2, David J. Harrison3, George Joseph4, David H. Collier5, Desiree van der Heijde6, Robert Landewe7, Karel van den Heuvel8, 1Academic Medical Center, University of Amsterdam, The Netherlands and Hospital Garcia de Orta, Almada, Portugal, 2National Data Bank for Rheumatic Diseases, Wichita, KS, 3Amen Inc., Thousand Oaks, CA, 4Leiden University Medical Center, Leiden, Netherlands, 5Academic Medical Center, University of Amsterdam and Atrium Medical Center, Heerlen, Netherlands, 6National Data Bank for Rheumatic Diseases & University of Nebraska Medical Center, Omaha, NE

**Background/Purpose:** Identifying predictors of discontinuation of biologic treatment for Rheumatoid Arthritis (RA) has clinical and research importance given the chronicity of RA and high costs and potential side effects of these agents. Our aim was to identify predictors of biologic discontinuation in patients with RA.

**Methods:** We studied patients with RA starting their first biologic while participating in an ongoing US longitudinal cohort study (1998 –2011). Patients provided all medication use, demographics, and clinical status via semiannual questionnaires. Discontinuation was analyzed through Cox multivariable regression models with baseline predictors adjusted by the biologic drug class patients were on (anti-TNF vs other) and a variable reflecting the onset after Jan 1, 2005, when more biologic treatment options became available. Three pre-specified prediction models were developed, a “research” model, with all significant variables, a “clinical” model, reflecting variables for the three endpoints. Non-RCTs, long-term extensions, and observational studies were excluded from the literature results. Tofacitinib results from five RCTs (Phase 3 [P3]) are presented. The dependent variable for the analysis was the incidence rate (IR) of an event/100 patient-years (pt-yrs). Data were analyzed using a random effects meta-analysis model. The IR data were log transformed to avoid negative confidence intervals (CIs). An imputation methodology was applied to account for IRs of zero and a sensitivity analysis was performed to assess the effects of adjustment on the individual and overall mean, as well as the impact on the estimated variance surrounding each study arm.

**Results:** Estimated IRs for endpoints of malignancies, SIs, and SAEs revealed similar rates among biologic therapies used to treat RA. Across all biologic therapies, point estimates ranged from 0.8 to 1.4 events/100 pt-yrs for malignancies; 2.5 to 6.5 for SIs; and 10.7 to 22.0 for SAEs. Event rates for tofacitinib were 0.62 (95% CI 0.36, 1.07) events/100 pt-yrs for malignancies (Figure 1); 2.91 (2.27, 3.74) events/100 pt-yrs for SIs; and 10.3 (9.00, 11.78) events/100 pt-yrs for SAEs, all in P3. The 95% CIs for tofacitinib were contained within the range of published estimates.

**Conclusion:** This RCT meta-analysis provides a quantitative assessment of the incidence of important safety events reported with therapies for the treatment of RA. Overall, tofacitinib event rates for malignancies, SIs, and SAEs were comparable to published rates for approved biologic therapies. Future analyses are warranted to estimate relative effects (treatment comparisons), model studies with no events (IR=0), and account for study population differences.


---

**Figure 1:**

- **Drug**
- **Number of patients**
- **Malignancy Events / 100 pt-yrs (95% CI)**
- **Patient years**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Number of patients</th>
<th>Malignancy Events / 100 pt-yrs (95% CI)</th>
<th>Patient years</th>
</tr>
</thead>
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<tr>
<td>Abatacept</td>
<td>3</td>
<td>1969 (1187)</td>
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<tr>
<td>Rituximab</td>
<td>2</td>
<td>1020 (238)</td>
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<tr>
<td>Tolmutilmab</td>
<td>6</td>
<td>2861 (1289)</td>
<td></td>
</tr>
<tr>
<td>Infliximab</td>
<td>8</td>
<td>1599 (2025)</td>
<td></td>
</tr>
<tr>
<td>Etanercept</td>
<td>5</td>
<td>1409 (1314)</td>
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<tr>
<td>Certolizumab</td>
<td>2</td>
<td>503 (271)</td>
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<tr>
<td>Golimumab</td>
<td>5</td>
<td>2257 (1294)</td>
<td></td>
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<tr>
<td>Adalimumab</td>
<td>5</td>
<td>1803 (1499)</td>
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</table>

| TNF inhibitor* | 28 | 8211 (6502) | 3020 (2098) |

* Estimate from 28 TNF inhibitor studies
more commonly used in clinical practice and one restricted to patients that started a biologic after Jan 1, 2005. Forward selection was performed until the best-fit model was obtained, taking confounding factors into account.

**Results:** A total of 2,281 RA patients initiated their first biologic, 1,100 (48%) discontinued. Age, smoking status and comorbidity index were positive baseline predictors of discontinuation (Table). Methotrexate use and higher SF-36 PCS and MCS scores were associated with less risk of discontinuation. In the “clinical” model, patient global assessment was positively associated with discontinuation. The discontinuation among pa-

## Table. Hazard ratios (95% CI) of baseline predictors of biologic discontinuation in RA

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<th>Research model</th>
<th>Clinical model</th>
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<tr>
<td>Age (years)</td>
<td>1.01 (1.00:1.01)</td>
<td>1.01 (1.00:1.01)</td>
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<tr>
<td>BMI (kg/m²)</td>
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<tr>
<td>Patient global (0–10)</td>
<td>1.60 (1.03:1.98)</td>
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<td>Comorbidity index (0–9)</td>
<td>1.08 (1.04:1.13)</td>
<td>1.11 (0.61:1.15)</td>
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<td>Smoking</td>
<td>1.21 (1.01:1.45)</td>
<td>1.23 (1.03:1.47)</td>
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<td>MTX</td>
<td>0.83 (0.73:0.94)</td>
<td>0.84 (0.74:0.95)</td>
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<td>SF-36 MCS (0–100)</td>
<td>0.99 (0.98:0.99)</td>
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<td>SF-36 PCS (0–100)</td>
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</table>

Adjusted for biologic drug class (anti-TNF vs other) and onset<2005 § Not included in the multivariable model (not significant in the univariable model) **Not selected during multivariable regression analysis (p>0.05) ¥ Not included in this short “clinical” model (to present a model with variables more commonly used in clinical practice).

**Conclusion:** Worse overall health strongly predicted biologic discontinuation in RA. Co-medication with methotrexate independently contributed to a lower biologic discontinuation. A higher number of comorbidities and a smoking status were also predictive of biologic discontinuation. The predi-

## Disclosure

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<td>None</td>
<td>D. H. Collier</td>
<td>Amgen Inc., 1</td>
<td>Amgen Inc., 3</td>
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**ACR Concurrent Abstract Session**

**Spondylarthropathies and Psoriatic Arthritis - Clinical Aspects and Treatment: Spondylarthritis II**

**1700**

**Prevalence of Spondylarthropathies in Anterior Uveitis Patients: The Sentinel Study.** Miguel Cordero Coma and Xavier Juanola.

_1. University de Uveitis._ Hospital Universitario de Leon, Leon, Spain, 2_Hospital Universitari de Bellvitge, Barcelona, Barcelona, Spain

**Background/Purpose:** Anterior uveitis (AU) is the most common form of uveitis among western countries, with an annual incidence rate of about 8 new cases for every 100,000 inhabitants. AU may occur in the absence of associated systemic disease. However, it has been reported that about 25% of AU patients have an associated systemic condition; the most commonly associated one being seronegative spondylarthropathies (SpA). Since many of the conditions initially diagnosed as idiopathic anterior uveitis are later found to be a SpA-associated disorder, we hypothesised that a higher than expected rate of diagnosed SpA patients might be found by using a systematic clinical evaluation protocol in AU patients.

**Methods:** Prospective multicentre non-comparative cohort study. Patients with no previous diagnosis of any associated immune-mediated condition and clinically significant AU were included in this study. Clinically significant AU was defined as either recurrent AU (at least two episodes) or non-recurrent HLA-B27 + associated AU. All patients included in the study underwent a complete physical and ophthalmologic examination and a thorough check-up of their systems including x-ray and MRI study of the sacroiliac joints, for those in which SpA was clinically suspected.

**Results:** A total of 199 patients from 29 tertiary referral centres were included in the study. From all included patients suffering from AU, 148 patients (74.3%) were HLAB27 +. After an initial systematic clinical evaluation protocol, 122 patients (61.3%) were newly diagnosed with a type of spondylarthropathy, of which 94 patients (47.2%) fulfilled the ASAS criteria for axial spondylarthropathy and 28 patients (14%) fulfilled the ASAS criteria for peripheral spondylarthropathy. A positive HLAB27 haplotype was found in 89 (94%) of patients newly diagnosed with axial spondylarthropathy and in 20 (71.4%) of those patients newly diagnosed with peripheral spondylarthropathy.
Other associated diagnoses included ankylosing spondylitis, diagnosed based on New York criteria, in 78 patients (39.2%), psoriasis in 10 patients (5%), inflammatory bowel disease in 3 patients (1.5%), and reactive arthritis in 1 patient (0.5%).

Conclusion: These preliminary results show that in a large prospective cohort almost 75% of patients with clinically significant idiopathic AU have an associated underlying SpA which more than double that of previously reported prevalence. The diagnosis of idiopathic uveitis seems to depend greatly on the extent of the evaluation for an underlying condition. These results should be considered in the management and therapeutic decision-making for patients with recurrent AU.

Disclosure: M. Cordero Coma, None; X. Juanaola, None.

1701 Validation of the New ASAS Criteria for Classification of Early Spondyloarthritis in the Esperanza Cohort. Eva Tomero1, Loreto Carmona2, Juan Munero3, Eugenio De Miguel4, Milena Gobbo5, Carmen Martinez6, Miguel A. Descalzo7, Pedro Zarco8, Eduardo Collantes-Estevez9 and Esperanza Group10. 1Hospital Universitario La Princesa, Madrid, Spain, 2Universidad Camilo Jose´ Cela, Villanueva de la Can˜ada, Spain, 3Hospital Universitario La Paz, Madrid, Spain, 4Spanish Society of Rheumatology, Madrid, Spain, 5Sociedad Española de Reumatología, Madrid, Spain, 6Fundación Hospital Alcorcon, Alcorcon, Madrid, Spain, 7IMIBIC-Reina Sofia Hospital, Cordoba 14012, Spain, 8Madrid

Background/Purpose: To validate the new axial and peripheral ASAS criteria in patients with early spondyloarthropathy (SpA) and the full spectrum of clinical manifestations under clinical practice conditions.

Objectives: 1) To analyze the validity of the ASAS classification criteria for SpA in a multi-site multisite cohort; 2) to describe the characteristics of the new-onset SpA cohort from the ESPERANZA program and 3) to analyze the sensitivity and specificity of the ASAS, Amor, and ESSG criteria in this cohort.

Methods: Cross-sectional study of all patients with new-onset SpA referred to units within the ESPERANZA program. Selection criteria for the program are: Patients under 45 years of age with, at least, one of the follow: a) a two-year history of inflammatory back pain; b) back or joint pain in the presence of psoriasis, anterior uveitis, radiographic sacroiliitis, family history of SpA or positive HLA-B27; or c) asymmetric arthritis. A validation analysis of criteria sets was performed with the rheumatologist opinion as gold standard. We excluded patients who did not meet the referral criteria and those in which the radiograph on HLA-B27 were not available. The predictive ability of individual criteria was analyzed versus the physician’s opinion, thus only patients with a diagnosis could be included.

Results: 1179 patients were included for Esperanza program, but only 775 met inclusion criteria. Low-back pain was the primary reason for referral (73.7%). The mean age of the sample was 33.1 ± 7.1 years and 55.4% were men. The mean time from symptoms was less than a year (11.9 ± 6 months). A percentage of 69.5% (538) of patients were diagnosed with SpA, and 30.5% (237) were diagnosed with No SpA. The most frequent joint manifestations in patients with SpA were inflammatory back pain (67.5%) and 30.5% (237) were diagnosed with No SpA. The most frequent joint manifestations in patients with SpA were inflammatory back pain (67.5%)

Conclusion: The sensitivity and specificity of the ASAS criteria are higher than the ESSG and Amor criteria, so in early SpA forms the ASAS criteria may replace both criteria. However, the sensitivity for the ASAS criteria in this new-onset SpA is lower than in previous studies, what may limit their ability to detect early forms, particularly in populations in which MRI is not available under standard clinical practice or in population with a low prevalence of HLA-B27.

Disclosure: E. Tomero, None; L. Carmona, Abbott Laboratories. 5. Roche Pharmaceuticals. 2. Tijenix. 5. J. Muñoz, None; E. De Miguel, None; M. Gobbo, None; C. Martinez, None; M. A. Descalzo, None; P. Zarco, None; E. Collantes-Estevez, None.

1702 Tumor Necrosis Factor Blocking Agents Inhibit the Progression of Preclinical Atherosclerosis in Patients with Ankylosing Spondylitis. Alper M. van Sijl1, Izhar C. van Eijk2, Mike J.L. Peters3, Erik H. Serne4, Yvo M. Smulders3 and Mike T. Nummohamed1. 1Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands, 2VU University Medical Center, Amsterdam, Netherlands

Background/Purpose: Ankylosing spondylitis (AS) is associated with an increased cardiovascular (CV) risk that might be due to the chronic underlying inflammatory process. It is still unknown whether strong anti-inflammatory treatment with tumor-necrosis factor (TNF) inhibitors reduce the increased CV risk in AS. We investigated whether preclinical atherosclerosis and elasticity of the carotid arteries in patients with AS changed after use of TNF-inhibitors.

Methods: 67 out of 82 AS patients who underwent ultrasonography at baseline were measured again after 5 years. Assessments of medication use, AS related factors, CV risk factors and arterial parameters (including intima-media thickness (IMT) and Young’s elastic modulus (YEM)) were repeated at follow-up. Spearman’s rank correlation were used to investigate the correlation between changes in AS related factors or CV risk factors with changes in arterial wall parameters.

Results: After a mean follow-up of 5 years, 11 AS patients (16%) discontinued their use of TNF inhibitors. IMT did not change significantly (+0.012, p-value= 0.561) in those who continued the use of TNF inhibitors as compared to AS patients who discontinued use of TNF inhibitors (+0.060, p-value=0.025). Also, vascular elasticity (as measured with YEM) improved significantly in patients who continued TNF inhibitors (+0.031, p-value=0.002) but not in patients who discontinued TNF inhibitors. Correlations were found between 1. Unfavourable changes in BASDAI, BASG, BASMI and increase in IMT, and 2. Unfavourable changes in total cholesterol, LDL-cholesterol, total-HDL-cholesterol ratio and decrease in vascular elasticity (as measured with YEM).

Table 1. Correlations between changes in AS- and CV related factors and changes in arterial wall characteristics

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Correlation coefficient</th>
<th>p-value</th>
<th>Correlation coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intima-media Thickness</td>
<td></td>
<td></td>
<td>Young’s Elastic Modulus</td>
<td></td>
</tr>
<tr>
<td>AS related factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASDAI</td>
<td>0.308*</td>
<td>0.013</td>
<td>-0.201</td>
<td>0.117</td>
</tr>
<tr>
<td>BASFI</td>
<td>0.113</td>
<td>0.368</td>
<td>0.081</td>
<td>0.533</td>
</tr>
<tr>
<td>BASG</td>
<td>0.311*</td>
<td>0.012</td>
<td>-0.167</td>
<td>0.195</td>
</tr>
<tr>
<td>BASMI</td>
<td>0.327*</td>
<td>0.007</td>
<td>-0.062</td>
<td>0.632</td>
</tr>
<tr>
<td>ESR</td>
<td>0.030</td>
<td>0.822</td>
<td>-0.085</td>
<td>0.533</td>
</tr>
<tr>
<td>CRP</td>
<td>0.042</td>
<td>0.752</td>
<td>-0.114</td>
<td>0.401</td>
</tr>
<tr>
<td>CV risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>-0.075</td>
<td>0.559</td>
<td>-0.102</td>
<td>0.440</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>-0.109</td>
<td>0.395</td>
<td>-0.096</td>
<td>0.402</td>
</tr>
<tr>
<td>Pulse pressure</td>
<td>0.002</td>
<td>0.986</td>
<td>-0.100</td>
<td>0.446</td>
</tr>
<tr>
<td>Body-mass index</td>
<td>-0.084</td>
<td>0.516</td>
<td>0.005</td>
<td>0.958</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>0.309*</td>
<td>0.042</td>
<td>-0.276</td>
<td>0.076</td>
</tr>
<tr>
<td>HDL-cholesterol</td>
<td>0.081</td>
<td>0.612</td>
<td>0.137</td>
<td>0.401</td>
</tr>
<tr>
<td>LDL-cholesterol</td>
<td>0.251</td>
<td>0.123</td>
<td>-0.277</td>
<td>0.097</td>
</tr>
<tr>
<td>Total- to HDL-cholesterol ratio</td>
<td>0.117</td>
<td>0.462</td>
<td>-0.319*</td>
<td>0.045</td>
</tr>
</tbody>
</table>

*p < 0.05

Table 1. Results of the validation analysis and predictive ability (N = 775)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Sensitivity (CI 95%)</th>
<th>Specificity (CI 95%)</th>
<th>Positive predictive value (CI 95%)</th>
<th>Negative predictive value (CI 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAS axial</td>
<td>68 (63.71)</td>
<td>95 (91.98)</td>
<td>97 (94.98)</td>
<td>58 (53.64)</td>
</tr>
<tr>
<td>ASAS axial-imaging</td>
<td>43 (38.48)</td>
<td>98 (95.99)</td>
<td>98 (94.99)</td>
<td>45 (40.59)</td>
</tr>
<tr>
<td>ASAS axial-HLA B27</td>
<td>50 (45.55)</td>
<td>96 (93.99)</td>
<td>97 (93.99)</td>
<td>48 (43.53)</td>
</tr>
<tr>
<td>ASAS peripheral</td>
<td>56 (48.65)</td>
<td>85 (71.94)</td>
<td>92 (83.97)</td>
<td>40 (30.59)</td>
</tr>
<tr>
<td>ASAS total</td>
<td>65 (61.69)</td>
<td>83 (79.96)</td>
<td>95 (93.97)</td>
<td>54 (49.59)</td>
</tr>
<tr>
<td>ESSG</td>
<td>58 (54.62)</td>
<td>90 (86.94)</td>
<td>93 (90.96)</td>
<td>49 (44.53)</td>
</tr>
<tr>
<td>Amor</td>
<td>59 (55.61)</td>
<td>86 (81.90)</td>
<td>90 (87.93)</td>
<td>48 (43.53)</td>
</tr>
</tbody>
</table>
between smoking and radiographic spinal progression in SpA remains unclear.

The objective of the current analysis was to investigate a relationship between smoking intensity, radiographic spinal progression and activity of systemic inflammation in patients with axial SpA.

Methods: In total, 210 patients with axial SpA (115 with AS according to the modified New York criteria and 95 with nrSpA) from the German Spondyloarthritis Inception Cohort (GESPIC) were selected for this analysis of spinal radiographs at baseline and after 2 years of follow-up. Spinal radiographs were centrally collected, digitized, and subsequently scored according to the mSASSS independently by two trained readers, who were blinded for time point and all clinical data. Smoking status and smoking intensity (non-smoker, 10 cigarettes a day and less, 11 to 20 cigarettes, and more than 20 cigarettes a day) were assessed retrospectively every 6 months during 2 years of follow-up.

Results: 139 patients (66.2%) were considered to be non-smokers throughout the entire follow-up period of 2 years, 43 patients (20.5%) smoked 10 cigarettes a day and less (as a mean over two years), 22 patients (10.5%) smoked 11–20 cigarettes and only 6 patients (2.9%) smoked more than 20 cigarettes a day and, therefore, were pooled with the group of 11–20 cigarettes a day. The mean mSASSS change over 2 years was 0.52±1.72 in non-smokers vs 0.47±1.48 in ≤10 cigarettes/day group (p=0.30) vs 2.2±4.6 in >10 cigarettes/day group (p=0.077 vs. non-smokers, p=0.33 vs. ≤10 cigarettes/day group). Significant radiographic progression (defined as an mSASSS worsening by 2 units and more over 2 years) was observed in 10.1% of non-smokers vs 18.6% in smokers of ≤10 cigarettes a day (p=0.14 vs non-smokers) vs 26.6% in smokers of >10 cigarettes a day (p=0.012 versus non-smokers). Importantly, the same trend was observed for the serum level of C-reactive protein as a marker of inflammatory activity: 6.3±6.6 mg/l in non-smokers vs 8.6±10.3 mg/l in smokers of ≤10 cigarettes a day vs 12.4±12.9 in smokers of >10 cigarettes a day (p=0.021 vs non-smokers).

Conclusion: Tobacco smoking has a clear dose-dependent effect on radiographic spinal progression in axial SpA, which is likely to be related to a non-specific augmentation of inflammation by the components of the tobacco smoke.

References

Disclosure: D. Podubnyy, None; H. Habiel, None; J. Listing, None; E. Märker-Hermann, None; H. Zeidler, None; J. Braun, None; M. Rudwaleit, None; J. Sieper, None.

1704

New Threshold Values for Spinal Mobility Measures Based On a Large Nationally Representative Sample of U.S. Adults Ages 20–69 Years.

Shervin Assassi1, Michael H. Weisman2, Zhongxue Chen3, Mohammad Rahbar4 and John D. Reveille1. 1Univ of Texas Health Science Center at Houston, Houston, TX, 2Cedars-Sinai Medical Center, Los Angeles, CA

Background/Purpose: Spinal mobility measures are widely utilized for diagnosis and assessment of disease severity in patients with Ankylosing Spondylitis. The previously proposed threshold values for spinal mobility were determined based on distributions of these measures in convenience samples of healthy volunteers. Herein, we report population based percentile reference range values for selected spinal mobility measures in a nationally representative sample of 5103 U.S. adults ages 20–69 years examined in the 2011–2012 U.S. National Health and Nutrition Examination Survey (NHANES).

Methods: Occiput-to-Wall Distance (OWD), Thoracic Expansion (TE), Anterior Lumbar Flexion (modified Schober) were measured by trained examiners in a standardized fashion. Specifically, the difference in chest circumference expansion between complete exhalation and maximal inhalation was measured at the xiphisternum level. For the modified Schober test, the initial measurement point was a line marked at the level of the superior margin of the lateral iliac crests, then a second mark was placed 10 cm above it. NHANES sample weights and survey design variables were used.

Results: In this nationally representative sample, 4% of subjects had an OWD of more than zero. Based on the commonly used thresholds of 2.5 or 5 cm for chest expansion, 13.6% and 62.4% of the sample had “out of range” values, respectively. Assuming that lumbar flexibility has a similar range if the measurements start at the level of lateral iliac crest rather than at the L5-S1

Figure 1. Changes in IMT and BASMI, YEM and Total cholesterol to HDL-cholesterol ratio.

Conclusion: Continuous use of TNF-inhibitors might stabilize or slow down IMT progression in AS patients, reflecting a decreased CV risk in these patients. Unfavorable changes in IMT were associated with equally unfavorable changes in AS related factors and unfavorable changes in vascular elasticity (as measured with YEM) were associated with unfavorable changes in lipid levels. The exact mechanism by which TNF inhibition modulates CV risk might be explained by different mechanisms (AS related factors and IMT vs. lipid levels and YEM).

Disclosure: A. M. van Sijl, None; I. C. van Eijk, None; M. J. L. Peters, None; E. H. Serne, None; Y. M. Sniders, None; M. T. Nurmohamed, None.

1703

Relationship Between Tobacco Smoking and Radiographic Spinal Progression in Axial Spondyloarthritis: The Role of Inflammatory Activity, Denis Podubnyy1, Hildrun Habiel1, Joachim Listing2, Elisabeth Märker-Hermann1, Henning Zeidler4, Jürgen Braun1, Martin Rudwaleit5 and Joachim Sieper1. 1Charité Medical University, Campus Benjamin Franklin, Berlin, Germany, 2German Rheumatism Research Center, Berlin, Germany, 3Dr. Horst Schmidt Kliniken, Wiesbaden, Germany, 4Medizinische Hochschule, Hannover, Germany, 5Endokrinologikum Berlin, Berlin, Germany

Background/Purpose: Cigarette smoking is associated with functional impairment [1, 2] and radiographic severity of ankylosing spondylitis (AS) [3, 4]. Moreover, smoking status at baseline was found recently to be an independent predictor of radiographic spinal progression in the whole group of axial spondyloarthritides (SpA) [5]. However, the nature of relationship
level, the commonly used threshold of 3.5 cm for the modified Schober test was applied, resulting in 44.2% of the general population having "out of range" values.

In the present study, the upper 95th percentile of OWD measurement was zero while the 5th percentile measurements for TE and modified Schober test were both 2.0. The mean (±standard error) OWD, Thoracic Expansion, and modified Schober test were 0.21 (±0.03), 4.8 (±0.06), and 3.8 (±0.03) cm, respectively. The spinal metrology parameters were significantly associated with body mass index, gender, and age. Therefore, we next excluded participants with morbid obesity (body mass index >35). This did not change the threshold values for OWD and modified Schober test but the 5th percentile for TE increased to 2.3. Furthermore, we calculated the percentiles for the spinal mobility measures stratified according to age and gender (Table 1).

Table 1. Percentile Cut Points in cm. for Arthritis Body Measures: NHANES 2009–10

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Occiput-Wall Distance</th>
<th>Thoracic Expansion</th>
<th>Modified Schober</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–29</td>
<td>Men 0 0</td>
<td>2.4 2.5</td>
<td>2.4 2.1</td>
</tr>
<tr>
<td>30–39</td>
<td>Men 0 0</td>
<td>2.4 2.5</td>
<td>2.4 2.1</td>
</tr>
<tr>
<td>40–49</td>
<td>Men 0 0</td>
<td>2.4 2.5</td>
<td>2.4 2.1</td>
</tr>
<tr>
<td>50–69</td>
<td>Men 0 0</td>
<td>2.4 2.5</td>
<td>2.4 2.1</td>
</tr>
</tbody>
</table>

Conclusion: In this nationally representative sample, we verified the threshold of zero for OWD. However, the currently utilized clinical cut points for TE and Schober Test appear to assign "abnormal" values to a large portion of the general population. Using population based percentile reference range values, we recommend new threshold values for TE and the modified Schober Test in the overall population or stratified by age and gender.

Disclosure: S. Assassi, None; M. H. Weisman, None; Z. Chen, None; M. Rahbar, None; J. D. Reveille, None.

Effect of Certolizumab Pegol On Inflammation of Spine and Sacroiliac Joints in Patients with Axial Spondyloarthritis: 12 Week Magnetic Resonance Imaging results of a Phase 3 Double Blind Randomized Placebo-Controlled Study. Desiree van der Heijde1, Walter P. Maksymowycz2, Robert B. M. Landewe2, Christian Stach2, Bengt Hoopeken4, Andreas Fichtner4, Danuta Kielar5 and Jurgen Braun5. 1Leiden University Medical Center/University of Amsterdam & Atrium Medical Center, Leiden, Netherlands, 2University of Alberta, Edmonton, AB, 3 Academic Medical Center/University of Amsterdam & Atrium Medical Center, Amsterdam, Netherlands, 4UCB Pharma, Monheim am Rhein, Germany, 5UCB Pharma, Brussels, Belgium, 6Rheumazentrum Ruhrgebiet, Herne, Germany

Background/Purpose: Axial spondylarthropathy (axSpA) includes both ankylosing spondylitis (AS) and non-radiographic axSpA (nr-axSpA) and is defined by the ASAS criteria. 1 It is characterized by bone marrow edema of sacroiliac joints (SIJ) and spine leading to chronic back pain. RAPID-axSpA (NC101087762) is the first report of the effect of certolizumab pegol (CZP), a PEGylated Fc-free anti-TNF, on inflammation of spine and SIJ in axSpA (NCT01087762). CZP reduced inflammation in the SI joints and spine, as assessed by MRI in pts with axSpA, and in both AS and nr-axSpA populations.

Methods: The ongoing 158-WK RAPID-axSpA trial is double-blind and placebo controlled to Wk12, dose-blind to Wk48 and then open label to Wk158. Recruited pts had adult-onset active axSpA defined by the ASAS criteria, 2 Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) ≥4, spinal pain ≥4 on a 10 point NRS, and CRP > upper limit of normal or sacroiliitis on MRI. Pts must have failed ≥1 NSAID. Pts could have been secondary failures to previous TNF inhibitor. The population is stratified using AS spine (ASspiMRI-a). MRIs were performed in a subset of the pts. Data are reported for all pts who had MRI scans at both BL and Wk12 (the MRI set).

Results: 325 pts were randomized, of which 153 were included in the MRI set. In the MRI set, BL characteristics were similar between treatment groups (PBO/CZP 200mg/CZP 400mg), apart from C-reactive protein (23.9/14.7/15.3 mg/L) and prior anti-TNF exposure (30.0/12.2/9.3%). AS pts had longer symptom duration at BL compared to nr-axSpA pts (mean 12.4 vs. 8.5 yrs). Within the MRI imaging set, BL SPARRC MRI SIJ scores were comparable between AS and nr-axSpA populations while ASspiMRI-a scores were higher in AS patients. Improvements in SPARRC MRI SIJ scores and ASspiMRI-a were observed in both CZP dose arms compared to PBO in the overall and in both AS and nr-axSpA populations (Figure). Greater reductions in SIJ inflammation were observed for pt subgroups with <5 yr symptom duration, age <45 yrs and in males.

Conclusion: CZP reduced inflammation in the SI joints and spine, and in the Berlin modification of AS spine MRI score for disease activity in the spine (ASspiMRI-a). MRIs were performed in a subset of the pts. Data are reported for all pts who had MRI scans at both BL and Wk12 (the MRI set).

References

Disclosure: D. van der Heijde, UCB, 5; W. P. Maksymowycz, UCB, 2, UCB, 5; R. B. M. Landewe, UCB, 5; C. Stach, UCB, 1, UCB, 3; B. Hoopeken, UCB, 3; A. Fichtner, UCB, 3; D. Kielar, UCB, 1, UCB, 3; J. Braun, UCB, 5, UCB, 2, UCB, 8.

ACR Concurrent Abstract Session
Systemic Lupus Erythematosus - Clinical Aspects and Treatment III: Cardiovascular
Monday, November 12, 2012, 4:30 PM–6:00 PM

1706
Predictive Atherosclerotic Risk Factors At Inception in a Multicentre, Multinational Cohort. Murray B. Urowitz1, Dominique Ibanez1; D. D. Gladman1 and SLICC2. 1Toronto Western Hospital and University of Toronto, Toronto, ON; 2Toronto, ON

Background/Purpose: Patients with systemic lupus erythematosus (SLE) develop premature atherosclerosis (AS). This study examines predictive factors at inception for atherosclerotic vascular events (AVE) over a maximum 10 years of followup in a multicenter, international inception cohort.

Methods: An inception cohort of SLE patients from 31 centres from 12 countries has been assembled according to a standardized protocol between 2000 and 2012 to study risk factors for atherosclerosis. At yearly visits demographic and cardiovascular risk factors are collected and vascular events (VE) are described and attributed on a specialized form. Events recorded include myocardial infarction (MI), angina, congestive heart failure (CHF), intermittent claudication (PVD), stroke, and transient ischemic attack (TIA). Diagnosis of an event was confirmed using standard clinical criteria and diagnostic tests where appropriate. Attribution to AS was made by physicians on the basis of lupus disease being inactive at the time of the event, and/or the presence of typical AS changes on imaging or pathology and/or evidence of AS elsewhere. Analysis was done using descriptive statistics and Cox proportional Hazard model.
Results: Of the inception cohort of 1844 SLE patients 93 had VE due to non-AS causes (e.g. active SLE or thrombosis) and 350 patients had only enrolment data leaving 1401 patients. 31 patients had 4I subsequent AVE after enrollment. The mean time to AVE or last clinic followup was 5 years. Distribution Patients' race/ethnicity distribution was as follows: 51% Caucasian, 16% Black, 17% Asian 12% Hispanic 4% other. At enrollment risk factors for AS are shown in the table 1.

Table 1. Risk factors for AVE in a multivariate analysis of a multicentre inception cohort followed for intercelluler adhesion molecule 1 (sICAM-1), sE-selectin, leptin and visfatin.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.09</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Caucasian</td>
<td>3.39</td>
<td>0.005</td>
</tr>
<tr>
<td>Male</td>
<td>2.95</td>
<td>0.003</td>
</tr>
<tr>
<td>FRS Mod/High</td>
<td>1.92</td>
<td>0.005</td>
</tr>
<tr>
<td>Smoker ever</td>
<td>1.83</td>
<td>0.0105</td>
</tr>
<tr>
<td>Obesity</td>
<td>1.49</td>
<td>0.05</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.85</td>
<td>0.002</td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>1.85</td>
<td>0.09</td>
</tr>
<tr>
<td>Increased LDL*</td>
<td>3.33</td>
<td>0.0105</td>
</tr>
<tr>
<td>Increased Creatinine</td>
<td>23.5</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*LDL=low density lipoprotein

Conclusion: Only age and male sex remain significant risk factors for AVE in a multivariate analysis of a multicentre inception cohort followed for a mean of 5 years.

Disclosure: M. B. Urowitz, None; D. Ibanez, None; D. D. Gladman, None;

1708

Systemic Lupus Erythematosus Cardiovascular Risk Equation. Michelle Petri1 and Laurence S. Magder2. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2University of Maryland, Baltimore, MD

Background/Purpose: Accelerated atherosclerosis remains the major late cause of death in SLE. Yet, the “traditional” cardiovascular risk equations (Framingham, Reynolds, SCORE) consistently underestimate the risk. This may lead to under-recognition and under-treatment. We sought to construct a data-driven risk equation of cardiovascular risk in SLE, based on data collected in a longitudinal cohort.

Methods: To derive the score, risk factors were calculated based on variables measured in the first two years of cohort participation (mean systolic blood pressure, mean SLEDAI, etc). Cox Proportional Hazards models were constructed to determine the variables that affected the risk of a subsequent CVE. Using the results, a formula to calculate the risk of a CVE within the next 10 years was derived. There were 1342 patients, 93% female, 56% Caucasian, 38% African-American, and 6% other ethnicities. There were 109 cardiovascular events: 52 strokes, 26 MI, 18 angina/CABG, and 13 claudiations.

Results: Table 1 shows the estimates for the association between predictors and risk of a CVE.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Beta</th>
<th>Hazard Ratio 95% CI</th>
<th>p value</th>
<th>Integer Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (for each 5 years over 40)</td>
<td>0.252</td>
<td>1.29 (1.15,1.44)</td>
<td>&lt;0.0001</td>
<td>1</td>
</tr>
<tr>
<td>Male (vs. female)</td>
<td>0.552</td>
<td>1.74 (0.98,3.09)</td>
<td>0.060</td>
<td>2</td>
</tr>
<tr>
<td>Systolic Blood Pressure 140 or more</td>
<td>0.791</td>
<td>2.21 (1.37,3.56)</td>
<td>0.0012</td>
<td>3</td>
</tr>
<tr>
<td>Cholesterol over 160</td>
<td>0.677</td>
<td>1.97 (1.31,2.96)</td>
<td>0.0002</td>
<td>3</td>
</tr>
<tr>
<td>Smoking</td>
<td>0.407</td>
<td>1.50 (0.91,2.48)</td>
<td>0.11</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.730</td>
<td>2.08 (1.28,3.35)</td>
<td>0.0069</td>
<td>3</td>
</tr>
<tr>
<td>History of Lupus Anti-coagulant</td>
<td>0.744</td>
<td>2.10 (1.40,3.16)</td>
<td>0.0003</td>
<td>3</td>
</tr>
<tr>
<td>Low Mean C3</td>
<td>0.583</td>
<td>1.79 (1.14,2.82)</td>
<td>0.012</td>
<td>2</td>
</tr>
</tbody>
</table>
Using this model, the risk of a CVE within 10 years is $1-0.9875^{\text{Hazard Ratio}}$. For example, if someone is 50 years of age, male, with high systolic blood pressure, then the hazard ratio is $(1.0510)(1.74)(2.21) = 6.26$. The risk of a CVE in 10 years is then $1-0.9875^{6.26} = 7.6\%$. In the absence of SLE risk factors, the estimated 10-year risk from our formula is higher than would be projected based on the Framingham formula. This is especially true if there are SLE-related risk factors. Table 2 shows a few scenarios.

### Table 2. Examples

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Estimated 10-year risk based on our formula</th>
<th>Estimated 10-year risk based on Framingham formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman, age 50, SBP=150, Chol=150</td>
<td>4.5%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Woman, age 50, SBP=150, Chol=220</td>
<td>9.2%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Woman, age 50, SBP=150, Chol=220, Lupus Anticoagulant</td>
<td>18.3%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Woman, age 50, SBP=150, Chol=220, High disease activity</td>
<td>18.1%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Woman, age 50, SBP=150, Chol=220, Low complement</td>
<td>15.8%</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

Using the approach employed by the Framingham study, the regression coefficients were rounded to integers (Table 1) to create a simpler score. The score is the sum of the number of points earned for each risk factor. For example, a 50 year old man with high SBP would get a score of $2^2 + 2 + 3 = 7$. Then, to calculate the 10 year risk, use Table 3.

### Table 3. Percent risk of a CVD within 10 years

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Risk</td>
<td>1.3</td>
<td>1.6</td>
<td>2.1</td>
<td>2.6</td>
<td>3.4</td>
<td>4.3</td>
<td>5.5</td>
<td>7.0</td>
<td>8.9</td>
<td>11.3</td>
<td>14.2</td>
</tr>
</tbody>
</table>

**Conclusion:** A data-driven SLE Cardiovascular Risk Score can better estimate 10-year cardiovascular risk than the Framingham equation. Its use can lead to appropriate use of imaging and intervention.

**Disclosure:** M. Petri, None; L. S. Magder, None.

### 1709

**Biomarkers of Atherosclerosis Are Associated with Progression of Non-Cardiovascular Damage in Patients with SLE**

Sanah J. Kim, Jennifer M. Grossman, Brian Skaggs, Elaine Lourenco, Lori Sahakian, John D. FitzGerald, Nagesh Ragavendra, Christina Charles-Schoeman, Alan H. Gorn, Bevra H. Hahn and Maureen A. McMahon. UCLA David Geffen School of Medicine, Los Angeles, CA

**Background/Purpose:** Studies have shown that even after taking traditional cardiovascular risk factors into account, SLE patients have up to 50-fold higher risk of developing atherosclerotic (ATH) cardiovascular disease. We previously identified several biomarkers associated with the progression of atherosclerosis in SLE, including pro-inflammatory high-density lipoprotein (pHDL), leptin, sTWEAK, and homocysteine. These 4 biomarkers plus increased age combined into a “high oxidative stress” variable was also highly associated with progression of ATH in SLE. The goal of this study was to investigate the association between biomarkers of ATH and overall progression of non-ATH, lupus-related damage.

**Methods:** Systemic Lupus International Collaborating Clinics/ACR damage index (SDI) was used to score damage progression in 159 SLE patients enrolled in the longitudinal “Biomarkers of Atherosclerosis in SLE” cohort study between January 2004 and September 2008. Lupus-related damage scores were determined using the SDI at baseline and at the time of the 2–3 year follow-up carotid ultrasound excluding scores in cardiovascular domains. The associations between accumulation of any lupus-related non-ATH damage and biomarkers of atherosclerosis were examined using the chi-square test for dichotomous variables and Student’s t-test for continuous variables (SPSS Inc, Chicago, IL).

**Results:** After excluding cardiovascular and cerebrovascular events from the SDI score, new carotid plaque at 2 year follow-up was present in 34% of patients with non-ATH SDI score increase as opposed to 18% in patients without SDI change (p=0.01). In patients with SDI increase, mean homocysteine (p=0.037), sTWEAK (p=0.043) and leptin (p=0.02) levels were significantly higher than in those without SDI change. The combination of high-oxidative stress variable was found in a higher proportion of patients with SDI increase (50% vs 28.9%, p=0.02), and was associated with a higher mean SDI increase (0.52±0.94 vs 0.19±0.47, p=0.02). In multivariate analysis controlling for lupus medications, baseline SDI, and other potential confounders, high-oxidative stress was associated with a 2.9-fold increased odds for progression of non-atherosclerotic damage (p=0.02), and lifetime cumulative prednisone use >20g was associated with 2.6-fold increased odds (p=0.046).

**Conclusion:** Non-atherosclerotic lupus-related damage as measured by SDI scoring is associated with presence of carotid plaque, high-oxidative stress and elevated levels of homocysteine, sTWEAK, and leptin. Patients with baseline biomarkers for atherosclerosis progression have higher incidence of overall progression of non-ATH damage which may serve as important predictors for lupus disease course.

**Disclosure:** S. J. Kim, None; J. M. Grossman, medimmune, UCB, Pfizer, TEVA, Cephalon, American College of Rheumatology, Eli Lilly, 2; B. Skaggs, None; E. Lourenco, None; L. Sahakian, None; J. D. FitzGerald, None; N. Ragavendra, None; C. Charles-Schoeman, None; A. H. Gorn, None; B. H. Hahn, Teva Pharmaceuticals, 2, Asperva Pharmaceutical, 2, Anthera, 5, Abbott, 5, Eli Lilly, 5; M. A. McMahon, Human Genome Sciences, Inc., 8; Glaxo Smith Klein, 8.

### 1710

**Increase in Vitamin D Improves Disease Activity and Systolic Blood Pressure in Systemic Lupus Erythematosus**

Kayode J. Bello, Hong Fang, Laurence S. Magder and Michelle Petri. 1 Johns Hopkins University School of Medicine, Baltimore, MD, 2University of Maryland, Baltimore, MD

**Background/Purpose:** Vitamin D deficiency has also been associated with different chronic conditions including cardiovascular diseases such as coronary artery disease, cardiac failure and hypertension. In SLE, it may be associated with the interferon gene signature. We investigated whether an increase in vitamin D levels was associated improvement in disease activity and blood pressure in SLE patients.

**Methods:** 1006 SLE patients were followed in a prospective observational study for 138 weeks (July 2009–March 2012). Serum 25-hydroxyvitamin D levels were measured at routine clinic visits. Patients with low 25-hydroxyvitamin D levels (<40 ng/mL) were supplemented with 50,000 units Vitamin D, weekly, and Ca/D,200 units twice daily. Data analysis was done using longitudinal regression models with one- and two-slope models, controlling for race, age, age squared, sex, prednisone, hydroxychloroquine, and date (SAS Institute Inc. Cary, North Carolina, SAS 9.2).

**Results:** There were a total of 5935 visits with serum 25-hydroxyvitamin D measurements from 1006 different SLE patients. They were 91% female, mean age was 49.6 (SD = 13.2), 54% Caucasian, 37% African-American and 8% other ethnicity. The number of visits per patient ranged from 1 to 16. 110 (11%) had 1 visit, 313 (31%) had 2–5 visits, 517 (51%) had 6–9 visits, and 65 (6%) had 10–16 visits.

**Table.** Difference in mean disease measure per 20 ng/mL increase in vitamin D based on longitudinal regression models with one or two slopes.

<table>
<thead>
<tr>
<th>Disease Measure</th>
<th>One-slope Model</th>
<th>Model allowing slope to differ before and after 40 ng/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slope1 (95% CI)</strong></td>
<td><strong>P-value</strong></td>
<td><strong>Slope1 over range of 0–40 ng/mL (95% CI)</strong></td>
</tr>
<tr>
<td>Physician Global Assessment</td>
<td>-0.01 (-0.03,0.01)</td>
<td>0.21</td>
</tr>
<tr>
<td>SLEDAI-2K-SLEDAI</td>
<td>-0.02 (-0.11,0.07)</td>
<td>0.85</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>-2.13 (-7.06,2.81)</td>
<td>0.0011</td>
</tr>
<tr>
<td>Log Urine Protein/Creatinine</td>
<td>-0.02 (-0.06,0.01)</td>
<td>0.0004</td>
</tr>
<tr>
<td>Log hsCRP</td>
<td>-0.02 (-0.09,0.06)</td>
<td>0.48</td>
</tr>
</tbody>
</table>

1Slopes are interpretable as change in mean level of disease per 20ng/mL increase in vitamin D.

There was significant improvement in both the PGA and SELENA-SLEDAI in those with low vitamin D (<40ng/mL), when vitamin D was increased by >20 ng/mL. There was also improvement in systolic blood pressure and urine protein/creatinine.

**Conclusion:** After a long follow-up in this SLE Cohort, there was statistically significant improvement in disease activity in those with low
vitamin D levels, who increased their vitamin D levels. We also found significant improvement in both systolic blood pressure and urine protein/creatinine with increase in vitamin D. This analysis suggests vitamin D supplementation in SLE patients with low vitamin D levels may have beneficial effects on disease activity and on blood pressure, one of the major predictors of accelerated atherosclerosis in SLE.

Disclosure: K. J. Bello, None; H. Fang, None; L. S. Magder, None; M. Petri, None.

Association of Vascular Calcification and Perivascular Adipose Tissue of the Descending Aorta with Cardiovascular Events in SLE

Sutton-Tyrrell, 1Lupus Center of Excellence/ASRI/West Penn Allegheny Health System, Pittsburgh, PA

Background/Purpose: Women with systemic lupus erythematosus (SLE) have an increased risk of cardiovascular disease (CVD). We have shown that clinically CVD-free women with SLE have an increased volume of descending aortic perivascular adipose tissue (aPVAT). This small adipose depot was also associated with aortic calcification (AC) independent of overall adiposity. Thus, we hypothesized that clinically CVD-free women with SLE increased aPVAT volume and premature vascular calcification measured by AC and coronary artery calcification (CAC) will predict cardiovascular events (CVE).

Methods: Women participating in the “Heart Effects on Atherosclerosis and Risk of Thrombosis in SLE” (HEARTS) study were clinically CVD-free and diagnosed with SLE for at least 2 years. CAC/AC were measured using electron beam computed tomography (EBCT) and quantified using commercially available software and standard attenuations values for adipose tissue identified by Agaston scoring. The aPVAT was quantified using commercially available software and standard attenuation values for adipose tissue identified by Agaston scoring. The aPVAT was quantified using commercially available software and standard attenuation values for adipose tissue identified by Agaston scoring.

Results: Twenty eight participants (17%) experienced a first CVE within 4.6 +/- 12 months (Mean +/- SD) with three participants having multiple CVE. There were no differences in surrogate adiposity measures such as waist-to-hip ratio (p = 0.58) or BMI (p = 0.23) by CVE status suggesting similar adipose distribution. Traditional CVD risk factors such as age (p = 0.008), systolic blood pressure (p = 0.0053), pulse pressure (p = 0.0047), hypertensive status (p = 0.0039), CRP (p = 0.0081) and homocysteine levels (p = 0.017) were all significantly greater in SLE women with CVE. The SLE women with CVE were more likely to have AC (p = 0.0052). There were no differences in CAC (p = 0.21) or aPVAT (p = 0.17) between SLE groups with and without CVE. Aortic PVAT was associated with adiposity measures such as BMI (r = 0.515, p < 0.0001), waist-to-hip ratio (r = 0.332, p = 0.0001), and circulating inflammatory markers such as CRP (r = 0.393, p < 0.0001). In univariate models using Cox proportional-hazards regression, CAC (Hazard ratio/HR [95% CI]: 2.43 [1.1-5.5], p = 0.03) was a predictor of first CVE, but AC (p = 0.74) and aPVAT (p = 0.20) were not predictors. In the multivariable Cox regression models, age per 5 years (HR 1.61 [1.3-2.1], p = 0.0001) and CRP (HR 1.10 [1.0-1.2], p = 0.0055) remained predictors of first CVE.

Conclusion: Traditional CVD risk factors were independent predictors of first CVE in women with SLE in this study. The clinically CVD free SLE women experiencing a CVE were more likely to have hypertension along with AC indicating premature vascular dysfunction. CAC was an independent predictor of first CVE emphasizing the significant influence of calcification in this vascular bed. Aortic PVAT was found to be significantly associated with traditional CVD risk factors, but not found to be predictive of first CVE. Considering our previous findings, aPVAT and AC may be considered precursors to measurable subclinical CAC.

Disclosure: K. J. Shields, None; E. Barinas-Mitchell, None; A. H. Kao, NIH K23, 2; S. S. Gutierrez, Bristol-Myers Squibb Company, 9, Exagen, Inc., 9, Humax, 9, Human Genome Sciences, 9, UCB S.A, 2, Human Genome Sciences, Inc., 2; K. Sutton-Tyrrell, None.

1711

Systemic Sclerosis, Fibrosing Syndromes, and Raynaud’s – Clinical Aspects and Therapeutics II

Monday, November 12, 2012, 4:30 pm–6:00 pm

1712

The Submaximal Heart and Pulmonary Evaluation: A Novel Noninvasive Test to Identify Pulmonary Hypertension in Patients with Systemic Sclerosis

Elenia J. Bernstein, Jessica K. Gordon, Robert F. Spiera, Lisa A. Mandl and Evelyn M. Horn

1Hospital for Special Surgery, New York, NY, 2New York Presbyterian Hospital/Weill Cornell Medical College, New York, NY

Background/Purpose: Pulmonary hypertension (PH), defined as a mean pulmonary artery pressure (mPAP) ≥ 25 mmHg on right heart catheterization (RHC), is a leading cause of death in patients with systemic sclerosis (SSc). Although RHC is the gold standard for diagnosing PH, it is an expensive, invasive test with significant associated risks. Transthoracic echocardiogram (TTE) and pulmonary function testing (PFT) are standard noninvasive screening methods used to assess SSc patients for PH. However, both are limited in their ability to distinguish between SSc patients with and without PH. The existence of an accurate, noninvasive technique to screen for PH in the SSc population is an important unmet need.

The submaximal heart and pulmonary evaluation (SHAPE) is a noninvasive, submaximal stress test that consists of a 5.5 inch high step that patients step up and down on for 3 minutes. The test, end tidal carbon dioxide which is equivalent to the ratio of cardiac output to pulmonary blood flow and reflects the severity of PH, is monitored. Our aim was to assess the correlation between change in end tidal carbon dioxide (ΔPETCO2) from rest to end-exercise on the SHAPER test and PH between November 2008 and May 2012. Charts of 679 patients in an academic cardiology practice were reviewed; 70 patients had a diagnosis of SSc, 19 of whom had undergone both a SHAPER test and RHC and were included in this study. The primary outcome was correlation between ΔPETCO2 and mPAP. Statistical analysis was performed using Spearman’s correlation and multivariable linear regression.

Results: The mean age of subjects was 61 years (± 12.5); 84% were female, 84% had lcSSc, and 79% had PH. ΔPETCO2 was significantly negatively correlated with mPAP (r = -0.82, p < 0.0001) (see Table). In a multivariable linear regression model evaluating the relationship between ΔPETCO2 and mPAP, and controlling for age, sex, time between SHAPER and RHC, and change in medications between SHAPER and RHC, ΔPETCO2 remained significantly associated with mPAP (β = −1.91, p < 0.001). The SHAPER had better sensitivity, specificity, positive predictive value, and negative predictive value for PH than did TTE or PFTs.

Performance Characteristics and Correlation of SHAPE, TTE, and PFTs with RHC (N=19)

Table

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Negative Predictive Value</th>
<th>Spearman’s Correlation</th>
<th>p-value for Spearman’s Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPER (ΔPETCO2 &lt; 4 mmHg)</td>
<td>100%</td>
<td>79%</td>
<td>93%</td>
<td>100%</td>
<td>0.42</td>
<td>0.0001</td>
</tr>
<tr>
<td>TTE (systolic pulmonary artery pressure (sPAP) &gt; 35 mmHg)</td>
<td>80%</td>
<td>28%</td>
<td>80%</td>
<td>25%</td>
<td>0.74</td>
<td>0.0004</td>
</tr>
<tr>
<td>PFTs (forced vital capacity/ diffusion capacity (FVC/DLCO) &lt; 1.0)</td>
<td>91.7%</td>
<td>78%</td>
<td>97%</td>
<td>75%</td>
<td>0.53</td>
<td>0.054</td>
</tr>
</tbody>
</table>

* Cut-points were derived from the literature
** Using RHC as the gold standard for diagnosis of PH (mPAP ≥ 25 mmHg)
† Correlation is with mPAP on RHC
‡ 16 of the 19 patients had PFTs with DLCO

Conclusion: ΔPETCO2 as measured by the SHAPE has a very strong, statistically significant negative correlation with mPAP on RHC, and is better correlated with mPAP than are sPAP on TTE or FVC/DLCO. The SHAPE has excellent sensitivity, specificity, PPV, and NPV in this small group of SSc patients with a high prevalence of PH. The SHAPE may be a better screening test for PH in patients with SSc than TTE or PFTs. Larger prospective studies investigating the ability of the SHAPE to distinguish between SSc patients with and without PH are needed.

Disclosure: E. J. Bernstein, None; J. K. Gordon, None; R. F. Spiera, None; L. A. Mandl, None; E. M. Horn, None.
Developing an Index for Disease Activity and Therapeutic Response in Connective Tissue Disease Related Interstitial Lung Disease: Results From A Delphi Exercise: Delivering A Consensus On Domains, Lesley Ann Saketkoo, Dörte Huscher, Dinesh Khanna, Paul F. Dellaria, Kevin Flaherty, Chester V. Oddis, Kristine Phillips, Athol U. Wells, Christopher P. Denton, Oliver Distler, Otylia M. Kowalczyk. Search Consultants LLC, Avon, CT, National Jewish Hospital, Denver, CO, Stanford University, Portola Valley, CA, Scleroderma Research Consultants LLC, Avon, CT, National Jewish Hospital, Denver, CO, Mayo Clinic, Rochester, MN

Background/Purpose: Lack of reliable and valid measures of disease activity and clinical response in patients with connective tissue disease (CTD)-related interstitial lung disease (ILD) makes clinical trial design difficult. From a multi-tiered investigation to develop consensus on criteria in both CTD-ILD and idiopathic pulmonary fibrosis (IPF), we report results of expert voting from a 3-tiered Delphi exercise to identify domains ‘important’ to measure in a 1 year randomized controlled trial (RCT) in IPF and CTD-ILD.

Methods: Using OMERACT methodology, 270 experts nominated 23 “domains” and 616 “instruments” that were assembled into an initial voting survey for a 3-tiered Delphi exercise with degree of importance on a 9-point Likert scale with “insufficiently familiar” as a voting option. All stages of data collection used a custom-designed secure web-site that included related articles and opportunities for participants to upload commentary supporting or refuting importance of each item.

Tier 1 Analysis: A cut-off median <4 was applied to the results. Final review demanded 100% consensus agreement for dismissal of an item based on lack of: 1. Face validity, 2. Content validity (more suited to diagnostic, demographic, or inclusion criteria) and 3. Feasibility in a multicenter trial.

Tiers 2 and 3 Analysis: To protect against bias introduced by using an arbitrary cut-off, cluster analysis was implemented to identify patterns of consensus within the data.

Results: 90% of invited experts: 137 pulmonary, 102 rheumatology and 4 cardiology specialists from 32 countries/6 continents participated. 74% and 69% of participants considered ILD and rheumatologic lung disease respectively as their primary field of research or clinical interest. Recidivism after Tier 1 was <1% with each subsequent Tier. Five common domains with their candidate instruments were identified for CTD-ILD and IPF (Table 1). Three domains identified for CTD-ILD: biomarkers, cough and medications awaited nominal group decisions.

Table 1. Results of Tier 3

<table>
<thead>
<tr>
<th>DOMAINS</th>
<th>(median/mean ratings)</th>
<th>Candidate Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea</td>
<td></td>
<td>Borg Dyspnea Index</td>
</tr>
<tr>
<td></td>
<td>CTD-ILD (8.0/7.8)</td>
<td>Dyspnea 12</td>
</tr>
<tr>
<td></td>
<td>IPF (8.0/8.1)</td>
<td>Medical Research Council (MRC) Breathlessness (Chronic Dyspnea) Scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modified MRC Dyspnea Scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Borg Dyspnea Index - Pre and Post Exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical Outcomes Trust Short Form-36 Health Survey</td>
</tr>
<tr>
<td>Health Related Quality of Life (HRQoL)</td>
<td></td>
<td>St. George’s Dyspnea Respiratory Questionnaire</td>
</tr>
<tr>
<td></td>
<td>CTD-ILD (8.0/7.7)</td>
<td>Visual Analogue Scale of Patient Assessment Disease Activity</td>
</tr>
<tr>
<td></td>
<td>IPF (8.0/7.8)</td>
<td>Ability to Carry Out Activities of Daily Living (ADLs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health Assessment Questionnaire Disability Index (HAQ-DI)</td>
</tr>
</tbody>
</table>

Lung Imaging CTD-ILD IPF Extent of Honeycombing on HRCT Extent of Retraction on HRCT Extent of Ground Glass Opacities on HRCT Overall Extent of Interstitial Lung Disease on HRCT

Lung Physiology/Function CTD-ILD IPF Supplemental Oxygen Requirement Forced Vital Capacity on Spirometry Diffusion Capacity of Lung for Carbon Dioxide

Survival CTD-ILD IPF 6MWT with Maximal Desaturation on Pulse Oximetry

Conclusion: Development of valid, discriminatory and feasible outcome measures to assess disease progression and therapeutic responses is essential for performing RCTs in CTD-ILD. This is the first comprehensive, multi-disciplinary, international effort to assess domains for studies of ILD. Experts identified a core set of domains including radiographic, physiologic and patient-reported outcomes culled from a large number of candidate items. A research agenda focusing on candidate biomarkers and domains requiring instrument development has emerged. Broad participation from a multidisciplinary ILD research community reflects the high perceived need in this area.


Gender Differences in Systemic Sclerosis: Relationship to Disease Specific Clinical Manifestations and Extralod Levels, Christine Peoples, Mary Lucas, Zengbiao Qi, Thomas A. Medgier Jr. and Carol A. Feghali-Bostwick. University of Pittsburgh, Pittsburgh, PA

Background/Purpose: Systemic sclerosis (SSc) is a multisystem autoimmune disease characterized by inflammation, autoantibody production, and increased production of extracellular matrix (ECM), resulting in fibrosis. We demonstrated that estradiol (E2) promotes the development of a fibrotic phenotype, and serum levels of E2 were significantly elevated in female patients with diffuse cutaneous SSc (dcSSc) (postmenopausal, no hormone replacement therapy [HRT]) when compared to controls. Prompted by these findings, we compared gender differences in disease type, disease specific clinical manifestations, disease severity, and analyses of serum E2 levels in patients with SSc.

Methods: Using the University of Pittsburgh Scleroderma Databank and Serumbank, we identified a total of 2,503 patients (1985–2011) with a clinical diagnosis of SSc. Differences between male and female patients were examined, including disease type, disease specific clinical manifestations including organ system involvement and autoantibody profile, and disease severity using the modified Medsger Disease Severity Scale. Serum levels of E2 in male dcSSc patients (N = 89) were measured using ELISA. We utilized t-test, Chi-square test of proportions, and Fisher’s exact where appropriate.
Results: There were 1,994 female and 509 male patients with SSC. Most patients were Caucasian (89% in males, 91% in females, \( p = 0.37 \)). Men with SSC were significantly more likely to have dcSSc than women \( (p < 0.0001) \). Males had significantly higher incidence of pulmonary fibrosis (PF) \( (p < 0.0001) \), cardiac involvement \( (p < 0.0001) \), mean maximum modified Rodnan skin score \( (p < 0.001) \), and presence of tendon friction rubs \( (p = 0.0002) \). Males also had a significantly higher prevalence of anti-Scl-70 autoantibody as compared to females \( (p < 0.0001) \), whereas females had a significantly higher prevalence of anti-centromere antibody \( (p < 0.0001) \) with a trend of higher prevalence of anti-U1RNP \( (p = 0.068) \) and anti-PM-Scl \( (p = 0.055) \). Males also had more severe vascular \( (p = 0.012) \), joint \( (p = 0.013) \), skin \( (p = 0.046) \), pulmonary \( (p < 0.0001) \), and cardiac involvement \( (p = 0.0011) \) in addition to PF \( (p < 0.0001) \). For patients with dcSSc, there were 317 males and 939 females. Males had significantly higher incidence of PF \( (p = 0.0001) \) and GI involvement \( (p = 0.0488) \). There were no significant differences in regards to peripheral vascular, muscle, pulmonary arterial hypertension, or renal involvement. The mean Health Assessment Questionnaire score was significantly higher in females vs. males \( (p < 0.0001) \). Serum E2 levels were elevated in patients with dcSSc compared with controls. E2 levels were also significantly higher in male dcSSc patients as compared to female dcSSc patients \( (p = 0.035) \).

Conclusion: SSc is more severe in male than female patients, especially regarding skin, pulmonary, cardiac, and GI involvement. This can be explained, in part, by increased circulating levels of E2, a pro-fibrotic hormone. Blocking the actions of E2 represents a viable therapeutic approach, especially with the wide availability of estrogen receptor antagonists and aromatase inhibitors.

Disclosure: C. Peoples, None; M. Lucas, None; Z. Qi, None; T. A. Medger Jr., None; C. A. Feghali-Bostwick, None.

1716

Imatinib Mesylate (Gleevec™) in the Treatment of Diffuse Cutaneous Systemic Sclerosis: Results of a 24 Month Open Label, Extension Phase.

Background/Purpose: Imatinib mesylate (IM) has been shown to decrease fibrosis in preclinical models and is a treatment of interest for Systemic Sclerosis (SSc). We have previously reported the results of our open label trial. In that study, 2430 of patients tolerated 1 year of therapy and demonstrated a 22% improvement in the Modified Rodnan Skin Score (MRSS) as well as improvement or stability in measures of pulmonary function. Patients from the initial phase of that trial were eligible to continue treatment with IM in a 24 month extension phase of this open label trial.

Methods: This was a phase IIa, open-label, single-arm clinical trial in extension-phase. Patients with dcSSc were treated with imatinib at 200 to 400 mg daily and were assessed every 3 months for safety, MRSS, and measurement of additional outcome measures for an additional 24 mos. Pulmonary function testing, high resolution CT of the chest, and echocardiography were performed as part of standard clinical care.

Results: 24 patients completed the 12 month initial phase of the imatinib trial. 17/24 patients enrolled in the extension phase and 13 continued treatment with imatinib for 24 months. The median age was 48 (18–61). 76% were female. 65% were Caucasian. The mean disease duration from the first non-Raynaud’s symptom of SSc was 27 ± 2.1 years in this group at the time of enrollment in the initial phase. 29% were anti-scl70-positive. The baseline MRSS was 23.8 ± 4.8 points during the initial one month trial.

92 AEs were recorded, 43% of which were felt to be at least possibly related to IM and these were all Grade 1 or 2. 7 SAEs occurred, none of which were felt to be related to the IM. The most frequently noted side effects were muscle pain, fatigue, nausea, and edema.

The MRSS decreased from a median of 24 (IQR 18, 31) at the beginning of the extension phase to 18 (13, 29) after the additional 12 months of IM extension \( (n=15, \ p=0.08) \) and to 16 (13, 24) with an additional 24 mo of IM extension \( (n=13, \ p=0.002) \). In 12 patients, the FVC at baseline of extension was 92 (71.0, 105.0) and was 85 (67.0, 105.0) % predicted after 24 months, \( p = 0.09 \). The hemoglobin adjusted DLCO at baseline was 77% predicted (63.0, 108.0) and was 74.5% (53.5, 92.0) at 24 mo, \( p = 0.019 \). When the subgroup of patients with ILD is examined \( (n=6) \), the FVC is 61% (59.0, 90.0) at baseline and 62.5% (54.5, 70.0) at 24 mo, \( p = 0.25 \), and the DLCO is 63% (55.0, 63.0) to 50% (46.0, 53.5), \( p = 0.13 \). Two patients developed incident mild interstitial lung disease as seen on CT during the 24 month period of follow-up. Significant changes were not observed in ESR, SHAQ, or SF-36 mental and physical components.

Conclusion: A total of 36 months of imatinib treatment was tolerable to a subset of patients with dcSSc. Although improvement in MRSS is observed in this subset, conclusions cannot be drawn regarding efficacy given the open label nature of this study. The utility of imatinib and/or other TKIs should be evaluated in a controlled fashion to better evaluate efficacy in the treatment of SSc patients.

Disclosure: J. K. Gordon, None; M. L. Davids, None; K. Dooby, None; J. N. Mersten, None; C. Magro, None; H. F. Wildman, None; S. L. Lyman, None; M. K. Crow, Johnson & Johnson, 1, Pfizer Inc, 1, Novo Nordisk, 2, EMD Merck Serono, 5, Medimmune, 5, Idera, 5, Takeda, 5, Celgene, 5, Genentech and Biogen IDEC Inc., 5, Johnson and Johnson, 5, Baxter, 5, R. F. Spirova, Novartis Pharmaceutical Corporation, 2.

Outcomes Linked to Intensive Treatment Trials in Systemic Sclerosis.


Background/Purpose: A number of clinical trials using intensive immunosuppression followed by autologous haematopoietic stem cell transplantation (HSCT) in systemic sclerosis (SSc) are underway or have been recently completed. Inclusion criteria for these trials aim to recruit cases with poor outcome, so that potential treatment-related complications, including significant early mortality are justified. Exclusion criteria are selected to minimise treatment related mortality, especially from the conditioning regimen, by defining severe organ-based disease that might preclude HSCT.

We explored morbidity and mortality in a cohort of SSc patients that fulfil the eligibility criteria for one of those trials (ASTIS) but who have been treated with standard immunosuppression.

Methods: Patients were identified from a cohort of 398 incident SSC cases with disease onset between 1995 and 1999, using ASTIS trial inclusion criteria (age 16–65 years; diffuse cutaneous (dc)SSc with disease duration ≤ 4 year plus modified Rodnan skin score (mRSS) ≥ 15 plus either respiratory, renal or cardiac involvement or dcSSc with disease duration ≤ 2 years plus mRSS ≥ 20 plus ESR > 25mm/hr and/or Hb < 11g/dL) and exclusion criteria, relating to severe organ disease (respiratory, renal or cardiac) and malignancy.

Results: Of the 146 dcSSc cases, 87 fulfilled the inclusion and 66 satisfied both inclusion and exclusion criteria for the ASTIS trial. The final group was 82% female and 82% Caucasian. At the time patients fulfilled the trial eligibility criteria, mean age was 47 (range 17–65) years and disease duration was 20 months (range 1–44). Mean mRSS was 30 (range 15–54), 23 (35%) of the patients carried anti-topoisomerase 1 antibody, 11 (17%) anti-RNA polymerase antibody and 4 (6%) anti-U1RNP antibody. Smoking status was known for 57 of the patients - 21% were current, 21% past and 58% were non-smokers.

Pulmonary fibrosis (PF), confirmed by high resolution CT was present in 55 (83%) of the patients, scleroderma renal crisis (SRC) in 2 patients (3%) and cardiac SSc in 5 patients (7.5%). Cumulative incidence of severe organ disease at 5 and 10 years of follow-up were 44% and 53% for clinically significant PF, 5% and 15% for PH, 5% and 7% for SRC and 13% for cardiac SSc.

Survival among the 66 patients was 95% at 2, 89% at 5 and 72% at 10 years. Survival among patients with present or past smoke exposure was marginally worse (87% at 5 and 74% at 10 years) compared to non-smokers (97% at 5 and 81% at 10 years), but difference was not significant. We also analysed all 87 patients who fulfilled the inclusion criteria only, not excluding those with severe organ disease or malignancy and survival among those was marginally worse (86% at 5 years and 68% at 10 years) confirming that the more severe cases that would be excluded from HSCT protocols do indeed have a worse outcome.
Autologous Lipostructure in the Treatment of Fibrotic Perioral Changes in Systemic Sclerosis: A Pilot Study. Nicoletta Del Papa1, Fabio Caviglioni2, Domenico Sambataro3, Eleonora Zaccara2, Gabriele Di Luca1, Valeriano Vinci2, and Marco Klinger3. 1G. Pini Hospital, Milano, Italy, 2UOC Chirurgia Plastica, Multimedica Holding SpA, Università degli Studi di Milano, Milano, Italy, 3Istituto Clinico Humanitas, Università degli Studi di Milano, Milano, Italy

Background/Purpose: Systemic Sclerosis (SSc) is an autoimmune disease characterized by varying degree of fibrosis in skin and other tissues. Therapeutic options for fibrotic changes are very limited. Particular aesthetic and facial dysfunctions are followed by important oral and facial manifestations with loss of skin folds around mouth, thinned and rigid lips and tongue rigidity. Limitation of mouth opening leads to deterioration in dental health and decreases the quality of life in SSc patients.

We performed a prospective pilot study to evaluate whether the autologous fat administration in SSc patients can improve the functional limitation of oral and facial dysfunctions and the impairment of perioral aesthetic tissue.

Methods: 20 patients with the diffuse form of SSc (mean age = SD 34.5 ± 15 yrs and disease duration of 11 + 10 yrs) were treated by topical perioral administration of autologous fat graft. All the patients had perioral skin fibrotic changes with limited opening of the mouth (< 50mm) and limited accessibility to the oral cavity. Lipofilling was performed according to the Coleman technique, with scar release and implantation into parallel tunnels on multiple layers under the scars. A volume of 5 to 7 cc was injected using an 18-gauge needle. Follow-up was performed at 1, 3 and 6 months postoperatively by evaluating measure of inter-incisal distance and dermal thickness by high frequency ultrasound performed at 1, 3 and 6 months postoperatively by evaluating measure of inter-incisal distance and dermal thickness by high frequency ultrasound (US). A pre-treatment and 24 week post-treatment evaluation of microcirculatory abnormalities was made using labial video capillaroscopy and skin biopsy.

Results: All patients made good postoperative recovery without major complications. Sixteen of 20 patients had an immediate subjective improvement of their skin stiffness obviously attributable to release of severe scar contractures. One month after lipofilling, the median measure of inter-incisal distance was significantly increased in comparison with the score before treatment (p = 0.038). Three and 6 months after treatment, the median measures were increased further (p < 0.02). US evaluations showed that skin thickness resulted significantly lower after treatment (p = 0.001). Four patients underwent two lipofilling sessions because of improvement with the first lipofilling but had remaining sclerotic perioral areas. Interestingly 2 patients reporting trigeminal neuropathy, showed the complete resolution of painful syndrome. Finally, labial capillaroscopy of treated patients showed significant improvement in microvascular patterns after lipofilling in term of a more homogeneous capillary density, increased length and reduced diameter shapes. Skin capillary density measured by Hematoxylin Eosin and Safran staining showed upregulation of vessel number by 1.8-fold after lipofilling.

Conclusion: Our findings demonstrate that survival of cases that would have been eligible for ASTIS trial is substantially better than might have been predicted historically, especially when excluding patients with severe organ disease that are not suitable for HSCT. This must be taken into account when long-term outcomes for trials such as ASTIS are considered.

Disclosure: S. I. Nihytanova, None; V. H.Ong, None; C. P. Denton, None.

1717

Cost Effectiveness of Nurse-Led Care for People with Rheumatoid Arthritis: A Multicentre RCT. Mwidimi Ndosi1, Martyn Lewis2, Claire Hale1, Howard Bird1, Sarah Ryan1, Helen Quinn1, Elizabeth McVor1, Julia Taylor1, Gail Barber1, Deborah Bond2, Jo White1, Debbie Chagada1, Sandra Green1, Lesley Kay1, Adrian V. Pace2, Victoria Bejarano1, Paul Emery3, 4, and Jackie Hill4. 1University of Leeds, Leeds, United Kingdom, 2Keele University, Staffordshire, United Kingdom, 3Stobhill Hospital, Glasgow, UK, Glasgow, United Kingdom, 4Poole Hospital NHS Trust, Poole, United Kingdom, 5King’s Mill Hospital, Mansfield, United Kingdom, 6Queen Elizabeth Hospital King’s Lynn, King’s Lynn, United Kingdom, 7Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom, 8Royal London Hospital, London, United Kingdom, 9Weston General Hospital, Weston-Super-Mare, United Kingdom, 10Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne, United Kingdom, 11Russells Hall Hospital, Dudley, United Kingdom, 12Barnsley Hospital, Barnsley, United Kingdom, 13Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom

Background/Purpose: Despite the establishment of the innovative rheumatology nurse-led clinics (NLC) in the UK, the evidence of cost-effectiveness is unknown. This study aimed at determining the cost-effectiveness of NLC in patients with rheumatoid arthritis (RA).

Methods: This was a 10-centre, RCT where patients were randomized to either NLC or rheumatologist-led clinic (RLC). Adults with both stable and active RA were recruited. The interventions were delivered by 9 clinical nurse specialists (Mdn experience = 10 years) and 10 rheumatologists (Mdn experience = 9 years). The primary outcome was the average change (from baseline) in disease activity score (DAS28) assessed at weeks 13, 26, 39 & 52. The EQ-5D was used to derive Quality-of-Life-Adjusted-Year (QALY) utility values.

Mean differences (MD) between the groups were estimated using linear models controlling for baseline covariates following per-protocol (PP) and intention-to-treat (ITT) strategies. The economic evaluation jointly estimated cost relative to quality adjusted life years (QALYs) and DAS28. Only ITT results are reported here: missing data being accounted through multiple imputation. Joint parameterization was achieved via bootstrap evaluation of the imputed datasets, and estimates plotted using cost-effectiveness acceptability curves.

Results: Demographics and baseline characteristics of patients under NLC (n = 91) were comparable to those under RLC (n = 90). They had a mean age (SD) of 58.5 (11.6), disease duration of 9.9 (10.7) years and 74% were female. Average DAS28 change scores were higher in the NLC group (MD = −0.15, 95%CI: −0.45, 0.14) while average QALYs were higher in the RLC group (MD = 0.018, 95%CI: −0.037, 0.073).

Overall mean healthcare and National Health Service costs (UK-pounds) were higher in the RLC group compared to the NLC group (MD = 230, 95%CI: −406, 865 and MD = 223, 95%CI: −405, 850 respectively (approx. 360 US-dollars per person).

Figure 1 shows cost utility planes for healthcare costs. NLC was ‘dominant’ in terms of costs relative to change in DAS28 but not in respect of cost relative to QALY. Cost-effectiveness of NLC in relation to QALY is dependent on willingness-to-pay (WTP); this being the most likely cost-effective strategy for a WTP not in excess of £12,777 (i.e. 20.073 US-Dollars) for the healthcare perspective, and slightly less for the NHS perspective.

Disclosure: N. Del Papa, None; F. Caviglioni, None; D. Sambataro, None; E. Zaccara, None; G. Di Luca, None; V. Vinci, None; M. Klinger, None.

ARHP Concurrent Abstract Session
Care of Patients With Rheumatoid Arthritis
Monday, November 12, 2012, 4:30 PM–6:00 PM

Cost Effectiveness of Nurse-Led Care for People with Rheumatoid Arthritis: A Multicentre RCT.
Conclusion: This was the first economic evaluation of rheumatology NLC in the UK. While the findings indicate that NLC is likely to be a cost-efficient service under a cost-minimisation approach, we are not able to draw firm conclusions on cost-effectiveness given the variation in results between DAS28 and QALY.

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1719
What Do Patients Put up with for the Benefit They Get From Methotrexate? Sandra M. Robinson1, Peta S. Heslop1 and David Walker2.1 North Tyneside General Hospital, North Shields, United Kingdom, 2Freeman Hospital, Newcastle Upon Tyne, United Kingdom

Background/Purpose: As with all effective drugs, Methotrexate (MTX) comes with a range of side effects. Some such as pneumonitis are severe enough to require the drug to be stopped. Others such as nausea are more about what a patient will tolerate. We were aware that many patients were tolerating side effects in order to take MTX. If the benefits outweigh the problem, then the medical advice would be to continue. This also applies to patients taking methotrexate in combination with TNFis where there is considerable advantage from taking the combination. For this reason there was little interest in exploring methotrexate “tolerability”. However, there is now good evidence that Tocilizumab works as well alone as in combination with Methotrexate. This offers the possibility that some patients struggling with methotrexate may be better off on Tocilizumab monotherapy rather than a TNFi and their MTX. We were interested to quantify the tolerability with methotrexate may be better off on Tocilizumab monotherapy rather than a TNFi and their MTX. We were interested to quantify the tolerability of patients continuing on Methotrexate therapy.

Methods: 100 consecutive patients seen in outpatient clinics, who were taking a stable dose of MTX and planning to continue, were surveyed. A study sheet was completed seeking information on the effectiveness of the MTX, their concordance with treatment and any side effects they were getting. They were specifically asked about; nausea; fatigue; mouth ulcers and hair loss and asked to rate them on a VAS.

Results: Efficacy averaged 6.5 being similar in men and women (6.7 & 6.4). 56% complained of at least one side effect. The side effects and the judged severity are shown in the table. VAS scores for severity averaged in the range 3.5 to 5. Sex differences were apparent. Men were less likely to complain of problems, in particular hair loss and nausea. Whether this relates to tolerance or intolerance is not clear. Only 10% “forgot” to take their MTX and for glucose/Hba1c measurement; 42% had their weight and height recorded and 75% of smokers had received counselling.

Conclusion: Patients are putting up with a lot of side effects, which are outweighed by the benefits of MTX for them. When a biologic is necessary and a standard letter highlighting the increase in CV risk in RA together with the patient’s CV risk factor assessment was then sent to the family physician, with recommendation to address any apparent deficiencies.

Patients were seen again 6 months later and the completeness and effectiveness of CV risk management reviewed.

Results: Patient awareness of the increased CV risk in RA was only 19%

Initial review showed that in the prior 12 months 86% of patients had had a blood pressure (BP) check; 31% had adequate serum lipid and 39% had glucose/Hba1c measurement; 42% had their weight and height recorded and 75% of smokers had received counselling.

At the 6 month review of the 150 patients all patients had had their BP checked. 79 (53%) were on active treatment. 17 had their treatment changed and 1 was newly started.

Comprehensive assessment of lipid levels rose from 31% of patients to 60%; and for glucose/Hba1c from 39% to 62%. Two patients had treatment changes and one was newly started.

Counselling of the 30 patients who smoked and the 103 with abnormal body mass index (BMI) resulted in 2 patients quitting smoking. 59 (39%) showed an improved BMI with 2 returning to ideal body weight.

Average time per patient encounter was 26 mins at an estimated cost, excluding laboratory costs, of $21.03 AUS per patient encounter.

Conclusion: 1 A significant gap in the routine management of CV risk factors was identified

2 Patient awareness of the increased risk of CV disease in RA is low

3 A nurse led intervention programme is feasible and effective in addressing the problems of CV risk factor management in patients with RA, but needs to be adequately resourced.

Reference
1 Webster R J et al. MJA 2009; 191: 324–329

Disclosure: F. Niddrie, None; G. A. Major, None.

1721

Background/Purpose: The EUMUSC.net project facilitates cooperation between EU Member States and promotes a comprehensive European strategy to optimise musculoskeletal health.

The purpose of Work package 5, as a part of the EUMUSC.net project, was to develop evidence based and user-focused standards of care (SOC), for Rheumatoid Arthritis (RA).

Methods: A systematic review of international documents covering SOC for RA was conducted. National scientific societies, social leagues and health professional associations were contacted via the EULAR secretariat and asked to provide relevant documents. Documents concerning pharmacological and non-pharmacological interventions published after 2002 were included.

The obtained documents were evaluated based on the AGREE II criteria (www.agreetrust.org). All recommended methods to treat RA were extracted as well as information on them and all recommendations given. Each of these methods was discussed in a consensus group meeting of 21 EUMUSC.net researchers and patient representatives from different countries regarding
priority and relevance in their home countries as well as possible interrelation
with other methods. A scheme was developed with groups of interventions
and formulated in a way that could be understood by users. To this end,
conventional DMARDs, biological agents, NSAIDs, were grouped under
pharmacological treatment. Giving up smoking, weight control and physical
activity were grouped under Lifestyle Interventions.

Results: Out of therapies or other interventions, such as DMARDs,
biological agents, exercise based-, activity based interventions, were extracted
from the documents and could be grouped into seven types of interventions,
namely Pharmacological Treatment, Monitoring, Lifestyle Interventions,
Surgery, Education/Information/Self Management, Non-Pharmacological
Treatment and Access to care.

From these data 16 user-focused standards of care were formulated.

SOC Table

<table>
<thead>
<tr>
<th>SOC</th>
<th>Examples for the 16 Standards of Care</th>
</tr>
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<tbody>
<tr>
<td>SOC 1</td>
<td>People with symptoms of RA should have timely access (6 weeks) to a clinician/health professional competent in making a (differential) diagnosis.</td>
</tr>
<tr>
<td>SOC 3</td>
<td>People with RA should receive a treatment plan individually developed between them and their clinician.</td>
</tr>
<tr>
<td>SOC 5</td>
<td>People with RA should be fully assessed for symptoms, disease activity, damage, comorbidity and function at diagnosis; these assessments should also be done annually; if disease is not within target, clinical assessment should be done at least 3 monthly (all clinical variables) and possibly more frequently upon significant worsening.</td>
</tr>
<tr>
<td>SOC 6</td>
<td>People with RA should have rapid access to care when they experience significant worsening of the disease.</td>
</tr>
<tr>
<td>SOC 7</td>
<td>People with RA should be treated with a disease modifying anti-rheumatic drug as soon as the diagnosis is made.</td>
</tr>
</tbody>
</table>

Conclusion: The lay version of the user-focused SOC will be available in all 23 official languages of the European Union for the information of people with RA across all member states. This work should contribute to the harmonization of RA treatment in Europe.

Disclosure: M. Stoffer, None; J. S. Smolen, Abbott Immunology Pharmaceuticals, Roche, MSD, Pfizer, UCB, BMS, 2; Abbott Immunology Pharmaceuticals, Roche, MSD, Pfizer, UCB, BMS, Novo-Nordisk, Lilly, Astra-Zeneca, Glaxo, Dandoz, Sanofi, Medimmune, 5; Abbott Immunology Pharmaceuticals, Roche, MSD, Pfizer, UCB, BMS, Rheumatology SE.; A. D. Woolf, None; T. A. Stamm, Abbott Immunology Pharmaceuticals, 5.

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Exploring How Patients with Rheumatoid Arthritis Use a Methotrexate Decision Aid for Making Treatment Choices

Linda C. Li,1 Anne F. Townsend2, Paul M. Adam3, Catherine L. Backman1, Sydney Brooks4, Gwen A. Ellert5, Allyson Jones6, Otto Kamensek2, Cheryl Koehn7, Diane Lacaille2, Paul M. Adam3, Catherine L. Backman1, Sydney Brooks4, Gwen Ottaman,8 Arthritis Research Centre, Vancouver, BC, 9University of Ottawa, Ottawa, ON

Background/Purpose: To understand patients' experiences with a new MTX decision aid. The current study aimed to understand patients' experiences with this new medication. Patients were recruited from rheumatologists' clinics, patient groups and social networking sites. Eligible participants were those who had been diagnosed with RA, had been prescribed MTX but were unsure about starting it, and with access to the internet. Of the 30 participants enrolled, 11 were randomly selected to participate in an in-depth telephone interview on 3 broad topics: 1) their experience with the ANSWER, 2) their use of the Internet for health information, and 3) their views on disseminating the ANSWER to others with RA. We conducted thematic content analysis to understand their experiences.

Results: Eight women and 3 men, aged 31 to 65 years, were interviewed. All participants were MTX naïve at the time of enrolment, with disease duration from less than 1 week to 16 years. Of the 11 participants, 7 were able to make a decision after using ANSWER, and 4 remained unsure. Our analysis identified 3 main themes: 1) Seeking confirmation: regardless of their prior level of knowledge on RA and MTX, participants commented on what they learnt from ANSWER and sought confirmation with their own knowledge, even some of which was inaccurate. 2) Amplifying reluctance: while using ANSWER, participants' doubts about using MTX increased when they encountered information that did not align with their own experience with the disease. 3) Clarifying thoughts: By completing the ANSWER's preference clarification questionnaire, some participants were able to reach the 'best option' for them. Several participants commented that ANSWER legitimized the practice of asking questions during medical visits and advocating for themselves.

Conclusion: Our preliminary findings highlight the power of patients' prior knowledge and experiences with RA on how they approach the information presented in a decision aid. This suggests that decision aids should address myths about RA, in addition to presenting the evidence of treatment options. Moreover, as the ANSWER serves only to initiate the discussion between patients and their doctors about MTX, further strategies are needed to support ongoing patient-doctor communication during medical visits.

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The Development of the Rheumatoid Arthritis Patient Priorities in Pharmacological Intervention Outcome Measures

Tessa Sanderson1, John R. Kirwan2, Marianne Morris1, Jon Pollock3, Robert Noddings4, Anne Watts5 and Sarah Hewlett6. 1University of the West of England, Bristol, United Kingdom, 2Bristol Royal Infirmary, Bristol, United Kingdom

Background/Purpose: Previous research developed a set of 8 priority treatment outcomes generated by patients to complement the professionally developed ACR core set for RA. These outcomes were pain, activities of daily living (ADL), visible joint damage, mobility, life enjoyment, independence, fatigue, and valued activities. A abstract reports face validity in existing instruments (Phase 1), and the construction of new Numerical Rating Scales (NRS) where validated measures did not exist (Phase 2).

Methods: Phase 1: Two consultation meetings with patient research partners (N=18) were held. Patient research partners discussed and voted on their preferences for scales in the literature for the 8 priorities, except VJD (no scales could be found).

Phase 2: Two focus groups with RA patients (N=8) were facilitated. Draft scales constructed from the Phase 1 discussions were tested. Feedback on the stem question, time frame, anchors and layout was recorded and transcribed verbatim.

Results: Existing NRS for pain, ADL and fatigue were accepted. However, patient research partners strongly recommended that severity of, importance of and ability to cope with each priority outcome be assessed, resulting in 24 questions (21 new). Visual joint damage created the most discussion, with concerns that the word 'damage' would be upsetting to newly diagnosed patients. PRP understood 'mobility' diversely, but a consensus was reached that it should focus on 'getting around outside the home'. In relation to valued activities, patients stressed that the stem question should focus on current activities, not those valued pre-diagnosis: 'It needs to say 'currently' You know, if you’re asking about how a drug changes your life over four months, or six months or whatever it is, you know, it’s kind of what your current expectation, how that’s changed' (PE, p.30). Feedback on layout included making the questions in each domain visually separate using shaded boxes, underlining key words and putting the instructions in bullet points.

Conclusion: Existing instruments did not capture the patient perspective in 5 of the 8 priority outcomes. User involvement has been essential in developing the new patient-reported outcomes. An ongoing study will test the sensitivity of the 24 RAPP-PI NRS compared to the Disease Activity Score.

Disclosure: T. Sanderson, None; J. R. Kirwan, Horizon Pharma (formerly Nite Pharma), AstraZeneca, CombinatoRx, GlaxoSmithKline, Merck, and Wyeth; S. Hewlett, None; J. Pollock, None; R. Noddings, None; A. Watts, None; S. Hewlett, None.
Pandemic Influenza Immunization in Primary Antiphospholipid Syndrome (PAPS): A Trigger to Autoantibody Production? Danielle Medeiros1, Cleonice Bueno1, Ana Cristina M. Ribeiro1, Ana L. G. Calich1, Karina Rossi Bonfiglioli1, Vilmia S. Viana1, Jozelio F. Carvalho1, Clovis Artur Silva2 and Eloisa Bonfá1. 1Faculdade de Medicina da Tecnologico (CNPQ), 2Grants, 2; Universidade de São Paulo, São Paulo, Brazil, 2Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

Background/Purpose: There are scarce data suggesting that pandemic influenza vaccination may induce antiphospholipid (APL) autoantibodies in inflammatory rheumatic diseases, particularly in systemic lupus erythematosus patients. However, there is no study evaluating the APL autoantibodies induction in primary antiphospholipid syndrome (PAPS) patients. The objective was to perform short and long-term evaluations of a large panel of APL autoantibodies following pandemic influenza A/H1N1 non-adjuvant vaccine in PAPS patients and healthy controls. Lupus specific antibodies were also investigated in these patients.

Methods: Forty-five PAPS patients (Sapporo criteria) and 33 healthy controls were vaccinated with monovalent, inactivated H1N1 vaccine (Butantan Institute/Sanofi Pasteur, São Paulo, Brazil). They were prospectively assessed at pre-vaccination, 3 weeks and 6 months after vaccination. APL autoantibodies were determined by an enzyme-linked immunosorbent assay (ELISA) and included: anti-cardiolipin (aCL) IgG/IgM and anti-β2GPI IgG/IgM antibodies (Inova Diagnostics, USA), anti-annexin V IgG/IgM, anti- phosphatidylserine IgG/IgM and anti-Prothrombin IgG/IgM (Ourgentec Diagnostica, Germany). Anti-Sm was determined by ELISA (Inova Diagnostics, USA) and anti-dsDNA by indirect immunofluorescence. Arterial and venous thromboses were also clinically assessed. The statistical analyses were carried out with chi square test, McNemar’s test and one-way repeated measures analysis of variance (ANOVA).

Results: Pre-vaccination frequency of at least one APL antibody was significantly higher in PAPS patients compared to controls (58% vs. 21%, p=0.003). The overall frequencies of APL antibody at pre-vaccination, 3 weeks and 6 months after vaccination remained unchanged in patients (p=0.89) and controls (p=0.83). Further analysis of each evaluated antibody in PAPS revealed that their frequencies at pre-vaccination and after 3 weeks and 6 months were also comparable (p=0.05). aCL IgG (42%, 20% and 24%), aCL IgM (22%, 20% and 24%), anti-β2GPI IgG (22%, 22% and 20%), anti-β2GPI IgM (15%, 15% and 18%), anti-annexin V IgG (4.5%, 2.5% and 2.5%), anti-annexin V IgM (uniformly negative), anti-phosphatidylserine IgG (38%, 35% and 38%), anti-phosphatidylserine IgM (15%, 13% and 13%), anti-prothrombin IgG (20%, 15% and 18%) and anti-prothrombin IgM (2.5%, 2.5% and 2.5%). The same pattern was observed for the control group (p>0.05). At 3 weeks, 2 PAPS patients developed a new but transient APL antibody (moderate titer aCL IgG and IgM) whereas at 6 months, new APL antibodies were observed in 6 PAPS patients: 3 moderate titer aCL IgM, 1 moderate anti-β2GPI IgM, 1 low anti-phosphatidylserine IgG and 1 low anti-prothrombin IgG. Fluctuations of antibody levels were not detected for any evaluated antibody (p>0.05). Of note, anti-Sm and anti-dsDNA autoantibodies were consistently negative during all evaluations. No new arterial or venous thrombosis events occurred during the study period.

Conclusion: This was the first study to demonstrate that pandemic non-adjuvant influenza A/H1N1 in PAPS patients does not trigger a change in APL antibody profile or induce lupus specific autoantibodies.

Disclosure: D. M. Medeiros, None; C. Bueno, None; A. C. M. Ribeiro, None; A. L. G. Calich, None; K. R. Bonfiglioli, None; V. S. Viana, None; J. F. Carvalho, None; C. A. Silva, Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ), 2, Fedéroico Foundation Grants, 2; E. Bonfá, Fundação de Amparo à Pesquisa do Estado de São Paulo – FAPESP, 2; Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPQ, 2, Fedéroico Foundation Grants, 2.

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Affinity Purified Antibodies Directed to Domain I of 2GPI Are Pathogenic in a Mouse Model of Thrombosis. Charts Pericules, Patricia Ruiz-Limon, Zurna Romay-Penabad, Ana Laura Carrera Marin, Acely Garza-Carcia, Lucy Murfitt, Paul C. Driscoll, Ian Giles, Yiannis Ioannou, Anisur Rahman, and Silvia S. Pierangeli. University College London, London, United Kingdom, 1University of Texas Medical Branch, Galveston, TX, 2MRC National Institute of Medical Research, London, London, United Kingdom, 3MRC National Institute of Medical Research, London, United Kingdom

Background/Purpose: Circulating IgG antiphospholipid antibodies (aPL) against β2-glycoprotein I (β2GPI) are a serological hallmark for diagnosis of the antiphospholipid syndrome (APS). We and other groups have shown that aPL targeting domain I (DI) of β2GPI (aDI) are APS-specific, predominantly correlating with (venous) thrombosis. We have also demonstrated that recombinant DI inhibits aPL-induced thrombosis in a mouse microcirculation model. To date however, no study has confirmed a direct pathogenic link between aDI and features of the APS. We have now employed the same mouse model to determine the thrombogenic potential of affinity purified polyclonal aDI IgG derived from APS sera. Methods: Serum from one female APS patient was incubated with his-tagged DI coupled to nickel beads to adsorb aDI antibodies. The bead-seum mix was then spun, serum re-collected and antibodies bound to DI-coupled beads were eluted. IgG from re-collected serum (aDI-poor) and eluted fractions (aDI-rich) was then obtained by protein G purification. Serum and IgG fractions (100mg/ml) were tested for aCL (GPII), aβ2GPI (GBU, in-house calibrator) and aDI (GDU, in-house calibrator) activity.

For in vivo experiments, CD1 mice weighing between 32–39g were injected twice with 100μg/ml aDI-poor or aDI-rich IgG, or IgG from healthy volunteers (NHS-IgG) as a control (4–5 animals per group). 72h after the first injection, the size (μm) of induced thrombi in the femoral vein was determined (Circulation 1996;94:1746–1751). Tissue factor (TF) activity (pM/mg/mL protein) was determined in homogenates of pooled carotid arteries and peritoneal macrophages using a chromogenic assay. Mouse serum was obtained on the day of surgery and tested for the presence of circulating whole human IgG.

Results: Purified aDI-rich IgG displayed high aCL (90GPLU), aβ2GPI (95GBU) and aDI (50GDIU) activity whilst aDI-poor IgG displayed high aCL (90GPLU) but reduced aβ2GPI (47GBU) and aDI (17GDU) activity. NHS-IgG was negative in all assays. aDI-rich IgG induced significantly larger thrombi compared to aDI-poor and NHS-IgG (p<0.001). In addition, aDI-rich IgG induced the greatest increase in TF activity in carotids (1.4 fold) and peritoneal macrophages (3.3 fold) compared to NHS-IgG. In contrast, aDI-poor IgG induced smaller thrombi and less macrophage TF activity compared to aDI-rich IgG and did not increase carotid TF activity above that of NHS-IgG (Table 1).

Conclusions: This is the first study to directly determine the thrombogenic potential of affinity purified aDI IgG in vivo. Despite aDI-poor IgG retaining aCL and, to a lesser extent, aβ2GPI activity, significantly larger thrombi and elevated TF activity were induced with aDI-rich IgG. Our findings support the concept that although circulating aPL recognizing different domains of β2GPI can be pathogenic, the major population that drive thrombosis are directed against DI.

Disclosures: C. Pericules, None; P. Ruiz-Limon, None; Z. Romay-Penabad, None; A. L. Carrera Marin, None; A. Garza-Garcia, None; L. Murfitt, None; P. C. Driscoll, None; I. Giles, None; V. Ioannou, None; A. Rahman, None; S. S. Pierangeli, None.

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Background/ Purpose: Patients with the Antiphospholipid Syndrome (APS) have circulating antiphospholipid antibodies which cause vascular thrombosis (VT) and/or pregnancy morbidity (PM). Previously we have shown that IgG isolated from patients with APS-VT alone caused activation of p38MAPK and NFκB signalling pathways and up-regulation of tissue factor activity in monocytes. These effects were not seen with IgG from patients with APS-PM alone or healthy controls. TF up-regulation caused by the APS-VT samples was reduced by p38MAPK, NFκB, and TLR4 inhibitors, thus implicating a TLR4-MyD88 dependent signalling mechanism (J Immunol, 2010;184:6622). Therefore, in this study we examine whether IgG isolated from patients with different manifestations of the APS have differential effects upon similar pathways leading to activation and migration of trophoblast relevant to clinical relevant to clinical relevance.

Methods: IgG was isolated by protein G purification from serum of 5 patients with APS and VT alone (IgG-VT), 5 patients with APS and PM alone (IgG-PM) and 5 healthy controls. To investigate the intracellular signalling
pathways induced by these IgG. A single sample for each of the 3 groups was produced by pooling IgG from the 5 subjects in that group. A human first trimester trophoblast (HTR-8) cell line was incubated with 100 μg/mL IgG from each group. Time course experiments were then performed and mRNA expression of TLR4 and related adaptor protein TRIF was measured using quantitative PCR. The activation of p38MAPK, ERK and NF-κB signalling pathways was also examined in cell extracts by immunoblot. Trophoblast migration was determined using a collagen-based cell invasion assay.

**Results:** Only IgG-PM increased TLR4 mRNA expression (at 6 and 24 hours) and TLR4 (non-MyD88 dependent) adaptor protein TRIF mRNA levels (at 6 hours) compared with IgG-NT and healthy control IgG in HTR-8 cells. None of the APS (VT or PM)-IgG however, increased phosphorylation of TLR4-MYD88 dependent p38MAPK, ERK or NF-κB signalling pathways at any (15 minutes, 2 and 6 hour) time points measured in these cells compared with control IgG. IgG-PM caused the greatest inhibition of trophoblast (HTR-8) migration (with 27% inhibition) compared to untreated cells. IgG-PT caused the greatest inhibition of trophoblast migration comparable to levels seen with healthy control IgG.

**Conclusions:** IgG isolated from patients with APS-related PM preferentially inhibit trophoblast cell migration compared with APS-IgG from patients with VT alone. IgG isolated from patients with APS-related PM also activate trophoblast cells via a TLR4 MyD88 independent pathway. This is the reverse of our previous finding in monocytes that were only activated by APS-IgG from patients with VT and not from those with PM. Further experiments are now required to characterise the mechanistic and prognostic implications of these findings.

**Disclosure:** K. Poulton, None; V. Ripoll, None; C. Pericleous, None; Y. Ioannou, None; A. Rahman, None; I. Giles, None.

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1) Among many proteins confirmed in the spectrometry, RPN2 was associated with the lupus anticoagulant.

2) The binding between PT and His-RPN2 was confirmed by ELISA. 3) Flowcytometric analysis showed the expression of RPN2 on monocyte cell surface. 4) Treated cells with RPN2 siRNA showed significantly reduced expression of the TF expression mediated by PT and 231D. Fig.

**Conclusion:** RPN2 was detected as a major PT binding molecule by proteomics analysis. RPN2 may be involved in the pathophysiology of thrombosis in patients with APS.

**Disclosure:** Y. Fujieda, None; O. Amengual, None; Y. Kanetsuka, None; T. Odani, None; K. Otomo, None; K. Oku, None; T. Bohgaki, None; T. Horiga, None; S. Yasuda, None; K. Kuroki, None; K. Maenaka, None; M. Matsumoto, None; S. Hatakeyama, None; T. Atsumi, None; S. Japanese Society for Lupus Research.

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**Background/Purpose:** Antiphospholipid syndrome (APS) is characterized by thrombosis and the presence of antiphospholipid antibodies (aPL). Tissue factor (TF) is the major initiator of the extrinsic coagulation system, is induced on monocytes by aPL in vitro. Phosphatidylserine-dependent antithrombin antibody On Monocytes, Yuichiro Fujieda1, Olgur Amengual2, Yasuaki Kanetsuka1, Toshiro Odani1, Kotaro Otomo1, Kenji Oku1, Toshiyuki Bohgaki1, Tetsuya Horiga1, Shinshu Yasuda1, Kimiko Kuroki2, Katsumi Maenaka3, Masaki Matsumoto4, Shigetsugu Hatakeyama4 and Tatsuya Atsumi1.

1) Hokkaido University, Medicine II, Sapporo, Japan; 2) Hokkaido University, Laboratory of Biomolecular Science. Sapporo, Japan; 3) Kyushu University, Division of Proteomics, Multi-scale Research Center for Prevention of Medical Science, Fukuoka, Japan; 4) Hokkaido University, Biochemistry, Sapporo, Japan

**Methods:** RPN2 may be involved in the pathophysiology of RPN2 on cell surface. The binding between PT and His-RPN2 was confirmed by ELISA. 3) Flowcytometric analysis showed the expression of RPN2 on monocyte cell surface. 4) Treated cells with RPN2 siRNA showed significantly reduced expression of the TF expression mediated by PT and 231D. Fig.

**Conclusion:** RPN2 was detected as a major PT binding molecule by proteomics analysis. RPN2 may be involved in the pathophysiology of thrombosis in patients with APS.

**Disclosure:** Y. Fujieda, None; O. Amengual, None; Y. Kanetsuka, None; T. Odani, None; K. Otomo, None; K. Oku, None; T. Bohgaki, None; T. Horiga, None; S. Yasuda, None; K. Kuroki, None; K. Maenaka, None; M. Matsumoto, None; S. Hatakeyama, None; T. Atsumi, None; S. Japanese Society for Lupus Research.

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**Table 1.** Associations of aPE and Lupus Anticoagulant with Thrombosis and Pregnancy loss

<table>
<thead>
<tr>
<th>Group with the event</th>
<th>Group without the event</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>P-value when age, gender, and ethnicity were controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Thrombosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-PE</td>
<td>9 (6.6)</td>
<td>8 (6.1)</td>
<td>1.1</td>
<td>0.43, 1.1</td>
</tr>
<tr>
<td>LAC</td>
<td>47 (39.2)</td>
<td>44 (32.2)</td>
<td>1.3</td>
<td>0.0001</td>
</tr>
<tr>
<td>Venous Thrombosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-PE</td>
<td>4 (3.9)</td>
<td>3 (2.4)</td>
<td>1.4</td>
<td>0.0005</td>
</tr>
<tr>
<td>LAC</td>
<td>2 (1.6)</td>
<td>5 (3.8)</td>
<td>0.8</td>
<td>0.0005</td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-PE</td>
<td>2 (1.6)</td>
<td>1 (0.8)</td>
<td>1.8</td>
<td>0.08</td>
</tr>
<tr>
<td>LAC</td>
<td>16 (13.4)</td>
<td>9 (7.1)</td>
<td>1.6</td>
<td>0.08</td>
</tr>
<tr>
<td>Pregnancy Loss</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-PE</td>
<td>3 (2.5)</td>
<td>0 (0.0)</td>
<td>3.2</td>
<td>0.003</td>
</tr>
<tr>
<td>LAC</td>
<td>14 (11.7)</td>
<td>7 (5.6)</td>
<td>2.9</td>
<td>0.003</td>
</tr>
</tbody>
</table>

**Background/Purpose:** Antiphospholipid syndrome (APS) is characterized by thrombosis and the presence of antiphospholipid antibodies (aPL). Tissue factor (TF), the major initiator of the extrinsic coagulation system, is induced on monocytes by aPL in vitro. Phosphatidylserine-dependent antithrombin antibody (aPS/PT) recognized the phosphatidylserin/prothrombin (PS/PT) complex, and is highly associated with APS. We have previously reported that 231D, a mouse monoclonal aPS/PT, induced TF expression on monocytes. However, the cell surface receptor for the binding of PS/PT complex leading to the activation of cell signaling pathways and TF expression is unknown. To investigate the membrane protein involved in the binding of Prothrombin (PT) and aPS/PT to cell surface and the induction of TF expression on monocytes.

**Methods:** 1) Unknown PT binding membrane protein on monocyte was screened by a proteomics technique using immunofluorescence chromatography and mass spectrometric analysis. TAG ea:taged human PT (FLG-PT) was constructed and the expression vector encoding FLAG-PT was transfected into HEK293T cells. The expression of full length FLG-PT in the culture supernatant was evaluated by immunoblotting. RAW 264.7 cells with FLG-PT were incubated and applied for affinity chromatography with anti-FLAG antibody-conjugated Sepharose beads. The purified fraction was subjected to SDS-PAGE and detected with Coomassie Brilliant Blue staining. Immunopurified proteins were analyzed by an online-nano LC-MS/MS. Obtained MS/MS data were searched against nrNCBI database using Mascot algorithm. 2) The binding between PT and Ribophorin II (RPN2) was analyzed by enzyme-linked immunosorbent assay (ELISA) with purified His-tagged human RPN2 (His-RPN2). 3) RPN2 expression on cell surface of CD14 positive cells and RAW 264.7 cells was analyzed by flowcytometric analysis. 4) To elucidate the role of RPN2 in TF mRNA expression, RAW 264.7 cells treated with RPN2 small interfering RNA (siRNA) expression and TF mRNA was determined by real-time PCR.

**Results:** Among many proteins confirmed in the spectrometry, RPN2 was identified as the candidate molecule to be the membrane protein involved in the PT binding to cell surface. 

**Fig.:** RAW 264.7 cells transfected with RPN2 siRNA were incubated with monoclonal apoPS/PT (231D). TF mRNA was quantitated by Real Time PCR.

**Conclusion:** RPN2 was detected as a major PT binding molecule by proteomics analysis. RPN2 may be involved in the pathophysiology of thrombosis in patients with APS.

**Disclosure:** Y. Fujieda, None; O. Amengual, None; Y. Kanetsuka, None; T. Odani, None; K. Otomo, None; K. Oku, None; T. Bohgaki, None; T. Horiga, None; S. Yasuda, None; K. Kuroki, None; K. Maenaka, None; M. Matsumoto, None; S. Hatakeyama, None; T. Atsumi, None; S. Japanese Society for Lupus Research.
Conclusion: Anti-PE (IgG or IgM) is associated with the lupus anticoagulant by dRVVT. We found that the lupus anticoagulant by dRVVT was a stronger predictor of any thrombosis, venous thrombosis and stroke than anti-PE. In contrast to other studies, there was no association of anti-PE with thrombosis or pregnancy loss. In SLE, neither the lupus anticoagulant nor anti-PE was associated with a history of pregnancy loss.

Disclosure: E. Akhter, None; H. Fang, None; N. Bardin, None; M. San Marco, None; M. Petri, None.

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IgA Anti-β2-glycoprotein I Antibodies Are Pathogenic in a Mouse Model of APS. Patricia Ruiz Limon1, Zurina Romay-Penabad2, Ana Laura Carrera Marin1, Elizabeth Papalardo3 and Silvia S. Pierangeli1. 1University of Texas Medical Branch, Galveston, TX, 2Univ of TX Medical Branch, Galveston, TX

Background/Purpose: Recently exclusive IgA anti-β2-glycoprotein I (ab2GPI) seropositivity - in the absence of any other antiphospholipid (aPL) antibodies- has been reported particularly in SLE patients. A significant proportion of these (70–80%) were found to have Antiphospholipid Syndrome (APS)-clinical manifestations (e.g. thrombosis and/or pregnancy losses). APL antibodies of the IgG and IgM isotypes have been shown to be pathogenic in vitro, but whether IgA ab2GPI antibodies are thrombogenic in mice is unknown. Here we examined the effects of affinity purified IgA ab2GPI antibodies isolated from patients with exclusive IgA ab2GPI positivity on thrombus formation and tissue factor (TF) upregulation in mice.

Methods: IgA was isolated from pooled sera of four patients (IgA-APS) with isolated IgA ab2GPI titers (≥80 SAU) - two had strokes, one had a confirmed deep vein thrombosis and one had two pregnancy losses - and from normal human serum (IgA-NHS) using a Immobilized Jacalin column (Pierce Biotechnology). IgA ab2GPI in the IgA-APS and in the IgA-NHS preparations was determined by ELISA (INOVA Diagnostics), the protein concentration by the Bradford method and the lupus anticoagulant by using a modified silica clotting time (SCT). CD1 mice weighing between 26–30 g were injected twice with 100 μg/ml of IgA-APS or IgA-NHS. Seventy two hours after the first injection, the size of induced thrombi in the femoral vein was determined as described (Circulation 1996; 94: 1746–1751). Tissue factor activity was determined in homogenates of pooled carotid arteries and in peritoneal macrophages using a chromogenic assay. Student’s t test was used to determine differences in mean thrombus sizes between IgA-APS and IgA-NHS treated mice.

Results: IgA-APS and IgA-NHS were rendered endotoxin free by the Limulus amoebocyte lysate assay, and did not have detectable levels of IgG or IgM. The IgA-APS preparation but not the IgA-NHS was positive for IgA ab2GPI (103.7 SAU) and LA (SCT ratio IgA-APS/IgA-NHS) = 2; normal <1.2. Results of thrombus sizes and TF activities in mice treated with IgA-APS and IgA-NHS are shown in the table.

Table 1. Association of any thrombosis, venous thrombosis and stroke with anti-β2GPI antibodies

<table>
<thead>
<tr>
<th>Assay</th>
<th>Any Thrombosis</th>
<th>Venous Thrombosis</th>
<th>Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (%)</td>
<td>Number (%)</td>
<td>Number (%)</td>
</tr>
<tr>
<td>IgA-APS</td>
<td>53 (19%)</td>
<td>10 (5%)</td>
<td>12 (6%)</td>
</tr>
<tr>
<td>IgA-NHS</td>
<td>31 (13%)</td>
<td>6 (3%)</td>
<td>9 (4%)</td>
</tr>
</tbody>
</table>

Conclusion: We found that, in SLE patients, the lupus anticoagulant by dRVVT was a stronger predictor of any thrombosis, venous thrombosis and stroke than ASR. Annexin A5 resistance was strongly associated with the lupus anticoagulant. In patients negative for lupus anticoagulant, there was no association of ASR and thrombosis. In summary, ASR identifies a subset of half of SLE patients with thrombosis in whom this specific mechanism for thrombosis is operative. We speculate that this finding may allow the development of treatments that target this specific mechanism.

Disclosure: E. Akhter, None; H. Fang, None; X. X. Wu, None; J. Rand, None. A5X5 Resistance assay; 9. M. Petri, None.

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Annexin A5 Resistance Identifies a Subset of Thrombosis Patients in Systemic Lupus Erythematosus. Ehtisham Akhter1, Hong Fang2, Xiao Xuan Wu2, Jacob Rand3 and Michelle Petri1. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2Montefiore Medical Center, Bronx, NY

Background/Purpose: Annexins are a family of structurally related proteins that bind to phospholipids in a calcium dependant manner. Annexin A5 (AnxA5), present on the surfaces of human endothelial cells, platelets and trophoblasts has potent anticoagulant activity that is a consequence of its forming 2-dimensional crystals over phospholipid bilayers, shielding the phospholipids from availability for coagulation. Antiphospholipid antibodies (aPL) disrupt the crystallization of AnxA5 over phospholipid membrane and expose the underlying phospholipid membrane for coagulation reactions. aPL-mediated disruption of AnxA5 has been correlated with thrombosis in the antiphospholipid syndrome. We investigated the association of resistance to AnxA5 anticoagulant activity (ASR assay) with thrombosis in SLE, compared with the lupus anticoagulant (LAC).

Methods: Stored plasma samples from 296 SLE patients, 150 of whom had prior thrombosis, were assayed for annexin 5 resistance. The ASR assay was performed as previously described (Blood. 2007; 109: 1490–94). We considered assay results that were < 3 SD below the mean (<140%) of 30 normal healthy control plasmas to be abnormal, and between 2–3 SD (147–153) to be borderline. The lupus anticoagulant (LAC) was detected using dRVVT with confirmatory testing.

Results: Resistance to AnxA5 anticoagulant activity was found in 45 SLE patients (15%). Table 1 shows the association of any thrombosis, venous thrombosis and stroke with ASR and with LAC. ASR was consistently associated with increased risk for thrombosis. ASR was also highly associated with a positive LAC (p<0.0001). In the small number of SLE patients with negative LAC, no association between ASR and thrombosis was found.

Table 1. Association of AnxA5 Resistance and Lupus Anticoagulant with Thrombosis

<table>
<thead>
<tr>
<th>Assay</th>
<th>Any Thrombosis</th>
<th>Venous Thrombosis</th>
<th>Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (%)</td>
<td>Number (%)</td>
<td>Number (%)</td>
</tr>
<tr>
<td>ASR</td>
<td>21 (17%)</td>
<td>5 (4%)</td>
<td>12 (9%)</td>
</tr>
<tr>
<td>LAC</td>
<td>45 (39%)</td>
<td>12 (10%)</td>
<td>13 (10%)</td>
</tr>
</tbody>
</table>

Conclusion: Any Thrombosis A5R 27 (18%) 18 (13%) 2.1 (0.90,5.20) 0.097

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Effect of Hydroxychloroquine (HCQ) On the Annexin A5 Resistance Assay (AnxA5-RA) In Antiphospholipid Antibody (aPL)-Positive Patients: Preliminary Results of an Ongoing Prospective Study. Alana B. Levine1, Jacob H. Rand2, Xue Xuan Wu2, JoAnn Vega3, Glendale Ramon3, Stephen L. Lyman1, Doruk Erkan1 and Michael D. Lockshin1. 1Hospital for Special Surgery, New York, NY, 2Mount Sinai Hospital, New York, NY, 3Cell and Molecular Medicine, Stony Brook University School of Medicine

Background/Purpose: One proposed mechanism of aPL-mediated thrombosis is disruption of the AnxA5 shield, allowing initiation of coagulation reactions on phospholipid surfaces. The AnxA5-RA measures the resistance to AnxA5 anticoagulant activity in the plasmas of aPL-positive patients. Based on in vitro studies, HCQ interferes with aPL binding to cell surfaces and helps repair disrupted AnxA5 shields; however, no in vivo human studies exist. The purpose of this ongoing prospective study is to determine the effect of HCQ on the AnxA5-RA in aPL-positive patients; here we present the preliminary baseline results.

Table 2. Association of Anti-PE with Lupus Anticoagulant

<table>
<thead>
<tr>
<th>Lupus anticoagulant</th>
<th>Anti-PE/IgG</th>
<th>Anti-PE/IgM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (n = 61)</td>
<td>8 (13.1)</td>
<td>8 (4.6)</td>
</tr>
<tr>
<td>Negative (n = 174)</td>
<td>3.1</td>
<td>1.187</td>
</tr>
</tbody>
</table>

Odds Ratio (95% CI) P-value

Anti-PE/IgG or IgM 3.1 (1.187) 0.036

Conclusion: This data show for the first time that IgA ab2GPI antibodies are thrombogenic and upregulate TF in mice. Detection of IgA ab2GPI antibodies - currently not included in the classification criteria for APS - may further identify a group of patients with APS-associated clinical manifestations that otherwise would have been missed with tests routinely in the clinical laboratory to confirm APS.

Disclosure: P. Ruiz Limon, None; Z. Romay-Penabad, None; A. L. Carrera Marin, None; E. Papalardo, None; S. S. Pierangeli, None.
Methods: As part of the ongoing study, aPL-positive patients (positive lupus anticoagulant (LA), anti-cardiolipin antibody [aCL] ≥ 40 GPL/MPL, and/or -anti-β2-glycoprotein-I [aβ2-GPI]), were included in 147 SLE patients with no history of stroke. The primary endpoint was to determine the diagnostic accuracy of aPL-S for the diagnosis of APS. The secondary endpoints were the diagnostic accuracy of the combination of aPL-S and other clinical factors. Patient characteristics and clinical outcomes were recorded. The aPL-S was calculated using the risk factor scoring system described by the authors. The area under the receiver operating characteristic curve (AUC) was used to evaluate the diagnostic accuracy.

Results: The study included 147 patients with SLE, of whom 39 had APS. The AUC for the aPL-S was 0.709 (95% CI 0.600–0.793), with sensitivity of 0.67 (95% CI 0.50–0.80) and specificity of 0.62 (95% CI 0.50–0.75). The PPV of an aPL-S score ≥1 was 93% (95% CI 86–97) and the NPV was 82% (95% CI 75–88). The PPV and NPV for aPL-S were 92% (95% CI 85–96) and 80% (95% CI 73–86), respectively, for patients with APS. The diagnostic accuracy of aPL-S was comparable to that of the individual risk factors, with the highest AUC for the combination of aPL-S and LA (0.756). The results for the combination of aPL-S and LA were 0.808 (95% CI 0.716–0.862), with sensitivity of 0.79 (95% CI 0.64–0.89) and specificity of 0.80 (95% CI 0.70–0.87). The PPV of an aPL-S score ≥1 was 94% (95% CI 89–97) and the NPV was 81% (95% CI 74–86). The PPV and NPV for aPL-S were 93% (95% CI 89–96) and 82% (95% CI 76–87), respectively, for patients with APS. The results for the combination of aPL-S and LA were 0.831 (95% CI 0.743–0.898), with sensitivity of 0.81 (95% CI 0.67–0.90) and specificity of 0.81 (95% CI 0.71–0.90). The PPV of an aPL-S score ≥1 was 96% (95% CI 92–98) and the NPV was 79% (95% CI 72–85). The PPV and NPV for aPL-S were 95% (95% CI 92–97) and 80% (95% CI 73–86), respectively, for patients with APS.

Conclusion: The aPL-S is a useful tool for the diagnosis of APS, with high diagnostic accuracy and positive and negative predictive values. The combination of aPL-S with other clinical factors improves the diagnostic accuracy. The aPL-S is a valuable tool for the diagnosis of APS in clinical practice.
The Estimated Prevalence of Antiphospholipid Antibodies in the General Population with Pregnancy Morbidity. Cecilia B. Chighizola, Guilherme Ramirez de Jesus, Laura Andreoli, Alessandra Banzato, Guillermo J. Pons-Estel, Michael D. Lockshin, Doruk Erkan and On Behalf of APS Action. Instituto Auxologico Italiano, University of Milan, Milan, Italy, Department of Obstetrics, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil, Rheumatology Unit, University of Brescia, Brescia, Italy, Department of Cardiac Thoracic and Vascular Sciences, University of Padua, Padua Italy, Padua, Italy, Department of Autoimmune Diseases, Institut Clínico de Medicina i Dermatologia, Hospital Clinic, Barcelona, Spain, Hospital for Special Surgery, New York, NY.

Background/Purpose: AntiPhospholipid Syndrome Alliance For Clinical Trials and Internatıonal Networking (APS ACTION) is an international research network created to conduct well-designed clinical trials in persistently antiphospholipid antibody (aPL)-positive patients. One of the first needs of APS ACTION was to know the true prevalence of aPL in the general population with pregnancy morbidity (PM).

Methods: The search for “aPL” and multiple keywords regarding the pregnancy outcomes of interest (early/late pregnancy loss [PrL], intrauterine growth restriction [IUGR], pre-eclampsia [PEC] and HELLP syndrome) was completed in PubMed. A total of 47 full-text papers were collected and analyzed for the type of outcome, the aPL tests used (criteria tests vs. non criteria), the definition of “positive aPL” (low, medium, high, other), the confirmation of aPL (at least 6–12 weeks apart), and the prevalence of positive aPL in the study population. The median prevalence and interquartile range (IQR) of different aPL tests were calculated based on the combine analysis of all the papers.

Results: Out of 47 papers, the outcome of interest was PRL in 32 (68%), IUGR in 6 (13%), PEC in 20 (42%), and/or HELLP syndrome in 6 (13%). Despite the limitations of the literature, the table demonstrates the estimated aPL prevalence in patients with different type of PM. These limitations were: a) the definition of “pregnancy outcome” was highly heterogeneous (66% of the studies did not define the PrL based on the Updated Sapporo Criteria; 31% did not specify the number and/or the gestational week of the PrL; 47% of the early PrL studies included patients with less than 3 events; and 85% included patients with events before and after 10 weeks in the same analysis); b) nomenclature of late PrL was controversial due to the overlap between terms such as abortion, intrauterine fetal death, and stillbirth; fetal malformations were rarely excluded (36%); c) IUGR was defined as <5th percentile in 33% of the studies and <10th percentile in 50%; 17% of the papers included no cut-off values; d) PEC severity was identified only in 50% of the studies; e) the numbers of patients included in all studies were relatively small (median 70; IQR 29–162); f) aPL type (6th or isotype 32%) has not been specified in 38% of the studies; g) aCL and/or a2GPI IgG ELISA cut-off was not available in 11% of the studies and “low titer” (<20U) was used in 21% of the papers; and h) the confirmation of aPL was performed only in 9 studies (19%).

<table>
<thead>
<tr>
<th>aPL</th>
<th>LA</th>
<th>aCL</th>
<th>a2GPI</th>
<th>aPL</th>
<th>Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrL</td>
<td>9.5 (7.3–12.5)</td>
<td>6.3 (2.6–16)</td>
<td>6.3 (2.6–16)</td>
<td>14.5 (13.8–15.3)</td>
<td>9</td>
</tr>
<tr>
<td>Early PrL</td>
<td>0</td>
<td>2.5 (2.5)</td>
<td>4.5 (2.8–7.8)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Late PrL</td>
<td>22 (12.5–25.5)</td>
<td>9.1 (10.5)</td>
<td>4.5 (3.5–5.3)</td>
<td>21.5 (15.3–27.8)</td>
<td>11</td>
</tr>
<tr>
<td>IUGR</td>
<td>2</td>
<td>17.5 (8.2–54)</td>
<td>–</td>
<td>–</td>
<td>13</td>
</tr>
<tr>
<td>PEC</td>
<td>2</td>
<td>5.3 (5.3)</td>
<td>3 (1–12)</td>
<td>5 (4.5–6)</td>
<td>7 (4–11)</td>
</tr>
<tr>
<td>Severe PEC</td>
<td>16 (12.5–17.25)</td>
<td>9 (0.7–28)</td>
<td>5 (3.5–6.5)</td>
<td>16 (14.5–18)</td>
<td>15</td>
</tr>
<tr>
<td>HELLP</td>
<td>55</td>
<td>2.7 (2.0–10)</td>
<td>2 (2–4)</td>
<td>4.5 (2.38–6.33)</td>
<td>16</td>
</tr>
</tbody>
</table>

* Only one study; ** aPL tests were reported as aCL, aCL IgG, and/or aCL IgM; *** aPL tests were reported as a2GPI, a2GPI IgG, and/or a2GPI IgM; **** aPL tests were not specified

Conclusion: The current best estimates of aPL prevalence in patients with PM are impaired by several limitations of the literature including the definition of obstetric outcomes and “positive aPL”. One of the goals of APS ACTION is to improve upon existing literature in order to address the precise magnitude of the problem.

Disclosure: C. B. Chighizola, None; G. Ramirez de Jesus, None; L. Andreoli, None; A. Banzato, None; G. J. Pons-Estel, None; M. D. Lockshin, None; D. Erkan, None; O. B. O. APS Action, None.

1737


Background/Purpose: Diffuse alveolar hemorrhage (DAH) is an uncommon but severe complication of primary antiphospholipid syndrome (APS). The available literature is limited to very few case reports. We aim to describe the clinical characteristics, treatment and outcomes of patients with DAH due to primary APS managed at our institution.

Methods: A retrospective review of the medical records of all consecutive adults evaluated at Mayo Clinic with DAH secondary to primary APS between January 1, 1997 and December 31, 2011 was conducted. APS was diagnosed using the revised Sapporo classification criteria. DAH was defined as the presence of bilateral alveolar pulmonary infiltrates with a confirmatory bronchoalveolar lavage (BAL) documenting bloody return and/or >20% hemosiderin laden macrophages (HLM). Patients with documented connective tissue diseases, ANCA associated vasculitis or anti-GBM disease were excluded.

Results: A total of 17 patients (men=12) were identified, all of them white. The median age (interquartile range, IQR) was 43 years (36–47). The median time from diagnosis of APS to development of DAH was 1661 days (495–3605). Three patients underwent lung biopsy showing capillaritis. The median percentage of HLM was 87% (81–98), BAL differential cell count was predominantly neutrophilic, median 30% (18–60). All patients were treated with high doses of glucocorticoids; six of whom did not respond, requiring more aggressive immunosuppression. Mycophenolate mofetil was used in seven patients; none achieved remission. Azathioprine was used in six patients; no remission was noted in five and one patient did not tolerate it. Cyclophosphamide was used in seven patients; remission was achieved only in three patients. Plasma exchange was performed in two patients with no response. Intravenous gamma-globulin was used in four patients with remission seen only in one patient. Rituximab was used in 6 patients; two patients achieved remission and one was lost to follow up. Only the two patients treated successfully with rituximab are off glucocorticoids. Five patients died, four from complications of uncontrolled DAH and one from complications of autologous stem cell transplant conditioning regimen for treatment of refractory DAH/APS. Median time to death from diagnosis of DAH was 70 days (44–721).

Conclusion: To the best of our knowledge, we present the largest series of DAH secondary to primary APS. There is a long gap between the diagnosis of APS and the first episode of DAH. Alveolar fluid shows predominantly neutrophilic inflammation. This disease carries a very poor prognosis with very limited successful therapeutic options. B-cell targeted immunosuppression with either cyclophosphamide or rituximab may have the highest likelihood to induce remission and should be considered early.

Disclosure: R. Cartin-Ceba, None; T. Peikert, None; K. Keogh, None; S. R. Ytterberg, None; A. Ashrani, None; U. Specks, Genentech and Biogen IDEC Inc., 2.

1738

Myocardial Dysfunction and Valveopathy Worsens with Time in Patients with Antiphospholipid Syndrome: A 10-Year Follow-up Study. MG Tektonidou, CF Kampolis, L. Moyssakis, GE Telepisis, Haralampos M. Moutsopoulos and P. Vlachoyiannopoulos. 1University of Athens Medical School, Laiko Hospital, Athens, Greece, 2Laiko Hospital, Athens, Greece

Background/Purpose: Valvular disease represents the most common cardiac manifestation among patients with antiphospholipid syndrome (APS) and systemic lupus erythematosus (SLE) positive for antiphospholipid antibodies (aPL). Diastolic dysfunction of the left and right ventricle has also been observed in these groups of patients. The purpose of the present study is to describe the evolution of valve involvement and myocardial dysfunction over time in patients with SLE and/or APS and investigate possible associations with clinical and laboratory characteristics.

Methods: One hundred and fifty patients had been assessed by transthoracic echocardiography 10 years ago. Structural and functional (regurgitation or stenosis) valvular abnormalities and diastolic function parameters (‘E’ and ‘A’ waves, E to A ratio, deceleration time (DT), isovolumic relaxation time (IVRT)) for the left and right ventricle had initially been
recorded. The longitudinal arm of the study finally included 17 patients with primary APS (PAPS), 23 with SLE-associated APS (SLE/APS), 19 with SLE positive for aPL without APS and 23 with SLE negative for aPL, for the present echocardiographic re-evaluation.

Results: The proportion of patients with valvulopathy increased from 39.3% in the initial cohort to 64.7% among PAPS and 61.5% among SLE patients. Worsening of valvular lesions during the 10 year follow-up period was detected in approximately one third of the examined population including PAPS and SLE patients, either positive or negative for aPL. Disease duration and presence of SLE/APS were the only significant risk factors for progression of isolated mitral and combined valvular disease; there was an 1.5 times higher risk for progression for every 5 years of increase in disease duration (OR:1.54, 95% C.I:1.05–2.25, p=0.027 and OR:1.63, 95% C.I: 1.13–2.36, p=0.009, respectively) and 3.5 times higher risk for SLE/APS patients (OR:3.57, 95% C.I:1.19–10.70, p=0.023 and OR:3.51, 95% C.I:1.27–9.67, p=0.015, respectively). Presence of aPL aPL titres, presence of comorbidities and other clinical characteristics did not have any significant effect on progression of valvular lesions. No treatment regimen seemed to have a prophylactic role in preventing occurrence of de novo valvular lesions or in halting progression of preexisting valvulopathy. Left ventricular diastolic dysfunction similarly progressed over time with DT and IVRT being equally prolonged in each of the 3 SLE groups (p=0.040). Right ventricular DT was significantly prolonged in each of the 3 SLE groups (p<0.001), but IVRT increased only in SLE/APS patients (p=0.040).

Conclusion: Progression of valvulopathy, as detected by transthoracic echocardiography, was observed in the majority of patients with either SLE or APS, despite treatment of underlying disease. Secondary APS in SLE and disease duration were independent risk factors for progression of valvular disease. Ventricular diastolic dysfunction, primarily of the left ventricle, similarly progressed over the 10 year period.

Disclosure: M. Tektonidou, None; C. Kampaolis, None; I. Moysakis, None; G. Tzelepis, None; H. M. Moutopoulos, None; P. Vlachoyiannopoulos, None.

1739

Primary and Secondary Antiphospholipid Syndrome in Childhood. Senq-J Lee, Leonardo Brandao, Earl D. Silverman, Mahendranath Moharir, Julie Barsalou and Deborah M. Levy. The Hospital for Sick Children, Toronto, ON

Background/Purpose: Antiphospholipid syndrome (APS) is an autoimmune disease characterized by positive antiphospholipid antibodies and potentially life-threatening thrombotic events. APS can be classified as primary or secondary to other disease. In childhood, secondary APS is frequently associated with Systemic Lupus Erythematosus (SLE). Few longitudinal childhood APS cohorts have been described, and the proportion of patients who present with APS prior to an eventual diagnosis of SLE in childhood is unknown. The aims of the study are: (1) To determine the proportion of patients with primary versus secondary APS in childhood; (2) To determine the proportion of patients initially diagnosed with primary APS who eventually develop SLE.

Methods: A retrospective single centre cohort study of all patients diagnosed with APS at The Hospital for Sick Children between 1999 and 2011 was conducted. Data from the neurology (stroke/sinus venous thrombosis), haematology (thrombosis) and rheumatology databases were collected. All patients who fulfilled the Revised Sapporo Criteria for the diagnosis of APS prior to their 18th birthday were included. Chart reviews were conducted to extract relevant data, including demographic, clinical and laboratory data.

Results: Fifty three children were identified; 13 (25%) with primary APS (pAPS), 40 (75%) with secondary APS, of which 13 (33%) were diagnosed with APS secondary to SLE (APS-SLE), and 27 (67%) with APS secondary to other disease (sAPS) (Figure 1). Demographics and clinical characteristics are in Table 1. Three (23%) APS-SLE patients were initially diagnosed with pAPS who were later diagnosed with SLE after a mean of 2.8 years; the remainder of SLE patients developed APS after a mean of 1.3 years. 15% (2/13) of pAPS patients had persistent features of incipient SLE (<4/11 of the ACR classification criteria for SLE) after mean follow-up of 4.2 years. Majority of patients with APS were males, except patients with APS-SLE. Only 26% of sAPS patients met LAC laboratory criteria. In the sAPS group, arterial strokes were the most common thrombotic event.

Table 1. Basic demographic and clinical characteristics of patients diagnosed with APS.

<table>
<thead>
<tr>
<th>Gender (M/F)</th>
<th>Primary APS</th>
<th>Secondary to SLE</th>
<th>Secondary to other disease</th>
<th>Overall cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.4</td>
<td>12 (0–17)</td>
<td>3.5 (1–6.1)</td>
<td>3.5 (1–6.1)</td>
<td>9.4</td>
</tr>
<tr>
<td>5.8</td>
<td>13.7 (4–17)</td>
<td>3.0 (1–7.6)</td>
<td>3.0 (1–7.6)</td>
<td>5.8</td>
</tr>
<tr>
<td>21.6</td>
<td>4.1 (0–16)</td>
<td>7.4 (1–13.2)</td>
<td>7.4 (1–13.2)</td>
<td>21.6</td>
</tr>
<tr>
<td>35.18</td>
<td>8.4 (0–17)</td>
<td>5.3 (1–13.2)</td>
<td>5.3 (1–13.2)</td>
<td>35.18</td>
</tr>
</tbody>
</table>

Figure 1. APS secondary to other diseases, divided into aetiology.

Conclusion: The majority of childhood APS are secondary to underlying disease, with SLE being the most frequent cause. Five patients with primary APS had incipient SLE, 3 later developed SLE. For children diagnosed with APS, we recommend a thorough evaluation for SLE at diagnosis and during follow-up.

Disclosure: S. J. Lee, None; L. Brandao, None; E. D. Silverman, None; M. Moharir, None; J. Barsalou, None; D. M. Levy, None.

1740

Impairment of Quality of Life in Patients with Antiphospholipid Syndrome. Stephane Zuily1, Francis Guillumin2, Veronique Regnault3, Pierre Kaminsky5, Patrick Missetti5, Jacques Ninet5, Nicolas Bailleul5, Nadine Magy-Bertrand1, Bernard Lorcerie, Jean-Louis Pasquali2, Thomas Lecompte1, Anne-Christine Rat1 and Denis Wahl3. 1Vascular Medicine Unit and Regional Competence Center For Rare Vascular And Systemic Autoimmune Diseases, Vandoeuvre-Les-Nancy, France, 2INSERM, Centre d’Investigation Clinique - Epidémiologie Clinique (CIC-EC) CIE6, Nancy, France, 3INSERM U961, Université de Lorraine, Nancy, France, 4Orphan disease Unit, Nancy, France, 5CHU Saint-Étienne, Unité de Pharmacologie Clinique, Groupe de Recherche sur la Thrombose (EA 3065), Saint Etienne, France, 6Department of Nephrology and Internal Medicine, Hôpital Édouard Herriot, Lyon, France, Lyon, France, 7Hôpitaux civils de Colmar, Service de Médecine interne, Colmar, France, 8CHU Jean-Minjoz, Service de Médecine interne, épidémiologie et recherche, Besançon, France, 9Hôpital Du Bocage, Service de Médecine Intérieure et Immunologie Clinique, Dijon, France, 10Hôpitaux Universitaires de Strasbourg, Hôpital civil, Service de médecine interne et immunologie clinique, Strasbourg, France, 11Hôpitaux Universitaires de Genève, Département d’hématologie, Genève, France, 12Université de Lorraine, INSERM, CIC-EC CIE6, Rheumatology, Epidemiology, Nancy, France, 13Nancy University Hospital and INSERM U961, Vascular medicine division and Regional Competence Center For Rare Vascular And Systemic Autoimmune Diseases, Nancy, France.

Background/Purpose: Quality of life (QoL) is an important outcome in clinical care especially in patients with chronic disease such as systemic lupus
erythematosus (SLE). In antiphospholipid syndrome (APS) which can be associated to SLE, QoL has not been clearly evaluated. Therefore our objective was to assess QoL in patients with antiphospholipid antibodies (aPL) and/or SLE in particular according to their status (thromboembolic history or obstetrical morbidity).

Methods: QoL was assessed in a multicentre cohort study using The Medical Outcomes Study Short-Form 36 (MOS-SF-36) in patients with aPL and/or SLE without anticoagulant treatment at inclusion. A score from 0 to 100 was calculated for each dimension and each component was normal at 50. QoL scores were compared between groups of patients and to the general population.

Results: One hundred and fifteen patients were included (mean age 42.1±14 years-old, 85 women). Seventeen patients had SLE and aPL, 16 only SLE and 82 only aPL. Fifty-eight patients were asymptomatic (i.e. without thrombotic or obstetrical history), while 57 patients had a history of one or several thrombotic manifestations and in 54 patients APS was diagnosed. The presence of APS was associated to a significant impairment of QoL on both mental component summary (MCS) (40.4±11.9 vs 45.7±10.4, p=0.01) and physical component summary (PCS) (46.6±9.6 vs 49.3±8.4, p=0.03) scores compared to those without APS (Fig. 1). Furthermore, in patients with history of arterial thrombosis compared to those without, QoL was dramatically impaired on all dimensions and both MCS (35.9±12.8 vs 44.6±10.6, p=0.008) and PCS (40.3±10.2 vs 49.5±8.1, p=0.001) scores (Fig. 2). Comparisons of QoL scores between patients with SLE and/or aPL and general population according to age and sex, showed a significant impairment of the majority of dimensions of QoL especially in men between 35 to 54 years-old, and in women between 25 to 54 years-old.

Conclusion: In patients with aPL and/or SLE, the presence of APS is associated with a significant impairment of QoL assessed by MOS-SF-36. History of arterial thrombosis was associated to the greatest impairment of QoL. Compared to the general population, we showed that these young patients experienced a decreased QoL which should be taken into account on everyday APS patient management.

Disclosure: S. Zuily, None; F. Guillemín, None; V. Regnault, None; P. Kaminsky, None; P. Minnetti, None; J. Ninet, None; N. Ballot, None; N. Magy-Bertrand, None; B. Lorcerie, None; J. L. Pasquali, None; T. Lecompte, None; A. C. Rat, None; D. Wahl, None.

1741

Suppression of Glomerulonephritis in NZB/W F1 Mice by a Selective Inhibitor of Bruton’s Tyrosine Kinase (RN486).

Paola Mina-Osorio, Jacob LaStant, Natalie Keirstead, Toni Whittard, Stella Stefanova, Alka Patel, Jennifer Postelnek, John Woods, Soo Min, Yong Kim, Julie Demartino, Satwani Narula and Daigen Xu. Hoffmann-La Roche, Nutley, NJ

Background/Purpose: Bruton tyrosine kinase (Btk) is a Tec family kinase that participates in B cell receptor (BCR), Toll-like Receptor (TLR) and chemokine receptor signaling. It is expressed in all cell lineages of the hematopoietic system, except for T cells, and it plays a critical role in B cell development and function. We have recently reported a potent and highly selective competitive inhibitor of Btk RN486, which blocks the Btk kinase activity with an IC50 of 4.0 nM. This compound inhibits BCR and FcR-mediated signaling and is efficacious in murine models of arthritis. Here we tested RN486 in the NZB/NZW model of lupus.

Methods: Animals were randomized into two groups based on the serum anti-dsDNA antibody levels and proteinuria measured at 30 weeks of age. Beginning at 32 weeks of age one group of mice was fed chow formulated with 30mg/kg of RN486 equivalent to 0.225 mg/g of chow, while the other group received regular chow ad libitum for 8 weeks.

Results: Treatment of NZB/W F1 mice with RN486 completely prevented the progression of proteinuria in 32 week-old mice. In contrast, a normal progression of the proteinuria scores until the termination of the study at 40 weeks of age was observed in animals fed with regular chow. This effect was associated with decreased IgG1 antibody deposition and decreased glomerular nephritis at the histological level. At the cellular level, there was a dramatic inhibition of B cell activation upon BCR crosslinking in vitro in peripheral blood B cells, as determined by the induction of CD69 by flow cytometry which is used as a pharmacodynamic marker. The IgG anti-dsDNA antibody secretion was almost completely abolished in the treated group as determined by ELISA and total splenocyte ELISpot. In contrast, the anti-dsDNA antibody secretion from bone-marrow derived plasma cells was not significantly inhibited, suggesting that similar to other B-cell depleting therapies, the main target population corresponds to short-lived plasma cells in the spleen. This hypothesis was confirmed by flow cytometry data demonstrating complete depletion of a CD138hi population of cells in the spleen that was not detectable in the bone marrow. Interestingly, the compound inhibited IgG but not IgM anti-dsDNA secretion suggesting that pharmacological blockade of Btk resembles the previously reported transgenic expression of low endogenous Btk levels in B cells. Finally, we studied the effect of our compound in vivo. TLR9-mediated responses in vivo and found a dose-dependent inhibition of CptG-induced IL-12 secretion. In line with this result, the animals treated with RN486 for eight weeks had lower levels of IL-12 in the serum.

Conclusion: Our results demonstrate that Btk selective inhibition is efficacious in an animal model of lupus via plasma cell depletion and inhibition of BCR and TLR9-dependent stimulation.

Disclosure: P. Mina-Osorio, None; J. LaStant, None; N. Keirstead, None; T. Whittard, None; S. Stefanova, None; A. Patel, None; J. Postelnek, None; J. Woods, None; S. Min, None; Y. Kim, None; J. Demartino, None; S. Narula, Hoffmann-La Roche, Inc., 3; Hoffmann-La Roche, Inc., 1; D. Xu, None.

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1Washington Univ School of Med, St. Louis, MO, 2Washington University School of Medicine, Saint Louis, MO

Background/Purpose: B cell depletion therapies have been efficacious in several glomerulopathies. The contributions of B cells to proteinuria and foot process effacement remain unknown. The development of a murine model of B cell-mediated proteinuria assessed using PAGE. Kidneys were processed for immunofluorescence

Conclusion: In patients with aPL and/or SLE, the presence of APS is associated with a significant impairment of QoL assessed by MOS-SF-36. History of arterial thrombosis was associated to the greatest impairment of QoL. Compared to the general population, we showed that these young patients experienced a decreased QoL which should be taken into account on everyday APS patient management.

Disclosure: S. Zuily, None; F. Guillemín, None; V. Regnault, None; P. Kaminsky, None; P. Minnetti, None; J. Ninet, None; N. Ballot, None; N. Magy-Bertrand, None; B. Lorcerie, None; J. L. Pasquali, None; T. Lecompte, None; A. C. Rat, None; D. Wahl, None.
resence (IF), H&E and PAS staining, and scanning electron microscopy (SEM). Cultured podocyte membrane ruffling was assessed with DIC videomicroscopy.

**Results:** HEL embedded within the glomerular basement membrane (GBM) following IV injection. Proteinuria occurred after the transfer of HEL-specific B cells and was associated with foot process effacement. No antibody or complement deposition was observed in the GBM. 2-photon microscopy of live mice demonstrated that HEL-specific B cells arrested trafficking within glomeruli in the presence of HEL.

The rapid kinetics of proteinuria induction suggested cytokines secreted by activated intraglomerular B cells may be responsible. We hypothesized that activation of the small Rho GTPase Rac is important in podocyte injury by virtue of its ability to regulate the actin cytoskeleton. Using murine cultured podocytes, we measured membrane ruffling in the presence of cytokines as a surrogate for Rac activation. IL-4 significantly inhibited the effects of IL-5, another type 2 cytokine, on podocyte ruffling and induced foot process retractions on ex vivo fragments of renal cortex. Hydrodynamic DNA immunization of wild-type 129 mice with plasmid encoding IL-4 lead to proteinuria.

**Conclusion:** We have developed a novel model of B cell-induced proteinuria with foot process effacement. Furthermore, these data demonstrate that cytokines can induce alterations in foot process morphology, leading to proteinuria. This has important implications in therapies preserving podocyte function in glomerular disease.

**Disclosure:** A. H. Kim, None; A. S. Shaw, None.

### 1743

**IL-5-Induced FasL\(^*\)** **Regulatory B Cells Are Inhibited by IL-4 and Cyclosporine.** Matthew W. Klinker\(^1\), Brian R. Alzua\(^1\), Tamra J. Reed\(^1\), David A. Fox\(^1\), and Steven K. Lundy\(^2\).

**University of Michigan, Ann Arbor, MI;** **2Univ of Michigan Med Ctr, Ann Arbor, MI**

**Background/Purpose:** We previously identified a subset of regulatory B cells that express the apoptosis-inducing molecule Fas ligand (Fasl), and reported that these B cells were expanded by IL-5. This study tested the effects of IL-4, another type 2 cytokine, on podocyte ruffling and induced foot process retractions on ex vivo fragments of renal cortex. Hydrodynamic DNA immunization of wild-type 129 mice with plasmid encoding IL-4 lead to proteinuria.

**Methods:** B cells were purified from mouse spleenocytes by CD19\(^+\) MACS beads and cultured with a monolayer of CD40L-expressing fibroblasts in the presence or absence of cytokines. After culture, surface expression of phenotypic markers was assessed by flow cytometry. Cytokine release from stimulated B cells was measured by ELISA. The ratio of stimulated B cells to induced apoptosis was measured by culturing B cells with activated T cells from TCR-transgenic mice and assessing apoptosis in CD4\(^+\) cells by Annexin V/propidium iodide staining. Cyclosporine was used to test the effects of inhibiting the calcineurin signaling pathway on regulatory B cell function.

**Results:** B cells stimulated with IL-5 displayed regulatory B cell functions, including increased expression of Fasl, antigen-specific killing of CD4\(^+\) T cells, and secretion of IL-10. Unexpectedly, the addition of IL-4 to B cell cultures completely abrogated the ability of B cells to induce apoptosis in target T cells and secrete IL-10, and instead induced the secretion of IL-6. Both IL-4 and IL-5 stimulated similar levels of B cell proliferation, and the combination of both cytokines had an additive effect on proliferation. IL-5-stimulated B cells resembled marginal zone B cells, with increased surface expression of CD80, CD86, CD9 and CD5, and reduced CD23 expression. This change in surface phenotype was also inhibited by IL-4. Finally, the calcineurin inhibitor cyclosporine prevented the induction of Fasl expression and IL-10 secretion mediated by IL-5.

**Conclusion:** IL-4 inhibits the regulatory B cell function induced by IL-5, such as Fasl-mediated induction of apoptosis in CD4\(^+\) T cells and secretion of IL-10. The IL-5 receptor utilizes a calcineurin-dependent pathway for induction of FasL regulatory B cells. These findings suggest that while IL-4 has regulatory effects on T cells in inflammatory diseases such as rheumatoid arthritis, it may have an opposing role on B cells by antagonizing the IL-5-mediated induction of Fasl regulatory B cells.

**Disclosure:** M. W. Klinker, None; B. R. Alzua, None; T. J. Reed, None; D. A. Fox, None; S. K. Lundy, None.

### 1744

**Regulatory B Cells Suppress the Progression of Fatal Autoimmunity in Lupus-Prone Mice.** Yury Baglaenko\(^1\), Nan-Hua Chang\(^2\), Evelyn Pau\(^3\) and Joan E. Wither\(^4\).

**1Toronto Western Research Institute, University Health Network, Toronto, ON;** **2Toronto Western Hospital, University Health Network, Toronto, ON**

**Background/Purpose:** Systemic lupus erythematosus (SLE) is a complex multisystem autoimmune disorder characterized by the production of anti-nuclear antibodies (ANA) which form immune complexes and promote end-organ damage. Studies in our lab have focused on identifying genetic defects that contribute to a loss of immune regulation in autoimmune prone New Zealand Black (NZB) mice. Previous work has shown that the intragenome of a NZB chromosome 1 (c1) interval extending from 135 to 179 Mb onto the non-autoimmune C57BL/6 (B6) background resulted in increased B and T cell activation, elevated ANA levels, and fatal kidney disease. Despite the presence of mapped susceptibility loci on NZB c4 and c1 intervals, treatment with IL-4 retards the progression of autoimmune disease.

**Methods:** Cellular phenotypes were examined by flow cytometry of de novo splenocytes. Intracellular production of IFN-\(\gamma\) and IL-17 was measured following 4 to 5 hour stimulation with LPS, PMA and Ionomycin, respectively. Serum levels of anti-nuclear antibodies were measured by ELISA. Adoptive transfer experiments were performed by injecting 5–10 million B cells intravenously into c1.Thy1.1 IgHa recipients.

**Results:** There was a significant increase in IL-10 producing B cells in c4 and c1 mice when compared to B6 and c1 controls. Interestingly, the expansion of IL-10 producing cells in c1c4 and c1c4 mice is distinct from previously documented B regulatory populations and localizes to the CDS\(^*\)CD11d\(^*\) B cell compartment. There was an inverse correlation between the levels of anti-sDNA IgG and the frequency of IL-10-producing B cells in c1c4 but not B6 mice suggesting that they may play a role in disease suppression. There was no correlation between the proportion of conventional Treg or iNKT cells and anti-sDNA IgG antibodies. In support of a direct suppressive capacity for the expanded CD5\(^+\) B cells, adoptive transfer of total B cells from c4, but not B6, mice into autoimmune prone c1.Thy1.1 IgHa recipients reduced the proportion of activated B cells, germinal centre B cells, memory/effector T cells, and IFN-\(\gamma\)- or IL-17-secreting T cells.

**Conclusion:** Taken together, these data indicate the presence of a phenotypically novel IL-10 producing B cell population in c4 mice which can suppress the progression of fatal autoimmunity.

**Disclosure:** Y. Baglaenko, None; N. H. Chang, None; E. Pau, None; J. E. Wither, None.

### 1745

**Amelioration of Experimental Autoimmune Arthritis by Adoptive Transfer of Foxp3-Expressing Regulatory B Cells Is Associated With the Regulatory T Cell/T helper 17 cell Balance.** Young Ok Jung\(^1\), Yu Jung Heo\(^2\), Mi Kyung Park\(^3\), Mi-La Cho\(^4\), Seung Ki Kwok\(^5\), Ji Hyeon Ju\(^2\), Kyung Heo\(^6\), Seung Ju Park\(^7\), Ho Youn Kim\(^8\) and Jun-Ki Min\(^9\).

**1Seoul, South Korea;** **2Catholic University of Korea, Seoul, South Korea;** **3Catholic University of Korea, Seoul, South Korea;** **4Catholic University of Korea, Seoul, South Korea;** **5Catholic University of Korea, Seoul, South Korea;** **6Division of Rheumatology, Department of Internal Medicine, Seoul National University, Seoul, South Korea;** **7Catholic University of Korea, Seoul, South Korea**

**Background/Purpose:** Foxp3 is a key regulator of the development and function of regulatory T cells (Tregs), and its expression in both T cell and B cell-restricted. We hypothesized that B cells can express Foxp3 and B cells expressing Foxp3 may play a role in preventing the development of collagen-induced arthritis (CIA).

**Disclosure:** M. W. Klinker, None; B. R. Alzua, None; T. J. Reed, None; D. A. Fox, None; S. K. Lundy, None.
Methods: Protein and mRNA expression of Foxp3 in CD19+ B cells from mice was determined by flow cytometry, western blotting, and RT-PCR. Confocal microscopy was used to visualize the location and expression of Foxp3 in B and T cells. Foxp3 expression was modulated in CD19+ B cells by transfection with shRNA or using an over-expression construct. In vitro suppressive activity of Foxp3-expressing B cells on T cell proliferation was assessed by a 3H-thymidine incorporation assay. In addition, Foxp3-transduced B cells were adoptively transferred to CIA mice. Therapeutic effects were evaluated by clinical symptoms and joint histopathology.

Results: We found that lipopolysaccharide (LPS) or anti-IgM stimulation induced Foxp3 expression in B cells. Foxp3-expressing B cells were found in the spleens of mice. To generate Foxp3-expressing B cells in vitro, we transfected CD19+ B cells with a Foxp3 over-expression construct. Over-expression of Foxp3 conferred a contact-dependent suppressive activity on proliferation of responder T cells. Down-regulation of Foxp3 by shRNA caused a profound reduction in proliferation of responder T cells. Adoptive transfer of Foxp3+CD19+ B cells attenuated the clinical symptoms of CIA with concomitant suppression of IL-17 production and enhancement of Foxp3 expression in CD4+ T cells from splenocytes.

Conclusion: Our data indicate that Foxp3 expression is not restricted to T cells. The expression of Foxp3 in B cells is critical for the immunoregulation of T cells and limits autoimmunity in a mouse model.

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1746
Semaphorin 3A Increases the Regulatory Characteristics of B-Regulatory Cells. Zahava Vadasz1, Aharon Kessel2 and Eliash Touibi1. Bnai-Zion Medical Center, Haifa, Israel, 2Bnai-Zion Medical Center, Israel

Background/Purpose: Semaphorin 3A (sem3A) and neuropilin-1 (NP-1), are important regulatory molecules, previously reported by us to play role in lupus glomerulonephritis. In a recent study we demonstrated that sem3A expression on B-regulatory cells (B regs) of systemic lupus erythematosus (SLE) patients is significantly decreased when compared to that on Bregs of normal individuals. Aiming to achieve a better characterization of Bregs (previously identified by us as CD19+CD1001b+NP-1-) we asked whether other regulatory/stimulatory molecules are altered in SLE.

Methods: Protein and mRNA expression of Foxp3 in CD19+H11001 patients was determined by flow cytometry, western blotting, and RT-PCR. Protein and mRNA expression of Foxp3 in CD19+H11001 patients was determined by flow cytometry, western blotting, and RT-PCR. Protein and mRNA expression of Foxp3 in CD19+H11001 patients was determined by flow cytometry, western blotting, and RT-PCR.

Results: Nineteen sera with anti-gemin5 antibodies were identified. All except one (18/19) also had anti-snRNPs (13 anti-U1RNP, 5 anti-U1RNP + Sm) and one had anti-SMN complex antibodies without anti-snRNPs. Among 18 with anti-snRNPs, 13 clearly had anti-SMN complex antibodies, 3 were inconclusive while 2 were negative. Anti-gemin5 sera were also positive for anti-snRNPs, thus showed nuclear speckled pattern and Cajal body ANA staining. In WB using affinity-purified gemin5, 10 sera were clearly positive, confirming their direct reactivity with gemin5. Anti-gemin5 was found in 6% of anti-snRNPs positive Caucasian or African American and 15% in Latin American. Diagnoses include 10 SLE, one each of SSC and PM and 7 unclassified connective tissue disease (UCTD). Clinical features of SLE in anti-gemin5+snRNPs (+) patients were similar to those of anti-snRNPs (+) patients except for absence of discoid lesions, seizures, and phospholipid antibodies (0% vs 48%, P < 0.0001) in the former group. Among anti-gemin5 (+), 4 cases had accompanied muscle weakness and elevated muscle enzymes and 32% (7/19) had at least one of these, suggesting muscle involvement may be common in this subset. Raynaud’s phenomenon was seen in 73%, interstitial lung disease (ILD) in 25%, and sclerodactyly in 14% of anti-gemin5 patients. A case of PM with anti-TIF1beta and U1RNP antibodies developed anti-gemin5 and SMN antibodies a few months later, consistent with the idea of epitope spreading within macromolecular complex.

Conclusion: Anti-gemin5 antibodies are produced in tight association with anti-snRNPs and anti-SMN complex antibodies in SLE and other systemic rheumatic diseases. Clinical features of anti-gemin5+snRNPs antibody positive patients are similar to those with anti-snRNPs although muscle involvement may be more common.

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1748
Antibody Secreting Cells Arising After Vaccination of Lupus Patients May Produce High Affinity Autoantibodies. Kenneth Smith1, Jennifer Muther2, Angie Duke1, Emily McKee1, Alina Lorant2, Patrick C. Wilson2 and Judith A. James3. 1Oklahoma Medical Research Foundation, Oklahoma City, OK, 2University of Chicago, Chicago, IL, 3University Medical Research Foundation and Oklahoma University Health Sciences Center, Oklahoma City, OK

Background: Vaccinating SLE patients with influenza and pneumococcal vaccines is generally considered safe and effective. However, conflicting reports regarding the impact of vaccination on autoantibody production exist. Whether vaccination might facilitate affinity maturation of autoantibody specificities or cause novel specificities to arise is difficult to determine from serum antibody measurements alone. In order to study this question on a per antibody basis, we have isolated and expressed human monoclonal antibodies from SLE patients following vaccination with both the influenza vaccine and Pneumovax23. Our technique utilizes antibody secretory cells arising from a memory response to produce antibodies specific to the vaccine. Furthermore, in autoimmune donors we can further characterize the antibodies with respect to common autoimmune specificities.

Methods: We developed a technology that allows us to make fully human monoclonal antibodies from any antigen currently approved as a vaccination in humans. This allows us to make human monoclonal antibodies which are highly specific to the vaccine antigen(s). This technology is based on the discovery of a population of B cells (ASCs), which arise 7 days after vaccination and produce antibody that is specific for the vaccine antigen. These serum-specific antibody gene clones cloned to express the antigen-specific antibody from each ASC. We are also capable of reversion the antibodies to their germline configurations to examine the role of somatic hypermutation in their auto-specificities.
Results: Two interesting antibodies were characterized from two SLE donors, one following vaccination with the influenza vaccine (2, 156pE105) and the other following vaccination with Pneumovax23 (pni34p1D02). Although antibody 2, 156pE105 does not bind to influenza virus, it is the first example of a fully human high affinity antibody to Sm (8x10^-10M). By line immunoblot, we show that it binds to SmD. When reverted to its naive/germline configuration, this antibody loses all binding to Sm indicating that such antibodies are acquired by somatic hypermutation. Unlike 2, 156pE105, pni34p1D02 does bind to S. pneumoniae serotype 5 polysaccharide with high affinity (2x10^-10M). However, by line immunoblot, we show that it also binds to nRNP A.

The serum of the donor of 2, 156pE105 was also carefully analyzed over a three year period and this patient’s antibody response to Sm clearly affinity matured, increasing in overall affinity in each year. Since this antibody does not bind influenza, it is unclear whether the vaccine played a role in this maturation, however, pni34p1D02 clearly binds polysaccharide and arose or matured after vaccination with Pneumovax23.

Conclusion: The ability to analyze the autoimmune response of a patient with SLE after vaccination on a per antibody basis allows us to determine whether new auto-specificities may occur after vaccination. Although this does not appear to be a common event, the fact that it can occur does indicate that vaccination has the potential to increase autoantibody production and potentially clinical flares in select SLE patients.

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1749 Targeting of CD22 by Epratuzumab Potentially Raises the Threshold of B Cell Receptor Activation. N. Sieger1, S. F. Fleischer1, K. Reiter1, H. E. Mei1, A. Shock2, G. Burnerste1, C. Daridon1, and T. Dormer1. 1Charité University Medicine Berlin, Berlin, Germany, 2UCB Pharma, Slough, United Kingdom.

Background/Pattern: CD22, a member of the sialic acid-binding immunoglobulin-like lectins (Siglec) family, is exclusively expressed on B cells at mature stage and is lost upon plasma cells differentiation. CD22 mediates migration by modulating cell-cell interaction and negatively regulates B-cell receptor (BCR) signaling. By recruiting a tyrosine phosphatase to its intracellular tail, CD22 acts as an inhibitory co-receptor of the BCR to ligands on the same cell surface) or (to ligands on neighboring cells). The humanized anti-CD22 monoclonal antibody epratuzumab, currently in phase III clinical trials in systemic lupus erythematosus (SLE) patients, is the first of fully human high affinity antibody to Sm (8x10^-10M). Although antibody 2, 156p1E05 does not bind to influenza virus, it is the first example of a fully human high affinity antibody to Sm (8x10^-10M). By line immunoblot, we show that it binds to SmD. When reverted to its naive/germline configuration, this antibody loses all binding to Sm indicating that such antibodies are acquired by somatic hypermutation. Unlike 2, 156pE105, pni34p1D02 does bind to S. pneumoniae serotype 5 polysaccharide with high affinity (2x10^-10M). However, by line immunoblot, we show that it also binds to nRNP A.

When B cells are pre-treated with epratuzumab, we observed a recruitment of CD22 to the CD79a molecule associated to the BCR on B pre-incubated with F(ab')2 fragment of epratuzumab which excludes an inhibitory effect dependent on FcR signaling. The reduction of BCR-induced kinase phosphorylation was demonstrated in both CD27 naive and CD27 memory B cells. Interestingly, preventing sialo-interactions of CD22 partially reduced the inhibitory effect of epratuzumab on Syk and PLC-γ2 phosphorylation. In addition, a F(ab')2 fragment of epratuzumab reduced the BCR-induced calcium flux.

Conclusion: Taking these data together, these data show that targeting CD22 with epratuzumab potentially raises the threshold for BCR activation and therefore would provide additional control of B cell function. Furthermore, the analysis of CD22 ligation by epratuzumab would provide further understanding of CD22 biology in human autoimmune diseases.

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1750 Phosphoprotein Changes Induced by Epratuzumab, an Antibody Targeting CD22 On B Cells. S. Lomb1, N. Torbett2, I. Vandreli2, H. Turner2, M. Page1, P. Hales1, A. Maloney1, B. Vanhaesebroeck1, P. Cutillasis2 and A. Shock1. 1UCB Pharma, Slough, United Kingdom, 2Activiomics Ltd., London, United Kingdom.

Background/Pattern: Epratuzumab is a monoclonal antibody targeting CD22 that is currently in phase III clinical trials in systemic lupus erythematosus (SLE) patients. CD22 is found almost exclusively on B cells and in vitro culture with epratuzumab down-regulates B cell receptor (BCR)-dependent cell signaling and B cell activation events. The objective of this study was to investigate epratuzumab-dependent changes in phosphoprotein signals in activated B cells using a recently developed LC-MS/MS methodology (IQUAS™ or Targeted Quantification of Cell Signalling).

Methods: B cells were purified from human tonsils (n=8 donors) by mechanical homogenisation followed by Ficoll-Hypaque gradient centrifugations. T cells were depleted by E-rosetting using 2 α-methyl-D-thiothiouronium bromide (AET) treated sheep red blood cells. The resulting B cells were counted and analysed by flow cytometry for purity, typically B cells preparations were >90%pure. 4x10^5 B cells B cells were then stimulated through the BCR using anti-IgM for 2 minutes with or without prior pre-incubation with epratuzumab or IgG1 isotype control for 1 hour. Immediately following stimulation the cells were harvested in ice cold PBS buffer containing phosphatase inhibitors, pelleted by centrifugation and lysed in a urea based lysis buffer containing phosphatase inhibitors. The cell lysates were sonicated on ice and quantitated by BCA protein assay. 500μg of cell extracts were subject to protease digestion and TiO2 phosphopeptide enrichment. LC-MS-MS phosphoproteomic analysis was performed using a label-free quantification strategy. A mixed linear effect statistical model was applied to the quantitation output which comprised data for 3825 distinct phosphopeptides from 96 samples. The phosphopeptide data set was imported into Ingenuity Pathway Analysis (IPA) and mapped to canonical pathways for further analysis.

Results: This analysis was able to identify statistically significantly regulated phosphorylation sites in response to pre-incubation with epratuzumab using adjusted p- and q-threshold values of <0.05, although the most significant changes generally showed no more than a 2-fold difference from signals induced by BCR stimulation alone. Among the changes observed were BCR-specific downstream signals on a broad range of protein family types: adaptor proteins (SHC1), kinases (ERK1/2, p38delta), phosphatases (SHIP1), histones (H1) and transcription factors (NFAT). Additionally, there was down-modulation of the phosphorylation of Ser749 on CD22.

Conclusion: Pre-incubation of human tonsil-derived B cells with epratuzumab induced discrete but statistically significant changes in phosphopeptide signals after BCR activation. Such observations may enable a better understanding of how epratuzumab modulates B cell functions in vivo and possibly in patients with SLE.

Disclosure: S. Lomb, UCB Pharma, 3; N. Torbett, Activiomics Ltd., 3; I. Vandreli, Activiomics Ltd., 3; H. Turner, Activiomics Ltd., 3; M. Page, UCB Pharma, 3; P. Hales, UCB Pharma, 3; A. Maloney, UCB Pharma, 3; B. Vanhaesebroeck, Activiomics Ltd., 3; P. Cutillasis, Activiomics Ltd., 3; A. Shock, UCB Pharma, 3.


Background/Pattern: To assess the safety and efficacy of repeated infusions of rituximab (RTX) in patients with primary Sjögren syndrome (PSS).

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P. C. Wilson, None; J. A. James, None.
Methods: Patients with PSS were selected for RTX treatment in case of severe glandular disease or any potentially threatening extra-glandular manifestations. Patients received 2 doses of 1000 mg RTX with a 2-week interval. RTX courses were thereafter programmed every 6 months, for 2 years. The patients were evaluated every 3 months. Criteria for discontinuation were disease progression, appearance of adverse events or inactive disease. At baseline, activity measures and B cell subsets in peripheral blood were studied. Global disease activity was scored with ESSDAI. Descriptive data are expressed in average (limits). Statistical differences between baseline and final measures and the association of disease characteristics at baseline with a favorable outcome were analyzed with non-parametric tests.

Results: 12 patients (11 women) fulfilling inclusion criteria, with a mean age of 60 (42–82) year-old and disease duration of 5.9 (1 – 16) years have been enrolled. Eleven patients had extra-glandular active disease at baseline, consisting of arthritis (6 p), ILD (6 p), Raynaud’s phenomenon (5 p), peripheral neuropathy (3 p), and exanthema (3 p). Anti-Ro antibodies were positive in 10 cases, anti-La were found in 4 and rheumatoid factor in 6 cases. At baseline, global B cell counts were within normal range, with a prominent shift towards naïve cells (68% of all CD19+ cells). Interestingly, this appeared to be a favorable marker, since percentage of naïve cells was negatively correlated with RF titers (rho = −0.84, p < 0.02) and was significantly associated to prednisone dose reduction at end points (rho 0.983, p < 0.005).

The patients have received a total dose of 42500 mg RTX, 3750 mg (500–6000) per patient, over an observation period of 13 (3 – 23) months. During this period, 2 treatments were withdrawn, due to an acute Epstein Barr virus infection at the first RTX course and the second one due to sustained remission. Two additional infections were observed during follow-up, neither of them leading to discontinuation. At endpoints, daily prednisone was tapered in 10 mg/d (Z = −2.2, p 0.028). The average ESSDAI dropped from 4.1 (1-9) to 2.2 (0-4), Z = −2.33, p 0.02, and showed an adjusted change of −4.22 points per year of follow-up. The change in ESSDAI was correlated to the cumulative dose of RTX (rho 0.665, p < 0.02). Reduction of prednisone was positively correlated to the number of RTX courses and the cumulative dose of RTX. Finally, no reconstitution of the B cell subpopulations has been found over the observation period.

Conclusion: In this cohort of patients with Sjögren’s syndrome, RTX showed a favorable safety profile as well as a possible benefit in the short-term control of the process. Although these results should be taken with caution, they suggest that B cell depletion can fill a gap in the management of difficult to treat Sjögren’s syndrome.

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1753
A Rheumatoid Factor Paradox: Inhibition of Rituximab-Induced Complement Dependent Cytotoxicity of B Cells. Jonathan D. Jones1, Irene Shyu1, Marianna M. Newkirk2 and William F. C. Rigby1, 1Dartmouth-Hitchcock Med Ctr, Lebanon, NH, 2McGill University Health Centr, Montreal, QC

Background/Purpose: Rheumatoid factor (RF) is an autoantibody directed against the Fc portion of IgG antibodies. It is found in ~80% of patients with rheumatoid arthritis (RA). It has been postulated that RF potentiates immune complex disease in RA by enhanced fixation of complement. Rituximab (RTX), an antibody targeting CD20 on B cells, exhibits increased efficacy in seropositive patients with refractory RA. We hypothesized that this improved efficacy was due to the ability of RF to enhance the ability of RTX to mediate complement-dependent cytotoxicity, leading to enhanced syncytial depletion of B cells.

Methods: We developed a model assay system of RTX to mediate complement-dependent cytotoxicity (CDC) using the Daudi human B cell line modified to grow in serum-free media. CDC was determined by propidium iodide staining 30 minutes after combining Daudi cells with RTX 10 µg/ml and human sera (1%; as a source of complement) from healthy donors and patients. The effect of RF on RTX-CDC was determined by the following methods: i) Comparison of CDC by RF+ sera vs RF- sera; ii) Addition of monoclonal IgA or IgM RF to seronegative sera; iii) Mixing studies of RF+ and RF- sera.

Results: In the presence of 1% human sera, RTX resulted in rapid (minutes) and profound (>50%) Daudi cell death. This effect was complement-dependent as proven by a lack of Daudi cell death by RTX in serum free media, heat-inactivated serum, and C5 deficient serum. A surprising variation in the ability of human sera to mediate RTX-CDC was observed. The mean percent of RTX-CDC ranged from healthy donors 54% (n=15), RF+ RA patients 47% (n=40), RF- RA patients 88% (n=15), non-RA patients 83% (n=15). Remarkably, sera with an IgM RF >250 IU/ml resulted in a mean CDC of 13% compared to sera with IgM RF 9–100 IU/ml having a mean CDC of 74%. A similar effect of increasing IgA RF concentration was seen but was not as profound an effect as IgM RF. Mixing of RF+ sera with RF- sera demonstrated the reduced RTX-CDC, indicating the presence of an inhibitor. The identity of RF as the inhibitory factor was demonstrated by the ability of either purified monoclonal IgM RF or monoclonal IgA RF added to RF- sera to mediate near complete inhibition of CDC at concentrations of 50 µg/ml and 10 µg/ml, respectively. The inhibitory effect of RF could be blocked by excess IgG. In addition, we observed that RF did not alter RTX binding to CD20 on B cells. Therefore, we conclude that RF blocks the ability of early complement components to be recruited to the IgG Fc portion of RTX.
Conclusion: Contrary to our original hypothesis, RF inhibits RTX induced CDC in vitro. Thus, the enhanced efficacy of RTX in seropositive RA patients cannot be easily attributed to modulation of B cell depletion through CDC. This result is surprising given the roles of RF in immune complex clearance and complement activation. Not only does this generate a new set of insights into the biologic role of RF, it indicates that high RF levels may potentially modulate the efficacy of any therapeutic monoclonal antibody.


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Disruption of Dominant B-Cell and Plasma Cell Clones in Rheumatoid Arthritis Synovium by Rituximab Correlates with Treatment Response
Marieke E. Doorenspleet1, Paul L. Klarenbeek1, Maartje J. Boumans2, Rogier M. Thurlings1, Rebecca E. Esveldt1, Barbera D. van Kampen1, Antoine H. van Kampen1, Danielle M. Gerlag2, Frank Baas3, Paul-Peter Tak1, Robert M. Plenge2 and Niek de Vries1. 1Academisch Medisch Center of the University of Amsterdam, Amsterdam, Netherlands; 2Division of Clinical Immunology and Rheumatology, Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands; 3Brigham and Women’s Hospital, Boston, MA

Background/Purpose: Autoreactive B lymphocytes are thought to play an important role in rheumatoid arthritis (RA). B-cell depletion therapy by rituximab (RTX) has shown that targeting B-cells can result in clinical improvement. Unfortunately, the depletion is transient and might result in disease relapse. Hence, analysis of the B-cell/plasma cell compartment in synovium (ST) in patients undergoing RTX therapy might help to identify autoreactive cells responsible for disease persistence and relapse.

Objective: To compare the B-cell/plasma cell repertoire in ST at baseline, 4 weeks and 16 weeks after RTX treatment using a newly developed high-throughput sequencing protocol.

Methods: Eleven RA patients were included and treated with two intravenous infusions of 1000mg RTX without additional methylprednisolone. At baseline, all patients fulfilled ACR criteria for RA, were ACPA+ and had a DAS28score >3.2. At week 24, nine patients demonstrated moderate to good EULAR responses, two patients were marked as non-responders. Immunohistochemistry stainings were performed on formalin-fixed paraffin embedded sections using antibodies against CD22 and CD138. mRNA was isolated from consecutive samples and full-repertoire analysis of the B-cell receptor (BCR) heavy-chain was performed with primers for all V(artiable)-genes. All amplified products encode the CDR3, a unique sequence that defines a unique clone. The number of sequences reflects the amount of BCRs produced by that clone and can be used as a measure for ‘dominance’ of that particular clone. >40,000 bead-bound sequences were analyzed using a Genome Sequencer FLX (Roche/454). Clones with a frequency of >0.5% were arbitrarily considered as dominant clones.

Results: Clones were detected in equal numbers at baseline and 4 weeks after RTX in all patients. However, after 16 weeks the number of dominant clones significantly increased compared to baseline (mean 17.9%, p=0.005, r2=0.58). This mirrored the regression of clinical symptoms measured by the DAS28 score as well as subsequent declines in the number of CD138+ plasma cells in the synovium 16 weeks after the infusion. In 5 patients, 17.9% of the dominant clones at baseline was still detectable after 16 weeks (mean 8.8%, SD 4.6%), whereas in the remaining 6 patients dominant clones at baseline were not at all retrieved 16 weeks after RTX. Interestingly, the latter group showed better treatment responses determined by the ΔDAS28score (−0.76 (SD 0.37) and −2.2 (SD 0.79) DAS28 points resp., p=0.005, r2=0.58).

Conclusion: Our observations suggest a disruption of dominant clones and a repopulation of distinctly different clones 16 weeks after rituximab. The persistence of dominant clones was associated with decreased treatment response. Further analysis of clones persistence, amongst others during disease relapse, might help to characterize disease-associated B-cells and/or plasma cells, and identify novel biomarkers for treatment response.

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The Alternative ΔCD20 Transcript Variant Is Not Expressed in B Cells and Synovial Tissue From Patients with Rheumatoid Arthritis. Clémentine Gamonet1, Marina Deschamps2, Béatrice Gauget2, Philippe Saas1, Isabelle Auger2, Christophe Ferrand3, Eric Toussirot1 and CIC BT506. 1INSERM UMR1098/Etablissement Français du Sang/Université de Franche Comté, Besançon, France; 2INSERM UMR1098/ Etablissement Français du Sang/Université de Franche Comté, Besançon, France; 3INSERM UMR1098/Etablissement Français du Sang/Université de Franche Comté, Besançon, France; 4INSERM UMR1098/ Plateforme de Biomonitoring, Besançon, France; 5INSERM UMR1097, Marseille, France; 6INSERM UMR1098 Etablissement Français du Sang/Université de Franche Comté, Besançon, France; 7CIC Biotherpy 506 and Rheumatology and EA 4266 Pathogens and Inflammation, Besançon, France; 8Clinical Investigation Center Biotherapy 506, Besançon, France

Background/Purpose: Determining predictive factors for response to biologics may help to select appropriate treatment in patients with RA. Rituximab (RTX) is a chimeric monoclonal antibody directed against the membrane CD20 protein present on B cells. Predictive factors for good response to RTX therapy in RA have been identified and included the presence of rheumatoid factors and anti-CCP antibodies. A spliced transcript of CD20 (ΔCD20) has been observed in B cell lines from patients with lymphoma and leukaemia (1). This transcript is coding for a non anchored membrane protein and its expression is associated with resistance to RTX in patients with haematological malignancies.

Objectives: To determine whether ΔCD20 is expressed by circulating B cells and synovial tissue from patients with RA and whether it could be a factor for non response to RTX therapy in RA.

Methods: 23 RA patients (17 F, age (mean ± SEM): 60.1 ± 2.7 years; disease duration: 13.3 ± 1.7 years, positive rheumatoid factors: 19/23; positive anti-CCP antibodies: 19/23) and 20 healthy controls (HC) (15 F, age: 59.6 ± 2.5 years) were evaluated. Patients were under DMARDs, low corticosteroids (<10 mg/l) or anti TNFa agents, but none received or had received RTX. Five patients with RA requiring treatment with RTX were also evaluated prior to the first RTX infusion and during a one year follow-up study. CD20 mRNA expression study was performed using RT-PCR assay allowing first to discriminate full length CD20 (membrane CD20) from ΔCD20 transcripts. A more sensitive RT-PCR assay, using a specific primer spanning the splice fusion area was then used to detect specifically only the ΔCD20 transcript. This analysis was performed on peripheral blood B cells from patients with RA and HC and synovial tissue from RA patients obtained during surgery.

Results: RA patients had mild active disease (DAS28 score: 3.7 ± 0.3; CRP levels: 6.8 ± 1.9 mg/l). Number of circulating B cells per µl was not different between RA patients and controls (mean ± SEM, range: 184 ± 22, 18–437 vs 211 ± 27, 63–408, respectively). Among all 23 RA samples, although full length CD20 expression was always detected, we were unable to detect ΔCD20, even with the more sensitive RT-PCR assay permitting to identify the spliced transcript form. Among the 5 patients who received RTX, 4 well responded to the treatment. Both responders and non responder patients did not express ΔCD20 before RTX administration and during the follow-up study. ΔCD20 was also not detected in synovial tissue samples from 5 patients with RA.

Conclusion: The present study showed that, on the contrary of leukemic or lymphoma B cells, RA B-cells and synovial tissue from RA patients do not express ΔCD20, suggesting that this transcript may be a molecular marker of malignancies rather than a factor predictive to RTX response in auto-immune diseases like RA. We are currently examining whether B cell stimulation may help to evidence ΔCD20 expression in RA B-cells.

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Peripheral Blood B Cell Subsets and BAFF/APRIL Receptor Expression, Together with Circulating BAFF and APRIL Levels, Are Disturbed in Rheumatoid Arthritis but Not in Ankylosing Spondylitis. Beatrice Gaugler1, Caroline Laheurte2, Ewa Bertolini3, Philipp Saas4, Eric Toussirot5 and CIC BTD06. 1INSERM UMR1098/Plateforme Biomonitoring, Besançon, France, 2Rheumatology, Besançon, France, 3Minjoz University Hospital, Besançon, France, 4INSERM UMR1098/Plateforme de Biomonitoring, Besançon, France, 5CIC Biotherapy 506 and Rheumatology and EA 4266 Pathogens and Inflammation, Besançon, France, 6Clinical Investigation Center Biotherapy, Besançon, France

Background/Purpose: B cells play a critical role in systemic autoimmune disease and especially rheumatoid arthritis (RA). BAFF and APRIL are involved in B cell activation and survival. B cell depletion therapies may target specific B cell subsets and/or B cell activating factors or receptors. Few studies have evaluated the distribution of the different peripheral blood B cell subsets in RA as well as the expression of BAFF/APRIL receptors. Ankylosing spondylitis (AS) is an inflammatory rheumatic disease without current evident contribution of B cells to the inflammatory response.

Objectives: To evaluate the distribution of circulating B cell subsets and their expression of BAFF/APRIL receptors (TACI, BCMA and BAFF-R) as well as the circulating levels of BAFF and APRIL in patients with RA or AS compared to healthy controls (HC).

Methods: 59 patients with RA (ACR criteria, 12 M, age [mean ± SEM; year]: 58 ± 1.5, disease duration: 10.1 ± 1.5; all under traditional DMARDs, no biologics, corticosteroids < 10 mg/day (N= 33), 61 patients with AS (modified NY criteria; 46 M; age: 46 ± 1.8, disease duration: 11.6 ± 1.2; all under NSAIDs or traditional DMARDs) and 61 HC (13 M; age: 43.6 ± 2.1) were evaluated. For each subject, peripheral blood B cell subsets were assessed using multi-color flow cytometry. B cell subsets were analysed according CD27, CD38 and IgD staining (naïve B cells: CD27- IgD+ CD38lo, transitional: CD27- IgDlo CD38hi, pre-CD27+ CD38hi; TPC: CD27+ IgD-CD38lo). The expression of BAFF-R3, TACI and BCMA was analysed on each subset. RFI was calculated by dividing the MFI of the marker divided by MFI of the isotype-matched mAb. Cells were analysed using a FACSCanto II and FACSDiva software.

Results: Circulating BAFF and APRIL levels were increased in RA compared to HC (1100.5 ± 62.5 vs 904.9 ± 29.4 pg/ml, p = 0.01 and 19116.3 ± 4918.6 vs 5699.2 ± 1034.5 pg/ml, p < 0.001, respectively), while no difference was observed in the levels of these activating B cell factors in AS and HC. The ratio BAFF levels/ peripheral B cell count was also significantly increased in RA (p = 0.04). The following B cell subsets were decreased in RA compared to HC: total B cells (p = 0.004), naïve B cells (p = 0.02), transitional B cells (p < 0.001) while post GC and CD272 B cells were not different. B-cell subsets were comparable in AS and HC. Expression of BAFF and APRIL receptors were increased in the RA group, especially TACI on CD19+ B cells, transitional B cells and pre GC B-cells (all p < 0.05) and BCMA on CD19+, naïve B cells, transitional B cells, memory B cells, pre-GC and post-GC B-cells (p < 0.05) while BAFF-R RFI was comparable in RA and HC. The expression of BAFF/APRIL receptors did not differ between AS and HC.

Conclusion: Overall, our data confirm that B cell responses are altered in RA, but not in AS compared to HC. The expression of plasma cell differentiating factor (PCDF) is increased in RA compared to HC. The expression of BAFF/APRIL receptors did not differ between AS and HC.

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B Cell Activating Factor Receptor Expression After Rituximab: Comparison of Patients with Rheumatoid Arthritis and Thrombotic Thrombocytopenic Purpura. Elena Becerra1, Maria J. Leandro2, Edward O. Heelas3, John P. Westwood4, Immaculada de la Torre1, Marie A. Scully5 and Geraldine Cambridge1, 1Rheumatology, University College London, London, London, United Kingdom, 2Hematology, University College London, London, London, United Kingdom, 3Rheumatology, Gregorio Maranon Hospital, Madrid, Spain

Background/Purpose: B cell depletion therapy based on rituximab (RTX) is an effective therapy for Rheumatoid Arthritis (RA) and for Thrombotic Thrombocytopenic Purpura (TTP). Serum B cell activating factor (BAFF) levels are within normal limits in patients with RA prior to RTX therapy, but may be raised in TTP. BAFF levels rise after RTX in both diseases. Nearly all mature B cells express BAFF-receptor (BAFF-R) in normal individuals. We have previously described lower % of naïve and memory B cells expressing BAFF-R in RA at relapse following RTX. Here, we present B cell phenotypes and %BAFF-R+ve cells in TTP patients at repopulation and in both diseases in repopulated patients in remission after RTX. Results were also analyzed in relation to serum BAFF levels.

Methods: Phenotypes and %BAFF-R+ve naïve (CD27-) (NB) and memory (CD27+) (MB) B cells were performed using FACS analysis. Healthy controls (HC), patients with TTP, either repopulating or in remission were compared with RA repopulated patients remaining in remission after RTX (Mann Whitney U test).

Results: Median time to repopulation in TTP patients was 6 months, range 4–7. Time of sampling after RTX in repopulated patients ranged from 8–38 months in RA remission patients and 10–68 months in TTP remission patients. In remission, NB cells remained high with slow regrowth of MB in both RA and TTP. As previously shown in RA, % BAFFR+ve cells in TTP were low at repopulation in both NB and MB cells. However, % BAFFR+ve cells reached normal levels in TTP patients remaining in remission months after repopulation, but stayed low in patients with RA, independent of time after last RTX cycle or number of cycles. BAFF levels remained elevated in RA patients in remission as opposed to TTP. There was a significant inverse correlation between BAFF levels and % BAFF-R+ve NB and MB cells in TTP patients in remission (r<0.01; r=0.70 in both) but not in patients with RA.

Conclusion: Repopulation of B cells after RTX follows similar patterns in patients with TTP and RA, with naïve B cells predominant. The finding that % BAFF-R+ve B cells was lower in remission in RA but not in TTP after RTX suggests a disease specific dysregulation, consistent with an autoimmune phenotype already present in repopulating B cells.

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Serum BAFF Levels and Relationship with BAFF Binding Receptors in Patients with Rheumatoid Arthritis Relapsing After B Cell Depletion Therapy. Elena Becerra1, Immaculada de la Torre2, Maria J. Leandro1 and Geraldine Cambridge1, 1University College London, London, United Kingdom, 2Gregorio Maranon Hospital, Madrid, Spain

Background/Purpose: B-cell-activating-factor (BAFF) coordinates differentiation of B cells into immunoglobulin secreting cells (ISC) by binding to 3 different receptors (BBRs), namely BAFF-R, transmembrane activator and calcium signal modulating cyclophilin ligand interacting (TACI) and B cell maturation antigen (BCMA). BAFF levels rise after B cell depletion therapy based on rituximab (BCDT) and remain raised in some patients at relapse. BAFF-R expression is reduced in relapsing patients after BCDT. We examined the level of BBR expression at relapse in relation to serum BAFF levels.

Methods: BBRs % expression was examined on B cell sub-populations defined using combinations of CD19, CD38 and IgD. Serum BAFF levels were determined using a Human Quantikine O` BAFF/BLyS Immunoassay ELISA kit. We studied 10 Healthy Controls (HC), 10 RA patients before BCDT (Pre-BCDT) and 20 patients with RA at relapse, including 10 patients who had relapsed within 3 months after repopulation (Concordant Relapse:
Results: Peripheral blood B cells obtained from normal (n=11), SLE (n=13), and RA (n=12) were characterized by flow cytometry. The MFI of APRIL, BAFF, BAFFR and TACI on CD19+IgM+ B cells of RA and SLE patients were compared to normal PB. Surface APRIL expression was significantly higher on B cells from RA (p=0.0083) and SLE (p=0.0146) patients as compared to normal donors. The receptor, TACI, which binds both APRIL and BAFF was also increased on B cells from RA (p=0.0114) and SLE (p=0.0146) patients.

Conclusion: Expression of surface APRIL and the TACI receptor are significantly higher on B cells from RA and SLE patients as compared to normal B cells. These results show that in SLE and in RA the patient’s B cells themselves serve as a reservoir of surface APRIL that provides a potential source of stimulation for the TACI receptors that are also upregulated on these cells. These data implicate surface APRIL and TACI in B-cell mediated autoimmune disease. Ongoing studies are focused on establishing the relationship between the level of surface APRIL expression and disease activity.

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Background/Purpose: Production of pathogenic autoantibodies by inappropriately self-reactive plasma cells (PC) is a hallmark of autoimmune diseases. MEDI-551 is an anti-CD19 antibody which is expected to significantly deplete PC, distinct from anti-CD20 targeted therapy which does not deplete PC. Low PC numbers in whole blood (usually 0.5% of total cells) and their instability, make it challenging to implement routine flow cytometry assays to measure PC levels in clinical trials. To address this limitation, we developed a robust gene-expression based assay which can be easily implemented in clinical trials to measure the PC population.

Methods: Based on literature and whole genome microarray analysis of sorted cellular fractions and purified PC, we identified genes (IGHA, IGH, IGKC, IGKV, and BCMA) whose expression is highly significantly enriched in PC. We developed a signature score combining expression levels of these genes to estimate PC counts in whole blood. Flow-sorted cells obtained from healthy volunteers were used to assess the sensitivity, specificity, and reliability of detecting alterations in PC numbers using this gene expression signature.

Results: We demonstrated clinical utility of this PC signature using samples from patients enrolled in CP-200, a Phase I single dose-ranging trial (N = 27) of MEDI-551 in scleroderma. MEDI-551 caused a robust depletion of the PC gene signature in whole blood and skin, with maximum depletion reaching approximately 98% and 90%, respectively. Up to 90% B cell depletion was observed in blood and skin. At 85 days following MEDI-551 administration, the last timepoint evaluated, PC and B cell levels recovered up to 65% of baseline.

Conclusion: This newly developed gene-expression based PC signature provides a robust and straightforward way to accurately measure PC levels in the clinic. By applying this PC signature, we demonstrated significant depletion of PC cells by MEDI-551, an anti-CD19 monoclonal antibody. In combination with flow cytometry data, this PC signature will help inform dosing decisions for future trials of MEDI-551, as well as provide the ability to correlate clinical activity with baseline PC levels or with the extent/duration of PC depletion.

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Suppression of Rheumatoid Arthritis B Cells by XmAb5871, an Anti-CD19 Monoclonal Antibody That Co-Engages the B Cell Antigen Receptor and the FcγRIIB Inhibitory Receptor. Seung Y. Chu1, Karen Y. Yeter2, Eric Pong1, Yvonne Miranda3, Huang Chen3, Sung-Hyung Lee1, Irene Leung1, John R. Desjarlais1, William Stohl1 and David E. Szymkowski3. 1Xencor, Inc., Monrovia, CA; 2University of Southern California Keck School of Medicine, Los Angeles, CA

Background/Purpose: XmAb5871 is a humanized and Fc-engineered antibody that coengages CD19, part of the B cell receptor (BCR) complex, with the inhibitory receptor FcγRIIB (CD32b). This antibody is in clinical development as a potential therapy for RA and SLE, and we have previously characterized its immunosuppressive effects on B cells from normal and SLE donors. In this study, we assessed whether XmAb5871 similarly inhibits activation of RA B cells. Because XmAb5871 activity requires its Fc domain to bind with high affinity to FcγRIIB, we also assessed whether rheumatoid factor (RF), an anti-IgG Fc autoantibody, could interfere with its therapeutic mechanism.

Methods: Blood from RA (N = 50) and normal (N = 72) donors was obtained with IRB approval. PBMC were analyzed by flow cytometry for expression of CD19, CD27, CD32b and CD86. Phosphorylation of FcγRIIB following incubation of PBMC with XmAb5871 was determined by phospho-western blotting. XmAb5871-mediated suppression of intracellular calcium flux was assessed by anti-CD79b in PBMC loaded with Fluo-4 NW dye was quantified by flow cytometry. Inhibition by XmAb5871 of CD86 expression on anti-CD95-stimulated B cells was determined in whole blood. Plasma RF and ACPA levels were measured by ELISA. Demographic and clinical characteristics of RA patients were correlated with results from in vitro assays.

Results: RA and normal B cells expressed CD19 and CD27, the targets of XmAb5871. There was a smaller memory (CD27+ B) cell compartment in RA (P = 0.003). CD32b expression was higher on naïve (CD27-) (P = 0.0018) but not on memory B cells (P = 0.85) from RA vs. normal donors. BCR-mediated calcium flux was suppressed by XmAb5871 in RA and in normal B cells (67% vs. 50%, respectively; P = 0.0038). This inhibition was associated with FcγRIIB activation in RA and normal B cells (average 10-fold induction in both). Baseline CD86 expression was increased in naïve and particularly in memory B cells of RA donors (P = 0.04 and < 0.001, respectively). XmAb5871 efficiently inhibited CD86 induction in RA and normal B cells (76% vs. 62%, respectively; P = 0.055). Notably, there was no effect of RF or ACPA levels on drug efficacy (R² = 0.002 and 0.021, respectively). Among RA patients, functional effects of XmAb5871 did not correlate with age, sex, years from diagnosis, extra-articular manifestations, tender or swollen joint counts, DAS28, erosive disease, or use of methotrexate, hydroxychloroquine, corticosteroids, or TNF antagonists. A history of rituximab treatment was associated with fewer memory B cells and reduced CD32b expression (P = 0.003 and 0.040, respectively). Nonetheless, the functional effects of XmAb5871 on B cells from these patients were not different from those in the RA cohort at-large.

Conclusion: The FcγRIIB inhibitory pathway in B cells from RA patients can be amplified by an antibody engineered to co-engage FcγRIIB and CD19 with high affinity. The potency observed across multiple measures of B cell function was higher in donor cells that demonstrated a better degree of interference by physiologic levels of RF and ACPA in RA patient sera suggests that XmAb5871 may represent a new therapeutic strategy to suppress autoreactive B cell populations in RA and related autoimmune diseases.


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IL-6 Receptor Inhibition by Tocilizumab Modulates Double Negative (CD19+IgD-CD27-) B Cells in RA. Zafar Mahmood1, Khalid Muhammad1, Petra Roll1, Stefan Kleinert1, Thomas Dörner1 and Hans Peter Tony1. 1University of Würzburg, Würzburg, Germany; 2Charité Universitätsmedizin Berlin and DRFZ, Berlin, Germany

Background/Purpose: Double negative (CD19+IgD-CD27-) B cells have been reported to be part of human memory B cell compartment. Detailed studies of DN B cells in autoimmune diseases like rheumatoid arthritis (RA) and during different B cell targeted therapies are sparse. Therefore we analyzed in detail these cells in RA patients under IL-6 R inhibitor tocilizumab.

Methods: DN B cells were phenotypically analyzed from RA patients (mean age ~61 years) at baseline and 12, 24 and 48 weeks after tocilizumab treatment. Additionally, single B cell sorting technology followed by nested PCR approach was used to study mutational pattern of Ig- receptors VH genes.

Results: The phenotypic analysis of DN B cells in RA patients (n = 33) and healthy individuals (n = 22) showed a significantly expanded population (p = 0.034) of these cells in RA. DN B cells showed a heterogeneous mixture of IgA, IgG and IgM expressing cells with clear dominance of IgG+ cells. Pre-therapy analysis of rearranged IgR sequences from patients (n = 7) revealed comparable but diversified mutational pattern of DN B cells comprising mutated and non-mutated sequences. During tocilizumab, DN B cells showed significantly reduced mutational frequency in their Ig-receptors with a marked reduction of the mutated Ig-receptors at week 12 (p < 0.0001), 24 (p = 0.0147) and 48 (p = 0.0017) during treatment.

Conclusion: Our data suggest expanded DN B cells population in RA which are susceptible to IL-6R inhibition in vivo by tocilizumab. Particularly, acquisition of mutations was substantially altered in DN B cells. These results indicate that DN B cells have dependence on the IL6/IL6R system for differentiation in vivo which can be modulated by anti-IL6R therapy.

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The Role of SYK in Human B CELL Activation and Its Relevance to Autoimmune Diseases. Shigeru Iwata1, Kunihiro Yamakoa1, Hiroaki Niirou, Kazuhiro Nakano1, Shuey-Pey Wang1, Koichi Akashii2 and Yoshiya Tanaka1. 1University of Occupational and Environmental Health, Kitakyushu, Japan; 2Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan

Background/Purpose: B cells play a pivotal role in pathological processes of autoimmune diseases. Spleen tyrosine kinase (Syk) functions as a key molecule in B-cell receptor (BCR)-mediated signaling. However, the underlying mechanisms of Syk in autoimmune diseases such as RA and SLE remain unclear.

Methods: Purified naïve (CD27−) and memory (CD27+) B cells from healthy donor were stimulated with BCR cross-linking, soluble CD40L, and CpG-ODN2006. The role of Syk was evaluated with a specific Syk inhibitor, BAY61–3606. B cell line (Raji) and PBMCs from RA and SLE patients were utilized to assess the detailed molecular mechanism of activated B cells and involvement in the pathology of RA and SLE.

Results: BCR-crosslinking, in conjunction with CD40 and TLR9 stimulations, efficiently activate B cells and induced various functions such as proliferation and differentiation especially in memory B cells, while specific Syk inhibitors completely abrogated them to background levels. It is noteworthy that BCR-crosslinking markedly induced expression of TNF receptor-associated factor (TRAF)-6 but not TRAF-2, -3 and -5. Additional CD40 and TLR9 stimulations further induced expression of TRAF-6 and phosphorylation of SYK, while specific Syk inhibitor again significantly inhibited them. Strong phosphorylation of Syk were observed in B cells from RA (n = 62) and SLE patients(n = 58) compared with healthy donors (n = 27). Levels of Syk phosphorylation were higher in SLE patients positive for anti-dsDNA antibodies than those negative for them and also well correlated with the disease activity score such as SLEDAI. On the other hand, Syk phosphorylation were higher in RA patients most positive for anti-CCP antibodies than those negative for them and also well correlated with the disease activity score such as DAS28, CDAI and SDAI.

Conclusion: Syk-mediated BCR-signaling is prerequisite for optimal induction of TRAF-6, thereby allowing efficient propagation of TLR9-signaling critical for proliferation and differentiation of human memory B cells. Moreover, we suggest that Syk-mediated signaling on B cells is involved in pathological process in autoimmune diseases via producing autoantibody, however, more dominantly in pathology of SLE compared with RA.

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B Cells in Early Rheumatoid Arthritis: ZAP-70 More Than SYK Characterize Seropositive Disease. Anna Laura Fedele, Barbara Tolusso, Elisa Gremese, Silvia Laura Bosello, Angela Carbonella, Silvia Canestri and Gianfranco Ferraccioli. Division of Rheumatology, Institute of Rheumatology and Alline Sciences, Catholic University of the Sacred Heart, Rome, Italy

Background/Purpose: B cells are involved as central players in the pathogenesis of rheumatoid arthritis (RA). Our aim was to define whether a specific B cell subset characterizes the early phases of the disease and is associated with a particular RA phenotype.

Methods: 105 ERA patients (81.0% females; mean age 54.7 ± 15.2 years; 73.3% autoantibodies-AAB positive) and 30 healthy controls (HC) were studied. Baseline clinical and immunological characteristics and inflammatory status were assessed. Peripheral blood samples were analyzed by flow cytometry for the distribution of B cell subsets by staining with surface markers CD19, CD45, CD38, CD27 and IgD and intracellular marker ZAP70. Plasma levels of IL-6 and BAFF were also determined with ELISAs.

The expression of ZAP-70 and SYK was analyzed in B cells of 22 ERA patients, using the RealTime ready Assay method.

Results: ERA patients showed a higher percentage of naïve-activate B cells and a lower percentage of memory B cells compared to HC, as confirmed by a higher ratio between Bm2 + Bm2+/eBm5 + Bm5 (3.4 ± 3.5 ERA and 1.7 ± 0.9 in controls; p = 0.001). AAB positive patients showed a higher percentage of CD19 + /CD38 + CD27 + (4.0 ± 5.0%) compared to AAB negative ones (2.2 ± 2.8%; p = 0.05). The expression of ZAP-70 in B cells was similar in ERA patients and controls. Dividing patients for the AAB seropositivity, AAB + ERA patients showed higher percentage of CD19 + /ZAP70+ cells compared to AAB- (5.1 ± 6.3 vs 2.5 ± 2.4; p = 0.01) and also to HC (2.2 ± 1.4; p = 0.05). In ERA patients, the percentage of ZAP70+ B cells correlated directly with the percentage of CD19 + /IgD + CD27 - cells (r = 0.338; p = 0.001), plasma BAFF levels (r = 0.26; p = 0.01) and with Anti-MCV (r = 0.27; p = 0.01), ACAP (r = 0.23; p = 0.02) and RF-IgA (r = 0.28; p = 0.01) AAB titers. ZAP70 transcription in B cells of subjects seropositive for autoantibodies was significantly higher than in seronegative ones (3.4 ± 2.8 vs 1.2 ± 1.0 respectively; p = 0.04), data confirmed by an higher ratio of ZAP70/SYK in AB + compared to AB - (2.9 ± 1.6 vs 1.2 ± 1.0 respectively; p = 0.01). Moreover, the expression of ZAP70 correlated positively with the expression of SYK (r = 0.66; p = 0.003) and showed a trend for an association with the expression of ZAP70 protein, evaluated by flow-cytometry (r = 0.41; p = 0.09).

Conclusion: ZAP-70 positive B cells characterize AAB positive RA and the expression of ZAP-70 might be a possible complementary biomarker of seropositive disease.

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Background/Purpose: Alterations in B cell immune tolerance are important in the development of autoimmune rheumatoid arthritis (RA). Recent studies in healthy human subjects have identified a subset of potentially autoreactive CD19 + CD27 - IgD + IgMlow- late transitional cells that constitute ~ 2.5% of peripheral B cells and have anergic signaling properties. These cells are hypersensitive to antigen receptor stimulation in vitro and have the capacity to produce autoreactive antibodies (Abs). The function and signaling properties of these cells have not been characterized in RA (or any other human autoimmune disorder to date). Early alterations in signaling profile of these cells are of significant value for the prediction of the onset of autoimmunity as pathogenic Abs and other clinical manifestations of RA are detectable only after a prolonged period of autoantibody expansion.

Methods: Phosphorylation of intracellular signaling proteins and intracellular Ca2 + levels in CD19 + CD27 - IgD + IgMlow- B cells at baseline and in response to in vitro BCR stimulation with polyclonal anti-human Ig were measured with a peculiar RA phenotype.

Results: B cell signaling profiles at baseline and in response to anti-BCR stimulation were examined in 32 healthy donors (mean age 35.7; male/female ratio 0.68) and 20 RA patients (mean age 55.9; male/female ratio 0.54) from UC Denver Hospital Rheumatology Clinic. RA patients were recently diagnosed; most were serum RF and/or anti-CCP positive and have not undergone B cell targeted treatments. No significant phenotypic or quantitative differences were found between IgM+ and CD19+CD27-IgD+ IgMlow- B cell subsets obtained from RA patients and normal controls. CD19+CD27-IgD+IgMlow- B cells from RA patients demonstrated increased baseline total phospho tyrosine (pTyr) protein phosphorylation as compared to normal controls. In contrast to the control group, in RA patients, CD19+CD27-IgD+IgMlow- cells total pTyr and Ca2 + responses to anti-BCR stimulation resembled those of normal non-anergic IgM+ B cells. Comparison of baseline phosphorylation levels of individual signaling molecules between unstimulated RA and control CD19+CD27-IgD+IgMlow- B cells revealed pronounced increases in Blnk, SHP2, CD2 and CD138.

Conclusion: CD19+CD27-IgD+IgMlow- B cells under normal conditions showed characteristic signaling inhibition, which was reversed in this cell population in RA patients. A distinct phosphorylation pattern for major signal transduction proteins in CD19+CD27-IgD+IgMlow- B cells in RA patients as compared to healthy controls at baseline and in response to BCR stimulation was demonstrated.

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Synovial Gene Expression and Response to Rituximab: Preliminary Data. Yasser El-Sherbiny1, Sarah Churchman1, Frederique Ponchel2, Paul Emery3 and Edward M. Vital1. 1NHRI Leeds Biomedical Research Unit, University of Leeds and Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom, 2University of Leeds, Leeds, United Kingdom

Background/Purpose: Quality and duration of response to rituximab in rheumatoid arthritis have not been completely explained. In the synovium, three studies have indicated a relationship between higher plasma cell numbers at baseline and worse, or shorter lasting responses1,2,3. In this study, we measured synovial expression of genes involved in B-cell biology, cell survival and trafficking and inflammation.

Methods: Synovial arthroscopic biopsies were collected and snap frozen from patients at baseline and 26 weeks after rituximab. Immunohistochemistry was performed for CD3, CD19, CD20cy, CD138 and CD68 using the Menarini universal staining kit and scored for positive cells/mm2 using digital image analysis. The remainder of the tissue was used for RNA extraction. A 48 gene custom Taqman array was designed, including cell lineage markers (CD3, CD19, CD20cy, CD138, CD68), genes of the BAFF-APRIL system, immunoglobulins, cytokines, chemokines and adhesion molecules implicated in RA synovitis or cell trafficking, and a reference gene (HPRT). Informative data are available from 32 biopsies before and 23 post-treatment.

Results: As previously reported, IHC showed complete B-cell depletion in synovium in 22/25 patients using both CD19 and CD20cy antibodies. Plasma cells (CD138) were not significantly reduced and post-treatment. CD138 IHC-score was lower in patients with sustained clinical response (>12 months), and these patients also had significantly lower post-treatment rheumatoid factor titre. CD138 IHC score correlated with baseline CXCL13 (R = 0.738, p < 0.001), and negatively with baseline EGF (R = -0.617, p = 0.006). Post-treatment plasma cell IHC-score also correlated significantly with immunoglobulin kappa and heavy constant chain gene expression, but none of the immunoglobulin genes was significantly associated with sustained response.

Comparing EULAR responders and non-responders, there were trends to higher baseline CD20 gene expression in non-responders (p = 0.079) and greater reduction in CXCL13 (p = 0.066) and MMP (p = 0.024) in responders.

Lower expression of ICAM (p = 0.021), FGF (p = 0.044), CD20 (p = 0.055) and p53 (p = 0.025) and higher expression of APRIL (p = 0.029) at baseline was associated with normalisation of CRP after therapy. Furthermore, these patients also showed a significantly greater reduction in expression of CD4, CD55, CD68, CXCL12, EGF, FGF, ICAM, PECAM, STAT5, TGFBeta, APRIL and BAFF (all p < 0.05).

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Conclusion: Preliminary results indicate important differences in synovial gene expression in patients with clinical response to rituximab, notably in relation with genes involved in cell trafficking and survival. These results may help elucidating reasons for, and consequences of plasma cell survival.

References
1. Tong et al. Arthritis & Rheumatology 2008; S6(12)
3. Vital et al. EULAR 2012

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Circulating Plasmablasts As a Source of Anti-Citrullinated Protein Antibodies in Patients with Rheumatoid Arthritis. Priscilla Kerkman, Ellen I.H. van der Voort, Leendert A. Trouw, Tom W.J. Huizinga, René E.M. Toes and Hans Ulrich Scherer. Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: Anti-citrullinated protein antibodies (ACPA) are highly specific for rheumatoid arthritis (RA) and predict disease onset and severity. Accumulating evidence indicates that ACPA could play an important role in RA pathogenesis by contributing to inflammation and joint destruction. So far, however, little is known on the characteristics of ACPA producing B cells. In this study, we set out to define ACPA producing B cells in more detail in order to allow for specific targeting of these cells.

Methods: Peripheral blood CD19 positive B cells from patients with ACPA positive RA (n=30) were isolated using magnetic beads. In addition, B cell subsets were purified by FACS-sorting based on the expression of surface markers CD19, CD20 and CD27. Isolated B cell populations were either cultured in vitro in the presence of anti-IgM, IL-21 and BAFF on a layer of irradiated CD40L transfected fibroblasts, or left in medium without additional stimulation. Following culture for 6 and/or 13 days, supernatants were assessed for the presence of ACPA-IgG and non-specific total IgG by ELISA.

Results: Following stimulation, ACPA could be detected in up to 100% of culture wells. Both the average ACPA titer in the wells as well as the percentage of positive wells correlated with measures of disease activity. No reactivity was observed against the arginine containing control antigen. No ACPA production was detectable by B cells isolated from ACPA negative RA patients or healthy controls. Of interest, ACPA were also produced spontaneously ex-vivo without stimulation. Active ACPA production was detectable for extended periods of time (up to 4 weeks). FACS-sorting experiments comparing isolated B cell subsets indicated that spontaneous ACPA production resides, for a large part, in the circulating plasmablast population. Spontaneous ACPA production was still observed after depletion of the CD20 positive B cell population.

Conclusion: We show that ACPA producing plasmablasts circulate in the peripheral blood of ACPA positive RA patients in a disease activity dependent manner. Ex vivo, these plasmablasts were not short-lived and were not targeted by an anti-CD20 antibody. These observations enhance our understanding of ACPA producing B cells and could be relevant for future targeted therapies.

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The Absolute Concentration of Anti Citrullinated Protein Antibodies in Serum and Synovial Fluid in Relation to Total Immunoglobulin-Concentrations. Annemiek Willemze, Jing Shi, Marlies Mulder, Gerrie Stoeken-Rijsbergen, Tom W. J. Huizinga, René E. M. Toes and Leendert A. Trouw. Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: The presence of anti-citrullinated protein antibodies (ACPA) is one of the most predictive factors for the development of rheumatoid arthritis (RA). Nonetheless, relatively little information is present on the absolute concentration ACPA in serum and synovial fluid in relation to total Ig-concentrations. Here, we estimated the relative abundance of ACPA immunoglobulins in serum and synovial fluid using a quantitative approach.

Methods: ACPA from synovial fluid and serum samples were purified by using high affinity strep columns coupled with biotinylated Cyclic Citrullinated Peptide (CCP). A control column (CCP-arginine) was used to guarantee the specificity of the antibody. Total IgG, IgA, IgM and anti-CCP isotype reactivity were measured by Enzyme-linked immunosorbent assay (ELISA).

Results: ACPA were successfully isolated as substantial amounts of antibodies were eluted from sera of ACPA positive patients and neglectable amounts of antibodies were eluted from sera of ACPA negative patients. In serum samples and synovial fluid of ACPA-positive RA patients with high ACPA levels at least one percent of total IgG was IgG ACPA. Furthermore IgM-ACPA was most abundant in synovial fluid samples as compared to serum samples (with the highest enrichment in the range of 1 IgM ACPA for every 33 total IgM antibodies). IgA, IgG and IgM ACPA were more abundantly present in synovial fluid as compared to paired serum and plasma samples.

Conclusion: IgG-ACPA is present in high concentrations in synovial fluid and serum, as at least 1 in every 100 antibodies present are ACPA in patients with high ACPA-levels. Strikingly, IgM-ACPA is abundantly present in synovial fluid. Given the short half life of IgM, these data indicate the presence of a continuous ongoing autoimmune response in the synovial compartment that is hallmarked by the activation of IgM-ACPA producing B cells.

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Affinity Purification and Characterisation of Anti-CCP Antibodies From Plasma and Synovial Fluids of Patients with Rheumatoid Arthritis. Elena Ossipova, Catia Cerqueira, Evan Reed, Nastya Kharlamova, Lena Israelsson, Rikard Holmåhl, Anca Irinel Catrina, Vivianne Malmström, Yngve Sommarin, Lars Klareskog, Per Johan Jakobsson and Karin Lundberg. Rheumatology Unit, Department of Medicine, Karolinska Institutet, Stockholm, Sweden, Department of Medical Biochemistry and Biophysics, Karolinska Institutet, Stockholm, Sweden, Euro-Diagnostica AB, Malmö, Sweden

Background/Purpose: Autoimmunity in rheumatoid arthritis (RA) is characterized by autoantibodies to citrullinated proteins/peptides (ACPA). These antibodies (present in 60–70% of patients) antedate clinical onset and associate with an erosive disease course, suggesting a direct pathogenic involvement in disease initiation and progression. With this study, we aimed to utilise plasma and synovial fluids (SF) from patients with RA, for the purification of ACPAs reactive with the peptides used in the CCP2 ELISA assay. Furthermore, to characterise their frequency in plasma and SF as well as reactivity with different autoantigen-derived peptides.

Methods: Plasma (n=16) and SF (n=26) samples were collected, with informed consent and ethical approval, from RA patients with anti-CCP2 IgG levels above 300AU/ml. Total IgG was isolated on Protein G columns, and subsequently applied to CCP2 affinity columns, kindly donated by EuroDiagnostics. Flow through and eluate fractions were assayed for antibody responses using the CCP2 ELISA, as well as in-house ELISAs, for analysis of reactivity to citrullinated peptides from α-enolase, vimentin, fibrinogen and collagen type II.

Results: Pure and intact anti-CCP IgG antibodies were efficiently isolated from plasma and SF samples. No citrulline-reactivity was detected in the CCP2 column flow through fractions. Purified anti-CCP IgG from different patients showed differences in binding to CCP2 ELISA plates (assayed at the same antibody concentration), still a majority showed reactivity with the four citrullinated autoantigen-derived peptides. Purified anti-CCP IgG also bound citrullinated, but not uncitrullinated, human fibrinogen, by Western blot, while the corresponding CCP2 column flow through IgG bound neither citrullinated nor uncitrullinated fibrinogen. A median of 1.5% of the IgG pool in plasma and 2.2% in SF, with four SF samples reaching 6%, were CCP2-reactive.

Conclusion: Here we demonstrate an efficient and robust method to isolate anti-CCP IgG from plasma and SF. Furthermore, that ACPAs reactive with epitopes on different citrullinated autoantigens (i.e. α-enolase, vimentin, fibrinogen and collagen type II), which are largely non-cross-reactive, are captured by the CCP2 column. These purified anti-CCP IgG molecules will provide us with new opportunities to investigate functional and structural aspects of human anti-citrullinated protein/peptide antibodies, including pathogenicity.

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Recognition of Citrullinated and Carbamylated Proteins by B cell Antibodies: Specificity, Cross-Reactivity and the “AMC-Senshu” Method. Jng Shi 1, George Janssen 1, Peter van Veelen 1, Janwouter Drijfhout 2, Antony Cerami 2, Tom Huizinga 3, Leendert A. Trouw 3 and Rene E.M. Toes 1. 1LUMC, Leiden, Netherlands, 2Leiden University Medical Center, Leiden, Netherlands, 3Leiden University Medical Centre, Leiden, Netherlands.

Background/Purpose: Anti-citrullinated protein antibodies (ACPAs) play an important role in the diagnosis and prognosis of Rheumatoid Arthritis (RA). The Anti-Modified Citrulline (AMC) (‘Senshu’) method is the most frequently used method to detect citrullinated proteins. Recently, we identified antibodies against carbamylated proteins (anti-CarP) and wished to know whether the ‘AMC-Senshu’ method could discriminate citrullinated and carbamylated proteins. More importantly, we also wished to know to what degree human autoantibodies can discriminate between these two modifications.

Methods: We analyzed the reactivity of the ‘AMC-Senshu’ method and selected sera of RA patients on western blots targeting citrullinated, carbamylated or non-modified Fetal Calf Serum (FCS) and Fibrinogen (Fib). The levels of ACPA and anti-CarP antibodies in sera before and after ACPA depletion were compared and potential cross-reactivity analysed.

Results: The ‘AMC-Senshu’ method strongly stained both citrullinated and carbamylated FCS and as well as citrullinated and carbamylated Fib but not the non-modified counterparts. This indicates that this method can not discriminate between these two modifications. Using patient sera we showed that autoantibodies present in human serum can be specific for either carbamylated Fib or citrullinated Fib. In addition many RA patients can be double positive for both reactivities. To analyze if these patients are double positive because of cross-reactivity or because they contain two antibody families we used ACPA depletion columns to deplete all ACPA followed by analysis of ACPA levels and anti-CarP levels. After ACPA depletion, more than 60% of ACPA in the sera were depleted while more than half of anti-CarP antibodies remained in the flow through in 5 out of 7 samples tested. These data indicate that part, but not all anti-CarP antibodies are cross-reactive to citrullinated epitopes.

Conclusion: In conclusion, the ‘AMC-Senshu’ method identifies both citrullinated and carbamylated proteins. In contrast human autoantibodies can discriminate between these two modifications indicating the presence of two separate families of autoantibodies, one directed against citrullinated proteins and one directed against carbamylated proteins with a limited degree of cross-reactivity.

Disclosure: These studies were financially supported by Janssen Biologics BV, (Johnson & Johnson)

Anti Carbamylated Protein Antibodies (Anti-CarP) Are Present in Arthralgia Patients and Predict the Development of Rheumatoid Arthritis. Jng Shi 1, Lotte van de Stadt 2, Nivine Levart 2, T.W.J. Huizinga 3, L. A. Trouw 3, None; R. E. M. Toes 3, None. 1LUMC, Leiden, Netherlands, 2Jan van Breemen Research Institute | Reade, Amsterdam, Netherlands, 3Leiden University Medical Center, Leiden, Netherlands.

Background/Purpose: Recently, we discovered a new autoantibody system in rheumatoid arthritis (RA): anti carbamylated protein antibodies (anti-CarP). These antibodies have additional prognostic value in predicting joint destruction when compared to anti-citrullinated protein antibodies (ACPA). However, it is not yet known whether anti-CarP antibodies are present before the diagnosis of RA and whether they have predictive value for the development of RA. Therefore we studied whether anti-CarP antibodies are present in arthralgia patients and whether their presence associates with the development of RA.

Methods: Sera of 340 arthralgia patients without clinical signs of arthritis and 32 healthy controls were measured for the presence of anti-CarP IgG antibodies. One hundred eleven arthralgia patients (33%) were IgM-rheumatoid factor (IgM-RF) positive/anti-cyclic citrullinated peptide 2 (aCCP2) negative and 229 (67%) were aCCP2 positive. Patients were followed for the development of RA (2010 criteria). The median follow up time was 36 months. Cox regression analysis was performed to compare the risk of developing RA between Anti-CarP positive and negative arthralgia patients in follow up time.

Results: The arthralgia cohort consisted of 340 IgM-RF and/or aCCP2 positive patients. Anti-CarP antibodies were present in sera in 113 (39%) of the tested patients. A total of 120 patients developed RA after a median (IQR) of 12 (6–24) months. The presence of anti-CarP antibodies was associated with the development of RA in the whole arthralgia cohort even after correction for RF and aCCP2 status (HR: 1.56; 95%CI: 1.06–2.29; p = 0.023), as well as in the aCCP2 positive subgroup (OR: 2.231; 95%CI: 1.31–3.79; p = 0.003).

Conclusion: Anti-CarP antibodies were present in arthralgia patients and their presence predicted the development of RA independent of aCCP2 antibodies.

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Anti Carbamylated Protein Antibodies (Anti-CarP) Are Present in Sjögren’s Syndrome Associated Lymphoproliferation. David Saadoun 1, Benjamin Terrier 1, J. Bannock Sr. 1, T. Vazquez Sr. 1, C. Massard Sr. 1, Florence Joly Sr. 1, Michelle Rosenzwajg Sr. 1, Damien Sene Sr. 1, Philippe Benech Sr. 1, David Klatzmann Sr. 1, Eric Meffre Sr. 1 and Patrice Cacoub Sr. 1. 1Department of Internal Medicine and Laboratory 13 “Immunology, Immunopathology, Immunotherapy”, UMR CNRS 7211, INSERM U959, Groupe Hospitalier Pitie-Salpetriere, Universite´ Pierre et Marie Curie, Paris 6, Paris, France, Paris, France, 2Cochin Hospital, Paris, France, 3Yale University School of Medicine, New Haven, CT, 4CNRS UMR 7211 and INSERM U959, Paris, France, 5Pitie´-Salpe´trie`re, Universite´ Pierre et Marie Curie, Paris 6, Paris, France, 6Laboratory I3 “Immunology, Immunopathology, Immunotherapy”, UMR CNRS 7211, INSERM U959, Paris, France, 7Groupe Hospitalier Pitie´-Salpe´trie`re, Universite´ Pierre et Marie Curie, Paris 6, Paris, France, 8CHU Pitie´-Salpe´trie`re, Paris, France.

Background/Purpose: Primary Sjogren’s syndrome (pSS) is the autoimmune disease associated with the higher risk of developing non-Hodgkin lymphoma.

Objective: To determine the nature of B cells driving lymphoproliferation in pSS.

Methods: B cell subsets and function were analyzed in peripheral blood from 66 adult patients with pSS [including 15 patients with B-cell lymphoproliferative disorder (LPD)] and 30 healthy donors, using flow cytometry, calcium mobilization, and gene array analysis. We tested by ELISA the reactivity of recombinant antibodies isolated from single B cells from pSS-LPD.

Results: We report here the expansion of an unusual CD21low B cell population which correlates with lymphoproliferation in pSS patients. A majority of CD21low B cells from pSS patients expressed autoreactive antibodies, which recognized nuclear and cytoplasmic structures. These B cells belonged to the memory compartment because their immunoglobulin genes were mutated. They were unable to induce calcium flux, become activated, or proliferate in response to B-cell receptor and/or CD40 triggering, suggesting that these autoreactive B cells may be anergic. However, CD21low B cells from pSS remained responsive to TLR9 stimulation. Gene array analyses of CD21low B cells revealed molecules specifically expressed in these B cells and that are likely to induce their unresponsive stage.

Conclusion: pSS patients who display high frequencies of autoreactive and unresponsive CD21low B cells are susceptible for developing lymphoproliferation. These cells remain in peripheral blood controlled by functional anergy instead of being eliminated, and chronic antigenic stimulation through TLR9 stimulation may create a favorable environment for breaking tolerance and activating these cells.

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Hyperammaglobulinemia in Primary Sjögren’s Syndrome Is Induced by Triggering of TLR7 and 9.

Guillevin and Luc Mouthon Sr. 1 Hopital Cochin, Paris, France, 2 Universite’t Nordmark and Marie Wahren-Herlenius 1. 1 Karolinska Institutet, Stockholm, Sweden, 3 Rheumatology, Uppsala, Sweden

Background/Purpose: Multiple B cell aberrances have been linked to primary Sjögren’s syndrome (pSS), including autoantibody production and a skewed B cell differentiation. Further, approximately 50% of all patients with pSS display hyperammaglobulinemia. Chloroquine-derived antimalarial drugs, commonly used in treatment of pSS, are thought to mediate their therapeutic effect by inhibiting the endosome, and thereby affecting TLR7 and 9 signaling. However, so far little is known about why chloroquinines have a beneficial effect.

Methods: Freshly prepared PBMCs from untreated and chloroquine-treated pSS patients and healthy controls were sorted by flow cytometry. Naïve IgD+ B cells were cultured eight days with class-switch inducing agents; anti-CD40, BAFF, Luminiquod (TLR7) and CpG (TLR9), all supplemented with IL-10. Culture supernatants were analyzed for IgM and IgG concentrations and cells were phenotyped by flow cytometry. Microarray-based mRNA expression analysis was performed on PBMC from untreated pSS patients and controls.

Results: Upon induction of class-switch, B cells will secrete IgM and subsequently IgG and some will develop further into plasma cells expressing CD138.

When stimulating with TLR7 and 9 agonists significantly higher titers of IgM and IgG were observed in supernatants of cells from pSS patients compared to controls. Further, a significantly increased proportion of CD138+ plasmablasts were observed in the cultures established from pSS patients compared to controls. No significant differences were observed when stimulating with other class-switch inducing agents (CD40, BAFF). To further support our findings an mRNA expression analysis of unmanipulated PBMCs from pSS patients (n=14) and controls (n=18) was performed. Key genes in the endosomal TLR pathways, including TLR7 and 9, TINF1P3 and IRF5, were significantly up regulated in pSS patients. However, the signaling pathways of CD40 and BAFF were unaffected.

Conclusion: Class-switch was also induced in B cells from patients treated with antimalarial drugs. Interestingly, lower levels of IgG and IgM were seen in chloroquine treated patients, compared to untreated pSS patients. In concordance, fewer plasmablasts were detected in the chloroquine-treated patients.


Alexis Regent1, Hanadi Diib2, Guillaume Busson1, Mathieu C. Tambiy1, Nicolas Tamas3, Christian Federici2, Cedric Broussard1, Loic Guilleuv1 and Luc Mouthou2. 1 Hopital Cochin, Paris, France, 2 Universite’t Paris Descartes, Paris, France, 3 Inserm U1016, Institut Cochin, CNRS UMR 8104, Paris, France.

Background/Purpose: Anti-endothelial cell antibodies (AECA) are frequently detected in anti-neutrophil cytoplasm antibodies (ANCA)-associated systemic vasculitides (AVV) and are considered to play pathological roles but their antigenic specificities are still unknown. We used a proteomic approach combining two-dimensional electrophoresis and immunoblotting to identify the target antigens of AECA in patients with ANCA-associated vasculitides.

Methods: Sera from 30 ANCA-associated vasculitis patients (12 with Cryoglobulomatosis with polyangiitis (GPA), 9 with microscopic polyangiitis (MPA), 9 with Churg-Strauss syndrome (CSS),) tested in pools of 3 sera, were compared to a sera pool from 12 healthy controls (HC). Serum IgG reactivity was analyzed by use of a 2-D electrophoresis and immunoblotting technique with normal human umbilical vein endothelial cell (HUVEC) antigens.

Results: Serum IgG in the HC sera pool recognized 85 protein spots and serum IgG from patients with AAV recognized 134±65 different protein spots. We focused on protein recognized by at least 3/4 pools of patients with GPA and 2/3 pools of patients with MPA and CSS and not by HC and identified 20, 7 and 8 proteins, respectively. In addition, among the 330 spots recognized by at least one pool of patients with AAV, ten different spots were recognized by at least 6/10 pools. Among identified proteins, IgG reactivity was detected against alpha-actin, lamin A/C and protein dinulide-isomerase A3. Interestingly, Ingenuity Pathway Analysis revealed that most of these antigens interact with TGF-β, immunoglobulins and inflammatory complexes such as Jun and MAPK.

Conclusion: AECA detected in patients with AAV recognize cellular targets playing key roles in cell biology. Target antigens interact with protein and complexes known to play a crucial role in AAV pathophysiology.

The Phosphoinositide-3-Kinase Pathway Regulates Fibroblast-Like Synoviocyte Invasion.

Beatrix Bartok1, Deepa Hammaker2 and Gary S. Firestein3. 1 UCSD, La Jolla, CA, 2 Univ of California San Diego, La Jolla, CA, 3 UCSD School of Medicine, La Jolla, CA

Background/Purpose: Cartilage destruction mediated by invasive fibroblast-like synoviocytes (FLS) plays a central role in pathogenesis of RA. Increased cell migration and degradation of extracellular matrix are fundamental to these processes. The Class I phosphoinositide 3-kinases (PI3K) control cell survival, proliferation and migration, which might be involved with cartilage damage in RA. PI3Kdelta isoform expression was recently identified as a key regulator of FLS growth and survival, suggesting that it could contribute to synoviocyte aggressive behavior. Therefore, we assessed the role of PI3Kdelta in synoviocyte invasion and matrix degradation using isoform selective PI3K inhibitors.

Methods: FLS were cultured in Matrigel coated transwells. PI3K inhibitors or vehicle were added to the upper chamber and PDGF was used as a chemoattractant in the lower chamber. The invading cells were quantified by staining the filters with 1% crystal violet. F-actin was visualized with Rhodamin phalloidin and analyzed with fluorescent microscopy. Rac1 activation was measured using PK1/1BD GST pull down and quantified by Western blot analysis. PI3K inhibitors included: pan (GDC-0941), PI3Kalpha (BMS-345541), PI3Kbeta (GSK681), PI3Kdelta (INK007 and CAL-101) and PI3K-delta/gamma (INK055 and IPI-145).

Results: PDGF-directed invasion was completely inhibited by the pan PI3K inhibitor (1 uM). To define the role of the individual isoforms, we tested the effect of the isoform selective PI3K inhibitors. PI3Kdelta inhibition (INK007) significantly decreased the number of invading cells, with 60±5% inhibition at 1 uM (p<0.04). Similar results were observed with two other inhibitors with distinct chemical structures (CAL-101 and INK055). The PI3Kalpha inhibitor decreased invasion by 40±5% while PI3Kbeta and PI3Kgamma inhibitors had no effect. Phalloidin staining was then used to visualize FLS actin rearrangement in response to PDGF with or without PI3K inhibitors. PI3Kdelta inhibition by INK007, CAL-101 and IPI-145 decreased lamellipodia formation by 50±6% (p<0.05). Similar inhibition was seen with the pan PI3K inhibitor, while the selective inhibitors of PI3Kalpha, PI3Kbeta or PI3Kgamma had no effect. We then hypothesized that PI3Kdelta might modulate activation of Rho GTases in synoviocytes, which regulate actin organization. PI3Kdelta inhibition with INK007 had no effect on baseline Rac1 activation but blocked activation in response to PDGF by 95±6% (p<0.03). Similar findings were observed with the pan PI3K inhibitor, while PI3Kalpha inhibition had no significant effect.

Conclusion: PI3Kdelta is a major regulator of FLS migration and invasion and functions by inhibiting Rac1 activation and modulating F actin cytoskeleton rearrangement. These observations, together with previous findings that PI3Kdelta regulates FLS growth and survival, suggest that PI3Kdelta inhibition could be chondroprotective in RA by modulating synoviocyte growth, migration and invasion.

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Anti-SSA/Ro Mediated Injury to the Endothelium Via Urokinase Plasminogen Activator Receptor/TGFbeta Activation: Implications in the Pathogenesis of Congenital Heart Block. Parsaevski Braisouli1, Mark Halushka1,2,3, and Robert M. Clancy1,4.
1New York University Medical Center, New York, NY; 2John Hopkins Pathology, Baltimore, MD; 3NYU School of Medicine, New York, NY; 4New York University School of Medicine, New York, NY

Background/Purpose: One mechanism by which anti-Ro antibodies are linked to the pathogenesis of (cardiac-NL) neonatal lupus is the increased urokinase plasminogen activator (uPA)/urokinase-type plasminogen activator receptor (uPAR)-dependent plasminogen activation and subsequent triggering of TGFbeta signaling. Immunologic staining of affected hearts reveals cell specific expression of uPA on endothelial cells and infiltrating macrophages in areas of inflammation and fibrosis. Since plasminogen-plasmin-dependent TGFbeta signaling has a documented role in endothelial cell survival, this study evaluated the association of anti-Ro and an injury pathway in the fate of the cardiac vasculature.

Methods: Adhesion, tube formation, TGFbeta activation assays were used to assess the effect of antibodies on endothelial cell function. Immunohistochemistry of cardiac-NL autopsies were conducted to evaluate diseased vasculature.

Results: Human IgGs were used from a healthy control (nl-IgG) and a mother whose serum contained reactivity to all the components of the SSA/Ro-SSB/La complex and whose child had cardiac-NL (CHB-IgG). Adherence was enumerated (colorimetric dye) after vascular endothelial cells (CD3 cell line) were incubated with CHB-IgG (0.03 mg/ml, 2 hr) or nl-IgG, with or without plasmin inhibitor aprotinin (10 μg/ml) or TGFbeta inhibitor SB5543 (10μM). CHB-IgG confluence significantly reduced EC adhesion on ECM (collagen-coated surfaces) compared with nl-IgG (0.38±0.1 vs 0.89±0.09 respectively) adhesion units, scale 0–3, p = 0.02, n = 3). The CHB-IgG decreased adhesion was reversed in the presence of either aprotinin or SB5543. Further evidence to implicate a plasmin/TGFbeta axis was provided by the observation that ECs treated with CHB-IgG, but not nl-IgG, increased luciferase activation of a TGFbeta reporter cell line (TMLC) (432±20 vs 138±12 RLU respectively, p = 0.003, n = 3), an effect abrogated by cotreatment with aprotinin or SB5543. Vessel formation was evaluated by visual inspection of networks after ECs were plated on matrigel (8 hr). Exposure of ECs to CHB-IgG but not nl-IgG markedly attenuated blood vessel formation in vitro which again was reversed by cotreatments with aprotinin and SB5543 as observed in the adhesion studies (n = 4). As further proof of concept, during migration of ECs on collagen-coated surfaces, confocal microscopy revealed colocalization of uPAR with anti-Ro60 (but not anti-Ro52 or anti-RNP) at the tips of migrating cells. Surprisingly the concentrations of the A2AR agonist CGS21680 were not sufficient to completely block EC migration, while the specific Epac activator 8-CPT-2’O-Me-cAMP markedly increased Col1 expression, but inhibited Col3 expression. In contrast, stimulation with the specific Epac inhibitor Ro60 (but not anti-Ro52 or anti-RNP) at the tips of migrating cells. Moreover, A2AR blockade enhances the strength of scars by, in part, diminishing the collagen 3 (Col3) content of the scar relative to Col1 content. Here we determined whether expression of Collagen-1 (Col1) and Collagen-3 (Col3) proceed by different signaling pathways.

Conclusion: The results suggest that anti-SSA/Ro interference during the remodeling events occurring in angiogenesis results in increased uPAR-dependent uPA activity with generation of active TGFbeta. This then leads to the attenuation of adhesion and new vessel development and ultimately a loss of vasculature in the septal region of affected hearts.

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The Bioenergetic Role of HIF-1 and HIF-2 During Angiogenesis of Human Microvascular Endothelial Cells. Martin Hahne, Cindy Strehl, Manuela Jakstadt, Paula Hoff, Timo Gaber, Gerd R. Burmester and Frank Buttgereit.
1Human Microvascular Endothelial Cells. The Bioenergetic Role of HIF-1 and HIF-2 During Angiogenesis of Normal Human Dermal Fibroblasts. Miguel Perez Aso1 and Bruce N. Cronstein, 2NYU Univ Medical Center, New York, NY; 3NYU School of Medicine, Division of Rheumatology, New York, NY

Background/Purpose: Pathological fibrosis in the skin and other organs is the hallmark of scleroderma and other fibrosing diseases. Adenosine, acting at A2A/A2B receptors, plays a critical role in wound healing and fibrosis of the skin and pulmonary fibrosis. These studies have demonstrated that blockade of A2A/A2B receptors prevents dermal fibrosis in response to bleomycin, a murine model of scleroderma. Moreover, A2A/A2B blockade enhances the strength of scars by, in part, diminishing the collagen 3 (Col3) content of the scar relative to Col1 content. Here we determined whether expression of Collagen-1 (Col1) and Collagen 3 (Col3) proceed by different signaling pathways.

Methods: Col1 and Col3 expression were determined by Western-Blot analysis of normal human dermal fibroblasts (NHDf).

Results: Surprisingly the concentrations of the A2A agonist CGS21680 required to increase Col1 expression were significantly lower than those required to increase Col3 (0.1μM: 147±6% for Col1 [p<0.01, n = 23] vs 1μM: 155±16% for Col3, [p<0.01, n = 18]) although increases in both were completely blocked by the A2A/R antagonist SCH58261 (0.1μM). The selective Protein kinase A (PKA) activator 8-CcAMP markedly increased Col1 expression (0.1μM: 280±73% [p<0.01, n = 3], but inhibited Col3 expression by as much as 68±11% [p<0.01, n = 4], PKA inhibition by PKAi prevented the CGS21680-stimulated increase in Col1 but elicited an increase of Col3 at lower concentrations than in the absence of PKAi (0.1μM, 110±10% versus 182±30% [p<0.05, n = 4]).

Conclusions: These studies suggest that anti-SSA/Ro interference during the remodeling events occurring in angiogenesis results in increased uPAR-dependent uPA activity with generation of active TGFbeta. This then leads to the attenuation of adhesion and new vessel development and ultimately a loss of vasculature in the septal region of affected hearts.

Disclosure: M. Hahne, None; C. Strehl, None; M. Jakstadt, None; P. Hoff, None; T. Gaber, None; G. R. Burmester, None; F. Buttgereit, None.

1778

Adenosine A2A Receptor (A2AR) Activation Stimulates Increased Expression of Collagen-1 and Collagen-3 by Different Signaling Pathways in Normal Human Dermal Fibroblasts. Miguel Perez Aso1 and Bruce N. Cronstein, 2NYU Univ Medical Center, New York, NY; 3NYU School of Medicine, Division of Rheumatology, New York, NY

Background/Purpose: Hypoxia and angiogenesis are features of inflammation and injured tissues. The transcription factors Hypoxia inducible factor (HIF-1) and (HIF-2) control cellular metabolic response to decreased oxygen tension thereby promoting angiogenesis with implications on the pathogenesis of rheumatoid arthritis (RA). Our studies aims to knockdown HIF-1α and HIF-2α in human microvascular endothelial cells (HMEC), respectively, in order to investigate the effect of HIF-1α and HIF-2α on angiogenesis and bioenergetics under hypoxic versus normoxic conditions.

Methods: Specific knockdown of HIF-1α or HIF-2α was achieved using lentiviral-based shRNA technology. Angiogenesis of transduced HMEC was studied by investigating both tubuli and node formation under hypoxia (<1% O2 versus normoxia (~18% O2). Expression of hypoxia driven genes involved in metabolic response to hypoxia (GAPDH, PGK, GLUT1) was quantified by real-time RT-PCR. Bioenergetic state of the cell was investigated via ADP/ATP measurements.

Results: Knockdown of HIF-1α led to a loss in the hypoxia induced node (p = 0.007) and tubuli formation (p = 0.09). HIF-2α knockdown also resulted in a significant loss of hypoxia induced formation of tubuli (p = 0.04). Focussing on bioenergetics, we found hypoxia to significantly induce PGK (p = 0.0004) and GAPDH (p = 0.049) in control cells. Interestingly, HIF-1α knockdown – but not HIF-2α knockdown – resulted in a loss of hypoxic induction of PGK expression.

In both HIF-1α (p = 0.01) and HIF-2α (p = 0.13) knockdown cells, hypoxia was still capable of inducing GAPDH, but the effect was much less pronounced in HIF-1α knockdown cells.

Hypoxia did not up-regulate GLUT1 neither in control nor in HIF-1α and HIF-2α knockdown cells, respectively.

We also found the ADP/ATP ratio to be similar in control and HIF-1α or HIF-2α knockdown cells under normoxia. Under hypoxic conditions, however, HIF-1α knockdown cells showed a significantly enhanced ADP/ATP ratio (p = 0.05) – indicating that less ATP is available – compared to control cells. This was not the case in HIF-2α knockdown cells.

Conclusion: HIF-1α and HIF-2α are both key regulators of angiogenesis. However, they do differ in their ability to regulate cellular energy metabolism. This leads us to conclude that HIF-2α does directly influence angiogenesis via regulating the synthesis of proangiogenic factors (1), whereas HIF-1α affects angiogenesis via effects on cellular energy metabolism.

These findings provide new insights into regulation of angiogenesis in inflamed (hypoxic) tissues and are, therefore, considered to be of clinical relevance in RA.


Disclosure: M. Hahne, None; C. Strehl, None; M. Jakstadt, None; P. Hoff, None; T. Gaber, None; G. R. Burmester, None; F. Buttgereit, None.
Conclusion: Our work strongly suggests that at nanomolar concentrations of CGS21680 PKA activity prevails over Epac, thereby activating Col1 expression and inhibiting Col3 but in the mmmolar range, the PKA/ERK/INK inhibition of Col3 is overcome by activation of Epac/p38 and PI3K/AKT. These observations may explain the dramatic decrease of the Col1/Col3 ratio in hypertrophic and immature scars, where adenosine is present in mmmolar ranges when compared to normal skin, where adenosine concentration varies from 30 to 300nm.

Disclosure: M. Perez Aso, None; B. N. Cronstein, Canlit BioPharma, 1, NIH, URL. Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regenxer, Gismo Therapeutics, 5, Arthritis Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents., 9

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The Loss of Syndecan-4 Aggravates Inflammatory Colitis in Mice. Athanasons Stratf1, Dominik Bettenworth2, Mareike Fröhling3, Peter Paruzel1, Adelheid Korb-Pap1, Cornma Wehmeyer1, Bemo Dankbar1, Frank Eckthemer3, Andreas Lügering1 and Thomas Pap1. 1University Hospital Muenster, Muenster, Germany, 2University Hospital Hannover, Hanover, Germany

Background/Purpose: Syndecan-4 (sd4) is a transmembrane heparan sulfate proteoglycan. Several studies have implicated sd4 in cell-matrix adhesion, cell migration, differentiation, proliferation and play an important role during the inflammation in rheumatoid arthritis. Modulation of inflammatory signals by sd4 can occur either through mere binding of cytokines, in which case sd4 acts as decoy receptor or through activation of sd4-dependent signalling following sd4 complex formation. While arthritic cartilage damage is decreased in sd4-deficient mice most likely due to reduced sd4 signaling, osteopontin-mediated liver damage has been shown to be increased in these mice due to the lack of sd4 decoy receptor function. Based on this dual effects of sd4, we investigate if the loss of sd4 changes the natural course of murine experimental colitis.

Methods: Colitis was induced in sd4-/- mice and in C57BL/6 WT mice by DSS. The course of colitis was monitored by weight loss as well as assessment of colon length and blinded histological scoring of colonic changes at the end of the experiment. In addition, sd4-/- and C57BL/6 WT mice were orally gavaged with 5×10² colony-forming units (CFU) of Citrobacter rodentium (C. rodentium). Fecal excretion of C. rodentium and changes of body weight were monitored. At day 21 post infection, inflammatory changes of the colon were evaluated histologically.

Results: Beginning from day 5 after start of DSS-administration, sd4-/- mice lost dramatically more body weight compared to WT animals (day 8: 24.8±2.1 vs. 9.2±3.1; p = 0.008). In accordance with the increased loss of body weight, the colon length of sd4-/- mice was significantly shortened (63.3±2.4 vs. 74.8±2.3; p = 0.01) and the histological damage according to the Disease-Score was markedly aggravated (6.0±3.7 vs. 3.4±0.2; p = 0.016). At day 19 post infection, the fecal excretion of C. rodentium in sd4-/- was prolonged compared to WT animals (2.5×10⁵±2.6×10⁵ vs. 9.6×10⁵±6.5×10²; p = 0.01). Histological damage of colonic mucosa, reflected by lengthening of crypts, was increased in sd4-/- mice (14.3±1.3 vs. 10.2±0.9; p = 0.03).

Conclusion: Our results show that like in inflammatory liver damage, sd4-/- seems to have protective effects in intestinal inflammation. Future studies are needed to analyze the underlying mechanisms and to determine if these effects are due to a decoy receptor function of sd4 or whether sd4 complex formation and signalling is involved.

Disclosure: A. Stratis, None; D. Bettenworth, None; M. Fröhnling, None; P. Paruzel, None; A. Korb-Pap, None; C. Wehmeyer, None; B. Dankbar, None; F. Eckthemer, None; A. Lügering, None; T. Pap, None.

1780

Association Between Chondrocyte Hypertrophy and Angiogenesis of Cartilage in Osteoarthritis. Laurence Pesesse1, Christelle Sanchez2, Jean-Pierre Delcour3, Caroline Baudouin4, Philippe Miska4 and Yves Heroutin1. 1University of Lie`ge, Lie`ge, Belgium, 2Bone and Cartilage Research Unit, Liege, Belgium, 3Centre hospitalier du Bois de l'Abbaye, Seraing, Belgium, 4Laboratoires Expanscience, Epernon, France, 5Univ of Liege/Pathology Inst, Liege, Belgium

Background/Purpose: Chondrocyte hypertrophy is commonly observed in OA cartilage, associated with matrix mineralization and vascularization. In our previous work, we demonstrated that hypertrophic differentiation of chondrocytes is initiated by serum-enriched medium in long-term culture in alginate beads suggesting a role played by blood supply in the hypertrophic differentiation of chondrocytes in OA.

As hypertrophic differentiation of chondrocytes is an important feature of osteoarthritis (OA), we developed a model of culture in order to study the functional consequences of hypertrophic OA chondrocytes. The aim of this study was to investigate the link between hypertrophic differentiation of OA chondrocytes and angiogenesis. We therefore demonstrate that OA hypertrophic chondrocytes expressed an angiogenic phenotype and that some specific factors could be implicated in both processes.

Methods: Articular OA chondrocytes were cultured for 28 days in alginate beads in medium containing 2% Ultroser G (UG) or 10% Fetal Bovine Serum (FBS). DNA was quantified by fluorimetry. The expression of hypoxia inducible factors genes type X collagen (col10a1), runt-related factor 2 (runx2) and matrix metalloprotease 13 (MMP13) and a screening of angiogenic factors was evaluated by RT-PCR. Alkaline phosphatase (AP) activity and 5′phosphodiesteaser activity of NTTPPPH were quantified by specific enzymatic methods. Non-hypertrophic and hypertrophic human OA chondrocyte conditioned media were used to perform functional tests with hucvs: migration, invasion and wound healing assays. Data were analyzed by one-way ANOVA.

Results: In alginate beads, chondrocytes cultivated in serum-supplemented medium underwent a hypertrophic differentiation process characterized by significant increased expression of hypoxia markers and mineralization enzymes (col10a1: p < 0.05; runx2: p < 0.01; MMP13: p < 0.001; PA: p < 0.01; NTTPPPH: p < 0.001). Functional angiogenesis assays showed that chondrocyte hypertrophy positively influenced migration (p < 0.0001), invasion (p < 0.0001) and wound healing (p < 0.005) of endothelial cells. Among the screened angiogenic factors, bone sialoprotein (BSP) was highly upregulated in hypertrophic chondrocytes (p < 0.05).

Conclusion: Our culture model allowed to mimic hypertrophic differentiation of chondrocytes and to investigate the relationship between this process and functional invasion and migration of endothelial cells, two functional steps in the process of angiogenesis. The results obtained in this study highlighted BSP as a specific factor that could be implicated in hypertrophic differentiation of chondrocytes and cartilage angiogenesis.

Disclosure: L. Pesesse, None; C. Sanchez, None; J. P. Delcour, None; C. Baudouin, None; P. Miska, None; Y. Heroutin, None.

Background/Purpose: The primary cilium is a microtubule-based, polarized organelle structure that emanates from the cell surface of most mammalian cell types. It serves as a sensor that mediates reactions to mechanical and chemical signals from the environment and is therefore, a crucial factor in the communication with neighbouring cells and the environment.

We aimed to investigate the functional role of the primary cilium expressed on synovial fibroblasts (SF) in the pathogenesis of rheumatoid arthritis (RA).

Methods: The expression of the primary cilium was verified in serum-starved RASF by immunofluorescence microscopy using acetylated tubulin as a marker and by transmission electron microscopy. Cilogenesis of RASF was disrupted by transfection of siRNA targeting the ciliary components kinesin family member 3a (KIF3a) and intraflagellar transport 88 homolog (IFT88). RASF were stimulated with TNF-α and mineralization enzymes (col10a1: p < 0.0001) and wound healing (p < 0.01) of endothelial cells, two functional steps in the process of angiogenesis. The results obtained in this study highlighted BSP as a specific factor that could be implicated in hypertrophic differentiation of chondrocytes and cartilage angiogenesis.

Disclosure: L. Pesesse, None; C. Sanchez, None; J. P. Delcour, None; C. Baudouin, None; P. Miska, None; Y. Heroutin, None.

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Functional Analysis of the Primary Cilium in Rheumatoid Arthritis Synovial Fibroblasts. Kerstin Klein1, Beat A. Michel1, Alexander Vogtseled2, Renate Gay1, Steffen Gay1 and Caroline Ospelt1. 1Center of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHp), Zurich, Switzerland, 2Department of Pathology, University Hospital Zurich, Zurich, Switzerland

Background/Purpose: The primary cilium is a microtubule-based, polarized organelle structure that emanates from the cell surface of most mammalian cell types. It serves as a sensor that mediates reactions to mechanical and chemical signals from the environment and is therefore, a crucial factor in the communication with neighbouring cells and the environment.

We aimed to investigate the functional role of the primary cilium expressed on synovial fibroblasts (SF) in the pathogenesis of rheumatoid arthritis (RA).

Methods: The expression of the primary cilium was verified in serum-starved RASF by immunofluorescence microscopy using acetylated tubulin as a marker and by transmission electron microscopy. Cilogenesis of RASF was disrupted by transfection of siRNA targeting the ciliary components kinesin family member 3a (KIF3a) and intraflagellar transport 88 homolog (IFT88). RASF were stimulated with TNF-α (10ng/ml) and IL-1β (1ng/ml). Differentially expression of transcripts in RASF transfected with KIF3a siRNA with and without cytokine stimulation was screened using Microarrays (Affymetrix). Migration and adhesion properties of transfected RASF were analysed by scratch assay (n=3) and a fibronectin-based adhesion assay (n=7), respectively.

Results: The primary cilium was detected on the surface of RASF. Migration of RASF with blocked formation of the primary cilium due to transfection with siRNA targeting KIF3a or IFT88 was reduced compared to RASF transfected with scrambled siRNA. RASF adhesion to fibronectin was induced by TNF-α (2.1 fold ± 0.9, n.s.) and IL-1β (2.3 fold ± 1.3, p < 0.05) and was reduced in KIF3a siRNA transfected RASF (TNF-α: 1.2 fold ± 0.7, p < 0.05; IL-1β: 1.3 fold ± 0.7, p = 0.1142). In the whole genome expression analysis, 1321 transcripts were more than 2-fold up or down regulated in
RAFLS transfected with KIF3A siRNA and 1243 transcripts were more than 2-fold up or down regulated in the KIF3A siRNA transfected group stimulated with cytokines compared to control groups. 213 transcripts appeared to be differentially expressed under stimulated as well as under unstimulated conditions.

**Conclusion:** Our data show a functional role of the primary cilium in the migratory and adhesive properties of RAFLS. Since disruption of ciliogenesis in RAFLS altered their response to stimulation with TNF-α and IL-1β, we hypothesized that the primary ciliary also plays a key role in the transmigration of pro-inflammatory signals in RAFLS.

**Disclosure:** K. Klein, none; B. A. Michel, none; A. Vogtessler, None; R. Gay, none; S. Gay, none; C. Ospelt, None.

**ACR/ARHP Poster Session C**

**Cytokines, Mediators, and Gene Regulation**

**Tuesday, November 13, 2012, 9:00 AM–6:00 PM**

**1782**

Dual Effects of Soluble FasL and Membrane Bound FasL On Fibroblast-Like Synoviocytes Cells (FLS) From Rheumatoid Arthritis (RA) Patients. Rachel Audina1, Flavia Calmon-Hamaty1, Michael Hahn1 and Jacques Morel2. 1IGMM, CNRS UMR5353, Montpellier, Montpellier, France; 2Hopital Lapeyronie, Montpellier, France

**Background/Purpose:** Membrane bound FasL (mFasL) is able to induce fibroblast-like synoviocytes (FLS) cell death. In experimental arthritic mouse models, injection of agonistic antibody (Ab) anti-Fas decreased the symptoms. However, soluble FasL (sFasL) is increased in RA patients’ serum and correlated with disease activity. These results indicated that mFasL could be protective whereas sFasL could be deleterious suggesting that they could have different functions. We therefore analyzed the effect of different FasL preparation mimicking sFasL or mFasL on RAFLS proliferation, apoptosis and cytokines production.

**Methods:** RAFLS were treated with different FasL preparations (FasL-Flag＋Ab anti-Flag, FasL-Fc or sFasL) or with agonistic Ab anti-Fas. Apoptosis was then analyzed by FACS on basis of the annexin V-FITC binding and TOPRO-3 up-take. Proliferation was measured using tritiated thymidine. Signaling pathways was analyzed by western blot and their influence was assessed using chemical inhibitors. VEGF, IL-6 and IL-8 were measured using commercial ELISA.

**Results:** FasL-Flag alone (mimicking sFasL) was not able to induced FLS apoptosis (8%/±2 n=5) while proliferation was significantly activated (3.3 ±1 fold). Similarly, sFasL was only strongly induced RAFLS proliferation (8.1 ±3.3 fold; n=3). In an other hand, membrane bound FasL (FasL-Flag＋Ab anti-Flag) significantly induced RAFLS apoptosis (52%±18; n=5) but also a slighter but significant proliferation (2.2 ±0.3 fold; n=4). Duality of mFasL was confirmed using agonistic Ab anti-Fas (mimicking mFasL) with pro-apoptotic (38%±18; n=2) and proliferative effect (2.5±0.15 fold). Finally, growing concentration of FasL-Fc leads to apoptosis of the protein, mimicking sFasL, at high concentration. In contrast, FasL-Fc at high and low concentration respectively. Dose responses confirmed mFasL and sFasL effects. FasL activated Akt and ERK (n=5) but also activated caspase-8. A pan-caspases inhibitor (z-VAD-FMK) prevented FasL-induced apoptosis, but also blocked mFasL and sFasL-induced proliferation (n=4). Moreover, sFasL but not FasL-Fc, induced significant production of VEGF, IL-6 and IL-8 in RA FLS. In addition, we observed that FasL-Fc was also able to induce OAFLS apoptosis but in contrast to RAFLS, neither FasL-Fc nor sFasL was able to significantly induced apoptosis of OAFLS (n=3).

**Conclusion:** mFasL induces preferentially RAFLS apoptosis, whereas sFasL only induces RAFLS proliferation and cytokines production. Proliferative effect of sFasL was only seen on RAFLS but not on OAFLS. According to what we have already described for TRAIL, caspases are involved in FasL-induced apoptosis and proliferation. This is the first demonstration of sFasL and mFasL have different effects on RAFLS proliferation and cytokines production. sFasL by enhancing RAFLS proliferation and cytokines could have a deleterious role in RA. Therefore, its blockage could be a therapeutic tool to prevent RA.

**Disclosure:** R. Audo, None; F. Calmon-Hamaty, None; B. Combe, None; M. Hahn, None; J. Morel, None.

**1783**

TNFa Influences RasGRP1 and RasGRP3 Expression Levels in PBMC, B and T Cells. Marie-Laure Potier1, Martine Hiron2, Clément Guillou1, Céline Derambure2, Olivier Boyer1, Xavier Le Loët1, Olivier Vittecoq1 and Thierry Lequerré1. 1Inserm 905 & Institute for Biomedical Research, University of Rouen, Rouen, France; 2Inserm 905, Institute for Biomedical research, University of Rouen, Rouen, France; 3Department of Rheumatology, Rouen University Hospital & Inserm 905, Institute for Biomedical Research, University of Rouen, Rouen Cedex, France

**Background/ Purpose:** Rheumatoid arthritis (RA) is the most common inflammatory arthritis. B and T lymphocytes play a central role in the pathophysiology of RA. RasGRP is a member of the CDC25 family of Ras guanyl nucleotide exchange factors. RasGRP is expressed in T and B cells whereas RasGRPs is only expressed in B cells. In previous studies, we have shown that RasGRPs expression level significantly decreased in Peripheral blood mononuclear cells (PBMC) from RA patients responders to adalimumab after 3 months, leading to the question of TNFa pathways including RasGRPs and RasGRPs. Objectives: To study TNFa effect on RasGRPs and RasGRPs expression levels in vitro.

**Methods:** We measured by qRT-PCR, RasGRPs and RasGRPs expression levels, i) in PBMC from 3 healthy controls (HC), ii) in negative selected B and T cells from PBMC isolated from 3 buffy coat. In each condition, cells were DMSO treated, left untreated, or with 24 or 48 hours TNFa was added for 24 or 48 hours. Immunofluorescence staining was performed to check the cell purity and B and T cells stimulation by flow cytometry. Moreover, IL-2 production was measured by ELISA in T-cells before and after TNFa stimulation. In addition, TNFa effects on cell proliferation were evaluated by [3H] thymidine incorporation by the B and T cells.

**Results:** In B cells, TNFa induced an increase of RasGRPs (p=0.001) and RasGRPs (p=0.001) expression levels in absence of BCR stimulation. In the same way, in T cells, TNFa induced an increase of RasGRPs (p=0.001) and RasGRPs (p<0.001) expression levels in absence of TCR stimulation. Furthermore, TNFa induced a significantly increased of IL-2 production (p<0.05) in unstimulated T-cells. However, TNFa have no effects on B and T cells proliferation.

**Conclusion:** This study suggests the RasGRPs and RasGRPs regulation by TNFa, independently of B and T cells stimulation. The increasing of RasGRPs and RasGRPs in B and T cells specifically via TNFa binding on its receptors could promote the activation and proliferation of B and T cells. The control of these signaling pathways could explain the maintenance of B and T cells activation by an independent antigen pathway.

**Disclosure:** M. L. Potier, None; M. Hiron, None; C. Guillou, None; C. Derambure, None; O. Boyer, None; X. Le Loët, None; O. Vittecoq, None; T. Lequerré, None.

**1784**

Dual Function of Interleukin-33 in Fibroblast-Like Synoviocytes in Patients with Rheumatoid Arthritis. Min W. Seo1, Bon S. Koo1, You J. Kim1, You-G Kim1, Wook J. Seo2, Chang-K Lee3 and Bin Yoo4. 1University of Ulsan College of Medicine, Asan Medical Center, Seoul, South Korea; 2Seoul Veterans Hospital, Seoul, South Korea

**Background/ Purpose:** IL-33 is a new member of the IL-1 cytokine family. Recent studies in an animal model of murine collagen-induced arthritis and human rheumatoid arthritis (RA) have suggested that IL-33 may be an important as an endogenous danger signal (alarmin) in the pathogenesis of RA. IL-33 mRNA and protein expression are induced in RA fibroblast-like synoviocytes (FLS) following TNF-α/IL-1β stimulation, and IL-33 protein is mainly detected in the nucleus of these cells. The nuclear localization of IL-33 in IL-1β/TNF-α stimulated cells suggests that it may have a regulatory function inside the cell, as has been shown previously for IL-1α and IL-17β. The purpose of our study was to analyze the role of extracellular and intracellular IL-33 as an alarmin or regulator of nuclear transcription in RA FLS.

**Methods:** Synovial tissues from RA patients fulfilling the ACR criteria were obtained during open joint replacement. RA synovial samples were digested, subsequently cultured for 7 days and 3-passaged cells were used for all experiments. For analysis, quantitative RTPCR, confocal analysis, western blot and ELISA were performed.

**Results:** IL-33 and ST2 mRNA expression increased in RA FLS stimulated with poly I:C (10 μg/ml) as a TLR3 ligand, IL-1β (10 ng/ml), and TNF-α (10 ng/ml). However, IL-33 release was not detected in
the culture supernatant. Similar to previous observations, IL-33 was released from damaged FLS. After identification of the ST2 on FLS by confocal analysis, FLS was stimulated with IL-33. Exogenous IL-33 stimulation (10–100 ng/ml) of RA FLS increased IP-10 and RANKL mRNA expression and treatment with anti-ST2 blocked this expression. The role of intracellular IL-33 as a nuclear protein was evaluated using IL-33 siRNA. Silencing of IL-33 increased MMP-1, 3, 13, IL-6, 8, and MCP-1 mRNA expression compared to the scrambled control in RA FLS stimulated with poly I:C, IL-1β, and TNF-α. In addition, we observed that the silencing of IL-33 induced significant degradation of IκBα and increased expression of NF-κB activity. These findings reveal a novel role for IL-33 as a negative regulator of NF-κB activity.

Conclusion: IL-33 has dual, opposing functions. As a pro-inflammatory cytokine, IL-33 induced the expression of IP-10 and RANKL mRNA. These effects may induce bone erosion by enhancing osteoclastogenesis in RA. In contrast to extracellular IL-33, intracellular IL-33 acted as negative modulator of NF-κB activity. These observations suggest that IL-33 may induce bone erosion by enhancing osteoclastogenesis in RA.

Disclosure: W. J. Seo, None; B. S. Koo, None; Y. J. Kim, None; Y. G. Kim, None; W. J. Seo, None; C. K. Lee, None; B. You, None.

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Background/Purpose: In rheumatoid arthritis (RA) resident cells of the joint, fibroblast-like synoviocytes (RA FLS) acquire an aggressive phenotype in response to intracellular factors such as PAMPs or DAMPs and intrinsic factors such as pro-inflammatory cytokines. They produce large amounts of cytokines and among them the B cell-activating factor (BAFF) which allows them to collaborate with auto-immune B cells. We found that the miR-30 family of microRNAs (miR-30a*, d*, e*, and f*), which differ only 1 to 3 nucleotides, was predicted to potentially target the 3′-UTR region of BAFF. As BAFF is also up-regulated in the skin and the serum of systemic sclerosis patients, the aim of this study was to evaluate the role of miR-30* in the regulation of BAFF synthesis in fibroblasts isolated from either RA or SSc patients.

Methods: FLS and HDF were isolated from RA synovial tissues (n=6) or from skin from normal individuals (n=3) or SSc patients (n=3) and were stimulated with TLR3 ligand (poly I:C) and IFN-γ for 3 days. RT-qPCR was performed to evaluate miRNA and mRNA expression. Transient transfection of RA-FLS and SSc-HDF with mimic miR-30* was performed using the Human Dermal Fibroblast NucleofectorTM kit from Amaxa. All assays were performed 24h post transfection.

Results: We first showed by qRT-PCR that like RA-FLS, SSc-HDF synthesized and released BAFF in response to poly I:C and IFN-γ. Conversely, HDF from normal subjects (NHDHF) released BAFF only in response to IFN-γ. Using qRT-PCR, we demonstrated that miR-30a* and miR-30e* expression was strongly down regulated in RA-FLS, SScHDF and NHDHF stimulated with either poly I:C or IFN-γ. Interestingly, NHDHF which did not release BAFF in response to poly I:C expressed higher levels of miR-30a* and miR-30e* in response to poly I:C. MiR-30a* was not expressed constitutively or after activation by poly I:C and IFN-γ by each cell type. To evaluate whether miR-30* regulates BAFF expression in poly I:C and IFN-γ-activated RA-FLS and HDF, we transfected cells with miR-30* mimics. Transfection of the mimics induced a strong down-regulation of BAFF synthesis and release in response to poly I:C and IFN-γ. Moreover, we transiently transfected into HEK-293 cells a reporter construct that contain the firefly luciferase gene fused to the BAFF 3′-UTR containing the putative miR-30* interacting site along with miR-30*. We observed a downregulation of the luciferase activity, indicating that the 3′-UTR of BAFF mRNA is directly targeted by miR-30*.

Conclusion: Our data strongly suggest a critical role of miR-30* in the regulation of the expression of BAFF which could play an important role in the regulation of the auto-immune response in RA and SSc.

Disclosure: G. Alsahel, None; A. Francois, None; L. Philippe, None; J. Sibilia, None; J. E. Gottenberg, None; P. Georgel, None; D. Wachsmann, None.

1786

Targeting CD1c-Expressing mDCs to Inhibit Increased Thymus and Activation Regulated Chemokine Levels in RA. M. R. Hillen, F. M. Moret, F. P. J. G. Lafieber, C. E. Hack, T. R. D. J. Radstake and J. A. G. van Roon. University Medical Center Utrecht, Utrecht, Netherlands

Background/Purpose: Thymus and activation regulated chemokine (TARC) is a chemokine that is highly expressed in T helper type 17 (Th17) cells and plays a critical role in the pathogenesis of rheumatoid arthritis (RA) by recruiting cells expressing CCR4. Our previous studies have shown that TARC is highly expressed in RA joint synovial fluid (SF) and plasma of RA patients. Therefore, we aimed to investigate the role of TARC in the pathogenesis of RA and its potential as a therapeutic target.

Methods: We used a mouse model of RA induced by a single injection of streptococcal cell walls in C3H/HeJ mice. The disease was scored using the arthritis index. TARC expression was measured by enzyme-linked immunosorbent assay (ELISA) in the serum and SF of mice. The role of TARC in the pathogenesis of RA was assessed by treating mice with a monoclonal antibody against TARC.

Results: We observed a significant increase in TARC expression in the serum and SF of mice with RA compared to healthy controls. Treatment with the anti-TARC antibody significantly reduced the arthritis index and TARC expression in both the serum and SF of mice. These findings suggest that TARC plays an important role in the pathogenesis of RA and supports the potential of TARC as a therapeutic target.

Conclusion: Our data strongly support the potential of TARC as a therapeutic target for RA. Further studies are needed to confirm these findings and to evaluate the long-term effects of TARC inhibition in RA.

Disclosure: M. R. Hillen, None; F. M. Moret, None; F. P. J. G. Lafieber, None; C. E. Hack, None; T. R. D. J. Radstake, None; J. A. G. van Roon, None.
Conclusion: TSLP potently induces TNFα production by CD1c mDCs and mDC-activated CD4 T cells from RA patients. Considering the fact that TNFα can induce TSLP secretion by synovial fibroblasts this suggests a novel positive feedback loop of TNFα and TSLP that contributes to immunopathology of RA.

Disclosure: F. M. Moret, None; T. R. D. J. Radstake, None; J. W. J. Bijlsma, None; F. P. J. G. Lafeber, None; J. A. G. van Roon, None.

1789
Evidence for an Additive Effect of Tumor Necrosis Factor Alpha and Hypoxia to Promote Bone Destruction in Arthritis. Shankar Revu1, Aklain Krishnamurthy1, Vivekananda Sunkari2, Ileana R. Botusaran2, Xiao Wei Zheng3, Sergiu Bogdan Catrina4 and Ana Iriel Catrina1, 2. 1: Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2: Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden.

Background/Purpose: Hypoxia is a major feature of the inflamed rheumatoid arthritis synovial membrane and promotes osteoclasts formation in vitro. We aimed to investigate the molecular mechanisms by which hypoxia contribute to bone destruction in the presence of local inflammation.

Methods: Osteoblast-like cells were cultured in normoxic (21% O2) or hypoxic (1% O2) conditions with or without tumor necrosis factor (TNFα)-Receptor activator of the NF-κB ligand (RANKL) and osteoprotegerin (OPG) were detected by rtPCR, Western blot and ELISA. siRNA deletion of HIF-1α, HIF-2α and VHL was performed in osteoblasts. Interaction between hypoxia inducible factor (HIF) and RANKL was investigated by promoter chromatin immunoprecipitation (ChIP). Chemical hypoxia using dimethyloxalylglycine (DMOG) and TNFα were tested on osteoclast formation from peripheral blood mononuclear cells of RA patients and on osteologic bone discs. Statistical analysis was performed using one-way ANOVA.

Results: Exposure of osteoblasts to hypoxia resulted in a significant increase in RANKL mRNA and cellular protein expression and a concomitant decrease of soluble OPG. Small interfering RNA against HIF-2α but not HIF-1α was able to abolish hypoxia effect on RANKL expression. Chromatin immunoprecipitation assay confirmed the direct interaction between HIF-2α with at least one hypoxia responsive element (HRE) in the RANKL promoter. Presence of TNFα had an additive effect with hypoxia to increase RANKL expression. Hypoxia mimicking by DMOG demonstrated an additional direct effect on osteoclastogenesis with an additive effect of hypoxia and TNFα to promote osteoclastogenesis and bone resorption in vitro.

Conclusion: Hypoxia promotes HIF-2α dependent RANKL up-regulation and osteoclastogenesis and has an additive effect with pro inflammatory cytokines to promote bone destruction.

Disclosure: S. Revu, None; A. Krishnamurthy, None; V. Sunkari, None; I. R. Botusaran, None; X. Zheng, None; S. B. Catrina, None; A. I. Catrina, None.

1790
Notch Promotes Matrix Metalloproteinase 13 Expression by Inducing Interleukin-6 in Primary Murine Chondrocytes. Stefano Zanotti and Ernesto Canalis. Saint Francis Hospital and Medical Center, Hartford, CT.

Background/Purpose: Notch1 to Notch4 are transmembrane receptors that determine cell differentiation and function. Interactions of Notch with its ligands result in the cleavage of the Notch intracellular domain (NICD), which translocates to the nucleus to induce gene expression. Notch suppresses collagen type II a1 (Col2a1) and induces collagen type X a1 (Col1a1) expression in murine chondrocytes. Activation of Notch signaling was observed in human osteoarthritic chondrocytes, although it was not reported whether Notch plays a role in the progression of osteoarthritis. Matrix metalloproteinase (Mmp13) is a collagen-degrading enzyme expressed by osteoarthritic chondrocytes, and overexpression of Mmp13 in murine articular chondrocytes causes joint degeneration, demonstrating that Mmp13 contributes to cartilage matrix degradation. Interleukin (Il6) is a secreted inflammatory molecule that suppresses Col2a1 and induces Mmp13 expression in chondrocytes. Il6 is expressed by osteoarthritic chondrocytes, and Notch induces Il6 in synoviocytes, but it was not reported whether Notch regulates Il6 expression in chondrocytes. To understand whether Notch regulates the expression of gene markers of osteoarthritis, we investigated the effects of Notch on Mmp13 and Il6 expression in primary murine chondrocytes, and tested whether Il6 mediates the effects of Notch.

Disclosure: S. B. Catrina, None; V. Sunkari, None; I. R. Botusaran, None; X. Zheng, None; S. B. Catrina, None; A. I. Catrina, None.
**Methods:** Notch was induced in chondrocytes from Rosa\textsuperscript{Notch} mice, where the Rosa\textsuperscript{26} promoter is followed by a STOP cassette flanked by Lox\textsuperscript{P} sites, and the NICD coding sequence. Primary chondrocytes from 3 to 4 day old Rosa\textsuperscript{Notch} mice were infected with an adenoviral vector expressing Cre recombinase, which excises the STOP cassette and induces expression of NICD directed by the Rosa\textsuperscript{26} promoter. As controls, parallel cultures of Rosa\textsuperscript{Notch} chondrocytes were infected with an adenoviral vector expressing green fluorescent protein (GFP).

To document Notch activation, Rosa\textsuperscript{Notch} chondrocytes were transfected with Notch reporter constructs. To assess the effects of Notch on gene expression, changes in mRNA levels were analyzed by quantitative reverse transcription PCR. To investigate whether IL6 mediates the effects of Notch in Rosa\textsuperscript{Notch} chondrocytes, cells were cultured in the absence of serum and exposed to an inhibitory monoclonal murine antibody against IL6, or to a murine immunoglobulin G, either under basal conditions or in the context of Notch activation.

**Results:** NICD overexpression in Rosa\textsuperscript{Notch} chondrocytes transactivated Notch reporter constructs and induced Notch target genes, demonstrating activation of Notch signaling. The effects of Notch on the expression of Col2a1 and Coll1a1 were confirmed. NICD induced Mmp13 and Il6 mRNA levels, and exposure of Rosa\textsuperscript{Notch} chondrocytes to an inhibitory IL6 antibody opposed the induction of Mmp13 by Notch, whereas it did not modify the effects of Notch on Col2a1 and Coll1a1 expression.

**Conclusion:** Activation of Notch signaling in primary chondrocytes induces expression of gene markers of osteoarthrosis. Induction of Mmp13 by Notch is mediated by IL6, whereas the effects of Notch on the expression of chondrocyte gene markers are determined by alternate mechanisms.

Disclosure: S. Zanotti, None; E. Canalis, None.

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**Different Mechanisms Responsible for IVIG Inhibition of Immune Complex Versus TLR Stimulated Interferon-Alpha.** Alice Wiedeman\textsuperscript{1}, Fabian Käsermann\textsuperscript{2}, Sylvia Miescher\textsuperscript{2} and Keith B. Elkon\textsuperscript{1}. 1University of Washington, Seattle, WA; 2CSL Behring, Bern, Switzerland

**Background/Purpose:** SLE immune complexes (IC) induce IFN-α production by stimulation of TLR7 and 9 in plasmacytoid dendritic cells (pDC). Serum from normal human donors inhibits IC-induced IFN-α in vitro and both C1q and IgG have been identified as inhibitory serum components. Since pooled IgG (IVIG) is used for therapy of autoimmune diseases and the sialylation of IgG is known to be a major source of variability in the biological activity of IVIG, we investigated whether sialylation of IgG could influence the inhibitory activity of IVIG.

**Methods:** To investigate this, IC-activated pDCs were stimulated with IVIG, either under basal conditions or in the context of Notch activation.

**Results:** IVIG dose-dependently inhibited SCIC-induced IFN-α (~20%, 50%, and 95% inhibition by treatment with 50, 500, and 5000 μg/mL IVIG, respectively). Inhibition was Fe-dependent (500 μg/mL IVIG inhibited 50% of IFN-α compared to molar equivalents of Fab(2)), <10%, and FC: 60%, p<0.01), but was sialylation-independent. IgG Fe inhibited SmRNP IC binding to pDC (50% of pDC bind IgG, which was reduced to 20% with 167 μg/mL Fe, p<0.001). In contrast, TLR agonist-induced IFN-α was only modestly (10–20%) inhibited by high doses (5000 μg/mL) of IVIG and inhibition was significantly higher by the SNA+ subset of IC as compared to SNA- fraction of IVIG (Lox: 90% and 40%; p<0.01; CPq 75% and 0%, p<0.001, for SNA+ versus SNA- fraction of IVIG). Furthermore, the inhibitory activity was contained in the Fab(2) fragment. The inhibitory activity of sialylated IVIG was not direct on pDC, but required the presence of monocytes (depletion of CD14+ monocytes reduced inhibition by 500 μg/mL SNA+ IVIG after Lox stimulation of IFN-α from 70% to 0%, p<0.05 while depletion of CD19+ B cells or CD56+ NK/NKT cells had no effect). Monocytes produced prostaglandin E\textsubscript{2} (PGE\textsubscript{2}) specifically in response to the sialylated IVIG subset (10-20 ng/mL with SNA+ IVIG compared to undetectable quantities with SNA- IVIG, p<0.05). Furthermore, blockade of PGE\textsubscript{2} from the monocyte supernatants reduced inhibitory activity to <10%, and addition of PGE\textsubscript{2} blocked IFN-α production.

**Conclusion:** IVIG Fe directly inhibits production of IFN-α in response to SCIC by blocking IC binding to FcγRIIa on pDC. In contrast, the SNA+-subset of IVIG inhibits TLR agonist stimulation of IFN-α by inducing the production of PGE\textsubscript{2} by monocytes. Understanding these disparate mechanisms of IVIG inhibition of IFN-α will provide novel methods for immunomodulation and may allow use of smaller amounts of subcomponents of IVIG for therapy.

Disclosure: A. Wiedeman, CSL Behring, 2, F. Käsermann, CSL Behring, 3; S. Miescher, CSL Behring, 3; K. B. Elkon, Hoffman La Roche, 5, Resolve Therapeutics, 4.

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**Identification of the Antimicrobial Peptide LL-37 As A Potential Mediator of Synovial Inflammation in Rheumatoid Arthritis.** Petra Neregård\textsuperscript{1}, Marianne Enström\textsuperscript{2}, Erik Af Klint\textsuperscript{1}, Birgitta Agerberth\textsuperscript{2} and Anca Irinel Catrina\textsuperscript{3}. \textsuperscript{1}Rheumatology Unit, Department of Medicine, Karolinska Institute, Karolinska University Hospital, Stockholm, Sweden; \textsuperscript{2}Karolinska Institute, Stockholm, Sweden; \textsuperscript{3}Hoffman La Roche, 5, Resolve Therapeutics, 4.

**Background/ Purpose:** LL-37, a member of the cathelicidin family of host defense peptides, has a broad range of antimicrobial and immunomodulatory effects that potentially can have an impact on the regulation of the adaptive immune system. In this study we aimed to investigate a potential role for LL-37 in mediating chronic synovial inflammation.

**Methods:** 49 patients meeting the 1987 American College of Rheumatology (ACR) criteria for RA were recruited for this study. We evaluated LL-37 by immunohistochemistry in synovial biopsy samples obtained before and after a mean of 8 weeks of treatment from 15 patients treated with adalimumab, 12 patients treated with etanercept and 11 patients treated with methotrexate, as well as from 11 patients prior to and 2 weeks after injection with intraarticular glucocorticoids. LL-37 was also evaluated in synovial biopsies obtained from 10 healthy volunteers. Microscopic results were analyzed by double-blind semi-quantitative analysis. Synovial localization of LL-37 was performed by double fluorescent stainings for LL-37 and cell surface markers. LL-37 was detected in synovial fluid by Western blots.

**Results:** LL-37 was expressed in most of the RA synovial biopsies both in the lining and sublining layers and readily identified in the synovial fluid. Seral and double-fluorescent immunostaining for cell surface markers identifies granulocytes (CD66 positive cells) and macrophages (CD68 positive cells) as main cells expressing LL-37. Inflamed synovial tissue obtained from active arthritis prior to treatment expressed higher levels of LL-37 as compared to healthy individuals. Treatment with adalimumab, etanercept and intraarticular glucocorticoids but not methotrexate resulted in a significant down-modulation of LL-37 expression.

**Conclusion:** Our results demonstrate presence of LL-37 in the context of chronic synovial inflammation and show specific regulation of this molecule by distinct anti-rheumatic agents. Further investigation to reveal the functional consequences of our findings on synovial antimicrobial and inflammatory activity is needed.

Disclosure: P. Neregård, None; M. Enström, None; E. Af Klint, None; B. Agerberth, None; A. I. Catrina, None.

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**The Cyclooxygenase/Prostaglandin-E\textsubscript{2} Pathway Is Critical for Autocrine IL-17A Production by Th17 Cells Upon Synovial Fibroblast Interaction.** Sandra M.J. Paulissen\textsuperscript{1}, Jan Piet van Hamburg\textsuperscript{2}, Nadine Davelaar\textsuperscript{2}, Patrick S. Agerberth\textsuperscript{2}, Janne E. Canalis\textsuperscript{2}, Aman H. Yu\textsuperscript{1}, Jonas M.W. Hazes\textsuperscript{2} and Erik Lubberts\textsuperscript{1}. \textsuperscript{1}Erasmus MC, University Medical Center, Rotterdam, Rotterdam, Netherlands, 3Erasmus MC, University Medical Center, Rotterdam, Netherlands, 4Erasmus Medical Center, Rotterdam, Netherlands, 5Erasmus Medical Center, Rotterdam, Netherlands

**Background/Purpose:** Recently, we have shown that Th17, but not Th1 cells, from patients with early rheumatoid arthritis (RA) are potent activators of RA synovial fibroblasts (RASF) resulting in autocrine IL-17A production. This IL-17A production results in a pro-inflammatory loop, which is characterized by an up-regulation in pro-inflammatory cytokines and cartilage degrading enzymes. The autocrine IL-17A production by Th17 cells is critical for the perseverance of the pro-inflammatory loop, but the mechanism underlying the autocrine IL-17A induction is unclear. The objective of this study is to investigate the mechanism responsible for the autocrine IL-17A induction upon Th17-RASF interaction.

**Methods:** CD4+CD45RO+CCR6+ (Th17) and CD4+CD45RO+ CCR6⁻ (Th1) cells were isolated by fluorescence-activated cell sorting
(FACS) sorting from healthy controls and early RA patients. These cells were co-cultured with RASF, in the presence of neutralizing antibodies directed against soluble IL-6R (anti-sIL-6R) and/or IL-1β, and celecoxib. Gene expression profiles were generated and supernatant was collected for cytokine analyses by enzyme-linked immunosorbent assay (ELISA).

**Results:** Gene expression analyses revealed that the genes encoding for IL-6 and IL-1β were up-regulated in Th17-RASF cultures. These data were confirmed by ELISA and quantitative polymerase chain reaction (Q-PCR), respectively. Since IL-1β and IL-6 may be involved in IL-17/Th17 polarization we examined the contribution of these cytokines on the autocrine IL-17A loop. Blockade of IL-1β and IL-6 significantly suppressed IL-17 production. However the effects of IL-1β and IL-6 blockade were limited, indicating the requirement of an additional mechanism.

Interestingly, the genes encoding for cyclo-oxygenase-2 (COX-2) and prostaglandin-E_synthase (PTGES), which are involved in prostaglandin-E₂ (PGE₂) synthesis, were also up-regulated in Th17-RASF cultures. This was associated with a dramatic increase of PGE₂ production in Th17-RASF cultures compared to Th1-RASF cultures. Treatment of Th17-RASF cultures with celecoxib, a COX-2 inhibitor, resulted in significant and specific inhibition of the fraction of IL-17A producing cells and the IL-17A levels. No inhibitory effects were found on IFN-γ and TNF-α production. Moreover, celecoxib treatment functionally inhibited the pro-inflammatory loop as production of the pro-inflammatory mediators IL-6 and IL-8 and tissue destructive enzymes MMP-3 and MMP-1 were significantly suppressed.

**Conclusion:** These findings show the critical role of the COX/PGE₂ pathway in the autocrine IL-17A production upon Th17 and synovial fibroblast interaction. Inhibition of this pathway down-regulates the pro-inflammatory feedback loop induced by Th17-RASF interaction leading to less production of pro-inflammatory cytokines and destructive mediators.

**Disclosure:** S. M. J. Paulissen, None; J. P. van Hamburg, None; N. Daveelaar, None; P. S. Asmawidjaja, None; J. M. W. Hazes, None; E. Lubberts, None.

**1794**

Matrix Metalloproteinase 3 and Acute Phase Proteins As Markers of Disease Activity and Radiographic Damage in Early Rheumatoid Arthritis. Mahmood MTM Ally¹, Bridget Hodkinson², Pieter W.A Meyer³, Eustasius Musenge⁴, Mohammed Tikly⁴ and Ronald Anderson¹. ¹University of Pretoria, Pretoria, South Africa, ²University of the Witwatersrand, Johannesburg, South Africa, ³University of Witwatersrand, Johannesburg, South Africa, ⁴Division of Rheumatology, University of the Witwatersrand, Johannesburg, South Africa

**Background/Purpose:** Although matrix metalloproteinase-3 (MMP-3) is believed to be intimately involved in the immunopathogenesis of rheumatoid arthritis (RA), relatively little is known about its relationships to: i) proven genetic markers of disease susceptibility and biomarkers of immune-mediated tissue damage; and ii) disease activity in early RA in comparison with that of the acute phase reactants, C-reactive protein (CRP) and serum amyloid A (SAA).

**Methods:** Circulating concentrations of MMP-3 were measured by an ELISA procedure in serum specimens from 128 disease-modifying agents in RA patients with active disease on and off immune suppressants), deconvolution on basophil frequencies using an FDR of 39% yielded 1421 DEG. Pathways associated with SLE disease activity.

**Results:** Correlation for basophil frequencies yielded a FDR of 25% and identified 502 DEG comparing BV and IV. Genes overrepresented in signaling pathways associated with SLE included LCK, CD44, CD40LG, SOS1, TNFRSF13C (BLys receptor), SLAMF1, IRF8, TNFAIP3, TNFRSF4, MIF, FCRGR1A and FCRGR1B. Comparing IV to BV, (representing a transition from low to high disease state without immune suppression on board), deconvolution on monocyte frequencies identified 68 DEG with an FDR of 25% at the BV. Genes in the p38 MAP Kinase, ERK/MAPK, IFN signaling, and IL-12 pathways were enriched. Comparing BV to IV, (same patients with active disease on and off immune suppressants), deconvolution on basophil frequencies using an FDR of 39% yielded 1421 DEG. Pathways overrepresented included antigen presentation and apoptosis. When assessing basophil frequencies, “antibody response” was overrepresented by 27 genes (p=2.27E−06) including BTK, CD86, TLR2, TNFRSF13B (TACI), and TNSF13B (BLYS).

**Conclusion:** Basophil and monocyte adjusted DEG analysis suggests that pathways associated with SLE signaling, apoptosis, antigen presentation, and antibody response functions are associated with changes in gene expression at transitions between high and low disease activity. These biomarkers could identify therapeutic targets or identify patients who are or are not good candidates for different targeted therapies.

**Disclosure:** M. G. Dozmorov, None; N. Domínguez, None; S. Kamp, None; C. Giles, None; J. D. Wren, None; S. T. Sridharan, Pfizer Inc, 3; J. T. T. Merrill, Genentech, Inc, 5, Medimmune, 5, Genentech, Inc, 2; A. A. James, None; J. M. Guthridge, None.

**1795**

Correction for Basophil and Monocyte Frequencies Identifies Specific Gene Expression Differences Associated with SLE Disease Flare: Interim Report From the Bold (Biomarkers of Lupus Disease) Study. Mikhail G. Dozmorov¹, Nicolas Domínguez¹, Stan Kamp², Cory Giles³, Jonathan D. Wren¹, Sadhakar T. Sridharan⁴, Joan T. Merrill⁵, Judith A. James⁶ and Joel M. Guthridge⁷. ¹Oklahoma Medical Research Foundation, Oklahoma City, OK, ²Oklahoma Medical Research Foundation, Oklahoma City, OK, ³Pfizer Inc, Collegeville, PA, ⁴Oklahoma Medical Research Foundation and Oklahoma University Health Sciences Center, Oklahoma City, OK

**Background/Purpose:** Heterogeneity of clinical manifestations and pathogenic mechanisms has complicated treatment of SLE patients. The BOLD study allows evaluation of gene expression changes associated with disease flare without the impact of background immunosuppressants which have confounded previous studies.

**Objectives:** 1. Define immune functions or pathways impacted by disease activity. 2. Evaluate gene expression differences due to variations of cell subsets. 3. Uncover cell specific biological pathways that are associated with lupus disease activity.

**Methods:** The BOLD study enrolled patients with active disease at the baseline visit (BV) who were withdrawn from background immunosuppressive therapy and given intramuscular steroids to induce improvement (IV), and then randomised to an anti-flare IV (FV). An interim profiling of gene expression using 15 SLE patients was performed. Cell specific significance analysis of microarrays (csSAM) compares gene expression between two groups, each separately deconvolved to yield cell specific expression. The false discovery rate (FDR) for cell specific differentially expressed genes (DEG) between groups is assessed via permutations. csSAM analysis was performed comparing the BV to IV, IV to BV and BV to BV. Bioinformatics analysis of pathways and gene functions was performed using the sets of DEG.

**Results:** Correction for basophil frequencies yielded a FDR of 25% and identified 502 DEG comparing BV and IV. Genes overrepresented in signaling pathways associated with SLE included LCK, CD44, CD40LG, SOS1, TNFRSF13C (BLys receptor), SLAMF1, IRF8, TNFAIP3, TNFRSF4, MIF, FCRGR1A and FCRGR1B. Comparing IV to BV, (representing a transition from low to high disease state without immune suppression on board), deconvolution on monocyte frequencies identified 68 DEG with an FDR of 25% at the BV. Genes in the p38 MAP Kinase, ERK/MAPK, IFN signaling, and IL-12 pathways were enriched. Comparing BV to IV, (same patients with active disease on and off immune suppressants), deconvolution on basophil frequencies using an FDR of 39% yielded 1421 DEG. Pathways overrepresented included antigen presentation and apoptosis. When assessing basophil frequencies, “antibody response” was overrepresented by 27 genes (p=2.27E−06) including BTK, CD86, TLR2, TNFRSF13B (TACI), and TNSF13B (BLYS).

**Conclusion:** Basophil and monocyte adjusted DEG analysis suggests that pathways associated with SLE signaling, apoptosis, antigen presentation, and antibody response functions are associated with changes in gene expression at transitions between high and low disease activity. These biomarkers could identify therapeutic targets or identify patients who are or are not good candidates for different targeted therapies.

**Disclosure:** M. G. Dozmorov, None; N. Domínguez, None; S. Kamp, None; C. Giles, None; J. D. Wren, None; S. T. Sridharan, Pfizer Inc, 3; J. T. T. Merrill, Genentech, Inc, 5, Medimmune, 5, Genentech, Inc, 2; A. A. James, None; J. M. Guthridge, None.

**Anti-IL-20 Targets Local Tissue Inflammation As Opposed to Systemic Inflammation.** Amanda L. Blasius¹, Joshua N. Bejika¹, Hal Blumberg¹, John Bu¹, Jennifer H. Cox¹, Tom Cox², Heidi J. Jessup³, Phillip L. Kong¹, Steven D. Levin¹, Valerie H. Odegard², Jason A. Stucky³, Evan P. Thomas³, Joseph A. Wahle² and John Rømer². ¹Novo Nordisk Inflammation Research Center, Seattle, WA, ²Novo Nordisk, Måløv, Denmark

**Background/Purpose:** In a recent Phase 2a clinical trial in patients with rheumatoid arthritis, the novel human anti-IL-20 monoclonal antibody NCC0109-0012 was shown to reduce disease activity (DASS2-CRP) and had a favourable safety/tolerability profile. In RF-positive and anti-CCP-positive patients it also improved the ACR20/50/70 responses. Response to anti-IL-20 therapy was rapid, with patients showing significant improvements in DAS28 scores as early as 1 week after treatment. Expression of IL-20 and its receptor chains IL-20R1, IL-20R2, and IL-22R has previously been demonstrated in synovium from patients with RA. The safety and efficacy data support the
hypothesis that anti-IL-20 works locally in the joint without modulating systemic inflammation. To test this hypothesis, human peripheral immune cells from blood and lymphoid tissue were evaluated as IL-20 target cells.

Methods: An extensive collection of immune cell subsets derived from human blood and tonsil were analyzed, both directly after isolation and following in vivo activation. Expression of IL-20R1, IL-20R2, and IL-22R was detected by flow cytometry and/or qPCR. In parallel, cell responsiveness to IL-20 was evaluated by measuring the phosphorylation of STAT3 following treatment of cells with IL-20. Further functional readouts of IL-20 responsiveness included measurement of proliferation and cytokine production in response to IL-20 treatment.

Results: The cell types evaluated included B cells, CD8+ T cells, CD4+ T cell subsets, NK cells, dendritic cells, monocytes, macrophages, mast cells, basophils, eosinophils, and CD34+ hematopoietic stem cells. The IL-20R2 subunit was detected on several cell types, including monocytes, macrophages, and tonsillar B cells. However, co-expression of the IL-20 receptor beta chain and one of the two alpha chains, requirements for a functional IL-20 receptor, was not detected on human peripheral immune cells under resting or activated conditions. Consistent with this, there was a lack of responsiveness to IL-20 as monitored by phosphorylation of STAT3. Finally, whole blood cultured with IL-20 failed to induce a response as measured by cytokine and chemokine production. This overall lack of response contrasted to non-immune cell types involved in local inflammation, such as keratinocytes.

Conclusion: The paucity of IL-20 receptor expression and IL-20 responsiveness by peripheral immune cells correlates with the absence of systemic inflammatory effects in the Phase 2a clinical trial of NNC0109-0012. In combination with earlier data showing expression of IL-20 in synovial tissues, these data suggest that IL-20 is restricted to acting locally on inflamed synovium in patients with RA.


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Wnt Signaling Pathway Status, Determined by Serum Dkk-1 and R-Spondin 1 Levels, in Rheumatoid Arthritis and Ankylosing Spondylitis.
Byoung Yong Choi, Hyon Jung Cho, Eun Ha Kang, Yeong Wook Song, Yun Jong Lee. Seoul National University Bundang Hospital, Seongnam-si, South Korea, Seoul National University Hospital, Seoul, South Korea

Background/Purpose: Dickkopf-1 (Dkk-1), known as inhibitor of Wnt signaling pathway, is involved in joint damage in inflammatory arthritis. While R-spondin 1 (Rspo1) reported to protect against bone destruction through antagonizing-Dkk-1 in murine arthritis model, the Rspo1 levels in inflammatory arthropathy such as rheumatoid arthritis (RA) and ankylosing spondylitis (AS) has not been investigated. We determined the circulating levels of Rspo1 and Dkk-1 in patients with RA or AS and investigated their clinical implication.

Methods: Serum sample were collected from 60 RA patients (mean age=53.3±1.55, 54 females), 55 AS patients (36.7±1.61, 8 females), and age-and gender-matched 65 healthy subjects (44.7±1.80, 35 females). Sera from 13 RA patients treated with anti-TNF-α agents were also collected at baseline and 12 weeks. Clinical and laboratory data included age, gender, body mass index, disease duration, medication history, ESR and CRP. Disease activities in RA and AS were measured by DAS28 or BASDAI respectively. Radiographic joint damages in RA were assessed by the modified Sharp/Van der Heijde score (Sharp score). Serum Rspo1 and Dkk-1 levels were determined by sandwich ELISA.

Results: Serum Rspo1 levels were significantly decreased in RA patients when compared to those in healthy subjects (p<0.0001). However, their levels were comparable between AS patients and healthy subjects. While serum Dkk-1 levels in AS patients were significantly lower than those in healthy subjects (p=0.001), those in RA were significantly higher (p<0.0001). Thus, the ratios of Dkk-1/Rspo1 were significantly elevated in RA patients but significantly suppressed in AS patients (both p<0.0001). Dkk-1/Rspo1 ratios in RA patients with high disease activities (DAS28 > 5.1) were much higher than those in RA patients with low disease activities (DAS28 < 2.6, p=0.012). However, Dkk-1/Rspo1 ratios were not correlated with Sharp scores in RA patients and not different between AS patients and healthy subjects (p=0.003). Serum Rspo1 levels were not changed but Dkk-1/Rspo1 ratios were decreased by anti-TNF-α treatment (p=0.0134). Glucocorticoid treatment (p=0.003) or presence of osteoporosis (p=0.044) was associated with increased Dkk-1/Rspo1 ratios.

Conclusion: This study demonstrated inappropriate suppression of Wnt signaling pathway, presented by high Dkk-1/Rspo1 ratios, in RA and activation of Wnt signaling pathway in AS. However, the ratios of Dkk-1/ Rspo1 levels were not directly associated with the cumulative radiographic change in RA patients although their levels were affected by RA disease activity.

Disclosure: B. Y. Choi, None; H. J. Cho, None; E. H. Kang, None; Y. W. Song, None; Y. J. Lee, None.

1798
Macrophage Migration Inhibitory Factor Regulates Dual-Specificity Phosphatases Via Glucocorticoid Induced Leucine Zipper.
Huapeng Fan, Devi Ngo, Ran Gu and Eric Morand. Monash University, Melbourne, Australia

Background/Purpose: Macrophage migration inhibitory factor (MIF) plays a pivotal role in promotion of inflammatory diseases such as rheumatoid arthritis (RA). MIF has previously been shown to oppose the action of glucocorticoid through regulation of dual-specificity phosphatase (DUSP)-1 (syn. MAPK phosphatase-1 (MKP-1)) and thereby to amplify MAP kinase signalling and up-regulate multiple cytokines and chemokines. Glucocorticoids also act by regulation of glucocorticoid induced leucine zipper (GILZ). Whether MIF opposition of glucocorticoid actions involves modulation of other DUSPs or GILZ is unknown. Therefore, the aim of this study was to examine the effects of MIF on the expression of DUSPs and GILZ.

Methods: Bone marrow derived macrophages and dermal fibroblasts were isolated from WT, MIF−/− and GILZ−/− mice. The expression of a panel of DUSPs and GILZ, and TNF and IL-6, were investigated by real time RT-PCR, Western blotting and ELISA.

Results: In MIF−/− macrophages, multiple DUSPs, including DUSP1/MKP-1, but also DUSP 2, 5, 6, 8, 9, 10, 16, and 19, were significantly increased. GILZ mRNA and protein were significantly increased in MIF−/− macrophages and fibroblasts, and GILZ expression induced by Dex was also significantly greater in MIF−/− cells. Correspondingly, recombinant MIF inhibited GILZ expression, MIF inhibited the expression and nuclear translocation of the transcription factor FoxO3a, and FoxO3a silencing reversed the effect of MIF deletion on GILZ. The basal and Dex-induced expression of the panel of MIF-regulated DUSPs was significantly reduced in GILZ−/− cells, and accordingly, LPS-induced TNF and IL-6 were significantly increased in GILZ−/− cells.

Conclusion: These studies indicate a previously unsuspected broad regulatory effect of MIF on multiple DUSPs. Moreover, we identify FoxO3a-dependent regulation of GILZ by MIF, and a corresponding regulatory effect of GILZ on DUSPs and cytokine expression. The results suggest that glucocorticoid-mediated regulation of GILZ expression mediates the antagonistic effect of MIF on glucocorticoid actions.

Disclosure: H. Fan, None; D. Ngo, None; R. Gu, None; E. Morand, None.

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ONO-4059 - A Novel Small Molecule Bruton’s Tyrosine Kinase (Btk) Inhibitor, Suppresses Osteoclast Differentiation and Activation.
Yuko Ariza, Toshio Yoshizawa, Yoshiko Ueda, Shingo Hotta, Masami Narita and Kazuhito Kawabata. Ono Pharmaceutical Co., Ltd., Osaka, Japan

Background/ Purpose: Bruton’s tyrosine kinase (Btk) is primarily expressed in B cells, mast cells, platelets, myeloid cells and osteoclasts. Osteoclast differentiation is regulated by signaling pathways activated by receptor activator of nuclear factor-κB ligand (RANKL), macrophage colony-stimulating factor (M-CSF) and immunoreceptor tyrosine-based activation motif (ITAM). Phosphorylation of ITAM results in the activation of phospholipase C-γ through activation of non-receptor tyrosine kinases Btk and Syk. However, the functional hierarchy of these two kinases has not been fully elucidated. To explore the distinct functions of Btk and Syk, we examined their relative contributions to osteoclast differentiation and activation using inhibitors to both Btk and Syk.

Methods: Human osteoclast precursors were differentiated with 33 ng/mL of M-CSF and 66 ng/mL of RANKL for 7 days. Increasing concentrations
Macrophages in Hypoxic Rheumatoid Joints Preferentially Express Hypoxia Inducible Transcription Factor-2. Sarah Aynsley1, Ursula Fearon2, Anthony G. Wilson3 and Munitta Muthana4. 1University of Sheffield, Sheffield, United Kingdom, 2Dr, Sheffield, United Kingdom, 3Section of Musculoskeletal Sciences, University of Sheffield, Sheffield, United Kingdom

Background/Purpose: In rheumatoid arthritis (RA), the influx of inflammatory cells as well as the aggressive proliferation of fibroblast-like synovial cells (FLS) outstrips the oxygen supply from blood vessels leading to joint hypoxia. Macrophages accumulate in hypoxic disease sites including RA joints where they possess broad pro-inflammatory, destructive and remodeling potential leading to inflammation and joint destruction. Macrophages respond to hypoxia by up-regulating the hypoxia inducible transcription factors – HIF-1 and –2 normally degraded in the presence of oxygen. This study will attempt to understand the relative contribution of HIF-1 and HIF-2 expressing macrophages in RA and the genes/mechanisms involved in their activation.

Methods: We obtained arthroscopy sections from RA patients for which tissue oxygen levels had been measured. This consisted of a random sample of mild (~40mmHg), moderate (~15mmHg) & severe (~3mmHg) joint hypoxia. We also used samples from a second cohort of patients scored with mild or severe disease (based upon extent of synovitis and vascularity), respectively.

Results: Both ONO-4059 and the Syk inhibitor, appears to play a pivotal role in osteoclast differentiation and activation. Rheumatoid arthritis (RA) is often complicated by generalized osteopenia due to increased bone resorption by osteoclasts. These preliminary results suggest that the selective, oral Btk inhibitor, may be a novel therapeutic target for rheumatoid arthritis (RA) to suppress bone erosion and inflammation.

Disclosure: Y. Ariza, None; T. Yoshizawa, None; Y. Ueda, None; S. Hotta, None; M. Narita, None; K. Kawahata, None.

1800

Interleukin-29 Modulates Proinflammatory Cytokine Production in Synovial Inflammation of Rheumatoid Arthritis. Xiaojia Zhang, Fang Wang, Lingxiao Xu and Wenfeng Tan, The First Affiliated Hospital of Nanjing Medical University, Nanjing, CHINA., Nanjing, China

Background/Purpose: The immunoregulatory function of interleukin (IL)-29 has recently been recognized. However, little is known about the involvement of IL-29 in the pathogenesis of rheumatoid arthritis (RA). We here investigated the potential role of IL-29 in the synovial inflammation of RA.

Methods: The transcript levels of IL-29 and its specific receptor IL-28Ra have been recognized. However, little is known about the involvement of IL-29 in the pathogenesis of rheumatoid arthritis (RA). We here investigated the potential role of IL-29 in the synovial inflammation of RA.

Results: The transcript levels of IL-29 and its specific receptor IL-28Ra in peripheral blood mononuclear cells (PBMC) and synovium were determined by real-time reverse transcription-polymerease chain reaction (real-time PCR). The concentrations of IL-29 in serum and synovial fluid (SF) were quantified by enzyme-linked immunosassay (ELISA), and the correlation of serum IL-29 levels with disease activity in RA patients was investigated. Furthermore, the expression of IL-29 in RA synovium was examined by immunohistochemistry and double immunofluorescence analysis. Finally, the expression of IL-6, IL-8, IL-10, IL-17 and matrix-metalloproteinase-3 (MMP-3) in synovial fibroblasts upon IL-29 stimulation was determined by real-time PCR.
and its only known ligand TNF-like protein 1A (TL1A) have been identified as key regulators of osteoclastogenesis in murine models of arthritis (Bull MJ, Williams AS et al. J.Exp.Med. 2008). We investigated the potential mechanisms by which the DR3/TL1A pathway orchestrates osteoclast (OC) formation in humans and assessed the impact of DR3 signalling upon bone pathology in RA.

Methods: CD14<sup>+</sup> monocytes were obtained from healthy females (n=8). Cells were cultured on ivory discs (with macrophage-colony-stimulating factor (M) and receptor activator of nuclear factor-κB ligand (R)) for 7, 10 and 14 days ± TL1A (10 and 100ng/ml). Osteoclastogenesis and area of disc resorbed were quantified. Levels of TNFα and MMP-9 were measured by ELISA. Serum samples were obtained from consenting normal human volunteers (n=12) and RA patients (n=36) attending outpatient clinic who fulfilled the ACR classification criteria.TL1A and TNFα were measured by ELISA. Ethical approval for this study was granted by the Bro-Taf Health Authority. All data is expressed as mean±SEM value.

Results: A significant dose-dependent increase in osteoclastogenesis was observed after addition of exogenous TL1A (P<0.01; 2-way ANOVA) in our in vitro human system. Cell counts per mm<sup>2</sup>, at end-point, were comparable for each condition tested (M+R=480±49; M+R=TL1A=10=517±62 and M+R+TL1A=100=475±59). However, TL1A (100ng/ml) doubled the number of OC observed on each ivory disk (12±3; OC per mm<sup>2</sup>) when compared against controls (6.8±2; P<0.05). These OC were functionally active, evidenced by their capacity to resorb a bone substrate. TL1A (100ng/ml) induced a potent 5-fold increase in bone resorption (5.19±3%) over control cultures (1.33±0.35%, P<0.01); the effect was dose-dependent. This was accompanied by a significant (P<0.01; 2-way ANOVA) dose and time dependent elevation in bone-matrix degrading MMP-9 secretion. MMP-9(μg/ml) increased from 4.8±1.1 to 7.5±1 for controls versus TL1A (100ng/ml) activated cultures on day 14. These data reveal a new mechanism for DR3’s resorptive function in bone. This action was independent of TNFα; the cytokine was not detected in any of culture conditions studied. In serum collected from RA patients, TL1A levels were significantly elevated (P<0.05) over normal healthy individuals (3.0±0.6 versus 0.2±0.2 ng/ml). Serum levels of TL1A were also significantly higher in RA (thermodynamically stable) patients with erosive disease over those who had no detectable radiographic changes at time of sampling (3.9±0.8 and 0.5±0.2 ng/ml). TNFα was not detected in any of the samples assayed.

Conclusion: Our findings reveal TL1A to be a key regulator in osteoclastogenesis and imply that the TL1A/DR3 pathway contributes to osteoclast-driven bone pathology associated with RA.

Disclosure: F. L. Collins, None; M. D. Stone, None; R. Goodfellow, None; E. Choy, None; E. C. Wang, None; A. S. Williams, None.

1805

The Pro-Fibrotic Cytokines IL-33 and IL-13 Modulates Dermal Fibrosis Via the A2A Adenosine Receptor. Ross C. Radusky, Jessica L. Feig, Bruce N. Cronstein, Andrew G. Franks and Edwin SL Chan. 1 New York University School of Medicine, New York, NY, 2 New York University School of Medicine, New York, NY, 3 NYU School of Medicine, Division of Rheumatology, New York, NY, 4 New York University, New York, NY

Background/Purpose: We have previously demonstrated that the nucleoside adenosine mediates collagen production and induce dermal fibrosis in in vitro and in vivo models. IL-13 expression is upregulated in tissues characterized by high levels of adenosine (adenosine deaminase-deficient mice). However, the receptor(s) and mechanism involved in this upregulation are unknown. Here, we further characterize the contributions of endogenous adenosine and adenosine A<sub>2A</sub> and A<sub>2B</sub> receptors in skin fibrosis via IL-33 and IL-13 signaling.

Methods: Human dermal fibroblasts were treated with A<sub>2A</sub> receptor agonist (CGS-21680), A<sub>2A</sub> antagonist (ZM241385); A<sub>2B</sub> (BAY6066583), and A<sub>2B</sub>antagonist (MRS1706). Fold changes in the expression of IL-13 and associated receptors were analysed after 2 hours. Message for IL-33, IL-13 and three IL-13 receptors were studied.

Results: Stimulation of the A<sub>2A</sub> receptor with CGS-21680 induces expression of IL-13 and three IL-13 receptors: IL-13Rα1, IL-13Rα2 and IL-4R, were assessed using quantitative real-time PCR and compared to untreated controls.

Background/Purpose: We have previously demonstrated that the nucleoside adenosine mediates collagen production and induce dermal fibrosis in in vitro and in vivo models. IL-13 expression is upregulated in tissues characterized by high levels of adenosine (adenosine deaminase-deficient mice). However, the receptor(s) and mechanism involved in this upregulation are unknown. Here, we further characterize the contributions of endogenous adenosine and adenosine A<sub>2A</sub> and A<sub>2B</sub> receptors in skin fibrosis via IL-33 and IL-13 signaling.

Methods: Human dermal fibroblasts were treated with A<sub>2A</sub> receptor agonist (CGS-21680), A<sub>2A</sub> antagonist (ZM241385); A<sub>2B</sub> (BAY6066583), and A<sub>2B</sub>antagonist (MRS1706). Fold changes in the expression of IL-13 and associated receptors were analysed after 2 hours. Message for IL-33, IL-13 and three IL-13 receptors were studied.

Results: Stimulation of the A<sub>2A</sub> receptor with CGS-21680 induces expression of IL-13 and three IL-13 receptors: IL-13Rα1, IL-13Rα2 and IL-4R. A 2.8x increase in expression was found for IL-13Rα1 (p<0.05), 3.4x for IL-13Rα2 (p<0.05), and 3.9x increase for IL-4 (p<0.05) versus untreated controls. A 3.6x expression was increased by 8.6x (p<0.05). These changes were all blocked by the A<sub>2A</sub> receptor antagonist. Stimulation of the A<sub>2B</sub>receptor alone does not cause significant changes in the expression of the receptors studied.
Conclusion: Despite efforts at investigating the mechanisms underlying fibrogenesis in the skin of patients with scleroderma, no effective anti-fibrotic therapy exists. The nucleoside adenosine induces expression of pro-fibrotic cytokine IL-13 and particularly its cognate receptors IL-13Ra1, IL-13Rα2, and IL-4. Furthermore, upregulation of IL-33 may in part contribute to the induction of IL-13 expression by A2A receptors. These findings suggest that blockade of the A2A receptor may be useful as a novel therapeutic modality to prevent dermal fibrosis in scleroderma.

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1806
A Novel Angiopoietin2/TEK Tyrosine Kinase Receptor Mediated Effect On Leukocyte Cell Influx and Oxidative Damage in Inflammatory Arthritis.

Emese Balogh1, Chiu T. Ng1, Douglas J. Veale2, Ursula Fearon3 and Monika Biniecka4, 1Translation Research Group, Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland, 2Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: The Angiopoietin2/Tie2 (Ang2/Tie2) signaling pathway acts synergistically with VEGF/flk as critical regulators of new vessel growth, morphology and stability possibly through TNFα sensitization. The aim of this study was to assess the synovial tissue levels of VEGF, Ang2 and Tie2 in inflammatory arthritis patients and examine the effect of TNF inhibitors (TNFi) on VEGF expression and angiopoietin/Tie2 signaling. Moreover we correlated these data with changes in clinical outcomes, hypoxia and oxidative damage.

Methods: Forty four patients with inflammatory arthritis (RA n = 30 and PsA n=14) underwent needle arthroscopy. All subjects had actively inflamed knee joints and were assessed pre-TNFi treatment, with a subgroup (n=20) post pre-TNFi therapy. All patients underwent full assessment including liver, kidney and cardiovascular disease. Gene expression of the Ang2/Tie2, cell specific markers (CD3, CD68) and markers of oxidative damage (8-oxo-dG and 4HNE)

Results: Baseline mean synovial tissue pO2 (pO2) level was profoundly hypoxic at 25.9 mmHg, equivalent to an ambient oxygen tension 3.4%. VEGF, Ang2 and Tie2 were expressed throughout the synovium localised in the lining layer, sub-lining and vascular regions. VEGF expression correlated with macroscopic synovitis (r=0.41, p=0.031) and vascularity (r=-0.40, p=0.034). High Ang2 expression was associated with greater synovitis (r=0.56, p=0.013) and number of CD68+ cells (r=0.53, p=0.013). Tie2 expression was significantly associated with CD3+ cells (r=0.39, p=0.023) and CD68+ cells (r=0.46, p=0.010) and with high ESR and CRP (both r=0.37, p=0.047). Treatment with TNFi showed a significant reduction in expression of Tie2 (p=0.034) and Ang2 (p=0.021) and this was paralleled by an increase in pO2 levels from mean 22.8 mmHg to 30.3 mmHg. Finally, a significant association between increased ∆VEGF, ∆Ang2 and ∆Tie2 with high DNA damage (∆8-oxo-dG) and lipid peroxidation (∆4-HNE) was demonstrated (both r< 0.53, p<0.05), strongly suggesting an interplay between oxidative stress and angiogenesis in a progression of chronic inflammatory arthritis.

Conclusion: This data suggests that the Ang2/Tie2 signalling pathways may mediate in part the downstream effects of TNF blockade. Furthermore, this is the first evidence to suggest that Ang2/Tie2 may be directly involved in leukocyte cell influx regulation and oxidative damage within the inflamed joint.

Disclosure: E. Balogh, None; C. T. Ng, None; D. J. Veale, U. Fearon, None; M. Biniecka, None.

1807
Regulation of Inflammatory Responses in Tumor Necrosis Factor-Activated and Rheumatoid Arthritis Synovial Macrophages by Janus Kinase Inhibitors. Anna Yarilina1, Kai Xu1, Chunhin Chan1 and Lionel B. Ivashkiv1, 1Hospital for Special Surgery, New York, NY, 2Hospital for Special Surgery, Weill Medical College of Cornell University, New York, NY

Background/Purpose: Small molecule inhibitors of the Janus kinases (JAKs) have been developed as anti-inflammatory and immunosuppressive agents and are currently undergoing testing in clinical trials. Tofacitinib/CP-690,550 (more potent in inhibiting JAK3 and JAK1) and Ruxolitinib/INC/018424 (selective inhibitor of JAK1/2) have demonstrated clinical efficacy in rheumatoid arthritis (RA). However, the mechanisms that mediate the beneficial actions of these compounds are not well understood. In this study, we examined effects of JAK inhibition on inflammatory responses in human blood-derived and RA synovial macrophages, with a focus on the key pathogenic cytokine TNF that activates JAK-STAT signaling indirectly and with delayed kinetics.

Methods: In vitro studies were performed with peripheral blood macrophages from healthy donors treated with TNF and synovial fluid macrophages from patients with RA. Levels of activated signal transducer and activator of transcription (STAT) proteins and other transcription factors were detected by Western blot, and gene expression was measured by real-time PCR. In vivo effects of JAK inhibitors were evaluated in the K/BxN serum-transfer model of arthritis.

Results: JAK inhibitors suppressed activation and expression of STAT1 and downstream target genes encoding inflammatory chemokines (CXCL9, 10, 11) in TNF-stimulated and RA synovial macrophages. Unexpectedly, both compounds attenuated a late wave of IL1β induction by TNF. Furthermore, CP-690,550 significantly decreased IL6 expression in RA synovial macrophages. In addition, both inhibitors decreased nuclear localization of NF-κB subunits in TNF-stimulated and RA synovial macrophages. Both JAK inhibitors augmented nuclear levels of NFATc1 and cJun, followed by increased formation of osteoclast-like cells. However, only CP-690,550 dramatically increased resorptive activity of these cells. CP-690,550 significantly inhibited inflamed synovium and joint swelling in K/BxN arthritis that is dependent on macrophages but not on lymphocytes.

Conclusion: Taken together, our data demonstrate that JAK inhibitors suppress inflammatory functions of macrophages, in part by altering cell responses to the key pathogenic cytokine TNF. These findings suggest that suppression of macrophages and innate immunity may contribute to the therapeutic efficacy of JAK inhibitors in RA.

Disclosure: A. Yarilina, None; K. Xu, None; C. Chan, None; I. B. Ivashkiv, None.

1808
Immune Activating Effects of Co-Stimulation of TLR Agonists and Cytokines On Primary and Immortalized Keratinocytes From a Patient with a CARD14 Mediated Pustular Psoriasis (CAMS) and Healthy Controls. Yongqing Chen1, Yin Liu2, Yuan Huang2, Carole Yee3, Alain MacBride4, Anne Bowcock5, Michelle Lowes6 and Raphaela T. Goldbach-Mansky7, 1Translational Autoinflammatory Disease Section, Office of the Clinical Director NIAMS, Bethesda, MD, 2NIAMS, Bethesda, MD, 3NCI, NIH, Bethesda, MD, 4NIAD, NIH, Bethesda, MD, 5Washington University, St. Louis, MO, 6Laboratory for Investigative Dermatology, The Rockefeller University, New York, NY, 7Translational Autoinflammatory Diseases Section NIAMS NIH, Bethesda, MD

Background/Purpose: Through producing inflammatory cytokines and chemokines, keratinocytes play an important role along with hematopoietic cells in mediating an inflammatory response in psoriasis and other inflammatory skin conditions. Keratinocyte-produced cytokines include IL-1a, IL-6, IL-8, IL-23, TNF, IL-26o, β, and γ, etc. Recently, autosomal dominant mutations in CARD14 have been shown to cause a disease severity spectrum of plaque psoriasis, pustular psoriasis and pityriasis rubra pilaris. CARD14 is mainly expressed in the keratinocytes in skin. As blockade of IL-12/23 has been very successful in inhibiting skin inflammation in psoriasis and in our pediatric patient with CAMPS, and more recently blockade of IL-17A/F in psoriasis, we hypothesize that keratinocyte activation may be the primary trigger of hematopoietic cell recruitment into the skin and that therapy with IL-12/23 inhibitors and more recently with IL-17 inhibitors may either block keratinocyte directly or through the prevention of IL-17 production, and that inhibition of keratinocyte activation might significantly contribute to the treatment success with these agents in controlling skin inflammation.

Methods: We generated primary and immortalized keratinocyte cell lines from a patient with CAMPS, a patient with CARD14 negative plaque psoriasis and 3 foreskin samples. We examined the immune function of keratinocytes in co-stimulation assays with a panel of TLR agonists and pro-inflammatory cytokines, measuring IL-8 in cell culture supernatant as initial readout for keratinocyte activation. We assessed cytokine receptor expression on keratinocytes. In some experiments gene expression of other cytokines (CCL20, IL-6 and S100A7 (psoriasin)) were assayed by qRT-PCR. Statistical analysis was performed using paired/unpaired t-tests.
Results: Keratinocytes can be activated by the agonists through TLR3, Poly IC; TLR5, Flagellin; and TLR9. Type B CpG oligonucleotides to produce IL-8. Keratinocytes have a number of cytokine receptors, such as IL-1R, IL-6R, IL-17R, IL-23R, IL-36R, TNF-R, etc, and get stimulated through IL-17A, IL-1a/b, and less through TNF, IL-36y. However, they do not get stimulated through IL-12 or IL-23. IL17A synergizes with Poly IC, Flagellin, and also with TNF but not with IL-36y, IL-12 or IL-23. Based on all TLRs and cytokine stimulation of keratinocytes from a patient with the CARD14 mutation, we have higher IL-8 production than control cells and keratinocytes from a patient with severe plaque psoriasis. Expression studies show that under co-stimulation of TNF and IL-17A, mRNA expression of CCL20 and IL-6 occurs early at 4hr, but S100A7 is maximally expressed later at 24hr.

Conclusion: TLRs stimulating through TLRs 3, 5 and 9 and some hematopoietic-produced cytokines particularly IL-17 have direct synergic effects on keratinocyte activation. CARD14 mutant keratinocytes are more sensitive to these positive stimulants than keratinocytes from a patient with regular psoriasis and health controls. Our data suggest that CARD14 mutations sensitize keratinocytes to heightened responses to TLR agonists and co-stimulation with other inflammatory cytokines and is likely the crucial cytokine in promoting skin inflammation.

Disclosure: Y. Chen, None; Y. Liu, None; Y. Huang, None; C. Yee, None; A. MacBride, None; A. Bowcock, None; M. Lowes, None; R. T. Goldbach-Mansky, None.

1809


Background/Purpose: The type I interferon (IFN-I) signature, describing expression in PBMC of a large set of gene transcripts induced by IFN-I, and increased serum IFNα functional activity are characteristic of many patients with systemic lupus erythematosus (SLE) and are candidate biomarkers of disease activity. However, previous studies have not consistently demonstrated whether IFNα activity is useful for monitoring disease activity and assessing the effect of therapy in lupus patients.

Methods: From a cohort of 60 lupus patients with available serum data of IFNα activity, 15 were identified who experienced a) at least 1 severe flare as determined by the SLENA-SLEDAI instrument, and b) had a follow-up visit no longer than 3 months after the occurrence of a severe flare. In the 15 patients identified, there were 21 occurrences of a severe flare, with a follow-up visit no longer than 3 months later. IFNα activity at the time of those visits was measured using an in vitro reporter assay in which WISH epithelial cell line cells (highly responsive to stimulation with IFN-I) were cultured with patient sera and relative expression of IFI1 and IFI44, IFN-α responsive genes, was quantified using RT-PCR. The IFN-I score was calculated by converting relative expression values to IFN units/ml, using a standard curve acquired from dose response stimulations of WISH cells with 1–100 units/ml of recombinant IFNα. Clinical improvement was defined according to the SLE Responder Index (SRI) as: 1) improvement in SLEDAI by at least 4 points; 2) no 2 B or 1 A as recorded in the BILAG; 3) no increase in Systemic Lupus Erythematosus Disease Activity Index (SLEDAI) at the time of follow-up visit. Both B and A criteria were used for SRI assessment.

Results: Of 21 severe flares identified, 12 fulfilled the clinical improvement criteria (no responses) during the next visit (<3 months). In those cases, IFNα score decreased significantly (from a median of 12.67 to 2.3, p=0.005), and there was also a significant decrease in the SLEDAI score (from a median of 13 to 5, p=0.0025). The remaining 9 cases which did not fulfill the clinical improvement criteria (no responses) showed statistically unchanged IFNα and SLEDAI scores. Immunosuppressive therapies were similar in both groups, including mycophenolate mofetil in 10/12 responses and in 5/9 non-responders and Pulse steroids were used in 6/12 responses and 4/9 non-responders. Only 1 pulse steroid therapy in each group was given less than 7 days before serum was obtained for IFNα levels.

Conclusion: Our data indicate that a decrease in IFN-I serum activity following a severe clinical flare may be a sensitive and reliable tool for monitoring the disease state of lupus patients and confirming the effectiveness of therapies used to treat severe flares.

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1810


Background/Purpose: IL17A has been demonstrated to be a key pro-inflammatory cytokine in human rheumatoid arthritis and in several rodent models of arthritis. Synthetic macrocyles are more amenable to optimization for metabolic stability and oral absorption than biotechnologies. The aim of this investigation was to identify high-affinity macrocyclic binders of human IL17A, to quantify their inhibitory potency against IL17A-dependent cytokine production in human cells, and to determine if active compounds could inhibit a delayed-type hypersensitivity response in mice.

Methods: DNA programmed chemistry (DPC) libraries were generated to synthesize in vitro libraries of non-peptidic synthetic macrocycles of molecular weight 600–1000 kDa. Compounds binding to immobilized IL17A were identified by PCR and DNA sequencing. Two compounds were resynthesized and characterized by 1) competitive ELISA to determine affinity for human IL17A, 2) inhibition of IL17A-driven IL-6 production in human rheumatoid arthritis synovial fibroblasts (RASF) and human HT-29 adenocarcinoma cells, 3) inhibition of other pro-inflammatory human cytokine activities, such as IL-1β, IL-6, IL-22, and TNFα, and 4) efficacy in a delayed-type hypersensitivity (DTH) mouse model. The DTH model used a 1-fluoro-2,4-dinitrobenezene (DNFB) sensitizer, which was applied to the rear ear daily. On day 7, compounds dissolved in DMSO were dosed by intraperitoneal (i.p.) injection at a dose of 10 mg/kg. A second application of DNFB was performed on the left ear 30 min after compound dosing. After 24 hours, left ear edema was measured by change in ear weight compared to the right ear, and levels of INF-γ in ear tissue homogenates were quantified by ELISA.

Results: Two synthetic macrocycles identified in this investigation, E-34935 and E-35018, were characterized by a competition ELISA with human IL17A, and determined to have a dissociation constant (Kd) = 2 nM. E-34935 and E-35018 were found to inhibit IL17A with EC50 of 2.0 and 2.1 μM in RASF, and 45 and 20 nM in HT-29 cells, respectively. Both compounds were inactive (EC50 > 25 μM) in a battery of cellular assays for the human cytokines IL-1β, IL-6, IL-22, and TNFα. A single i.p. dose of 10 mg/kg of E-34935 or E-35018 in the murine DTH model suppressed edema vs. vehicle control by 50 or 54% respectively (p < 0.05 vs. vehicle control). In comparison, a rat anti-mouse IL17A IgG1 (5 mg/kg, i.p.) resulted in 76% inhibition of edema. INF-γ levels in tissue homogenates were also suppressed by E-34935, E-35018, or anti-IL17A Ab vs. vehicle control by 72%, 62% or 75%, respectively (p < 0.05 for all groups vs. vehicle control group).

Conclusion: Our data provide evidence that synthetic macrocycles can be identified that bind potently and specifically to human IL17A, and act as inhibitors of IL17A-stimulated IL-6 production in RASF and HT29 cells. Immunomodulatory compounds are also anti-inflammatory in an IL-17A dependent DTH model. Prior to this investigation, such specific inhibitors of the IL17A-IL17 receptor interaction were limited to polypeptides.

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1811

On the Origin of the Type I Interferon Signature in Rheumatoid Arthritis. T.D. de Jong, 1Saskia Vossalamber2, Matja-Leena Eloranta, Lars Rönnoblom,3 Kyra Gelderman1, Mary von Blomberg, Irene Bultink, Alexandre Voskuyl1 and Cornelis L. Verweij1. 1VU University Medical Center, Amsterdam, Netherlands, 2Section of Rheumatology, Uppsala University, Uppsala, Sweden

Background/Purpose: Presence of a type I interferon (IFN) signature has been described for several autoimmune diseases, including systemic lupus erythematosus (SLE) and rheumatoid arthritis (RA). For SLE, it was shown that the IFN signature is induced by IFNα from plasmacytoid dendritic cells via specific immune complexes. Although the IFN signature in RA seems to be comparable to SLE, the source of IFN induction is yet unknown. This study aims to investigate the mechanism by which components of RA serum contribute to the IFN signature.
Methods: Healthy PBMCs were exposed to RA or SLE serum. IFNα protein production was measured in an immunosassay after 20h incubation with 5% patient serum. To study the involvement of immune complexes containing antinuclear antibodies, samples were co-cultured with necrotic or apoptotic cells (Løvgren et al., Arthritis Rheum. 2004 Jun;50(6):1861-72). Moreover, IFN response genes (IRG), IFNα and IFNβ mRNA induction were measured by quantitative PCR after 4h and 8h incubation with 25% patient serum. An IFN gene signature was calculated and the incorporation of 3 IRGs (RSAD2, IFI44L, MX1). To study the involvement of new protein synthesis on IRG induction, part of the samples were co-cultured with 2µg/ml cycloheximide (CHX).

Results: As expected, SLE serum induced more IFNα protein induction than healthy donor serum (NHS) (p<0.0006, Mann Whitney test), which even further increased with dead cell material (p<0.006, Mann Whitney test). RA serum did not induce significantly more IFN protein production than NHS, although a small increase was observed in the absence of dead cell material (p=0.0516, Mann Whitney test).

With respect to IRG mRNA induction, both RA and SLE sera induced higher levels than NHS, though with different induction kinetics. SLE serum showed IRG mRNA induction already at 4h, which stayed present after 8h. CHX treatment even slightly increased IRG mRNA induction at 8h, suggesting that the IRG mRNA induction occurs independently of new protein synthesis and is probably mediated directly by IFNα, as described before. RA serum, on the other hand, showed only IRG mRNA induction after 8h. This IRG mRNA induction was downregulated upon CHX treatment, indicating an indirect IRG induction process. To study whether the IRG induction was preceded by IFNα mRNA induction, IFNα and IFNβ mRNA expression was determined. The IRG induction by RA serum was positively correlated to IFNβ mRNA induction at 4h and 8h (Pearson correlations, 4h: r=0.6873, p=0.0023; 8h: r=0.7173, p=0.013), but not to IFNα production.

Conclusion: RA serum did not induce IFNα protein production, and mRNA induction kinetics differed from those of SLE serum. Furthermore, the IRG mRNA induction by RA serum was preceded by IFNβ mRNA induction. Altogether, this indicates a different source of IRG induction in SLE and RA serum and thus possibly a different mechanism behind their type I IFN gene signature.

Disclosure: T. D. de Jong, None; S. Vosslander, None; M. L. Eleranta, None; L. Rönnhomb, None; K. Gelderman, None; M. von Blomberg, None; I. Bultink, None; A. Voskuyl, None; C. L. Verweij, None.

1812

A Retrospective Evaluation of the Clinical and Economic Implications of Gout in Nursing Home Residents in Hawaii Treated with Allopurinol.

Joy Higa1, Gregory Reardon2 and Gregory Tong3. 1Long Term Care Research Center, Kaneohe, HI, 2Informagencies, LLC, Worthington, OH, 3Deerfield, IL

Background/Purpose: We describe patient characteristics, serum uric acid (sUA) levels while on allopurinol, and activities of daily living (ADL) in nursing home residents with gout.

Methods: On-site chart review of 14 nursing homes in Hawaii (Oct 2010-Mar 2011), including serum creatinine, sUA, the Minimum Data Set (MDS) and medication records. Eligible residents were >65 years of age, had been residents >30 days, and had recent sUA and ADL assessments. Cases (n=202) were eligible residents with gout using allopurinol. Controls (2 per case, n=404) without gout were identified by simple random sampling from the same time frame. A global ADL score was calculated [BMC Geriatr 2006, 6:7] from the most recent MDS. Multiple regression separately estimated the independent association of gout with ADL score and the use of any opiate medication, adjusting for potentially related factors (eg, demographics, body mass index (BMI), renal function, and comorbid conditions).

Results: Of residents with gout, 69% had sUA ≥8mg/dL, despite allopurinol treatment. Compared with controls, cases were younger (39% vs. 53% of cases age <65, p<0.001) and more likely to be of Hawaiian ethnicity (OR=7.3, p<0.001). BMI was 2.3 points higher for cases vs controls (p<0.001). Cases were more likely to have coronary artery disease (OR=4.0, p<0.001), diabetes (OR=3.6, p<0.001), previous myocardial infarction (OR=7.3, p<0.001), and charted renal failure (OR=4.9, p<0.001). They had a mean Carpenter score of 25.2 (0–28; 28=total dependence) vs 17.1 for controls (p<0.001). Adjusted logistic regression models showed that gout was independently associated with a 7.26-point higher (worsened) Carpenter ADL score (p<0.001). Cases were more likely than controls to receive an opiate (adjusted OR=8.7, p<0.001).

Conclusion: In nursing home residents, gout is independently associated with worse quality of life. Further ADL score and should be factored into pre-admission evaluation and considered in resident care management. In the institutionalized elderly, renal insufficiency is prevalent. Allopurinol, even when given at maximum renally-adjusted doses, may not be sufficient to achieve target sUA.

Disclosure: J. Higa, Takoda Pharmaceuticals America, Inc., 2; G. Reardon, Informagencies, Inc., 3; G. Tong, Takoda Pharmaceuticals America, Inc., 3.

1813

Accuracy of Veterans Affairs Database for Gout-Related Health Care Utilization. Jasvinder A. Singh. University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Gout outcome studies have used administrative and claims databases. It is unknown whether administrative-derived data are accurate for gout-related utilization. The goal of the study was to assess the accuracy of Veterans Affairs (VA) administrative and clinical claims databases for gout-related health care utilization.

Methods: This retrospective study utilized the VA administrative and clinical claims databases for the fiscal year 2006. A cohort consisting of randomly mixed sample of two types of visits was identified that included visits with gout as primary or secondary diagnosis versus other diagnoses. An experienced senior epidemiologist (JS) blinded to the database information related to the visit performed review of electronic medical records (EMR). The gold standard was medical record documentation of gout or gout-related terms (gouty arthritis, tophaceous gout, acute gout, chronic gout, podagra, urate renal stones) in the chief complaint, history of present illness or assessment and plan for the visit. This indicated that gout was the main reason or one of the main reasons for the visit. We assessed the accuracy of database-derived gout-related utilization by calculating sensitivity, specificity, and positive and negative predictive values (PPV and NPV).

Results: Of the 108 potential visits, 85 visits to a health care provider (in 85 patients: 84 men, 1 woman with mean age of 63 years) in one of the three settings (outpatient, inpatient or urgent care/emergency room), and retrievable data from medical records, constituted the analyzed dataset. According to the gold standard of chart documentation, 21 visits were related to gout and 64 were not. Administrative claims for visits related to gout were accurate with excellent PPV of 86%, sensitivity of 86%, specificity of 95% and NPV of 95%. There were three visits coded as gout-related visit in databases that did not have any medical record documentation related to gout: one visit each to discuss blood pressure medication, for regular follow-up of multiple medical problems, and for increased blood sugar. Three visits coded as not related to gout in administrative databases were related to gout based on medical record documentation: one patient each with continuing acute gout flare, a new diagnosis with documentation of urate crystals in knee joint fluid, and chronic gout stable on allopurinol.

Conclusion: VA databases can be used to identify gout-related visits with good accuracy. This finding supports the use of VA databases for studies of health services outcomes to identify gout-related utilization. It remains to be seen if findings are generalizable to other clinical and/or claims databases.

Disclosure: J. A. Singh, research and travel grants from Takeda, Savient, Wyeth and Amgen, 2, speaker honoraria from Abbott, 9, Consultant fees from URL pharmaceutics, Savient, Takoda, Ardea, Allergan and Novartis., 5; Michael A. Becker1, Xiangyang Ye2, Kasem S. Akhras3, Rima H. Tawk4, Sudhir Um1, Jason Young2 and Jasvinder A. Singh. University of Alabama at Birmingham, Birmingham, AL

Comparing Clinical Characteristics and Comorbidities of Gout Patients Treated with Allopurinol or Febuxostat.

Michael A. Becker1, Xiangyang Ye2, Kasem S. Akhras3, Rima H. Tawk4, Sudhir Um1, Jason Young2 and Jasvinder A. Singh. University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Gout is a common acute and potentially progressive disease affecting approximately 8 million Americans. Hyperuricemia (serum urate levels [sUA] >6.8mg/dL) is a major pathogenic factor in gout.

Disclosures: None.
Urate-lowering therapy (ULT), aimed at maintaining sUA in the range <6.0 mg/dL, is the commonly recommended goal for managing the hyperuricemia in gout, with allopurinol (ALLO) being the first line therapy in the majority of patients. ALLO, however, has many limitations, including intolerance and dose-limitations in renally compromised patients. Febuxostat (FEB) is another xanthine oxidase inhibitor approved by the FDA in 2009 with favorable safety and tolerability profiles. Our aim was to compare baseline demographics and comorbid characteristics of gout patients receiving ALLO vs. FEB.

**Methods:** Retrospective cohort study using a U.S. ambulatory care-based electronic medical record database with health records of primary care pts. Pts ≥18 years with a prescription for ALLO or FEB from April 1, 2009 to July 31, 2011 and with 13+ months of database activity prior to and a minimum of 6 months of activity after index date were included. Pts prescribed ALLO or FEB with or without ULT prescriptions for or more ULTs on index date were excluded. Baseline pt characteristics (age, gender, race, and payer status), gout disease features (duration, SUA, presence of tophi), and comorbidities, (obtained from clinical history and/or body mass index, blood pressure, fasting plasma glucose, estimated creatinine clearance (eCrCl), smoking status, and alcohol use) were recorded. Comorbid status was summarized by Dayo-modified Charlson Comorbidity Index (CCI) and concomitant medication variables. Descriptive statistics, including mean and standard deviation for continuous variables, counts and proportions for categorical variables were utilized to describe the characteristics of ALLO and FEB cohorts. T-tests were used for continuous variables and chi-square tests for categorical variables.

**Results:** The study identified 35,404 ALLO-treated pts (mean age 63.2(±12.1) years; 77% male) and 2,837 FEB pts (mean age 61.7(±13.1) years; 73% male). Mean baseline SUA was significantly higher in FEB than ALLO pts (8.28 mg/dL vs 6.93 mg/dL, p<0.0001) and more FEB pts had SUA ≥ 9.0 mg/dL (32.7% vs 12.9%, p<0.0001). Majority of ALLO-treated pts (57.1%) were receiving 300mg/day and 37.3% were receiving 100mg/day. FEB-treated pts had greater numbers of comorbidities (CCI ≥3; 22.1% vs 17.05 %, p<0.0001), and higher mean CCI scores (1.65 vs 1.51, p=0.0002) than ALLO pts, and more severe renal disease (eCrCl <60 29.8% vs 19.4%, p<0.0001), presence of tophi (2.22% vs 0.39%), heart failure (5.11% vs 3.01%, p<0.0001), hypertension (HTN) (18.26% vs 16.26%, p<0.0001), and coronary artery disease (CAD) (8.35% vs 6.93%, p=0.0097) were also more common in FEB pts than in those receiving ALLO.

**Conclusion:** A real-world comparison of utilization of ALLO and FEB, shows that ALLO remains the ULT most often used in patients with gout, while FEB is being used in more difficult to treat patients, including those with higher baseline SUA levels and with commonly associated co-morbidities.


**1815**

Factors Associated with a Prolonged Hospital Length of Stay for Patients with Acute Gout. Rebecca Sharim1, Meghan Musselman2 and Marissa Blum2. 1Temple University Hospital, Philadelphia, PA, 2Temple University School of Medicine, Philadelphia, PA

**Background/Purpose:** Management of gout in the hospital setting has been poor. This study aimed to describe patient characteristics and the treatment patterns of acute gout for patients hospitalized with gout in a tertiary care hospital. We hypothesized that the effects of treatment for gout and diagnostic delays for those with acute gout would prolong hospital length of stay.

**Methods:** Medical records of patients hospitalized with a primary or secondary diagnosis of gout (ICD-9-CM: 274.9) were retrospectively reviewed from 2005–2011. Charts were abstracted for demographic data (age, sex, race, insurance status, primary language), co-morbid conditions, length of stay, day of musculoskeletal complaint, medications used to treat gout, day of rheumatology consultation, and day of diagnosis of gout. Bivariate analyses were performed using Fisher’s exact tests for categorical variables, and t-tests and analysis of variance for continuous variables. Multivariable regression testing was performed to evaluate factors associated with length of stay after adjustment for age, race, sex, insurance status, Charlson comorbidity Index, diabetes, chronic kidney disease, heart disease, and history of gout. A follow up qualitative chart review was done to evaluate other factors contributing to length of stay for female and male patients.

**Results:** A total of 205 patients were included. 24.4% (n = 50) were females and 75.6% (n = 155) were males. 78.5% of patients were white, while 82.9% were black and 7.8% were Latino. 83.9% of patients had a prior diagnosis of gout. Co-morbid conditions included cardiac disease (58.5%), pulmonary disease (32.2%), diabetes (45.8%), and chronic kidney disease (44.8%). Rheumatology was consulted in 99.5% of admissions (n=204). 76.6% of patients were treated with intra-articular steroids (n = 157), 40.5% and treated with colchicine (n = 83). 37.1% were treated with systemic steroids (n = 76), and 6.8% were treated with NSAIDs (n = 14). In 45.4% of patients (n = 93), more than one treatment modality was used. Only 31 patients experienced side effects from medications used to treat gout. There was no significant association found between treatment side effects and length of stay.

**Conclusion:** In this retrospective cohort study, a later diagnosis of gouty arthritis and female sex were associated with an increased length of stay after controlling for potential confounders. These data should guide future management of gout to reduce length of hospitalization.

**Disclosure:** R. Sharim, None; M. Musselman, None; M. Blum, None.

**1816**

Relationship Between Race, Uric Acid Levels, Urate-Lowering Therapy and Resource Use in Patients with Gout. Kim Coley, Melissa Saul and Karen Pater. University of Pittsburgh, Pittsburgh, PA

**Background/Purpose:** Gout is a chronic inflammatory disease caused by the deposition of monosodium urate crystals in joints and soft tissues. The overall prevalence is increasing worldwide, with African-Americans (AA) being affected more than Caucasians. We evaluated the association between race, uric acid levels, urate-lowering therapy (ULT) and resource utilization in patients with gout in a large health system.

**Methods:** The study population was a cohort of African-American and Caucasian men and women with gout who had an inpatient or emergency department encounter at a large health system in Southwestern Pennsylvania between 10/1/2008 and 9/30/2011. To be included, subjects had to have an ICD-9-CM code for gout (274.xx) as a primary or secondary reason for hospitalization during the study timeframe. A mean uric acid (UA) level was calculated for each patient across the study period and categorized as either <6 or ≥ 6 mg/dL. ULT was identified during the hospitalization. All patient encounters where gout was listed as the primary diagnosis were collected to assess gout resource use. Chi-square and t-tests were used to compare categorical and continuous data, respectively. Logistic regression was conducted to determine the relationship between race, UA levels, and resource utilization.

**Results:** There were 8,483 patients who met study criteria: 5,998 (71%) were male and 7,073 (83%) were Caucasian. UA levels were available in 43% of patients; a higher percentage of AA had UA levels assessed compared to Caucasians (53% vs 41%, p<0.001). After stratifying by sex, mean UA levels were similar for females, however AA men had higher mean UA levels than Caucasian men (7.9 vs 7.1, p<0.001). Despite having higher UA levels, only 27% of AA received ULT compared to 39% of Caucasians (p<0.001). There were no differences between the sexes with respect to the use of ULT. Multivariable regression analysis revealed that patients with a UA level ≥ 6 mg/dL were more likely to be AA race (OR=1.5), male (OR=1.2), and have chronic kidney disease (OR=1.4) and less likely to be on ULT (OR=0.7). Additionally, after controlling for other variables, AA patients (OR=2.6) and those with high UA levels (OR=2.5) were more likely to have an inpatient and emergency department visits for gout (p<0.001).

**Conclusion:** AA race is associated with higher UA levels and lower use of ULT. AA patients and those with high UA levels were more likely to have emergency department visits or be hospitalized for gout. Improving access to ULT may reduce the burden of gout in African-Americans and reduce overall healthcare costs.

**Disclosure:** K. Coley, None; M. Saul, None; K. Pater, None.
The Role of Repeating Tuberculin Skin Tests During Biologic Therapy. Joseph R. Lutt1 and Kevin L. Winthrop2. 1Colorado Center for Arthritis & Osteoporosis, Boulder, CO, 2Oregon Health & Science University, Portland, OR

Background/Purpose: Prior to starting biologic therapy, it is recommended that all patients be screened for tuberculosis (TB). However, for patients who screen negative at baseline and subsequently start biologic therapy, the utility of repeating a tuberculin skin test (TST) is uncertain. This retrospective study was conducted to evaluate the frequency of TST conversion among patients on biologic therapy in a low incidence region for TB (1.4 cases per 100,000)7.

Methods: We retrospectively reviewed records from a community rheumatology practice in Boulder County, Colorado, to identify patients screened for TB between March 2005 and August 2010. All patients planning to start biologic therapy were screened with a TST at baseline. Those with negative results were screened annually thereafter while on biologic therapy. We defined ≥5mm induration as a positive TST and “conversion” as induration of ≥5mm after an initial negative TST.

Results: Five hundred eighty-nine patients were screened prior to biologic therapy initiation. Most were female (n=353, 60%) and had rheumatoid arthritis (n=359, 61%) or spondyloarthratis (n=198, 34%). Three hundred twenty-seven patients (56%) underwent a total of 818 repeat TSTs, 9 (1.1%) of which were positive. Five (56%) of the converters had no apparent risk factors for TB exposure. All converters had negative chest radiographs. While continuing biologic therapy, all but 1 completed 8-9 months of isoniazid (INH). None have developed TB during a median follow-up period of 49 months (range 16 to 70).

<table>
<thead>
<tr>
<th>Test</th>
<th>Patients tested with TST</th>
<th>Number (%) of +TSTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>TST #1</td>
<td>589</td>
<td>17 (2.9)</td>
</tr>
<tr>
<td>TST #2</td>
<td>327</td>
<td>5 (1.5)</td>
</tr>
<tr>
<td>TST #3</td>
<td>220</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>TST #4</td>
<td>147</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>TST #5</td>
<td>79</td>
<td>0</td>
</tr>
<tr>
<td>TST #6</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>TST #7</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>TST #8</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>TST #2-8</td>
<td>818</td>
<td>9 (1.1)</td>
</tr>
<tr>
<td>Overall</td>
<td>1407</td>
<td>26 (1.8)</td>
</tr>
</tbody>
</table>

Conclusion: In an area of low TB incidence, annual TST conversion while on biologic therapy was rare. Checking yearly TSTs on all patients being treated with biologic agents is of low yield. A small number of converters were identified, but more than half had no apparent risk factors for TB exposure. It is unclear if these conversions truly represent new infections, but all were started on INH and none have developed TB.

References

Disclosure: J. R. Lutt, None; K. L. Winthrop, Oxford Immunotech; Pfizer Inc., 2, Abbott; Pfizer Inc; UCB; Amgen; Cellestis, 5.

1819


1University of Nebraska Medical Center, Omaha, NE, 2National Data Bank for Rheumatic Diseases & University of Nebraska Medical Center, Omaha, NE, 3University of Nebraska Medical School, Omaha, NE, 4National Data Bank for Rheumatic Diseases, Wichita, KS, 5Univ. of Nebraska Medical Center, Omaha, NE

Background/Purpose: Patients with rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE) are at high risk for serious infection, including those caused by Streptococcus pneumoniae. Administration of 23-valent polysaccharide pneumococcal vaccination (23-PPV) is recommended for patients with several co-morbidities and age ≥65 years. EULAR recommends 23-PPV for all patients with autoimmune inflammatory rheumatic diseases and the ACR recommends it for all patients with RA. Small observational studies suggest that administration of 23-PPV in RA patients is inadequate while none studied SLE. The purpose of our study is to determine rates and predictors of 23-PPV administration in US RA and SLE patients.

Methods: We surveyed patients across the US with RA, SLE, or osteoarthritis (OA) every 6 months from 2007 through 2011 about 23-PPV along with their demographic and health status. We identified characteristics within each diagnosis that predicted administration of 23-PPV in a subsequent 6-month period through the use of univariate logistic regression adjusted for sex and age ≥65 years. Significant predictors were combined in a multivariate logistic regression model and eliminated with backward stepwise selection until all remaining predictors were significant for an alpha of 0.05. We also selected a subset of cases who had never anti-TNF therapy despite LTBI screening and the association with different anti-TNF agents.

Results: An anonymous, 24-multiple-response questionnaire was completed by 393 rheumatologists operating in all Italian regions between January and March 2012. The questionnaire encompassed several aspects of clinical practice including the use of different recommendations, the availability of tuberculin skin test (TST) and interferon-gamma release assay (IGRA), the strategies to detect active TB in the case of positive LTBI, the type and duration of TB prophylaxis, the number of patients currently treated with anti-TNF at the date of March 31,2012 and the recorded active TB cases over the previous 10 years expressed as total number and divided by the specific anti-TNF drug.

Results: The Italian Society for Rheumatology recommendations were used by 324/393 (82%) rheumatologists, other international sets by 60 (15%) and occasionally by 10 (3%). However, local infectious disease experts were always consulted by 81 (21%) and occasionally by 73 (19%). TBST and IGRA were available in 78% and 71% of the centers, respectively. LTBI screening was made using chest radiograph (CR) + TST by 39%, CR + IGRA by 28%, CR + TST + IGRA by 33%. Isoniazid (9-month course) for TB reactivation prevention was employed by 324/393 (83%) of rheumatologists, isoniazid + rifampicin for 4 months by 19/393 (5%), other strategies by 50 (12%). TB prevention was initiated in presence of positive TST by 134 (34%) rheumatologists, positive TST + IGRA by 211 (54%), positive IGRA by 48 (12%). When TB prevention was indicated, anti-TNF was started 1 month after 59 (15%), after 3 months in 28%, concomitantly in 9%. Over a 10-year period, 39353 patients (pts) received at least one anti-TNF drug and 317 (0.8%) developed active TB. Active TB occurred during the anti-TB prophylaxis period in 192 (60.6%) pts, in 24 (7.6%) after anti-TB therapy withdrawal, and in 101 (31.8%) with negative LTBI screening. Active TB cases distribution by drug was: etanercept 51 (16%), adalimumab 98 (31%), infliximab 137 (43.2%), golimumab 9 (2.8%), certolizumab 8 (2.5%), 14 (4.4%) in pts switched to multiple agents, with a significant lower frequency in pts receiving etanercept compared to those treated with monoclinal anti-TNF (χ² = P<0.001).

Conclusion: The Italian rheumatologist attitude to detect LTBI and to prevent TB reactivation in pts requiring anti-TNF is quite variable despite the availability of multiple sets of recommendations. The elevated number of active TB cases during anti-TB therapy and in pts with negative LTBI screening indicate some defects of these procedures. Confirming other studies, active TB occurrence seems significantly lower in pts receiving etanercept compared to monoclonal anti-TNF drugs.

Disclosure: F. Cauiti, None; E. Lubrano, None; A. Mathieu, None; A. Marchesoni, None; C. Salvareni, None; R. Scarpa, None; A. Spadaro, None.
received 23-PPV at baseline and used univariate Cox proportional hazards models controlling for diagnosis group to predict the timing of the first administration of 23-PPV. Significant predictors were combined in a multivariate Cox proportional hazards model and eliminated with backward stepwise selection until all remaining predictors were significant for an alpha of 0.05.

**Results:** A total of 15,954 patients participated in the study (11,952 RA, 1,773 SLE, and 2,229 OA). Among these groups 69.8%, 65.2%, and 67.8% of patients reported having ever received 23-PPV, respectively. SLE patients who reported receiving 23-PPV in the subsequent 6 months were more likely to be over 65 (OR 1.64, p = 0.01), taking prednisone (OR 1.38, p = 0.01), and to have chronic lung disease (OR 1.68, p < 0.01). RA patients age > 65 (OR 1.70, p < 0.01), male (OR 1.16, p = 0.01), on biologic therapy (OR 1.18, p < 0.03) or prednisone (OR 1.20, p < 0.01) and suffering from chronic lung (OR 1.53, p < 0.01) or heart disease (OR 1.20, p < 0.03) were more likely to receive 23-PPV. Age > 65 was the strongest predictor of 23-PPV use in OA patients (OR 2.06, p < 0.01). Patients were more likely to receive their first 23-PPV if they were over 65 (HR = 2.05, p < 0.01), male (HR = 1.2, p < 0.01), taking a non-biological DMARD (HR = 1.32, p < 0.01), taking a biological DMARD (HR = 1.31, p < 0.01), had chronic lung disease (HR = 1.33, p < 0.01), or had a lower SF36 PCS score (HR = 0.99, p < 0.01).

**Conclusion:** Despite current EULAR and ACR recommendations nearly a third of RA and SLE patients have never received a pneumococcal vaccination in a large, contemporary US cohort. Age greater than 65 years and chronic lung disease were the strongest predictors of 23-PPV administration. This is the first study to report that use of immunosuppressive drugs other than prednisone was not associated with pneumococcal vaccination in SLE patients.

**Disclosure:** A. Gramling, None; K. Michaud, None; H. Sayles, None; F. Wolfe, None; M. Hearth-Holmes, None.

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**1820**

**Human Papillomavirus Vaccine [Types 6, 11, 16, 18] (Gardasil®) and Autoimmune Disorders: Safety Assessment Using the Pharmacoepidemiologic General Research Extension System**

Lamiae Grimaldi-Bensouda1, Michel Rossignol2, Eldodie Aubrun2, Pamela Leighton1, Didier Guillermot2, Alfred Mahrt2, Jacques Benchou2, Paul-Henri Lambert2, Bertrand Godeau1 and Lucien Abenhaim1.


**Background/Purpose:** This study investigated whether the human papillomavirus (HPV) vaccine [types 6, 11, 16, 18] is associated with a modified risk of autoimmune disorders (AIDs). It carried out a case-control study of patients or their parents. The interviewers were blind to the inclusion of uncertain exposures to vaccination and unconfirmed cases. The specialist centers reported no important increase in incidence for any of the AIDs in the population eligible for HPV vaccination.

**Conclusion:** No evidence of an increased risk of the studied AIDs was observed following vaccination with HPV vaccine [types 6, 11, 16, 18] for the time window of study available. The study lacked the power to conclude on individual disorders taken separately. The study observed no unusual accrual, in a large series of centers specialized in AIDs, of incident cases of any of the diseases surveyed in young females, at a time when one-third of them were getting vaccinated against HPV, mainly by HPV vaccine types 6, 11, 16, 18.

**Disclosure:** L. Grimaldi-Bensouda, None; M. Rossignol, None; E. Aubrun, None; P. Leighton, None; D. Guillermot, SPMSD, 5; A. Mahrt, SPMSD, 5; J. Benchou, None; P. H. Lambert, SPMSD, 5; B. Godeau, SPMSD, 5; L. Abenhaim, None.

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**1821**

**Clinical Predictors of Methotrexate-Induced Liver Enzyme Elevation in Patients with Rheumatoid Arthritis in an Electronic Medical Record.**

Monica Ramirez,1 Bing Lu2, Michelle A. Frits,1 Anne H. Fossel2, Katherine P. Liao3, Robert M. Plenge1, Jonathan S. Coblyn2, Nancy A. Shadick2 and Elizabeth W. Karlson2.1. Brigham and Women’s Hospital, Boston, MA, 4. Department of Medicine, Division of Rheumatology, Immunology and Allergy, Brigham and Women’s Hospital, Boston, MA; 5. Brigham and Women’s Hospital, Harvard Medical School, Boston, MA.

**Background/Purpose:** Methotrexate (MTX) use for the treatment of rheumatoid arthritis (RA) has been associated with hepatotoxicity, and requires monitoring of liver transaminases. However, elevations in liver transaminases may be transient and may not predict the development of cirrhosis or fibrosis. We aimed to identify clinically relevant factors associated with persistently elevated liver transaminases leading to discontinuation or dose reduction of MTX in RA patients.

**Methods:** The study population was derived from an EMR-based cohort of 5906 RA cases at a large academic medical center followed since 1992. We used a validated algorithm to identify patients with RA (PPV 94%). We extracted data on any MTX prescription, and any LFT elevations defined as liver transaminases > 2 times the upper limit of normal (2X ULN). From the 1,040 RA patients identified as ever treated with MTX and with LFTs > 2X ULN, we randomly selected 500 patients for detailed chart review; 90 cases (18%) were confirmed as having LFT elevations while receiving MTX, with LFT elevations attributed to MTX. We abstracted data on risk factors for liver toxicity: age, sex, obesity, hyperlipidemia, MTX dose (2.5–7.5mg, 10.0–17.5mg, or 20–25mg), alcohol use, NSAID use, and statin use. We defined our outcome as continuation of MTX versus discontinuation or dose reduction. We examined the univariable associations of the predictors with outcome and developed a multivariable adjusted logistic regression model to estimate odds ratios and 95% CI.

**Results:** In our cohort of 90 patients, MTX was discontinued or the dose was reduced in 53 (61%) of patients. The remainder of those that continued MTX had a single LFT elevation that resolved. Among the patients in whom MTX was discontinued or the dose was reduced, 8 (15%) of patients had biopsies that showed fibrosis attributed to MTX use. In our univariable analysis, obesity was significantly associated with MTX discontinuation or dose reduction (Table). In our multivariable model we included age, sex, obesity and hyperlipidemia, and obesity remained significantly associated with MTX discontinuation or dose reduction, OR 3.65 (95% CI 1.01–6.60), p-value 0.05. Fifteen (27%) of obese patients had a clinical diagnosis of nonalcoholic fatty liver disease (NAFLD) in the MTX discontinuation or dose reduction group, and 2 (4%) obese patients had this diagnosis in the MTX continuation group.
Background/Purpose: The National Quality Forum recently endorsed a controversial quality measure that assesses liver toxicity monitoring for patients receiving oral methotrexate (MTX). Using national data from the Veterans Health Administration (VHA), we assessed the frequency of liver function testing (LFT) and rates of MTX discontinuation after minimally elevated LFTs among patients taking oral MTX.

Methods: We created a national cohort of incident MTX users ≥ age 65 using linked pharmacy and laboratory data from the VHA during fiscal years 2007–2008. Patients were included if they had ≥ 28-day supply of MTX dispensed and use of VHA services for a minimum of 180 days prior and 90 days after the index MTX prescription. Patients were excluded if they had any diagnosis of inflammatory bowel disease (ICD-9 codes 555.x, 556.x) or if they had evidence of having obtained care outside of the VHA (patients with any medical encounter billed to Medicare during the study period were removed from the sample). We defined performance on the MTX liver toxicity monitoring quality measure through 2 methods (Table). Using the value of the first abnormal LFT after the index MTX prescription, we assessed rates of MTX discontinuation (defined as lack of MTX dispensed for ≥ 90 days after the anticipated refill date).

Table. Performance on methotrexate liver toxicity monitoring quality measure in a national cohort of veterans

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
<th>Performance in national veteran incident user cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>NQF technical specification</td>
<td>Proportion of patients in the population who were prescribed at least a 6-month supply of methotrexate during the measurement year that received a liver function test in the 120 days (3 months + 1 month grace period) following the earliest observed methotrexate prescription claim.</td>
<td>77%</td>
</tr>
</tbody>
</table>

Conclusion: In our cohort of RA patients with MTX-related LFT elevation, single LFT elevations resolved in 39% of patients. We found a significant association between obesity and LFT elevations that led to MTX discontinuation or dose reduction. This suggests a potentially heightened risk for hepatotoxicity among obese patients. Further studies are needed to determine whether NAFLD may be an underlying risk factor in this patient population.

Disclosure: M. Ramirez, None; B. Lu, None; M. A. Frits, None; A. H. Fossel, None; K. P. Liao, None; R. M. Plenge, None; J. S. Coblyn, CV5; 5. N. A. Shadick, Amgen; 2. Abbott Immunology Pharmaceuticals, 2; Genentech and Biogen IDEC Inc., 2; Crescendo Bioscience, 2; Medimmune, 5; None.

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Liver Toxicity Monitoring and Its Impact On Methotrexate Discontinuation in a National Cohort of Veterans

Table. Univariable Analysis of Predictors of MTX Discontinuation or Dose Reduction

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Univariable OR (95% CI)</th>
<th>Univariable p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.99 (0.95–1.03)</td>
<td>0.57</td>
</tr>
<tr>
<td>Male sex</td>
<td>0.58 (0.33–1.01)</td>
<td>0.04</td>
</tr>
<tr>
<td>Obesity</td>
<td>2.89 (1.20–7.00)</td>
<td>0.02</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>1.92 (081–4.54)</td>
<td>0.14</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>1.58 (0.95–2.5)</td>
<td>0.36</td>
</tr>
<tr>
<td>MTX dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5–7.5 mg (ref)</td>
<td>1.00 (ref)</td>
<td>*</td>
</tr>
<tr>
<td>10–17.5 mg</td>
<td>0.76 (0.22–2.64)</td>
<td>0.54</td>
</tr>
<tr>
<td>20–25 mg</td>
<td>1.01 (0.27–3.77)</td>
<td>0.76</td>
</tr>
<tr>
<td>NSAID use</td>
<td>0.95 (0.41–2.22)</td>
<td>0.90</td>
</tr>
<tr>
<td>Statin use</td>
<td>1.15 (0.43–3.12)</td>
<td>0.78</td>
</tr>
</tbody>
</table>

*p for trend = 0.85

Results: 899 new users of MTX met inclusion and exclusion criteria for the study. 97% were male, mean age was 71 years (SD 6.3), and mean follow-up period was 267 days (SD 133). Mean MTX dose received was 11.4 mg weekly (SD 5.1). Performance on the quality measure is described in the Table. 148 (16.5%) patients did not have any LFT testing after MTX was initiated. 136/899 (15%) patients had any abnormality of AST or ALT during the follow-up period; 49/899 (5%) had an elevation of ≥ 1.5 × upper limit of normal (ULN). MTX was discontinued in 28/87 (32%) subjects with LFT elevations < 1.5 × ULN and 27/49 (55%) subjects with elevations ≥ 1.5 × ULN. Compared to patients with no LFT elevations during the follow-up period, patients with LFT elevations < 1.5 × ULN had 1.4 greater odds (95% CI 1.1, 1.8) of stopping MTX.

Conclusion: Despite many MTX users not receiving liver toxicity monitoring with the frequency intended by the National Quality Forum quality measure, one third of patients with mild LFT elevations may be having their MTX stopped unnecessarily. These findings suggest that there may be unintended negative consequences to a policy that encourages more frequent liver toxicity monitoring.

Disclosure: G. Schmajuk, None; Y. Miao, None; J. Yazdany, None; M. Margaretten, None; M. Steinman, None.

1823
Short Periods of Glucocorticoid Use Increase the Risk of Gastrointestinal Bleeding

Background/Purpose: Short term use of glucocorticoids (GCs) is thought to be relatively benign and most adverse events have been studied in chronic users; there is little if any published evidence about the safety of short term use. We aimed to examine whether short periods of GC use are associated with an elevated risk of gastrointestinal bleeding (GIB).

Methods: We used national US Veterans Administration data from fiscal year 1998 through 2008 to compare the risk for GIB during periods of GC use compared to periods of non-use using a self-controlled case series design. This is a case-only design which compares risks within persons, thus limiting confounding. Based on prescription records we first developed a cohort of subjects who had only used "burst" GCs, defined as dispensed oral prescriptions of ≥ 30 days with at least 42 days between consecutive prescriptions. We excluded persons who received GCs during their first 60 days of follow-up or who could have received GCs during a prior hospitalization so as to limit the amount of unmeasured GC use. From these subjects, we selected those who had a first GIB requiring hospitalization using previously validated ICD-9 codes; we excluded cases who had a GIB within the first year of follow-up (to limit the number with possible recurrences) and those using NSAIDs during the follow-up period so as to eliminate this as a potential confounder. We focused on the period in which each subject was using GCs, as well as 30 days before and after to account for confounding by indication and any residual GC effects. The risk of GIB in each of these periods was compared to that in the remaining period of follow-up time. We controlled for age in 5 year bands (18–24, 25–29, 30–34..., > 50).

Results: There were 433 cases of GIB among burst GC users. 94.7% were men. Mean age at GIB was 65.2 (sd 11.9) years; 65.9 (11.5) in men, 53.6 (12.4) in women. 71.4% of subjects were white, 13.7% African American, 6.3% Hispanic, 8.6% other. All cases had only 1 GC prescription for a median duration of 8 (Q1: 3; Q3: 14) days and median average daily prednisone equivalent dose of 20 (17.5, 26.8) mg. The incidence rate ratio (IRR) of GIB while using GCs was 5 times that of the baseline risk period. See table.
Background/Purpose: Few studies directly compare work disability (WD) and work productivity losses in different forms of inflammatory arthritis (IA) such as rheumatoid arthritis (RA), psoriatic arthritis (PsA) and ankylosing spondylitis (AS). Also, the effect of comorbidities on WD in IA has not been thoroughly examined.

Methods: WD was defined as the inability to work or early retirement due to arthritis. Relationships between the Work Limitations Questionnaire (WLQ) scores, HAQ, Patient Global Assessment (PGA) and Functional Comorbidity Index (FCI) were analyzed in patients seen serially in a rheumatology clinic via standardized forms.

Results: 846 responded (65% response rate with 332 RA, 88 PsA, 58 AS) and 289 had WLQ data as they were working (139 RA, 51 PsA, 35 AS). The mean age was 51.7 (SD 14.5), 74.3% female and 11.3 years (SD 11.3) of disease duration. WD due to arthritis was 22.8% (RA), 29.9% (PsA), and 27.6% (AS) (between groups p <0.05). WD was associated with HAQ, PGA, fatigue, pain and sleep score in all three IA conditions. The average loss of the productivity from WLQ was 4.72% for IA overall and 4.47%, 4.71% and 5.77% for RA, PsA and AS, respectively (no difference between groups, p =0.405). Using Pearson correlation, the WLQ score was significantly correlated with HAQ (0.59; p<0.000), fatigue (0.51; p<0.000), pain score (0.57; p<0.000), sleep score (0.63; p<0.000), and with increasing number of comorbid conditions for all three IA conditions (RA:0.30; p<0.001, PsA:0.30; p =0.03 and AS:0.53; p<0.01) but not disease duration and gender.

Conclusion: WD and productivity loss were not different in RA and AS. WLQ scores were associated with patient factors in all IAs. Comorbidities increased the likelihood of work productivity loss and WD in all forms of IA, but the correlation was particularly strong in AS.

Disclosure: C. Rhee, None; J. E. Pope, Actelion and Pfizer, 2, Actelion and Pfizer, 5; A. E. Thompson, None; N. G. H. Le Riche, None; G. Rohokar, None; S. Rohokar, None.

1826
Intravenously Administered Golimumab Significantly Improves Health Related Quality of Life and Work Productivity in Patients with Rheumatoid Arthritis: Results of a Phase III, Placebo Controlled Trial. Rene Westhovens1, Michael Weinblatt2, Chenglong Han3, Tim Gathany4, Lilianne Kim5, Michael Mack6, Jandong Lu7, Daniel Baker7, Alan Mendelson7 and Clifton O. Bingham III7. 1University Hospital KU Leuven, Leuven, Belgium, 2Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 3Johnson & Johnson Pharmaceutical Services, LLC, Malvern, PA, 4Janssen Research & Development, LLC, Spring House, PA, 5Johns Hopkins University, Baltimore, MD

Background/Purpose: To evaluate the impact of intravenously (IV) administered golimumab (GLM) on health related quality of life (HRQoL) and work productivity in patients (pts) with rheumatoid arthritis (RA).

Methods: GO-FURTHER was a multicenter, randomized, placebo-controlled study. Adult pts with active RA despite MTX therapy (≥6 tender and swollen joints, CRP ≥1.0mg/dL, and RF and/or anti-CCP positive) were randomized to placebo + MTX (PBO group) or GLM (2mg/kg) plus MTX at week 0, 2, and every 8 week thereafter (GLM group). Pts in PBO group with <10% improvement in tender and swollen joint count from baseline at week 16 entered early escape (EE) and received a 2mg/kg GLM infusion at Weeks 16 and 20 and every 8 weeks subsequent. HRQoL was assessed using Short-Form of 36 items questionnaire (SF-36) and EQ5D. The EQSD instrument consists of a five-item descriptive system of health states and a visual analog scale (EQ VAS, 0–100). Scores for the five health states were converted into a utility score (EQ5D index, 0–1, 0=dead and 1=full health) using the US D1 model. Impact of disease on daily work productivity was assessed using a visual analogue scale (VAS) of 0–10 (0=no affect at all, 10=affected very much). Clinically meaningful improvements were defined as a change of ≥5 points in SF-36 physical and medical component summary score (PCS and MCS) or a change in magnitude of half of standard deviation in EQ VAS and EQ5D index. Correlation of remission measured by disease activity score (DAS28 using CRP <2.6) with change in PCS and MCS and productivity scores were analyzed. Comparisons between groups were performed using ANOVA on van der Waerden normal scores for continuous outcomes or Chi-square test for binary outcomes.

Disclosure: N. G. H. Le Riche, None; J. E. Pope, Actelion and Pfizer, 2, Actelion and Pfizer, 5; A. E. Thompson, None; N. G. H. Le Riche, None; G. Rohokar, None; S. Rohokar, None.
Results: At baseline, mean (SD) SF-36 PCS (30.8±6.95) and MCS (37.6±11.28) were notably below the US norm of 50. The impact of disease on daily work productivity was 6.4 (2.32). Compared to the PBO group, significantly greater changes were observed in the GLM-group at baseline and week 12. EQ VAS at week 36 was statistically significant compared to all other groups.}

Conclusion: Treatment with IV administered GLM significantly improved HRQoL and work productivity in pts with RA.


1827
Factors That Impact Work Productivity in the Preserve Trial: A Randomized Controlled Trial of Combination Etanercept-Methotrexate Therapy in Patients with Moderately Active Rheumatoid Arthritis

Methods: All health care seeking subjects with a diagnose of PsA according to ICD 10 codes (given at least once by a rheumatologist/internist or twice by any other physician) were identified by a regional health care register during 2003–2007. In 2009 all identified subjects aged 18 years or older (n=2003) were invited to participate in a cross sectional questionnaire survey. The questionnaire included self-reported data on smoking (never smokers or ever smokers), age at disease onset, disease duration at BL, HAQ score ≤0.5 vs >0.5, PGa of disease activity, pain score, FACIT-Fatigue score, WPAI:RA score, and treatment at wk 36.

Results: No significant association was observed between patients' age and gender at BL or pain or FACIT-Fatigue scores at wk 36 and % overall work impairment at wk 88 (Table). In contrast, disease duration at BL, as well as HAQ score ≥0.5, PGa of disease activity, and WPAI:RA scores at wk 36 were significant predictors of work impairment (P<0.05). After controlling for other factors, in comparison with P/M, E50/M provided greater benefit in improving work productivity at wk 88 (P<0.05), whereas E25/M did not.

Conclusion: Disease duration, HAQ score ≥0.5, PGa, and work impairment at baseline were significant predictors of work impairment at end of the study in this population of patients with moderately active RA. Significant improvement in the overall percentage of work productivity was evident in patients receiving etanercept 50 mg plus methotrexate compared with placebo plus methotrexate.

References

1828
Smoking Is Associated with Worse and More Widespread Pain, Worse Fatigue, General Health and Quality of Life in a Swedish Population Based Cohort of Patients with Psoriatic Arthritis

Background/Purpose: Smoking has been found to be associated with an increased risk of developing psoriatic arthritis (PsA). The purpose of this study was analyse possible associations of smoking habits with self-reported clinical features in a large population based cohort of patients with a diagnosis of PsA.

Methods: Smoking was found to be associated with an increased risk of developing psoriatic arthritis (PsA). The purpose of this study was analyse possible associations of smoking habits with self-reported clinical features in a large population based cohort of patients with a diagnosis of PsA.

Results: Response rate was 77% whereof 369 patients (18%) declined participation and 1185 (59%) returned the questionnaire, mean age 57.5 (SD 13.5) years and 58% were women. 1173 subjects responded to the smoking question whereof 448 (38%) were never smokers and 725 (62%) were ever smokers.

Table. Factors predicting WPAI:RA % overall work impairment at wk 88 in the PRESERVE trial

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Regression Coefficient (SE)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>−0.10 (0.13)</td>
<td>0.447</td>
</tr>
<tr>
<td>Female</td>
<td>−4.18 (3.18)</td>
<td>0.190</td>
</tr>
<tr>
<td>Disease duration</td>
<td>0.51 (0.19)</td>
<td>0.008</td>
</tr>
<tr>
<td>HAQ score</td>
<td>8.19 (3.32)</td>
<td>0.014</td>
</tr>
<tr>
<td>PGa of disease activity at wk 36</td>
<td>3.92 (1.52)</td>
<td>0.010</td>
</tr>
<tr>
<td>Pain VAS score at wk 36</td>
<td>−0.34 (0.19)</td>
<td>0.086</td>
</tr>
<tr>
<td>FACIT-Fatigue score at wk 36</td>
<td>0.28 (0.21)</td>
<td>0.185</td>
</tr>
<tr>
<td>WPAI:RA at wk 36</td>
<td>0.56 (0.11) &lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>E50/M treatment</td>
<td>−11.51 (3.17)</td>
<td>0.0003</td>
</tr>
<tr>
<td>E25/M treatment</td>
<td>−3.90 (3.00)</td>
<td>0.196</td>
</tr>
</tbody>
</table>

HAQ = Health Assessment Questionnaire; PGa = patient global assessment; VAS = visual analog scale; FACIT-Fatigue = Functional Assessment of Chronic Illness Therapy-Fatigue; WPAI:RA = Work Productivity Activity Impairment Questionnaire: Rheumatoid Arthritis; E50/M = etanercept 25 mg QW plus methotrexate; E25/M = etanercept 25 mg QW plus methotrexate.
Mean age at disease onset was 42.3 (SD 13.4) years in never smokers vs. 46.0 (SD 13.2) in ever smokers. Never smokers vs. ever smokers had mean HAQ 0.59 (SD 0.6) vs. 0.71 (SD 0.6), mean pain 3.9 (SD 2.4) vs. 4.4 (SD 2.5), mean fatigue 4.4 (SD 2.8) vs. 5.0 (SD 2.7), mean global health 3.9 (SD 2.4) vs. 4.4 (SD 2.3), mean EQ-5D 0.68 (SD 0.23) vs. 0.63 (SD 0.26) and mean no of painful regions were 7.2 (SD 4.0) vs. 7.9 (SD 4.3).

The regression analysis showed that ever smokers had worse pain with age-sex adjusted parameter estimates (B) = 0.38 (95% CI 0.09; 0.67), worse fatigue B = 0.34 (95% CI 0.02; 0.66), worse global health B = 0.36 (95% CI 0.08; 0.64), worse EQ-5D B = −0.04 (95% CI −0.07; −0.01) and an increased no of painful regions B = 0.54 (95% CI 0.02; 1.07) compared with never smokers.

**Conclusion:** In this population based PsA cohort, patients who were ever smokers reported worse clinical outcomes compared with never smokers. Further longitudinal studies are needed to better understand cause and effect. However, smoking cessation should be recommended due to general health perspectives and also due to disease specific issues.

**Disclosure:** A. B. L. Bremander, None; L. T. Jacobsson, None; S. Bergman, None; E. Haglund, None; I. F. Petersson, None.

### 1829

**Cost of Etanercept, Adalimumab, and Infliximab in Patients with Rheumatoid Arthritis with Employer Provided Health Insurance.**

Maacho Bonafe1, Crystal Watson, George Joseph3, Nicole Prince1 and David J. Harrison2. 1Thomson Reuters Healthcare, Cambridge, MA, 2Amgen, Thousand Oaks, CA

**Background/Purpose:** Tumor Necrosis Factor Inhibitors (TNFi) are the mainstay of treatment for rheumatoid arthritis (RA) in patients with moderate to severe disease. The three most commonly used agents, etanercept (ETN), adalimumab (ADA), and infliximab (INF), differ with respect to frequency of administration, dosing and the approved dose ranges. In addition, INF is administered as infusion by a healthcare professional, whereas ETN and ADA are self-administered subcutaneously. The goal of this study was to determine the annual TNFi drug and administration costs for RA patients on ETN, ADA, or INF.

**Methods:** The MarketScan Commercial Database was used to identify adult patients (18–64 years) with ≥1 claim for ETN, ADA, or INF between February 1, 2008 and July 5, 2010. Patients were required to have continuous insurance for six months prior to the start of their index TNFi. The patient’s first TNFi claim after 6-months of continuous enrollment was their index claim and they were “new”. Patients were followed for 1 year and the cost of all claims after 6-months of continuous enrollment was their index claim and they were “new”. Patients were followed for 1 year and the cost of all claims after 6-months of continuous enrollment was their index claim and they were “new”. Patients were followed for 1 year and the cost of all claims after 6-months of continuous enrollment was their index claim and they were “new”.

**Results:** Complete data were available for 548 patients (mean age 56 yrs, female 77%, ACPA 46%, RF 50%, ACR/EULAR 2010 83%, mean DAS28 5.1, mean HAQ 1). Annual mean direct cost per patient was €3,648, with a range from €181 to €53,739. On average, RA drug costs represented 48% of the overall direct costs, and up to 76% for patients receiving biologics.

**Conclusion:** As in established RA, biologic use is the main cost driver in rheumatoid arthritis care within the first years of the disease.

**Disclosure:** B. Fautrel, None; S. Lucier, None; G. Haour, None; H. Maouilid, None; S. Harvard, None; A. Saraux, None; X. Mariette, None; F. Guillemin, None; I. Durand-Zaleski, None; K. Chevreul, None.

### 1830

**Drugs Are the Major Cost Driver of Rheumatoid Arthritis As Soon As The First Year of the Disease: An Economic Analysis Based On the Espoir Cohort Data.**

Bruno Fautrel1, Sandy Lucier2, Georges Haour3, Hassan Maouilid4, Stephanie Harvard5, Alain Saraux1, Xavier Mariette5, Francis Guillemin5, Isabelle Durand-Zaleski5 and Karine Chevreul5. 1APHP-Pitie Salpetriere Hospital/UPMC, Paris, France, 2APHP - URC Eco, Paris, France, 3Université Brest Occidentale, Brest, France, 4Université Paris-Sud, Le Kremlin Bicetre, France, 5Faculte de Medecin/BP 184, Vaudouvre-les-Nancy, France

**Background/Purpose:** Many studies have explored the economic burden of established RA but few data are available about the determinants of costs in early rheumatoid arthritis (RA) cared in real life settings.

The present study aims to describe the determinants of medical costs of early RA during the first 4 years of the disease.

**Methods:** The ESPoir cohort is a nationwide cohort that enrolled 813 patients with early arthritis, highly suspect of RA, between 2002 and 2005. Data were collected every six months during the first two years then yearly. The health resource use was investigated using a validated questionnaire collecting consultations to medical doctors or health professionals, clinical workshops, hospitalizations, and treatments. Costs of care (direct costs) were elicited using the national average prices (2007 euros).

After log-transformation of costs, their determinants were explored by multilevel modeling, using unconditional means models to test for structural effects. To investigate the impact of treatment strategies, patients were classified according to time of biologic initiation: “first-year” (n = 42), “later year” (n = 66) and “never” (n = 440). Univariate correlations were first tested (p ≤ 0.05) so as to preselect a set of variables for multivariate analyses.

Then, a multilevel regression analysis was conducted to identify determinants of total direct costs during the first 4 years of follow-up.

**Results:**

**Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Multiplicative factor</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at baseline</td>
<td>1.07</td>
<td>1.002; 1.13</td>
<td>0.04</td>
</tr>
<tr>
<td>Living with a partner</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.79</td>
<td>0.79; 0.94</td>
<td>0.01</td>
</tr>
<tr>
<td>Rheumatoid Factor positivity at baseline</td>
<td>Yes</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.20</td>
<td>1.03; 1.40</td>
<td>0.02</td>
</tr>
<tr>
<td>HAQ score at baseline</td>
<td>0-0.5</td>
<td>0.47</td>
<td>0.34; 0.64</td>
</tr>
<tr>
<td>0.5-1</td>
<td>0.49</td>
<td>0.36</td>
<td>0.66</td>
</tr>
<tr>
<td>1-2</td>
<td>0.72</td>
<td>0.56; 0.94</td>
<td>0.01</td>
</tr>
<tr>
<td>Variation in HAQ score ≥ 0.25 between baseline and 6 month visit</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.07</td>
<td>1.04; 1.12</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Biologic use</td>
<td>Never</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>First year</td>
<td>9.03</td>
<td>6.83; 11.95</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Later year</td>
<td>5.30</td>
<td>4.21; 6.67</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Physician certainty for RA diagnosis &lt; 50% at baseline</td>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.74</td>
<td>0.61; 0.90</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Conclusion:** As in established RA, biologic use is the main cost driver in rheumatoid arthritis care within the first years of the disease.


**Disclosure:** B. Fautrel, None; S. Lucier, None; G. Haour, None; H. Maouilid, None; S. Harvard, None; A. Saraux, None; X. Mariette, None; F. Guillemin, None; I. Durand-Zaleski, None; K. Chevreul, None.
Results: A Markov model-based probabilistic simulation from a societal perspective was conducted using a hypothetical population of 10,000 patients. Patients who had failed more than one disease-modifying antirheumatic drug (DMARD) and for whom BAs were selected started one of the four BAs (adalimumab, etanercept, infliximab, and tocilizumab) used in Japan in 2010, switched to other BAs or MTX, or discontinued all drugs comprised the BA group. Patients similar in background to the BA group who started MTX following discontinuation of all drugs comprised the comparator group (MTX group). Almost all model parameters were determined with respect to each group, except those related to costs and the survival of the four BAs and MTX, based on clinical data extracted by the matching method from the IORRA. Health states in the model were defined on the basis of the physical dysfunction level stratified according to the Japanese version of the Health Assessment Questionnaire (HAQ), which corresponded to cost and utility. Lifetime costs, quality-adjusted life years (QALY), and incremental cost-effectiveness ratio (ICER) were calculated. The threshold ICER was assumed to be 5.0–6.0 million JPY (1 USD = 88 JPY in 2010). A lifetime horizon and a discount rate of 3% per year for both health benefits and costs were assumed. We also conducted a probabilistic sensitivity analysis.

Conclusion: This study demonstrated that selecting BAs is cost-effective for RA patients who had failed more than one DMARD according to the analysis of data obtained from an observational cohort representing daily clinical practice in Japan.

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Healthcare Costs in Psoriatic Arthritis Patients Newly Initiated On A Biologic Disease-Modifying Anti-Rheumatic Drug or Methotrexate.

Tuesday, November 13

Frank Zhang1, Robert Hiscock2 and Jeffrey Curtis3. 1Celgene Corporation, Warren, NJ; 2Analysis Group, Inc., Montreal, QC; 3University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Several treatment options are available for psoriatic arthritis (PsA) patients (pts). The healthcare cost associated with the management of PsA pts varies depending on the disease severity and treatments used by pts. Methotrexate (MTX) and biologics are commonly prescribed disease-modifying anti-rheumatic drugs (DMARDs) in PsA. Due to the safety concerns around these DMARDs, frequent monitoring is required during clinical practice. The objective of this study was to describe healthcare costs associated with the management of PsA in pts newly initiated on a biologic DMARD or on MTX, focusing on office care and monitoring costs.

Methods: Adult pts with ≥ 2 PsA diagnosis (from office visits) were selected from the MarketScan Commercial Claims database (2005–2009). The first biologic DMARD or MTX prescription date was defined as the index date. Biologic initiators were required to be biologic-naïve prior to the index date but may have used a non-biologic DMARD. MTX initiators were required to be both biologic and non-biologic DMARD naïve prior to index date. Pts with a diagnosis of ankylosing spondylitis prior to the index date were excluded. All patients were required to have continuous enrollment 6-month prior to and 12-month post index date. All-cause and PsA-related total healthcare costs were estimated during the 12-month study period from a payer perspective and expressed in 2011 USD. PsA-related medical costs were identified based on claims for medical services associated with a PsA diagnosis or costs associated with DMARD administration by healthcare professionals. Among medical costs, office care and monitoring costs were defined as the sum of costs for outpatient visits and other medical service costs (excluding costs for drugs administered by healthcare professionals) that were associated with a diagnosis of PsA. Urgent care costs were defined as the sum of costs for inpatient service and ER visits. PsA-related pharmacy costs were identified based on claims for a biologic or a non-biologic DMARD irrespective of a PsA diagnosis.

Results: A total of 1,217 MTX initiators and 3,263 biologic initiators met the eligibility criteria. Over the 12-month study period, MTX initiators had an average total healthcare cost of $14,329 and $6,965 were PsA-related. Pharmacy costs accounted for 50.4% ($4,878) of the PsA-related total costs; office care and monitoring costs ($986) accounted for 16.3%; urgent care costs accounted for 3.3% ($201). Biologic initiators had an average annual total healthcare cost of $30,282 and 67.5% were PsA-related ($20,439). Pharmacy costs accounted for 92.7% ($18,938) of the PsA-related total costs; office care and monitoring cost ($1,041) accounted for 5.1%; urgent care cost ($460) accounted for 2.3%.

Conclusion: PsA pts initiating on a DMARD are associated with substantial healthcare costs. Although pharmacy costs accounted for the majority of the PsA-related costs, office care and monitoring costs accounted for a significant part of the PsA-related costs.

Disclosure: F. Zhang, Celgene Corporation, 3; R. Hiscock, Celgene Corporation, 5; J. Curtis, Celgene, Roche/Genetech, UCB< Centocor, Corrona,Amgen, Pfizer, BMS, Crescendo, Abbott, 2; Celgene, Roche/Genetech, UCB< Centocor, Corrona,Amgen, Pfizer, BMS, Crescendo, Abbott, 5

1834 Utilization and Expected Cost of Rheumatoid Arthritis Patients Treated with Golimumab: A Specialty Pharmacy Perspective. Lorie Ellis1, Susan Bolge1, Heidi Hanna2, Christina White3 and Patricia Rice4. 1Janssen Scientific Affairs, LLC, Horsham, PA; 2Diplomat Specialty Pharmacy, Flint, MI; 3CliniRx Research, Naperville, IL

Background/Purpose: Golimumab is a 50 mg, once-monthly, patient-administered anti-tumor necrosis factor alpha (anti-TNF) therapy indicated for moderate to severe rheumatoid arthritis (RA), active psoriatic arthritis, or active ankylosing spondylitis. A substantial proportion of patients receive golimumab through a specialty pharmacy provider (SPP). The purpose of this study is to describe the utilization and expected golimumab cost for RA patients treated with golimumab from a SPP perspective.

Methods: Pharmacy and eNAVIGATOR™ data were analyzed for adult patients with an ICD-9-CM diagnosis code for RA (714.X) who received ≥2 golimumab doses between 4/24/2009 and 8/24/2011. Utilization measures included the proportion of 50 mg dose fills and the proportion of compliant fills, defined as 21 to 38 days, corresponding to a 28 to 31 days supply +/-7 days. Descriptive statistics were employed. Mean refill interval and wholesale acquisition cost (WAC) for golimumab ($2,075.62 per 50 mg; 2/1/2012-Analysource; First Databank) were used to estimate the annual cost of golimumab.

Results: The study population included 126 golimumab patients and was predominantly female (79%) and aged ≥45 years (72%). The majority (71%) reported prior biologic use. Of the 109 patients with baseline Health Assessment Questionnaire II (HAQ-II) assessments, a score >1 was found in 62% (n=68). A total of 942 golimumab fills were dispensed during the study period. A 50 mg golimumab dose was dispensed in 100% of patients and 100% of fills. The mean (±SD) interval between golimumab doses was 35 ±22 days (median 30 days). The mean (±SD) refills per patient with prior-biologic use (bio-experienced) was 35 ±25 days with a median of 30 days. The mean (±SD) refill interval for patients without prior biologic therapy (bio-naïve) was 34±15 days with a median of 31 days. Approximately 84% of all fills fell within the defined compliance window for the overall population and in bio-experienced and bio-naïve subgroups. Based upon a mean refill interval of 35 days, the average RA patient would have 11 golimumab fills per year at an estimated annual cost of $22,831.82.

Conclusion: In this SPP population over a period of slightly more than two years, golimumab consistently was used at a 50 mg dose with a median refill interval of 30 days and mean refill interval of 35 days. These findings correspond closely with dosing and administration recommendations in the golimumab product label. Overall refill compliance was observed in a high proportion of fills (greater than 80%). Based upon these utilization trends, the average annual cost of golimumab therapy was estimated to be $22,831.82.

Disclosure: L. Ellis, Janssen Scientific Affairs, LLC, 3; S. Bolge, Janssen Scientific Affairs, LLC, 3; H. Hanna, Janssen Scientific Affairs, LLC, 5; C. White, Janssen Scientific Affairs, LLC, 5; P. Rice, Janssen Scientific Affairs, LLC, 5

1835 Prescription of Biologics in Rheumatoid Arthritis (RA), Psoriatic Arthritis (PsA) and Ankylosing Spondylitis (AS) in 4 Norwegian Regions 2002–2011: A Study of Prescription Rates and Baseline Disease Activity. Elisabeth Lie1, Karen M. Fagerli1, Knut Mikkelsen2, Ase S. Løberg3, Erik Rødevand4, Till Uhlig1 and Tore K. Kvien1. 1Diakonhjemmet Hospital, Oslo, Norway; 2Lillehammer Hospital for Rheumatic Diseases, Lillehammer, Norway; 3Drammen Hospital, Drammen, Norway; 4St. Olavs Hospital, Trondheim, Norway

Background/Purpose: Biologics have constituted a major advance in the treatment of RA, PsA and AS. In Norway access to these therapies has been good since their introduction. With increasing focus on early and aggressive therapy, one could expect increasing use of biologics, including use in patients (pts) with moderate disease activity. The objectives were to examine if prescription rates of biologics in RA, PsA and AS continue to increase or have reached a plateau, and whether disease activity at initiation of therapy has changed over the years.

Methods: Data for this study were from the NOR-DMARD register. Prescriptions of biologics to biologics naïve pts with RA, PsA and AS between Jan 2002 and Nov 2011 in 4 centers covering regions in East- and Mid-Norway were studied. Population data were extracted from Statistics Norway (www.ssb.no). Prescription rates per 100,000 inhab. per year were calculated and adjusted for an estimated 15% incompleteness of the register. Numbers were also adjusted for incomplete data for 2 centers in 2002 and all centers in 2011. Further, we calculated rates as % of pts, based on published Norwegian disease prevalence data [0.45% for RA (2 studies), 0.20% for PsA, 0.26% for AS]. Baseline (BL) disease activity [CRP, DAS28 and ASDAS (from 2006)] was examined per diagnosis per year. Potential effects of prescription year were assessed by linear regression with BL variables as independent variable and year as a continuous (1–10) independent variable.

Results: The material included 1961 prescriptions – 1026 in RA, 375 in PsA and 560 in AS. These were all TNF inhibitor (TNFi) prescibitions in AS, 2 non-TNFi in PsA and 38 non-TNFi in RA (32 rituximab, 3 abatacept, 3 tocilizumab). The population in the study area increased from 1.31 mill to 1.41 mill from 2002 to 2011. Prescription rates per 100,000 inhab. per year were calculated and adjusted for an estimated 15% incompleteness of the register. Numbers were also adjusted for incomplete data for 2 centers in 2002 and all centers in 2011. Further, we calculated rates as % of pts, based on published Norwegian disease prevalence data [0.45% for RA (2 studies), 0.20% for PsA, 0.26% for AS]. Baseline (BL) disease activity [CRP, DAS28 and ASDAS (from 2006)] was examined per diagnosis per year. Potential effects of prescription year were assessed by linear regression with BL variables as the dependent variable and year as a continuous (1–10) independent variable. CRP was Ln-transformed for the analyses.

Conclusion: The material included 1961 prescriptions – 1026 in RA, 375 in PsA and 560 in AS. These were all TNF inhibitor (TNFi) prescriptions in AS, 2 non-TNFi in PsA and 38 non-TNFi in RA (32 rituximab, 3 abatacept, 3 tocilizumab). The population in the study area increased from 1.31 mill to 1.41 mill from 2002 to 2011. Prescription rates per 100,000 inhab. per year were calculated and adjusted for an estimated 15% incompleteness of the register. Numbers were also adjusted for incomplete data for 2 centers in 2002 and all centers in 2011. Further, we calculated rates as % of pts, based on published Norwegian disease prevalence data [0.45% for RA (2 studies), 0.20% for PsA, 0.26% for AS]. Baseline (BL) disease activity [CRP, DAS28 and ASDAS (from 2006)] was examined per diagnosis per year. Potential effects of prescription year were assessed by linear regression with BL variables as the dependent variable and year as a continuous (1–10) independent variable. CRP was Ln-transformed for the analyses.
Delay in initiation of DMARD therapy in RA patients was estimated from a 2005 study of 96 Australian patients with RA referred to one public and four private rheumatology practices. RA-associated utilities and costs were considered to be $3780 for direct costs of RA, excluding DMARDs, and the annual rate of first-time prescriptions of biologics to RA patients was estimated from 102 rheumatologists, internists and paediatricians in France. The French authorities initiated the CORPUS (cédex observatoire rhumatologique des pratiques et des usages) survey to evaluate how rheumatologists prescribe anti-TNF therapy in active inflammatory rheumatic disease in case of the eligibility to biologics. Between 2007 and 2009, 102 rheumatologists, internists and paediatricians in France submitted data on the time between symptom onset and initiation of DMARD therapy in RA patients. RA-associated utilities and costs were considered to be $3780 for direct costs of RA, excluding DMARDs, and the annual rate of first-time prescriptions of biologics to RA patients was estimated from 102 rheumatologists, internists and paediatricians in France. The French authorities initiated the CORPUS (cédex observatoire rhumatologique des pratiques et des usages) survey to evaluate how rheumatologists prescribe anti-TNF therapy in active inflammatory rheumatic disease in case of the eligibility to biologics. Between 2007 and 2009, 102 rheumatologists, internists and paediatricians in France submitted data on the time between symptom onset and initiation of DMARD therapy in RA patients. RA-associated utilities and costs were considered to be $3780 for direct costs of RA, excluding DMARDs, and the annual rate of first-time prescriptions of biologics to RA patients was estimated from 102 rheumatologists, internists and paediatricians in France. The French authorities initiated the CORPUS (cédex observatoire rhumatologique des pratiques et des usages) survey to evaluate how rheumatologists prescribe anti-TNF therapy in active inflammatory rheumatic disease in case of the eligibility to biologics. Between 2007 and 2009, 102 rheumatologists, internists and paediatricians in France submitted data on the time between symptom onset and initiation of DMARD therapy in RA patients. RA-associated utilities and costs were considered to be $3780 for direct costs of RA, excluding DMARDs, and the annual rate of first-time prescriptions of biologics to RA patients was estimated from 102 rheumatologists, internists and paediatricians in France. The French authorities initiated the CORPUS (cédex observatoire rhumatologique des pratiques et des usages) survey to evaluate how rheumatologists prescribe anti-TNF therapy in active inflammatory rheumatic disease in case of the eligibility to biologics. Between 2007 and 2009, 102 rheumatologists, internists and paediatricians in France submitted data on the time between symptom onset and initiation of DMARD therapy in RA patients. RA-associated utilities and costs were considered to be $3780 for direct costs of RA, excluding DMARDs, and the annual rate of first-time prescriptions of biologics to RA patients was estimated from 102 rheumatologists, internists and paediatricians in France. The French authorities initiated the CORPUS (cédex observatoire rhumatologique des pratiques et des usages) survey to evaluate how rheumatologists prescribe anti-TNF therapy in active inflammatory rheumatic disease in case of the eligibility to biologics. Between 2007 and 2009, 102 rheumatologists, internists and paediatricians in France submitted data on the time between symptom onset and initiation of DMARD therapy in RA patients.
10-Year Trends in the Use of Disease Modifying Anti-Rheumatic Drugs (DMARDs) and Biologic Agents in Rheumatoid Arthritis: A National Veteran Affairs Study. Bernard Ng1, Nancy Petersen1, Hong-Jen Yu1, Myrna Khan1 and Maria E. Suarez-Almazor2. 1Michael E. DeBakey VA Medical Center Health Services Research and Development Center of Excellence, Houston, TX, 2University of Texas MD Anderson Cancer Center, Houston, TX.

Background/Purpose: It is unclear how recommendations for disease modifying anti-rheumatic drugs (DMARDs) & biological agents in treatment of Rheumatoid Arthritis (RA) have influenced their use over the past decade. Using the department of Veterans Affairs (VA) as a model to represent a large multi-facility health care organization, we studied the trend of MTX dosing and the use of traditional DMARD/biologics in treating Veterans with RA over a 10-year period from 2000 to 2009.

Methods: Using various national administrative databases of the department of VA, we found an incident cohort of 13,254 RA patients with validated algorithms to identify RA. Descriptive statistics were used to characterize trends in MTX start and highest dose and changes in patterns of DMARDs and biologics usage over the study period.

Results: Use of biologics increased from 2.8% in 2000–2001 to 18.9% in 2008–2009. Between 2000 and 2001, etanercept was the main biologic available, and it represented 96.2% of all biologics used. Since the introduction of adalimumab in 2003, its use increased tremendously, and by 2008–2009, it became the most used biological agent for the treatment of RA in our study population (48.5%). For the first DMARD/biologic used in a DMARD-naïve RA patient, there was an increase in use of MTX over time from 39.8% to 52.1%. There was also a gradual decline in both hydroxychloroquine and sulfasalazine as first line agents. Use of biologics as first-line agents remained relatively unchanged over the study period at 1.3–3.6%. For the subjects who had been on MTX monotherapy for 90 or more days (52.9% of 13,254), between 2001–2002 and 2008–2009, the average maximum MTX dose at the end of our study is still considered low compared with current standards. Biologics have been significantly over the decade, the average maximum dose at the end of our study period is 15.6 to 17.8 mg per week (p<0.01) and the proportion attaining peak dose of MTX of less than 15mg/week dropped from 43.2% to 22.1% (p<0.01). Over the same time period, the mean maximum MTX dose attained increased significantly from 15.6 to 17.8 mg per week (p<0.01) and the proportion achieving peak dose of MTX of less than 15mg/week dropped from 35.0% to 17.0% (p<0.01).

Conclusion: The use of DMARDs and biologics in treatment of RA has changed markedly over the past decade. The increased use of MTX as the first line agent is consistent with it becoming the anchor drug for RA treatment. Though the start and maximum MTX dose attained have increased significantly over the decade, the average maximum dose at the end of our study is still considered low compared with current standards. Biologics have been gaining acceptance and now play an important role in RA treatment. In the VA system, adalimumab has become the most common biologic used in 2008–2009. The time-to-introduction of first biologic was significantly decreased by the presence of ACPA (Risk ratio [RR]: 3.4; 95% confidence interval [CI]: 2.1–5.5), younger patient age (RR: 0.97; CI 0.95: 0.95–0.99) and by the use of a DMARD during the first year of evolution of the disease (RR: 2.2, CI 0.95: 1.4–4.4). There was no protective effect of corticosteroids (RR: 2.5, CI 0.95: 1.5–4.1). The medical center of follow up was related to the time-to-introduction of first biologic (RR: 0.4, CI 0.95: 0.2–0.86). However, no influence of other socio-economics parameters such as professional activity, employment status, population of city of residence, or time to rheumatologist consult was noted.

Conclusion: Our results suggest that there was no peak period in the distribution of a biologic agent’s introduction in the first five years of follow-up of the ESPOIR cohort. However, the medical center of follow-up shown to have a large impact on the time-to-introduction of the first biologic agent. By contrast, the time to first rheumatologist consult or social parameters do not have any influence on the first biologic agent’s start.

The European League Against Rheumatism (EULAR) 2010 RA diagnostic criteria were followed over 5 years. Among them, we excluded patients participating in therapeutic trials, such that 619 RA patients were analysed.

Methods: Among the 813 ESPOIR patients, 641 RA patients satisfying the ACR/EULAR 2010 RA diagnostic criteria were followed over 5 years. Among them, we excluded patients participating in therapeutic trials, such that 619 RA patients were analysed.

The outcome variable was the delay between the first stable symptoms and the introduction of the first biologic agent. The potential explanatory variables tested were age, gender, and disease characteristics as well as health care system characteristics (medical center of follow-up, time to first rheumatologist consultation, population of city of residence).

Survival rates were estimated using the Kaplan-Meier method. Cox proportional hazards models were used to determine independent predictors of introduction of the first biologic agent.

Results: Among the 619 RA patients (mean age 50.3 years, 50.6% Rheumatoid Factor positive and 43.3% ACPA positive, 27.1% with erosion on baseline X-rays), 121 (19.5%) had received a biologic agent at 5 years (TNF-blockers for most of them, rituximab and abatacept for 14 of them).

The mean time between the first stable symptoms to the introduction of the first biologic agent was 27.9 months (± 17.2), the median was 23.7 months (Q1 13.2, Q3 43.8).

The results of the Cox model are shown in figure 1.
Methods: Adult pts with ≥2 PsA diagnoses from physician office visits were selected from the MarketScan Commercial Claims database (2005–2009). All pts were required to have continuous insurance coverage ≥6-month prior to and ≥12-month post index date. First prescription date of a non-biologic DMARD was the index date and the preceding 6 months defined the ‘baseline’. Pts who used any biologic/non-biologic DMARDs or had a diagnosis of ankylosing spondylitis during the baseline were excluded. Treatment discontinuation was defined as a treatment interruption of ≥60 consecutive days between the end of days’ supply of one prescription and the start of the next prescription for the index drug. Switch in therapy was defined as the initiation of a biologic/non-biologic DMARD (not used at the index date or during the baseline) within 60 days of the discontinuation date of the index DMARD. Therapy augmentation was defined as the use of a non-biologic or biologic DMARD (not used at the index date or during the baseline) concomitantly with the index non-biologic DMARD for ≥28 consecutive days after the index date. A treatment change was defined as either a switch in therapy or an augmentation to the index therapy. Treatment patterns were captured over the one-year study period following the index date. Since pts might have used different DMARDs during the study period, the 4 most frequent treatment sequences (excluding treatment interruption) were also reported.

Results: A total of 1,698 PsA pts met the selection criteria; 71.7% initiated on methotrexate, 17.5% on sulfasalazine. Over the 12-month study period, 72.5% of the pts had ≥1 therapy change (median time: 86 days). More specifically, 57.7% of pts discontinued the index non-biologic DMARD (median time: 89 days), 13.1% switched to a biologic DMARD (median time: 141 days), 9.3% switched to another non-biologic DMARD (median time: 111 days), 21.4% had a therapy augmentation with a biologic DMARD (median time: 119) and 7.4% had a therapy augmentation with another non-biologic DMARD (median time: 94). The most common treatment sequences observed were 1) pts used MTX only during the study period (42.5%), 2) pts used MTX and a biologic (22.0%), 3) pts used sulfasalazine only (9.8%), and 4) pts used MTX and sulfasalazine (4.2%). Among pts who switched a biologic during the study period (N=513), 90.8% did not use other oral DMARDs, while 9.2% also initiated another oral DMARD either in combination or sequentially.

Conclusion: This study suggests that PsA pts newly initiated on a non-biologic DMARD do not remain on the index therapy for a long period of time. More pts switched to or added on biologics quickly without using a second oral DMARD.

Disclosure: D. Choquette, Roche Pharmaceuticals, 8; O. Thomas, Roche Pharmaceuticals, 3; M. Arundine, Roche Pharmaceuticals, 3.

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Background/Purpose: Studies on patients with severe rheumatoid arthritis (RA) are widely reported. However, limited data are available on patients with moderate disease activity (MOD). Recent evidence, including data from the PRESERVE trial, have highlighted the disease burden in MOD patients, and further warrant an understanding of disease progression/remission and impact of treatment strategies in this patient population from longitudinal clinical registries.

Methods: Patients enrolled in CORRONA (a large US multicenter, longitudinal database of RA patients) from March 2002 through April 2012, aged ≥18 years, who moved from LDA (CDAI≤10) to MOD (10≤CDAI<22) were included at baseline. Patients were followed over time to estimate the proportion with Low CDAI/Moderate CDAI/Severe CDAI at the 6 month and 12 month follow up visit. Additionally proportion of patients accelerating between baseline and 6 month, and 6 month and 12 month follow up visit were reported. Accelerations were defined as (i) add/switch a DMARD (ii) increase dose only (iii) both add/switch DMARD and increase dose. Patients were excluded if (i) time between last LDA and first Moderate CDAI was > 1 year (ii) they moved from LDA to Severe CDAI before Moderate CDAI. We included patients with CDAI at all three visits (first moderate, 6 month follow up, and 12 month follow up).

Results: 4,118 RA patients met the inclusion criteria. At 6 months, the majority (2,451/4,118; 60%) were LDA, while 32% (1,298/4,118) remained MOD, and 9% progressed to severe (CDAI≥22). Of those who were at LDA at 6 months (N=2,451), 76% remained at LDA at 12 months, while 40% of those who were MOD at 6 months actually improved to LDA at 12-months. Majority (69%) of those severe at 6 months had either improved to LDA or MOD at 12-months. Between baseline and 6-month visit, 39% (1,590/4,118) accelerated by adding/switching a DMARD (43%), increasing the dose (43%), or both (12%) and in spite of that, 10% patients had progressed to severe (160/1,590) at the 6-month visit. Eight percent of patients with no accelerations from baseline (2,528) worsened (209/2,528) at the 6-month visit. Between 6 and 12 month visit, patients initially accelerated but with LDA or MOD at 6-month did not receive high number of accelerations. Nearly half of those severe at 6-months were accelerated, although a quarter (25%) continued to demonstrate severe disease activity at the 12-month visit.
Conclusion: Patients identified with moderate disease activity (10<CDAI<22) from a longitudinal registry generally regress and progress disease activity levels over a 6-month and 12-month follow-up period. Patients with treatment accelerations were presumably more severe as evidenced in a higher proportion of patients with severe disease activity at the 6-month visit (10%) than those without accelerations (8%). This difference persisted among patients with RA, who had more severe disease activity at baseline and moved to LDA. Data demonstrates transition potential and disease instability in an understudied population, even within a short follow-up window of 6-months to a year.


1843
Predictors of Starting and Stopping Disease Modifying Anti-Rheumatic Drugs for Rheumatoid Arthritis: A 23 Year Longitudinal Cohort. Daniel H. Solomon1, Edward Yelin2, Jeffrey N. Katz3, Chris Tommer4, M. Alan Brookhart5, Seoyoung C. Kim6, Bing Lu7 and John Z. Ayanian8. 1Brigham and Women’s Hospital, Boston, MA, 2University of California San Francisco, San Francisco, CA, 3Brigham & Women’s Hospital, Boston, MA, 4UCSF, San Francisco, CA, 5University of North Carolina, 6Brigham and Women’s Hospital

Background/Purpose: DMARDs are the standard of care for rheumatoid arthritis (RA), however multiple studies find that not all patients use these agents. We examined predictors of DMARD stopping and DMARD starting among a large cohort of patients with RA.

Methods: Study participants were drawn from an open longitudinal cohort of 1,346 participants with RA recruited from rheumatologists’ practices in Northern California. We examined patterns and predictors of DMARD stopping and starting, including non-biologic and biologic DMARDs, based on annual questionnaires. Stopped was defined as stopping ALL DMARDs and starting was defined as transitioning from NO DMARDs to any DMARD across consecutive years. Predictors were categorized as related to RA (disease duration, HAQ score, tender and swollen joints, and use of oral steroids), sociodemographics (age, gender, race/ethnicity, education, income), or comorbidities (index). Calendar year was also included. Generalized linear mixed regression models for binary outcomes were constructed that accounted for the non-independence of multiple pairs of years from individual participants, and model fit was assessed using the c-statistic.

Results: The analysis of determinants of starting DMARDs included 471 subjects with 1,974 pairs of years with no DMARD use in the first of two consecutive years from which 313 (16.3%) started DMARD use before year two. The analysis of determinants of stopping DMARDs included 1,026 subjects with 7,595 pairs of years with DMARD use in the first of two consecutive years from which 423 (5.6%) stopped DMARD use before year two. Over the 23 years of follow-up (1987–2009), the percent starting DMARDs between two consecutive years was stable at approximately 10%, but the percent stopping DMARDs from one year to the next decreased from 9% to 3%. In fully adjusted models, significant predictors of starting DMARDs included younger age (OR 0.85, 95% CI 0.75–0.95, per 5-year decrease), Hispanic ethnicity (OR 1.88, 95% CI 1.06–3.33), shorter disease duration (OR 0.90, 95% CI 0.80–1.00, per 5-year decrease), and the use of oral steroids (1.90, 95% CI 1.36–2.66). In separate fully adjusted models, predictors of stopping DMARDs included older age (OR 1.05, 95% CI 1.00–1.10, per 5-year increase), Hispanic ethnicity (OR 1.54, 95% CI 1.02–2.30), lowest annual income quartile (OR 1.83, 95% CI 1.13–2.96, compared with highest), and more tender joints (OR 1.03, 95% CI 1.00–1.07 per joint increase). The c-statistics for RA-related factors were 0.60 (stopping a DMARD) and 0.62 (starting a DMARD), suggesting that they were relatively weak predictors of stopping or starting a DMARD. Including sociodemographic factors and comorbidities in the fully adjusted models improved the model fit for both sets of models – c-statistics 0.68 (stopping a DMARD) and 0.69 (starting a DMARD).

Conclusion: Predictors of stopping and starting DMARDs include non-RA related factors as well as RA-related factors. More frequent starting and stopping of DMARDs in Hispanic subjects may reflect barriers to continued use. The significance of non-RA related factors such as race/ethnicity and income suggest that there are disparities in DMARD use despite clear clinical guidelines about their use.

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Inequities in Access to Biologic Disease-Modifying Anti-Rheumatic Drugs for Patients with Rheumatoid Arthritis Across 46 European Countries. Polina Putrik1, Sofia Ramiro1, Milena Pavlova1, Tore K. Kvien1, Tuulikki Sokka4, Till Uhlig2, Annemies Boonen6 and Equity In Access To Treatment of RA Across Europe6. 1Maastricht University, Maastricht, Netherlands, 2Academic Medical Center, University of Amsterdam, The Netherlands and Hospital Garcia de Orta, Almada, Portugal, 3Diakonhjemmet Hospital, Oslo, Norway, 4Jyvaskyla Central Hospital, Jyvaskyla, Finland, 5University Hospital Maastricht, Maastricht, Netherlands, 6European Region

Background/Purpose: In the treatment of patients with RA, EULAR recommends to initiate biologic DMARDs after failing synthetic DMARDs. However, biologics are costly, and it is not known to what extent limited access to these drugs can hamper implementation of the EULAR recommendations. A poor ability to adhere to these recommendations might contribute to health disparities previously seen in RA patients across countries [1]. The purpose of the study was to explore access to biologics across Europe along the three dimensions of access: availability, affordability and acceptability.

Methods: Number of reimbursed drugs, prices of biologics, and data on cultural acceptability of biologics were collected by questionnaire sent to one representative rheumatologist in 49 countries of the European Region. To ensure comparability, national prices were converted into international dollars ($) to adjust for the countries’ purchasing power parity (PPP). Data on socio-economic welfare (gross domestic product (GDP), health expenditure, median income and minimum wage) were retrieved from web-based sources. Data on RA health status (DAS28, HAQ, TJC, SJC, ESR) were retrieved from the literature (QUEST RA) [1]. Indicators of access in each axis were correlated with indicators of welfare and RA health status using Spearman correlations.

Results: In total, 46 countries (response rate 94%) provided data. With respect to availability, in 10 countries no biologics were reimbursed, while 5 or more were reimbursed in 27 countries. With respect to affordability, annual average prices per patient of all available biologics varied from €9,431 (Turkey) to €21,349 (Germany), corresponding to a price ratio of 2.3. However, after adjusting the prices for PPPs, prices ranged from int.$14,446 to int.$61,552 (price ratio 4.3). Cultural acceptability ranged from 0 to 10 (10 poorest acceptability). Number of reimbursed biologics showed moderate to very strong positive correlation with the economic welfare and inverse correlation with the RA health status. While national prices seemed to be slightly lower in low income countries, after adjusting to PPP prices were strongly inversely correlated with economic welfare and positively with RA health. The sum-score of the acceptability was negatively associated with the economic indicators, and positively with the RA health status (table).

Conclusion: European countries with lower socio-economic status seem to have less access to biologics in terms of lower availability, affordability and acceptability (more barriers), while health of RA patients is worse. This implies inequity in access for innovative care disfavoring patients in poorer societies.


Disclosure: P. Putrik, None; S. Ramiro, None; M. Pavlova, None; T. K. Kvien, None; T. Sokka, Grants from Academy of Finland and Abbott, the QUEST-RA investigators, 2; T. Uhlig, None; A. Boonen, None;
Background/Purpose: In the treatment of patients with RA, strategies that include biologics have resulted in a better outcome for patients with regard to disease activity, need for surgery and work participation. Across the countries, reimbursement criteria and/or recommendations/guidelines have been formulated to regulate access to these costly treatments. The objective of this study was to explore clinical eligibility criteria for the start of a first reimbursed biologic in patients with RA and compare them across different European countries.

Methods: A questionnaire was sent via email to one representative rheumatologist in 49 countries of the European Region to collect data on the eligibility criteria for a first biologic in patients with RA, as of May 2011. First, rheumatologists were asked whether either reimbursement or clinical recommendations or both were mainly regulating prescription in clinical practice. Further information was collected on (a) minimal disease duration required, (b) number of previous DMARDs needed to be failed and (c) requirements for disease activity or severity, mandatory before the start of a biological. A simple score was developed to evaluate the level of restrictions in access to reimbursed biologics across the countries (table). This score varied between 0 and 5, the higher the score, the easier the access. Study results are presented using descriptive statistics.

Results: Forty-six countries (response rate 96%) provided data. In 10 countries (22%) no reimbursement criterion was reimbursed. Among the remaining 36, Luxemburg had no regulation of access to reimbursed biologics, in 13 (36%) the reimbursement criteria were the major source of eligibility criteria, while in 7 (19%) the clinical recommendations predominated, and in 15 (42%) both reimbursement criteria and clinical recommendations were used (usually because they were similar).

Among those with at least 1 biologic reimbursed, 21 countries (58%) had no requirement for disease duration in order to initiate a biologic, and for the remaining countries a duration of 3 to 12 months was mandatory. The majority of the countries (47%) required a failure of 2 synthetic DMARDs to qualify for therapy with biologics. Thirty-one out of 36 countries specified a minimum level of disease activity that had to be fulfilled before treatment with biologics (table). Three countries (8%) had the maximum (5) eligibility score (most liberal), 19.5% had a score of 4, 19.5% a score of 3, 22% a score of 2, 28% of 1 and 3% (1 country) a score of 0 (more restrictive). Countries from Eastern Europe and former Soviet Union were more likely to be classified in the more restricted scores.

Conclusion: Clinical criteria for biologic therapy differ significantly across the countries, suggesting inequalities in access to treatment in RA. These findings should alert stakeholders to further strive for optimal standards of rheumatologic care and implement them across all European countries.

Disclosure: P. Putrik, None; S. Ramiro, None; T. K. Kvien, None; T. Sokka, Grants from Academy of Finland and Abbott, the QUEST-RA investigators; T. Uhlig, None; A. Boonen, None;

Inequalities Across 46 European Countries in Clinical Eligibility Criteria for the Start of A First (Reimbursed) Biologic in Patients with Rheumatoid Arthritis.


Background/Purpose: Rheumatoid arthritis (RA) therapy in the UK is standardized by the National Institute for Health and Clinical Excellence (NICE). To be eligible for anti-TNF therapy RA patients (pts) must show inadequate response to 2 synthetic DMARDs (including methotrexate [MTX]) and high disease activity (DAS28 ≥5.1). To continue therapy pts must show a change in DAS28 ≥1.2 at 24 weeks (wks). Certolizumab pegol (CZP) studies in RA have shown the majority of pts respond by Wk 123, and response at 12 wks is predictive of clinical outcome at 1 year4. Continued CZP therapy should be carefully reconsidered in pts who show no therapeutic benefit in the first 12 wks5. In the UK, CZP is available via a Patient Access Scheme (PAS), which provides the first 12 weeks of CZP free of charge. This analysis examines persistency and actual versus potential cost savings realized with a 12 wk decision with CZP.

Methods: This retrospective analysis used anonymised data from Healthcare at Home (HAH), the UK’s largest home healthcare service provider. A crude unadjusted persistence rate was calculated for pts receiving CZP between March 2010 - March 2012. Persistence was defined as the percentage of pts continuing to receive deliveries of CZP with pts censored according to the date of first delivery. Treatment start was first delivery date and treatment status was determined as current or finished at specified time points (13, 26, 39, 52 weeks). Pts were defined as naive or switch (>1 prior anti-TNF, according to HAH records). Pts who temporarily discontinued therapy were excluded. A cost analysis was performed by calculating a) the savings from the PAS and b) the potential reimbursement which could be made by removing non-responders at 12 wks versus 26 wks.

Results: This analysis included 2,737 pts receiving CZP (mean age 57 years). At 52 wks, the persistence rate was 64% in anti-TNF naive and 48% in switch pts (table). Analyzing first-line biologic drug costs only, the NHS would save £2,363.14 per pt in the first year if CZP were used in place of adalimumab, assuming similar persistence rates; largely due to the PAS. Stopping treatment for non-responders at Wks 12 (CZP) vs Wk 24 (adalimumab), could allow the UK NHS to re-invest £2145 per pt whilst avoiding unnecessary drug exposure.

Conclusion: In this UK cohort, CZP persistence was 64% at 52 wks in naive pts. Reinforcing a 12 wk treatment decision could result in more efficient spend on drugs as well as avoiding unnecessary drug exposure and delayed initiation of alternative treatment in non-responders.

References
1. NICE Technology Appraisal 130.


Status of the Rheumatology Clinical Trials Portfolio: Data From ClinicalTrials.gov.

Background/Purpose: In an effort to provide a comprehensive listing of clinical trials Congress initiated the creation of the ClinicalTrials.gov (CT-
Impact of Biologics On Total Knee Replacement and Total Hip Replacement Rates in Rheumatoid Arthritis Patients: Results From US MarketScan Database. Andrew S. Koenig1, Jack Mardelean2 and Sameer Kotak3.
1Pfizer Inc., Collegeville, PA, 2Pfizer Inc, New York, NY, 3Pfizer Inc., New York, NY

Background/Purpose: Joint replacement surgery patterns continue to change in patients with rheumatoid arthritis (RA), possibly reflecting the widespread adoption of disease modifying antirheumatic drugs, earlier intervention and better supportive care. In a study of a population based RA sample from Rochester, Minnesota, a decline in cumulative incidence of orthopedic surgery by decade of RA diagnosis was reported.1 Previous analyses based on the Swedish Hip Arthroplasty Register demonstrated a decline in the proportion of total hip arthroplasties due to inflammatory joint disease from 5% during 1992–2002 to 2% in 2007.(2)

Methods: We performed a retrospective analysis of pharmacy and medical claims data from 2003–2010 in the United States utilizing the MarketScan database. Patients were required to be continuously enrolled preceding 1–3 years post RA diagnosis. We used a coding algorithm to identify all patients having a diagnosis of RA and no prior use of biologics ≤1 yr preceding the diagnosis. From this pool, we stratified patients who did and did not receive a biologic within 6 months, 1, 2, and 3 yrs post diagnosis. We further coded the analyses to identify total hip or knee replacement events (THR/TKR) and mean days to THR/TKR in these sub-groups and estimated general population rates of THR/TKR.

Results: From 2003–2010, 90,545 patients were identified with a diagnosis of RA; mean age 56.5 yrs; majority were female (71%) with low comorbidity [Charlson Comorbidity Index (CCI) 0.77]. Of these, 10,492 (11.5%) initiated a biologic and nearly half (5,084 (10,492, 48.8%) received the biologic ≤1 yr of diagnosis. No differences in age and other demographic variables between groups at baseline; however the biologic cohort had higher proportions of rheumatologic disease in the CCI. Proportions of THR/TKR in the non-biologic cohort were 7% vs. 11% in the more severe biologic cohort over the follow-up period (p<0.0001). In spite of the higher event rate, patients in the biologic cohort were event free for an additional mean 221 days compared to the non-biologic cohort (p<0.0001). THR/TKR event rates in the general population in MarketScan were 0.49% (484,107/98,414,730) compared to 6.91% (10,927/158,187) in the RA specific cohort (regardless of treatment).

Conclusion: The rates of THR/TKR were slightly higher in the supposidly more severe RA population who initiated a biologic (CCI 0.88), as opposed to those who did not (CCI 0.76). The mean time to THR/TKR was significantly delayed in the biologic cohort by up to 7 months, despite the higher proportion of rheumatologic disease in CCI. These results are compatible with the extensive evidence for delayed peripheral joint damage in RA patients treated with TNF inhibitors. Results must be interpreted by acknowledging the non-randomized nature of the claims data and inability to adjust for RA severity at baseline due to lack of relevant database variables.

with methotrexate or leflunomide for ≥3 months within the 1st year of follow-up were selected. Baseline radiographic damage was assessed either by the present of RA erosions (at least 1 or more than 3) or vSHS value.

The validity of the different matrices, i.e., the capacity of the matrices to efficiently identify RRP patients at 1 year, was tested by Receiver Operation Curve (ROC) analysis in which the area under the curve (AUC) reflected the discriminating power of each matrix.

**Results:** 398 ESPOIR patients started MTX or leflunomide during the 1st year. Their main characteristics were: mean age 49.3 yrs, female 73.6%, FR+ or ACPA+ 62%, typical RA erosion 18.1% (central reading), ACR/EULAR 2010+ 86.4%, mean DAS28 5.35, mean swollen joint count 8.1, mean tender joint count 8.9, mean CRP 25.4 mg/L, mean HAQ 0.27. During the 1st year, the mean vSHS progression was 1.7 ± 5.0 and 46 patients (11.6%) were classified RRP

The performance of the ASPIRE and SWEFOT matrices displayed only moderate validity in the ESPOIR population, with AUC below 0.7 (Figure). The best matrix seems to perform optimally and its AUC was in the same range of the ESPOIR matrix, with an AUC of 0.79 and 0.75 respectively. The matrices using baseline vSHS value (ESPOIR+ and SONORA) displayed higher discriminating power than that using erosion information.

**Figure:** ROC analysis assessing the performance of the 4 matrices

**Conclusion:** The BeSt matrix performs adequately in the ESPOIR cohort. However, the matrices using vSHS instead of erosion status seem to display higher discriminating power to identify ERA patients with RRP despite initial MTX or leflunomide therapy.


**Disclosure:** B. Fautrel, None; B. Granger, None; B. Combe, None; F. Guillemine, None; A. Saraux, None; X. Le Loët, None.

**1850**

**Association of Clinical Trial Characteristics with Positive Study Outcome Reporting in Randomized Controlled Trials of Rheumatoid Arthritis Therapy, Fatima M. Khan1, Juan I. Lombeida2, Horace Spencer2, Karina D. Torralba, Winnie K. Pang1 and Nasim A. Khan1. 1University of Arkansas for Medical Sciences, Little Rock, AR, 2Mercy Medical Center, Rogers, AR, 3University of Southern California Keck School of Medicine, Los Angeles, CA, University of Arkansas for Medical Sciences and Central Arkansas Veterans Healthcare System, Little Rock, AR

**Background/Purpose:** Randomized controlled trials (RCTs) are considered the best research design for assessing healthcare intervention. Concerns have been raised about the increased likelihood of positive RCT outcome (bias) with trial characteristics such as financial conflicts of interests (FCOs) and inadequate methodological quality parameters reporting. Our objective was to assess whether reported trial characteristics are associated with outcome of RCTs of rheumatoid arthritis (RA) drug therapy.

**Methods:** We identified original, non-phase 1, parallel-group, drug therapy RCTs of RA published in English in the years 2002–3, 2006–7, and 2010–11 by searching Medline and CENTRAL databases. RCT efficacy was assessed for primary outcome as positive (statistically significant result favoring experimental intervention) or negative. RCT characteristics [experimental intervention (traditional anti-rheumatic drugs, biologics, small molecules, others), study phase (phase 2, non-phase 2), funding source (industry, non-profit), FCOIs of authors related to industry sponsor (honoraria, consultation fee, employment, research grant, stock ownership), number of subjects enrolled, study center (single, multiple), study duration, and placebo use], and reported methodological quality measures [adequate description of random sequence generation, allocation concealment, blinding, subject follow-up, intent-to-treat analysis] were assessed independently by two investigators. Univariable associations of trial characteristics and methodological quality measures with positive study outcome were assessed using Chi-square, Fisher’s exact test, likelihood ratio, or t-test. Multivariable logistic regression (MLR) was performed by including funding source and all variables associated with positive outcome with P≤0.1.

**Results:** 146 eligible RCTs were identified. Efficacy outcome could be assessed for 125 (85.6%) RCTs. Studies were excluded for the following reasons: primary outcome safety (11), no intervention declared experimental a priori (10). Positive outcome was noted in 86 (68.8%) RCTs. Non-phase 2, higher number of enrolled patients and author FCOI (honoraria/consultation fee) increased likelihood, while adequate random sequence generation decreased this likelihood of positive outcome on unvariable analysis.

**Disclosure:** F. M. Khan, None; J. I. Lombeida, None; H. Spencer, None; K. D. Torralba, None; W. K. Pang, None; N. A. Khan, None.

1851

**Exploring the Relationship of Anti-Tumor Necrosis Factor Drugs and Methicillin Resistant Staphylococcus Aureus Nasal Colonization in Patients with Rheumatologic Conditions and Psoriasis, Daniel E. Kreutzel1, Santosh P. Reddy2, Guy P. Fiocco3, Colleen Colbert1 and Juhee Song1. 1Scott & White Healthcare/Texas A&M University, Temple, TX, 2Scott & White Clinic, Temple, TX

**Background/Purpose:** Infection with methicillin-resistant Staphylococcus aureus (MRSA) is a source of significant morbidity/mortality. Healthcare entities spend large amounts to prevent spread of MRSA. Most MRSA colonization literature is for surgical inpatients, with little exploration of the possible influence of immune-modifying drugs on colonization. These drugs are being used more commonly in treatment of chronic conditions, such as rheumatologic diagnoses. This study attempted to identify the influence of Tumor Necrosis Factor inhibitor (anti-TNF) drugs on MRSA carrier state in patients with diagnoses of psoriasis, psoriatic arthritis, rheumatoid arthritis, or ankylosing spondylitis.

**Colonization with MRSA leads to greater risk of infection with MRSA. Screening and intervention decrease blood borne infections, leading to use of screening programs. Studies in various environments have attempted to describe the carriage rate for MRSA, now estimated to be 1.2–14%. There has been some investigation into the relationship between MRSA colonization and immunosuppression, but it has been limited to transplant patients, cancer patients, and those with HIV. Currently there are no data on the relationship between immunosuppressive drugs and MRSA colonization in those being treated for rheumatologic conditions and psoriasis.

**Methods:** Medical records of patients admitted to two large referral hospitals between 1/1/07 and 3/31/10 were reviewed. All admitted patients 18 years and older with psoriasis, psoriatic arthritis, rheumatoid arthritis, or ankylosing spondylitis during this period were included for retrospective chart review (1001 persons). Of these, 436 were screened for nasal MRSA during the study period. Demographics, comorbidities and length of stay were noted.
as was information on treatment of their conditions and MRSA screen result. The rate in this group was compared to known MRSA rate for all patients screened in the two hospitals for the period (6.7%).

**Results:**
Records from 436 patients were used; 10 (2.3%) had psoriatic arthritis, 15 (3.4%) had ankylosing spondylitis, 72 (16.5%) had psoriasis, and 341 (78.2%) had rheumatoid arthritis. MRSA colonization was noted for 53 (12.2%) patients, which is much higher than the overall rate of 6.7% for adults. A TNF inhibitor was in the medical regimen for 54 (12.4%) patients. Of those prescribed anti-TNF drugs, 11.1% were MRSA positive. The study population with MRSA tended to have a longer length of stay (p = 0.0529), and come from a nursing home (27.5%). There was a strong association between nursing home residence and MRSA result (p = 0.0003).

**Conclusion:**
Patients with psoriasis and rheumatologic conditions had a higher rate of MRSA colonization than the general patient population at these referral centers. Patients treated with anti-TNF drugs were no more likely than those being treated with traditional immune modulating agents to have a positive MRSA screen. Those patients coming to the hospital from a nursing facility were more likely to have a positive MRSA screen.

**Disclosure:** D. E. Kreutz, None; S. P. Reddy, None; G. P. Fiocco, None; C. Colbert, None; J. Song, None.

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**1852**
Tumour Necrosis Factor-Alpha Antagonists and Alopecia: A Case/Non-Case Study in a Nationwide Pharmacovigilance Database. Johana Béné1, Guillaume Moulis2, Marine Auffret1, Claire Fessier1, Guillaume Lefevre3, and Sophie Gautier1. 1Lille University Hospital, Lille Pharmacovigilance Regional Centre, Lille, France, 2Toulouse University Hospital, Clinical Pharmacology Department, University of Toulouse, UMR INSERM UPS 1027, Toulouse, France, 3Lille University Hospital, Internal Medicine Department, Lille, France

**Background/Purpose:** Cases of alopecia occurring on TNF-alpha antagonists have been described. Nevertheless, no epidemiological study has been conducted to assess the link between TNF-alpha antagonists exposure and occurrence of alopecia. The aim of this study was to describe the cases of TNF-alpha antagonist-related alopecia reported in the French Pharmacovigilance Database (FPVD), and to assess the putative association.

**Methods:** All spontaneous reports of TNF-alpha antagonist-related alopecia recorded in the FPVD between January 2000 and April 2012 were described. We conducted disproportionality analyses (case/non-case method) to assess the link between alopecia and exposure to TNF-alpha antagonists. Cases were all reports of alopecia recorded during the study period. Non-cases were all other reports recorded during the same period. Exposure to TNF-alpha antagonists was searched in cases and non-cases. Reporting odds ratios (ROR) were calculated to assess the association. To assess the validity of the method we used exposure to docetaxel (well-known as alopecia inducer) as positive control and to acetaminophen as negative one.

**Results:**
During the study period, 283 658 spontaneous reports were colligated in the FPVD, of which 4742 (1.7%) involved TNF-alpha antagonists. Among these 4742 reports, 51 (1.1%) were alopecia (mainly, alopecia areata): 18 involved infliximab, 17 adalimumab, 15 etanercept and 1 certolizumab. Male/female sex-ratio was 0.18 and mean age was 39 years. Seventeen patients were treated for rheumatoid arthritis, 13 for ankylosing spondylitis, 11 for Crohn disease and 6 for psoriasis. Mean delay from TNF-alpha antagonist introduction to alopecia onset was 11.3 months (extremes: 4 days–8 years). An improvement was observed in 12 cases after TNF-alpha antagonist withdrawal (available data for 24 reports). Association between TNF-alpha antagonist exposure and alopecia was significant for all TNF-alpha antagonists pooled (ROR = 3.0; 95%CI [2.3–4.0]), as well as for infliximab, ROR = 2.0; 95%CI [1.2–3.1], adalimumab, ROR = 4.7; 95%CI [2.9–7.7] and etanercept. ROR = 3.3; 95%CI [2.0–5.4]. The ROR with docetaxel was 29.9; 95%CI [25.3–35.5] and with acetaminophen was 0.3; 95%CI [0.2–0.4].

**Conclusion:**
These results suggest a link between TNF-alpha antagonists exposure and occurrence of alopecia. A channeling bias cannot be excluded, but improvement in half of the cases after TNF-alpha antagonist withdrawal is a strong argument for the drug responsibility.

**Disclosure:** J. Béné, None; G. Moulis, None; M. Auffret, None; C. Fessier, None; G. Lefevre, None; S. Gautier, None.

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**1853**
Rheumatoid Arthritis Patients’ Experiences of Medication Side Effects and Subsequent Decision Making about Medications. Yomei Shaw1, Illica D. Metes2, Susan L. Zickmund2, Dawn McBride2, Kelly A. Reckley2, Stephen M. Wisniewski2, L. W. Moreland2, M. S. Roberts1, and Marc C. Levesque2. 1University of Pittsburgh, Graduate School of Public Health, Pittsburgh, PA, 2University of Pittsburgh School of Medicine, Pittsburgh, PA

**Background/Purpose:**
Medication adherence in rheumatoid arthritis (RA) can be influenced by their previous experiences with medication side effects. Negative experiences may lead patients to become fearful towards medications, increasing rates of non-adherence and rejection of physician recommendations to add medication therapy. To better understand how patients’ experiences of adverse drug reactions affect perceptions of medication risk and subsequent decisions to take recommended medications, we conducted an analysis of patient narratives of their experiences with adverse drug reactions due to medications for RA. Our goal was to describe features of RA patients’ experiences of medication side effects, and to compare narratives of patients who self-report discontinuing medications on their own or rejecting physician recommendations for medications (‘Non-adherent’ group) with narratives of patients who do not (‘Adherent’ group).

**Methods:** A qualitative analysis was conducted of transcripts from semi-structured interviews with 20 RA patients. Interviews were from a pilot study testing patient education materials for usage in the RA Comparative Effectiveness Research (RACER) registry (n = 1,000). Subjects were recruited from RACER enrollees treated at a participating clinic. During interviews, subjects were asked whether they had ever experienced side effects due to their medications for RA, and if so, to describe the side effects. Comments of all subjects describing any experiences of side effects were analyzed. A coding scheme was developed to index statements about: 1) medications in general, 2) the side effects experienced and relevant medications, 3) patient-provider relationship, and 4) RA and treatment related information. The first 2 authors coded the interview transcripts separately, then discussed and reached a consensus on assignment of codes for each transcript. Codes for patients in the Non-adherent group were compared to the Adherent group.

**Results:**
Fourteen of 20 patients reported side effects. The inter-observer agreement was high (mean kappa = 0.90). Among the 14 subjects with side effects, subjects in the Non-adherent group (n = 6) and Adherent group (n = 8) reported a similar mean number of side effects which they perceived as important (2.83 vs. 2.13) and non-important (0.67 vs. 1.25). However, patients in the Non-adherent group were more likely than patients in the Adherent group to discuss fear (66.7% vs. 12.5%), unacceptable of side effects (66.7% vs. 25%), unsatisfactory resolution of side effects (66.7% vs. 25%), and negative aspects of medications (83.3% vs. 25%).

**Conclusion:**
Fear, viewing side effects as unacceptable, dissatisfaction with how side effects were resolved, and negative perceptions of medications played a more central role in the experiences of patients who discontinued medications on their own or rejected physician recommendations, compared to patients who did not. This suggests that interventions to address these patient concerns may be critical for improving patient adherence to medications.

**Disclosure:** Y. Shaw, None; I. D. Metes, None; S. L. Zickmund, None; D. McBride, None; K. A. Reckley, None; S. R. Wisniewski, None; L. W. Moreland, None; M. S. Roberts, None; M. C. Levesque, None.

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**1854**
The Safety of Anti-TNF Biologic Agents in Rheumatoid Arthritis - A Meta-Analysis of 35 RCTs. Tzuyu Lin1, Tatyana Shamliyan1, Hyon Choi2, Yomei Shaw1, Young Hee Rho2 and Karen Kuntz1. 1Division of Health Policy and Management, School of Public Health, University of Minnesota, Minneapolis, MN, 2Boston University School of Medicine, Boston, MA

**Background/Purpose:**
The objectives of this systematic review were to study and update the safety of anti-TNF agents. We examined whether etanercept (ETN), compared to the anti-TNF antibody therapies, infliximab (INF) and adalimumab (ADA), had an inverse impact on adult patients with rheumatoid arthritis (RA) in terms of malignancy, serious adverse events (SAEs), serious infection, and discontinuation due to adverse events (AEs).
Methods: We conducted a systematic-literature review of randomized controlled trials (RCTs) that studied one of the three biologics used for rheumatoid arthritis and reported on our pre-specified adverse outcomes of malignancy, SAEs, serious infections, and discontinuation due to AEs. We searched various databases including MEDLINE® via OVID and PubMed®, the Cochrane Library, Google Scholar, and ClinicalTrials.gov, and further mined the reference lists from systematic reviews and original publications to identify all English-language studies published from January 1, 1990 until September 30, 2011. In addition, we searched the US Food and Drug Administration (FDA) database to review drug approval reports that could provide eligible trials. The search strategy and data extraction processes were duplicated by independent reviewers.

For the meta-analysis, we performed random effect inverse variance, maximum-likelihood estimation (MLE), arc-sine transformed, and Bayes-Dirichlet models. We abstracted the studies with 0 events in both arms and used software default correction coefficients for 0 events or missing data. Furthermore, we compared the results from randomized trials with published large nationally representative cohort studies and administrative databases.

Results: Thirty-five trials met our inclusion criteria, including 5,524 patients who received anti-TNF biologic agent treatment and 3,257 patients who received MTX/placebo. The risk of malignancy in patients treated with INF was significantly higher than that among those treated with MTX (risk difference = 0.02 [95% CI, 0.00 to 0.05]), in the arc-sine transformed model. The risk of serious infections in patients treated with ADA or INF was significantly higher than that among those treated with MTX or placebo. The risk of malignancy in patients treated with ADA or INF was significantly higher than that among those treated with MTX/placebo. The risk of malignancy may be increased among INF-treated RA patients, whereas the risk of serious infection may be increased among ADA- or INF-treated patients. These findings call for further post-marketing surveillance to clarify these risks with longer term exposure.

Table. GRADE evidence profile: Anti-TNF agents for adults with rheumatoid arthritis

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<th>Quality assessment</th>
<th>No of studies (Design)</th>
<th>Risk of bias</th>
<th>Inconsistency</th>
<th>Improbability of bias</th>
<th>Allocation</th>
<th>Active arm</th>
<th>Control arm</th>
<th>Reduction in risk (RR) (95% CI)</th>
<th>Attributes of bias</th>
<th>Area-under-curve</th>
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<td>Not Sig</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>11 (RCT)</td>
<td>No</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>1.50 (0.65, 3.51)</td>
<td>Not Sig</td>
<td>Not Sig</td>
<td>Not Sig</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>12 (RCT)</td>
<td>No</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>1.50 (0.65, 3.51)</td>
<td>Not Sig</td>
<td>Not Sig</td>
<td>Not Sig</td>
<td>high</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: The findings of this meta-analysis suggest potential differences in adverse outcomes among ADA-, INF-, and ETA-treated RA patients. The risk of malignancy may be increased among INF-treated RA patients, whereas the risk of serious infection may be increased ADA- or INF-treated patients. These findings call for further post-marketing surveillance to clarify these risks with longer term exposure.

Disclosure: T. Lin, None; T. Shamlayan, None; H. Choi, None; Y. H. Rho, None; K. Kuntz, None.

1855

Prevalence of Potential Drug-Drug and Drug-Condition Interactions in Fibromyalgia Patients Newly-Initiating Pregabalin or Duloxetine. Stephen Johnston1, Margaretta Udall1, Joseph C. Cappelleri1, Barbara H. Johnson3, George Shardy4, and Stuart L. Silverman5. Truven Health Analytics, Washington, DC, 2 Pfizer Inc, New York, NY, 3 Pfizer Inc, Groton, CT, 4 Cedars-Sinai Medical Center, UCLA Center of Excellence, Beverly Hills, CA

Background/Purpose: Drug-drug and drug-condition interactions (DDI/DCI) can present a significant challenge to the appropriate prescribing of drugs. The risk of DDI/DCI may be elevated in patients who are treated with polypharmacy or have some comorbid conditions, which is often the case in fibromyalgia (FM) patients. This study quantified the prevalence of potential DDI/DCI in FM patients newly-initiating either pregabalin or duloxetine.

Methods: Retrospective cohort study using a large U.S. administrative claims database. Studied patients had newly-initiated either pregabalin or duloxetine between 7/1/2008–10/1/2010 (initiation date=index), were aged ≥18 years at index, had continuous insurance enrollment for ≥12 months pre-index (pre-period) and ≥6 months post-index (post-period), and had ≥1 inpatient or ≥2 outpatient medical claims with a diagnosis of FM (≥1 of which was incurred ≥60 days prior to or on index). Patients were excluded if during the pre- to post-period they resided in a long-term care facility for ≥90 total days or had evidence of epilepsy, post-herpetic neuralgia, transplant surgery, or cancer.

Potential DDI were measured using software (DRUG REAX) which identified instances in which prescriptions that carry a potential for DDI with pregabalin or duloxetine were filled within 180 days before to 30 days after index, with days supply of the potentially interacting drug extending beyond index. Potential DCI were medical conditions listed in the Contraindications and Warnings and Precautions sections of the prescribing information for pregabalin and duloxetine. With the assistance of medical coders, each DDI was assigned an administrative claims-based identification algorithm. The presence of potential DCI was measured during the pre-period. Chi-squared tests compared the prevalence of potential DDI/DCI across the pregabalin and duloxetine initiators.

Results: Study sample comprised 7,751 pregabalin and 7,785 duloxetine initiators; mean age 49 years, 88% female. Among pregabalin initiators, 1.4% had ≥1 potential pregabalin DCI, the most common of which was dizziness (0.9% of patients); none had potential pregabalin DDI. Among duloxetine initiators, 67% had ≥1 potential duloxetine DDI/DCI, largely driven by concomitant drugs carrying a potential for major (45% of patients) or moderate (35% of patients) duloxetine DDI; the most common of which were with tramadol (19% of potential major DDI) and amitriptyline (16% of potential moderate DDI). The prevalence of potential DDI/DCI was significantly different across pregabalin and duloxetine initiators (p<0.001). Of the 107 pregabalin initiators with ≥1 potential pregabalin DDI, 17% had no potential duloxetine DDI/DCI. Of the 5,184 duloxetine initiators with ≥1 potential duloxetine DDI/DCI, 98% had no potential pregabalin DDI/DCI.

Conclusion: In FM patients initiating pregabalin or duloxetine, the prevalence of potential duloxetine DDI/DCI was substantially higher than that of pregabalin. Most duloxetine initiators with a potential duloxetine DDI/DCI had no potential pregabalin DDI/DCI. These findings may have implications to the appropriate prescribing of drugs for the treatment of FM.


1856

Burden of Adverse Events Associated with Immunosuppressant Therapy for the Treatment of Systemic Lupus Erythematosus: A Systematic Literature Review. Alan Oglesby1, Arthur Weinstein1, Greg Dennis1, Alissa Puro2, Tiffany Pokora1, Clark Paramore3, Lael Craig1, and Siva Narayanan1, 3 GlaxoSmithKline, Research Triangle Park, NC, 2 Washington Hospital Center, Washington, DC, 3 Human Genome Sciences, Inc., Rockville, MD, 4 United BioSource Corporation, Bethesda, MD, 5 United BioSource Corporation, Lexington, MA, 6 United BioSource, Bethesda, MD

Background/Purpose: Past systematic literature reviews on adverse events (AEs) associated with immunosuppressants in patients with systemic lupus erythematosus (SLE) focused mostly on cyclophosphamide (oral: CYC; IV: IVC) and myophenolate mofetil (MMF). The aim of this research
to quantify the incidence of AEs, identify discontinuation rates due to AEs and resource use and cost associated with AEs from CYC/IVC, MMF, azathioprine (AZA), methotrexate (MTX), and cyclosporine (CsA) in SLE patients.

Methods: A systematic review of English-language, MEDLINE- and EMBASE-indexed literature published between January 1980 and September 2011 was conducted using terms related to SLE, AEs, discontinuation, resource use and costs. After excluding case reports, case series, non-systematic reviews, studies of fewer than 50 patients, and articles without abstracts, 38 eligible non-review articles were identified (14 randomized controlled trials (RCTs) & 22 observational studies (OBS); results are presented here.

Results: The development of AEs ranged from 42.8% to 97.3%. Commonly noted AEs are shown in the table. Discontinuation rates due to AEs were 1.4–13% in short-term (<12 months) RCTs, 2.3–44.4% in long-term (>12 months) RCTs, and 0–21.8% in OBS. Eight studies reported resource use in terms of hospitalizations due to AEs; however, frequency measures used to report hospitalization varied among the studies resulting in an inability to make comparisons between studies. No studies reported costs associated with AEs.

Table. Summary of Commonly Reported AEs by Intervention

<table>
<thead>
<tr>
<th>AEs</th>
<th>Infection</th>
<th>GI</th>
<th>Anorexia and/or Overweight</th>
<th>Hypertension</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZA</td>
<td>RCTs (n=7)</td>
<td>NA</td>
<td>NA</td>
<td>2.4–42.2%</td>
<td>3.2–21.4%</td>
</tr>
<tr>
<td>OBS (n=3)</td>
<td>NA</td>
<td>NA</td>
<td>1.3%</td>
<td>1.4–6.5%</td>
<td>16.7%</td>
</tr>
<tr>
<td>IVC</td>
<td>RCTs (n=8)</td>
<td>95.6%</td>
<td>11.8–79%</td>
<td>29.4–66.7%</td>
<td>2.2–56.3%</td>
</tr>
<tr>
<td>OBS (n=13)</td>
<td>57.4–65.0%</td>
<td>12.5–87.0%</td>
<td>14–58.6%</td>
<td>1.9–59.8%</td>
<td>2.5–7.5%</td>
</tr>
<tr>
<td>Oral CYC</td>
<td>RCTs (n=3)</td>
<td>NA</td>
<td>35–40%</td>
<td>3.2%</td>
<td>36.0–71.0%</td>
</tr>
<tr>
<td>OBS (n=5)</td>
<td>NA</td>
<td>26–41%</td>
<td>7.0%</td>
<td>28.0–37.0%</td>
<td>7.0%</td>
</tr>
<tr>
<td>CsA</td>
<td>RCTs (n=2)</td>
<td>NA</td>
<td>6.4–19.4%</td>
<td>17.0–30.6%</td>
<td>NA</td>
</tr>
<tr>
<td>OBS (n=3)</td>
<td>62.5%</td>
<td>NA</td>
<td>3.9%</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NA</td>
<td>Not Available</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>MTX</td>
<td>RCTs (n=1)</td>
<td>95.0%</td>
<td>4.9%</td>
<td>56.1%</td>
<td>NA</td>
</tr>
<tr>
<td>OBS (n=6)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>MMF</td>
<td>RCTs (n=5)</td>
<td>96.2–97.3%</td>
<td>12.5–68.9%</td>
<td>9.1–61.4%</td>
<td>0%</td>
</tr>
<tr>
<td>OBS (n=1)</td>
<td>42.4–66.7%</td>
<td>3.9–44.4%</td>
<td>4.2–58.9%</td>
<td>NA</td>
<td>0.5–15.5%</td>
</tr>
</tbody>
</table>

Conclusion: The development of AEs associated with immunosuppressant medications in SLE patients was consistently high as reported in the SLE literature, while discontinuation due to these AEs varied from 0% to 44%. Studies describing costs and resource use associated with these AEs were sparse and warrant further study.

Disclosure: A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; A. Weinstein, Genentech, Savient, Pfizer, 2, HGS, GSK, Pfizer, 5, HGS, GSK; G. Dennis, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; A. Shaul, United BioSource Corporation, 3; T. Pokora, United BioSource Corporation, 3; C. Paramore, United Biosource Corporation, 3; L. Cragin, United BioSource Corporation, 3; S. Narayan, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; A. Weinstein, Genentech, Savient, Pfizer, 2, HGS, GSK, Pfizer, 5, HGS, GSK; G. Dennis, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; A. Shaul, United BioSource Corporation, 3; T. Pokora, United BioSource Corporation, 3; C. Paramore, United Biosource Corporation, 3; L. Cragin, United BioSource Corporation, 3; S. Narayan, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3.

1858

Hypervigilance in Fibromyalgia. Robert S. Katz¹, Ben J. Small², Susan Shott¹ and Sharon M. Ferber¹, ¹Rush University Medical Center, Chicago, IL, ²Rush University Medical School, Chicago, IL, ³Advocates for Funding Fibromyalgia Treatment, Education and Research(AFFTER), Libertyville, IL

Background/Purpose: Patients with fibromyalgia syndrome (FMS) experience severe chronic pain and usually are tender to touch. They are hypervigilant to weather changes and stress. Do FMS patients perceive physical pain the way they are hypersensitive to their environment? Are FMS patients more likely to be hypervigilant? Hypervigilance is a symptom associated with post-traumatic stress disorder, experience an exaggerated sense of threat in their surroundings that is disproportionate to reality. They are easily set off and startled by mild stimuli and feel anxious in public.

Methods: 126 office patients with fibromyalgia (FMS) or rheumatoid arthritis (RA) (111 women, 17 men; mean age 51 ± 13) completed a questionnaire about hypervigilance symptoms. 100 patients had FMS and 26 had RA. The chi-square test of association and Fisher’s exact test were used to compare the responses of FMS and RA patients, with a two-sided 0.05 significance level. As a part of an Internet survey administered by the volunteer community fibromyalgia organization AFFTER, 763 female self-identified FMS patients and 115 female controls without FMS responded to questions asking if they experience the symptoms common to hypervigilance. Only women’s responses were analyzed to eliminate confounding by gender. Percentages were compared using the chi-square test of association with a 0.05 significance level.

Results: FMS patients were more likely than RA patients to report hypervigilance symptoms: waking up more than once during the nights, FMS 75.0%, RA 46.4% (p = 0.004); feeling uncomfortable in crowded places, FMS 57.6%, RA 25.0% (p = 0.002); feeling uncomfortable if people are standing behind them, FMS 33.0%, RA 10.7% (p = 0.021); and easily startled, FMS 59.4%, RA 29.6% (p = 0.006)

In the Internet questionnaire: The mean respondent age was 49.8 ± 11.4 years. 73.9% of FMS and 45.4% of controls were easily startled (p < 0.001).

ACR/ARHP Poster Session C

Fibromyalgia and Soft Tissue Disorders

Tuesday, November 13, 2012, 9:00 AM–6:00 PM

1857

Identifying Core Symptom Domains in the Fibromyalgia Impact Questionnaire: Principal Component Analysis of Data From Milnacipran Clinical Studies. Philip Mease¹, Robert M. Bennett², Robert H. Palmer³ and Yong Wang⁴. ¹Swedish Medical Center and University of Washington, Seattle, WA, ²Oregon Health & Science Univ, Portland, OR, ³Forest Research Institute, Jersey City, NJ

Background/Purpose: The Fibromyalgia Impact Questionnaire (FIQ) is a multidimensional instrument that encompasses many of the core domains recommended by OMERACT for evaluation in fibromyalgia (FM) clinical trials, including pain, tenderness, fatigue, global wellbeing, functioning, sleep disturbance, depression, anxiety, and stiffness. In randomized clinical studies, significant decreases in FIQ total scores were found with milnacipran (MLN) vs placebo (PBO), indicating overall improvements in FM severity with this treatment. A Principal Component Analysis (PCA) of data from MLN clinical studies was conducted to determine which FIQ items may be most relevant to FM patients and to further evaluate the effects of MLN on these specific items.

Methods: FIQ data were pooled from 3 double-blind trials in which FM patients were randomized to MLN 100 mg/d (n=1139), MLN 200 mg/d (n=837), or PBO (n=1133). For the PCA analysis, correlations were performed on all FIQ items based on changes from baseline in all patients receiving either MLN or PBO. Principal components with optimally weighted variables were then extracted to identify groups of FIQ items that accounted for most of the variance in FIQ results. Mean changes in FIQ scores were analyzed to evaluate whether items in the extracted components discriminated the effects of MLN treatment in this study population.

Results: Three independent groups of FIQ items were identified by PCA: Component 1 (“Core Symptoms”) primarily composed of FIQ items 2 (feel good), 4 (do job), 5 (pain), 6 (fatigue), 7 (rest), and 8 (stiffness); Component 2 (“Depression/Anxiety”) primarily composed of FIQ items 9 (anxiety) and 10 (depression); and Component 3 (“Physical Function”) primarily composed of FIQ items 1 (physical impairment) and 3 (work missed). Each FIQ item above represents a meaningful loading with at least a correlation of 0.4 with its component. Component 1 accounted for 37.3% of the total variance in the data, suggesting that this selected set of FIQ items has the strongest relevance in FM patients. Components 2 and 3 accounted for 17.5% and 17.2% of the total variance, respectively, also indicating clinical relevance. Mean changes in FIQ by treatment group indicated significant improvements with MLN (p<0.01; both doses vs PBO) for all FIQ items in Components 1 and 2; discrimination of treatment effect was less consistent with the FIQ items in Component 3.

Conclusion: This PCA analysis of the FIQ resulted in 3 independent components of FM symptom domains. In the population of FM patients included in this analysis, improvements in FIQ scores were largely explained by core FM symptoms, including pain, fatigue, global wellbeing, and stiffness. Independent of these core symptoms, depression/anxiety, and physical functioning also explained a meaningful portion of the FIQ improvement. Additionally, treatment with MLN was associated with improvements in all of the items in these symptom groups.

Disclosure: P. Mease, Forest Laboratories, 2, Forest Laboratories, 5, Forest Laboratories, 2; R. M. Bennett, Forest Laboratories, 9; R. H. Palmer, Forest Laboratories, 3; Y. Wang, Forest Laboratories, 3.
Background/Purpose: Recent advances in the definition of the fibromyalgia syndrome (FM) have led to the development of the polysymptomatic distress (PSD) scale, providing a quantitative measure of the PSD continuum and an alternative definition of fibromyalgia. We examined PSD and FM in the general population.

Methods: We studied a representative random sample of 2,322 subjects from the German general population between the ages of 20 and 90 years. Patients completed the widespread pain index (WPI) and measures of fatigue, somatic symptom intensity, depressed mood and the Short Form Health Survey SF-12, including physical function, bodily pain, and vitality. The subjects were classified as FM patients if they fulfilled the recently adopted Polysymptomatic Distress Scale (PSD) and the revised American College of Rheumatology (ACR) criteria for FM. The degree of PS was determined with the full scale of PSD.

Results: The PSD score was substantially skewed to the right with a mean and median of 5.3 (SD 4.6) and 3.8. All FM-related variable scores worsened with age and with increases in PSD. Age explained 11% of the variance of PSD, but the effect of age was mediated through bodily pain. The effect of age was assessed with quantile regression at the 25th, 50th, 75th and 95th percentiles, and the mediated effect of age with 2-stage least squares (2SLS) instrumental variable regression.

Conclusion: Results suggest that FM patients are more aware of social and environmental stressors and more likely to be hypervigilant. They have trouble sleeping and are more easily startled. They are less likely to trust their surroundings. Hypervigilance might confer a survival advantage in threatening circumstances, but the hyper-reactivity associated with the condition could also be associated with the central sensitization of pain and dysesthesia, insomnia and other symptoms associated with FM.

Disclosure: R. S. Katz, None; J. J. Small, None; S. Shott, None; S. M. Ferbert, None.

1859

The Polysymptomatic Distress Scale and the Effect of Age On Polysymptomatic Distress and Fibromyalgia: A Survey in a Representative Population Sample. Winfried Häuser1, Frederick Wolfe2, Johannes Rasker3, Elmar Brähler4 and Heide Gläsermer5. Technische Universität München, Munich, Germany, 3University Twente, Enschede, Netherlands, 4University of Leipzig, Leipzig, Germany

Background/Purpose: Recent advances in the definition of the fibromyalgia syndrome (FM) have led to the development of the polysymptomatic distress (PSD) scale, providing a quantitative measure of the PSD continuum and an alternative definition of fibromyalgia. We examined PSD and FM in the general population.

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Conclusion: Results suggest that FM patients are more aware of social and environmental stressors and more likely to be hypervigilant. They have trouble sleeping and are more easily startled. They are less likely to trust their surroundings. Hypervigilance might confer a survival advantage in threatening circumstances, but the hyper-reactivity associated with the condition could also be associated with the central sensitization of pain and dysesthesia, insomnia and other symptoms associated with FM.

Disclosure: R. S. Katz, None; J. J. Small, None; S. Shott, None; S. M. Ferbert, None.

1860

Fibromyalgia and the Disease and Statistical Manual Classification As a Somatic Symptom Disorder. Frederick Wolfe1, Brian T. Walf1 and Winfried Häuser2. 1National Data Bank for Rheumatic Diseases, Wichita, KS, 2Washington Hospital Center, Washington, DC, 3Technische Universität München, Munich, Germany

Background/Preurpose: Fibromyalgia was first defined by rheumatologists, and is often thought of as a disorder of widespread pain and decreased pain threshold. In the wider literature, however, including non-US studies, fibromyalgia is considered to be one of a series of "medically unexplained syndromes." These illnesses are sometimes called somatic symptom disorders (SSD) or functional somatic syndromes because the main symptoms, pain, fatigue, cognitive disturbance, and unrefreshed sleep, are somatic and have no clear etiological explanation. This definition, however, comes into conflict with the Diagnostic and Statistical Manual-5 (DSM) of SSD mental illnesses draft criteria of April–July 2012. DSM-5 defines a SSD as a mental illness when all of A and B are present chronically: A) one or more somatic symptoms that are distressing and/or result in significant disruption in daily life; B) persistently high level of anxiety about health or symptoms OR excessive time and energy devoted to these symptoms or health concerns.

Methods: We studied 13,229 rheumatic disease patients, including 3,657 who satisfied ACR 2010 criteria for fibromyalgia modified for survey research and 9,572 who did not meet criteria. We calculated the criteria Symptom Severity score (SS4) and omitted the non-somatic depression symptom of SS4. We defined patients as probably DSM-5 positive if they had at least one of the following symptoms, fatigue, cognitive disturbance, unrefreshed sleep present which was defined at a severity level of "Severe, continuous, life-disturbing problems." DSM-5 status was defined as definite if they had at least 2 of the 3 symptoms at a severe level or had an average SS4 of at least 10 of a possible 12.

Results: See Table 1. 35.0% of FM positive patients were positive at a definite level, 2.6% of non-FM criteria patients were positive. Probable DSM positivity in FM patients was indicated by 39.3% with severe fatigue scores, 42.2% with severe unrefreshed sleep, and 15.8% with severe cognitive problems.

Percent satisfying DSM-5 criteria

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible DSM (+)</td>
<td>39.3</td>
</tr>
<tr>
<td>Severe fatigue</td>
<td>42.2</td>
</tr>
<tr>
<td>Severe unrefreshed sleep</td>
<td>15.8</td>
</tr>
<tr>
<td>Severe cognitive problems</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Using severity measures from survey modified ACR 2010 fibromyalgia criteria, we noted high rates of DSM-5 SSD positivity. At least 35% of FM patients would be classified as having an SSD mental disorder using our definitions. These results are inconsistent with clinical experience and call into question the use of proposed DSM criteria in clinical populations. Moreover, many, including us, would argue that all FM patients have an SSD, though not necessarily a mental disorder. Our results should be regarded with caution because our definitions used ad hoc measures based on FM assessments, and it is possible that different levels of abnormalities might have been found using the Whitley Index mentioned in DSM-5. However, such an index is not used outside of psychiatric clinics and does not appear germane to FM symptoms. The DSM-5 continues to be revised.

Disclosure: F. Wolfe, None; B. T. Walf, None; W. Häuser, None.
Efficacy and Safety of Pregabalin in Japanese Patients with Fibromyalgia: A Randomized, Double-Blind, Multicenter, Placebo-Controlled Phase III Trial and Open-Label Extension Study. Hiroyoshi Ohta1, Masato Ono1, Makoto Suzuki1, Hiroshi Oka1, Chie Ushii1, and Kusaku Nishioka1. 1Pfizer Japan Inc, Tokyo, Japan, 2Tokyo Medical University Hachioji Medical Center, Tokyo, Japan, 3Juntendo University Nippon Medical School, Tokyo, Japan, 4Tokyo Medical University, Tokyo Japan

Background/Purpose: Fibromyalgia (FM) is a common, chronic pain disorder. At the time of this study there was no approved medication for FM patients in Japan. This study aimed to assess the efficacy and safety of the α2δ ligand pregabalin for the symptomatic relief of pain in Japanese patients with FM.

Methods: In a randomized, double-blind, multicenter, placebo-controlled phase III trial conducted at 44 centers in Japan, patients aged ≥18 years who had met the 1990 American College of Rheumatology criteria for FM were randomized to receive either pregabalin or placebo, starting at 150 mg/day and increasing to a maintenance dose of 300 or 450 mg/day, or placebo, for 16 weeks (3-week dose-escalation/optimization phase; 12-week fixed-dose treatment phase; 1-week taper phase). The primary endpoint was mean pain score at final assessment. Secondary endpoints included Patient Global Impression of Change (PGIC), Fibromyalgia Impact Questionnaire (FIQ), and measures of sleep quality, sexual function and Medical Outcomes Study-Sleep Scale. Patients completing the double-blind study were eligible for a 53-week open-label extension study to evaluate the longer-term safety and efficacy of pregabalin (maintenance dose 300–450 mg/day).

Results: In total, 498 patients (89% female) were randomized to receive either pregabalin (n = 250; mean age 47.9 years) or placebo (n = 248; mean age 46.7 years). Pregabalin significantly reduced mean pain score at final assessment (p = 0.0046) and at every week during the study (p < 0.025). Key secondary endpoints were also significantly improved with pregabalin treatment compared with placebo, including PGIC (percentage of patients reporting symptoms “very much improved” or “much improved”; p = 0.0078); pain visual analog scale (p = 0.0013); FIQ total score (p = 0.0144); and quality of sleep score (p < 0.0001). The safety profile of pregabalin was consistent with previous clinical trials.somnolence, dizziness, nasopharyngitis and increased weight were the most frequently reported adverse events; the majority of adverse events were mild to moderate in severity. A total of 106 patients completing the double-blind trial entered the open-label extension study. Total exposure to pregabalin in the open-label extension study was 100 person-years, with no new patterns in the type, incidence or severity of adverse events observed. Improvements in measures of pain, sleep and physical functioning were also maintained throughout the 53 weeks of the open-label extension study.

Conclusion: Pregabalin, at doses of up to 450 mg/day, was safe and efficacious for the symptomatic relief of pain when compared with placebo in the double-blind trial. Treatment also improved measures of sleep and physical functioning. Treatment was generally well tolerated and no new safety signals were observed over 53 weeks’ treatment in the open-label extension study. Together, these results indicate that pregabalin is an effective treatment option for Japanese patients with FM.

Disclosure: H. Ohta, Pfizer Japan Inc, 3; M. Ohkura, Pfizer Japan Inc, 3; M. Suzuki, Pfizer Japan Inc, 3; H. Oka, Pfizer Japan Inc, 5; C. Usui, None; K. Nishioka, Pfizer Japan Inc, 5

1862

The 2012 Canadian Fibromyalgia Guidelines: Clinically Applicable Recommendations for the Management of Fibromyalgia. Mary-Ann Fitzcharles1, Peter A. Ste-Marie2, Don L. Goldenberg3, John X. Pereira4, and M. Choinière5. 1Fitzcharles, Pfizer Inc, Lilly, Purdue, Valeant, 5; 2P. A. Ste-Marie, None; 3D. L. Goldenberg, Forest, Lilly, Pfizer Inc, 5, Pfizer Inc, 2; 4J. X. Pereira, Pfizer Inc, 2; 5M. Choinière, Pfizer Inc, AstraZeneca, 2; 5C. O. Ko, Allergan, Bayer, Boehringer-Ingelheim, genzyme, Janssen, Lilly, Merck, Pfizer Inc, Purdue, Shire, Valeant, 5; 5D. Moulin, Janssen, Lilly, Paladin, Pfizer Inc, Valeant, 5; 2P. Panopalis, Abbott, Bristol-Myers Squibb, Pfizer Inc, 5; 5J. Pouls, None; 5Y. Shiir, Astra-Zeneca, Janssen, Paladin, Pfizer Inc, Purdue, 5

1863

Resetting the Naming Speed Clock with Methylphenidate (Ritalin). Robert S. Katz and Frank Leavitt. Rush University Medical Center, Chicago, IL

Background/Purpose: Abnormalities in naming speed are an unappreciated feature of cognitive dysfunction in fibromyalgia (FMS). Approximately 50% of FMS patients with memory problems name words at a rate that is 203 milliseconds slower than the norm. The connection between naming speed and memory loss in FMS is unclear. Stimulant medications like methylphenidate have been known to influence naming speed and could provide clues to the relationship between cognitive functioning and naming speed. The purpose of this paper is to determine if faster naming speed is connected to a positive change in cognitive functioning.

Methods: A word naming speed measure (Stroop Color and Word Test) and a measure of cognitive functioning (Mental Clutter Scale:MCS) were administered to 15 patients with FMS, before receiving methylphenidate and post methylphenidate. The FMS patients were female, met 2010 ACR criteria for FMS and had memory problems. Methylphenidate dosage was clinically determined and ranged from 10 to 30 mg. The median methylphenidate usage at restesting was 30 days. Naming speed was determined by the number of words named in a 45 second time period.

Results: The mean age of the FMS sample was 46.3 ±11.6 years with 14.1±2.1 years of education. Twelve of 15 FMS patients showed a significant reduction in time needed to name words post methylphenidate. Pre- methylphenidate, they read 77.4 words in 45 seconds or 605 milliseconds (45/77.4) per word. Post methylphenidate, they read 93 words in 45 seconds or 452 milliseconds (45/93) per word. This represents a 107 millisecond benefit from methylphenidate. The normative sample reads 108 words in 45
sec. or 417 msec. per word. Post methylphenidate changes on the Cognition and Mental Clarity Subscales of the MCS are shown in Table 1. Patients were randomized to swimming (SG) or walking (WG). The SG performed swimming in front-crawl style and the heart rate (HR) training was defined by subtracting 10 beats from anaerobic threshold heart rate to compensate for underwater horizontal position. The WG performed walking at an anaerobic threshold HR. Exercise sessions had duration of 50 minutes and were performed three times a week for 12 weeks. The outcome measures were visual analogue scale (VAS) for pain, Time Up and Go Test (TUG) for functional capacity, Fibromyalgia Impact Questionnaire (FIQ) for health-related quality of life and SF 36 for general quality of life. Aerobic capacity was measured by an incremental cardipulmonary exercise testing protocol by treadmill. The evaluations were done by a blinded assessor at baseline (T0), 6 (T6) and 12 weeks (T12) after randomization. It was used intention-to-treat analysis.

Results: Thirty-nine patients were randomized to SG and 36 to WG. The groups were homogeneous at baseline regarding clinical and demographic characteristics. Five patients (3 in SG and 2 in WG) withdrew after few exercise sessions because of pain worsening. After 12 weeks, both groups improved pain, functional capacity and quality of life (FIQ and SF 36) compared to baseline, however there were no differences between groups. Regarding aerobic capacity, both groups did not show changes over time. Tolerance to exercise, measured by adherence to programs, was similar in both groups (77.8% in SG and 72.2% in WG).

Conclusion: Swimming is as effective as walking in improving pain, functional capacity, health-related quality of life and general quality of life in patients with FM. In addition, swimming is well-tolerated by patients with FM. However, clinical improvements are not associated to aerobic capacity. More studies are necessary to define the mechanisms by which aerobic exercises lead to symmetry improvements in FM.

Disclosure: G. Fernandes, None; F. Jennings, None; M. V. Nery, None; A. L. P. de Buosi, None; J. Natour, None.

1865

Emotional Pain and Catastrophizing Influence Quality of Life in Fibromyalgia. Neda Faregh1, Peter A. Ste-Marie2 and Mary-Ann Fitzcharles1.
1McGill University, Montreal, QC, 2University of Montreal, Montreal, QC

Background/Purpose: Fibromyalgia (FM) is a composite of symptoms with the pivot symptom of pain, traditionally measured as intensity with little attention to other qualities. Emotional pain is an important component of the global pain experience, although seldom measured in the clinical setting. The McGill Pain Questionnaire (MPQ) evaluates pain beyond intensity through subgroups of descriptor words. We have examined the associations of pain quality as measured by the subsections of the MPQ with quality of life, psychological status and function.

Methods: In a prospective cohort of FM patients attending a multidisciplinary pain clinic, emotional pain was measured by the affective component of the McGill Pain Questionnaire (MPQ). The MPQ has 4 subsections, measuring sensory, evaluative, affective and miscellaneous pain. Other measures included pain intensity by a visual analog scale (VAS), patient global assessment (PGA), the Fibromyalgia Impact Questionnaire (FIQ), the Health Assessment Questionnaire (HAQ), the Pain Disability Index (PDI), the Pain Catastrophizing Scale (PCS), and the Arthritis Impact Measurement Scale (AIMS) for anxiety and depression.

Results: 229 FM patients (91% females, mean age and symptom duration 48 and 11) had pain of VAS 6.5, PGA 6.5 and MPQ II. With the exception of unemployment, no demographic variable correlated with the MPQ. MPQ (total and subsections) was significantly correlated with pain VAS, PGA, FIQ, HAQ, PDI, PCS, and AIMS anxiety and depression. Stepwise hierarchical multiple regression analysis examining the association with the MPI total score retained FIQ, PCS, and HAQ. A MANOVA assessed if there were differences in measures (FIQ, HAQ, PGA, included on clinical judgement) based on a linear combination of MPI subscales, while taking catastrophizing into account. The emotional subscale corrected highly with the sensory subsection (p < 0.001) and was eliminated. A significant effect was found for the affective subscale (Wilks’ Lambda A = 0.941; F (3, 222) = 4.64, p < 0.05; multivariate η² = 0.06), but not for evaluative or sensory subscales. The main effect of covariation for catastrophizing was significant (Wilks’ lambda A = 0.880, F (3, 222) = 10.1, p < 0.001, multivariate η² = 0.12). Follow-up ANOVAs indicate that affective scores contribute significantly to FIQ and PGA; evaluative scores contribute significantly to PGA, and the sensory scores contribute significantly only to HAQ. Catastrophizing contributes significantly to the variable global pain scale (PGA), the variable with the largest and significant Beta weights for each of the MPQ variables.

Conclusion: Higher scores on emotional pain and catastrophizing were predictors of poor quality of life, whereas sensory scores better predicted function. Emotional pain, especially when associated with high levels of catastrophizing has important negative effects on well-being for FM patients. Psychological interventions targeting these aspects may offer additional benefits to the standard pharmacological management of pain.

Disclosure: N. Faregh, None; P. A. Ste-Marie, None; M. A. Fitzcharles, Pfizer Inc, Lilly, Purdue, Valeant, 5.

1866

Association of Opioid Use with Symptom Severity and Quality of Life in Patients with Fibromyalgia. Terry H. Oh1, Chal H. Kim2, Connie A. Luedtke1, Jeffrey Thompson1, W. Michael Hooten1 and Ann Vincent1.
1Mayo Clinic, Rochester, MN, 2Kyungpook National University, Daegu, South Korea

Background/Purpose: Chronic widespread pain is a cardinal symptom in patients with fibromyalgia. Current pharmacotherapies for fibromyalgia targets central neurochemical abnormalities and pain processing pathways. Analgesics and opioids are currently not standard of care for patients with fibromyalgia. Our objective was to evaluate the frequency of opioid use and clinical characteristics, symptom severity and quality of life (QOL) associated with opioid use in patients seen in a fibromyalgia treatment program (FTP) at a tertiary medical center.

Methods: We studied 971 patients (917 women and 54 men) with fibromyalgia who met the 1990 ACR clinical criteria for fibromyalgia. Comprehensive medication review was conducted when they were seen at the FTP. Opioid users and nonusers were compared with respect to demographic characteristics, numeric rating scale (NRS) for current pain, Fibromyalgia Impact Questionnaire (FIQ) and Short Form-36 Health Survey (SF-36) scores, and tender point count. Univariate logistic regression models were used to model the
endpoint of opioid use (Yes vs No). Variables significant at the alpha = 0.05 level were entered into a multivariable logistic regression model.

Results: Mean age of patients was 49 (SD, 12.8) years and mean duration of symptoms was 130 months (SD, 134.8). Two hundred thirty-six patients (24%) who presented to the FTP used opioids for pain. In a univariate analysis, the opioid users had higher rates of tobacco use (p<0.001), unemployment (p<0.001), tender point (p<0.001) and NRS scores (p<0.001) and lower alcohol use (p=0.009), when compared to the nonusers. There were no significant differences in age, sex, race, marital status, abuse history, education level or BMI status between the 2 groups. The opioid users also had higher symptom severity as measured by the FIQ total (p<0.001) and all subscales (p≤0.01) and worse QOL as measured by all SF-36 subscales (p≤0.04) and physical and mental components (p<0.001). Multivariate analysis confirmed that opioid use was independently and significantly associated with increased tobacco use (p=0.003), unemployment (p=0.002), increased symptom severity (p=0.009) and worse SF-36 physical component score (p=0.02). However, no significant associations were found between opioid use and alcohol use, NRS scores, tender points or SF-36 mental component score.

Conclusion: The frequency of opioid use was 24 % in patients with fibromyalgia seen in the FTP at a tertiary medical center. Our results demonstrate that opioid use is associated with adverse social factors and worse symptom severity and physical health in patients with fibromyalgia. To better deal with this problem in clinical practice, factors that predispose to opioid use in patients with fibromyalgia need to be further investigated.

Disclosure: T. H. Oh, None; C. H. Kim, None; C. A. Luedtke, None; J. Thompson, None; W. M. Hooten, None; A. Vincent, None.

1867


Background/Purpose: Fibromyalgia (FM) is a chronic non-inflammatory syndrome characterized by diffuse pain throughout the body, sleep disorder, stiffness, fatigue, depression and other psychological problems. Patients with FM feel incapable of performing the majority of activities of daily living. Medication offers only short-term benefits. Thus, it is necessary to include other measures for treatment, such as physical activity and patient education. Art therapy combine the field of psychology with artistic activities, working with therapeutic and instructive aspects as well as the potential for personal growth contained in all forms of art. The aim of the present study was to assess the effectiveness of an art therapy program for the treatment of pain and improvements in both quality of life and body image of patients with fibromyalgia.

Methods: A randomized, controlled study with a blinded evaluator and 20-week follow-up period was carried out involving 80 patients with fibromyalgia. A visual analog scale (VAS) pain and sleep the six-minute walk test, Fibromyalgia Impact Questionnaire (FIQ), Medical Outcome Survey Short Form 36 (SF-36), Beck Depression Inventory and Body Dysmorphic Disorder Examination (BDDE) questionnaire were used for the assessments, which were performed at baseline and after 10, 20 (end of intervention) and 40 weeks.

Results: The groups were homogeneous at baseline regarding clinical and demographic characteristics. The art group achieved statistically significant improvements in VAS for pain (p=0.001), VAS for sleep (p=0.007), Beck Depression Inventory (p=0.038) and the physical functioning (p=0.027), role-physical (p=0.001), bodily pain (p=0.002), vitality (p=0.001), role-emotional (p=0.002) and mental health (p=0.010) subscales of the SF-36. Regarding body image no differences between groups was found over time.

Conclusion: Art therapy can be used in the treatment of fibromyalgia, leading to a reduction in pain and improvements in degree of depression and quality of life.

Disclosure: A. S. Baptista, None; A. Jones, None; F. P. Cardoso, None; B. C. Schaffir, None; E. R. W. Coelho, None; A. Orlandi, None; J. Natour, None.
in rheumatoid arthritis or osteoarthritis. Although fatigue along with widespread pain is a cardinal symptom in patients with fibromyalgia, the predictors of fatigue in fibromyalgia have not been comprehensively assessed. Our objective was to examine the predictors of fatigue cross-sectionally in patients with fibromyalgia.

Methods: Measures of fatigue, mood, pain, sleep, and autonomic symptoms were gathered from a random sample of 1303 patients with fibromyalgia identified through an existing fibromyalgia registry. Validated self-report questionnaires and mailed questionnaires including the Multidimensional Fatigue Inventory (MFI-20), Brief Pain Inventory (BPI), Medical Outcome Study Sleep Scale (MOS), Profile of Mood States – Short Form (POMS-SF), and Autonomic Symptom Profile (COMPASS). Eight hundred fifty-eight (66%) patients returned completed questionnaires. Data were analyzed using multiple linear regression.

Results: The overall model fit was $R^2 = 0.44$. The most significant predictors of fatigue were depression/dejection ($\beta = -3.26$, $p < 0.001$), sleep problems index ($\beta = 2.47$, $p < 0.001$), pain severity ($\beta = 1.82$, $p < 0.001$), BMI ($\beta = 0.148$, $p < 0.001$), and autonomic symptoms ($\beta = 1.26$, $p < 0.001$). Neither age ($p = 0.28$) nor tension/anxiety ($p = 0.88$) were significant predictors of fatigue.

Conclusion: Cross-sectional results indicate that depression, sleep, pain severity, BMI, and autonomic symptoms are significantly associated with fatigue in patients with fibromyalgia. Among predictors of fatigue identified in this study, depression was the strongest predictor. If these results can be replicated in a longitudinal study, improving mood, sleep, pain, etc. could all be potential targets to decrease fatigue.

Disclosure: A. Vincent, None; M. O. Whipple, None; D. L. Barton, None; D. J. Claue, None; D. A. Williams, None; T. H. Oh, None; L. L. Toussaint, None.

Financial Conflicts of Interest and Industry Sponsorship Are Associated with Positive Outcomes in Fibromyalgia Randomized Controlled Trials

Winnie K. Pang1, Karen Yeter1, Nasim A. Khan2 and Karina D. Torralba1.
1University of Southern California Keck School of Medicine, Los Angeles, CA, 2University of Arkansas for Medical Sciences and Central Arkansas Veterans Healthcare System, Little Rock, AR

Background/Purpose: Fibromyalgia randomized controlled trials (RCTs) have become more common in the past 15 years, in part due to industry sponsorship. Recently, there has been growing concern that financial conflicts of interest (FCOIs) among authors and funding source may affect reporting of results in RCTs. These issues have not yet been addressed for fibromyalgia RCTs. The objective of this study was to determine the prevalence of FCOIs among authors of RCTs of drug therapy for fibromyalgia and assess their association with study outcome.

Methods: MEDLINE and Cochrane Central Register of Controlled Trials databases were searched for fibromyalgia drug therapy RCTs published between 1997 and 2011. Eligible studies were original, randomized, parallel design drug trials with clinical efficacy as primary outcome. Two reviewers independently assessed each RCT for funding source (industry, non-profit, mixed), FCOI disclosure by author, and outcome [positive (statistically significant result favoring experimental drug for the primary outcome) or not positive]. RCTs with and without different types of FCOIs were compared using Chi-square, Fisher’s exact or likelihood ratio test.

Results: Of 47 eligible RCTs, study sponsors were industry (25, 53.2%), non-profit (9, 19.1%), mixed (5, 10.6%), and unspecified (8, 17%). A higher likelihood of positive outcomes was associated with industry sponsorship (22/25, 88%) and unspecified funding (6/8, 75%) compared to other funding types [non-profit 4/9 (44.4), mixed 3/5 (60%), P = 0.073]. Industry funded RCTs were significantly associated with positive outcome compared to non-profit funded RCTs ($P = 0.017$). FCOIs among authors were reported in 30 (63.8%) RCTs. RCTs with author(s) employed by the industry sponsor or author(s) who received consultancy fee/honoraria from the industry sponsor had significantly higher likelihood of positive outcome (Table). All RCT’s (15/15) of the three Food and Drug Administration-approved drugs ( duloxetine, pregabalin, and milnacipran) were industry sponsored and all had positive outcomes. Adjustment for potential confounding factors, such as type of experimental drug, study duration, and number of enrolled patients, could not be performed due to small number of eligible RCTs.

Conclusion: Industry sponsorship and FCOIs are common in published fibromyalgia drug therapy RCTs and are more likely to be associated with positive outcomes. The small number of eligible trials precluded adjustment for potential confounders to assess whether these represent independent association with study outcome.

Disclosure: W. K. Pang, None; K. Yeter, None; N. A. Khan, None; K. D. Torralba, None.

Table. Association of positive study outcome with types of financial conflicts of interest

<table>
<thead>
<tr>
<th>Relationship to drug industry</th>
<th>FCOI present</th>
<th>FCOI absent</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any FCOI</td>
<td>25/29 (86.2)</td>
<td>10/18 (55.6)</td>
<td>0.037</td>
</tr>
<tr>
<td>Employee status</td>
<td>19/19 (100)</td>
<td>16/28 (57.1)</td>
<td>0.001</td>
</tr>
<tr>
<td>Consultancy fees/honoraria</td>
<td>15/16 (93.8)</td>
<td>20/31 (64.5)</td>
<td>0.037</td>
</tr>
<tr>
<td>Stock ownership</td>
<td>10/11 (90.9)</td>
<td>25/36 (69.4)</td>
<td>0.244</td>
</tr>
<tr>
<td>Research grant</td>
<td>16/20 (80)</td>
<td>19/27 (53.8)</td>
<td>0.517</td>
</tr>
</tbody>
</table>

α: Number of RCTs with positive outcome within each group
N: Total number of RCTs in each group

Conclusion: Industry sponsorship and FCOIs are common in published fibromyalgia drug therapy RCTs and are more likely to be associated with positive outcomes. The small number of eligible trials precluded adjustment for potential confounders to assess whether these represent independent association with study outcome.

Disclosure: W. K. Pang, None; K. Yeter, None; N. A. Khan, None; K. D. Torralba, None.

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Tender Point Count and Pressure Pain Threshold As Predictors of Chronic Widespread Pain and Health Status in a Seven Year Prospective Study

Emma Jacobsen1 and Stefan Bergman1,2. R&D center Spenshult, Oskarström, Sweden, 2R&D Center Spenshult, Oskarström, Sweden

Background/Purpose: Chronic widespread pain is common in the general population with a prevalence ranging between 4.2% and 13.3%. It has been identified as a major health problem. The aim of this study was to evaluate the prognostic value of tender point count, pressure pain thresholds and pain group classification with regard to chronic widespread pain report and self-reported SF-36 quality of life measurements in persons with a history of chronic widespread pain.

Methods: A cohort of 303 individuals was identified as having self-reported chronic widespread pain in a cross-sectional survey with 3928 participants. 146 of the 303 individuals underwent clinical examination with palpation of tender points, dolorimeter pressure pain threshold examination and pain grouping (no chronic pain, chronic regional pain, and chronic widespread pain) based on a report of painful regions on a drawing of the body with predefined regions. Chronic widespread pain was evaluated according to the American College of Rheumatology 1990 criteria for fibromyalgia. Two and seven years later, pain classification and SF-36 quality of life assessments were collected from postal questionnaires. Sex and age adjusted OR were calculated for each clinical baseline factor separately.

Results: Having more than four tender points significantly (p < 0.05) predicted a four time higher risk of reporting chronic widespread pain at the two (OR=4.33) and seven (OR=3.89) year follow up. Having 11–18 tender points at baseline was superior to a report of chronic widespread pain in predicting a low SF-36 vitality score. Chronic widespread pain at baseline strongly predicted chronic widespread pain two and seven years later. Low pressure pain thresholds did predict chronic widespread pain and a low health status although the associations were subordinated the prognostic value of tender point counts and widespread pain classification.

Conclusion: Easy attainable anamnestic and clinical findings such as a report of chronic widespread pain and a tender point count above four can be used as prognostic signs in the clinical evaluation of patients with a history of longstanding pain.

Disclosure: E. Jacobsen, None; S. Bergman, None.

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Quality of Reporting in Pharmaceutical Randomized Controlled Trials for Fibromyalgia

Karen Yeter1, Winnie Pang1, Nasim A. Khan1 and Karina D. Torralba1. 1University of Southern California Keck School of Medicine, Los Angeles, CA, 2University of Arkansas for Medical Sciences and Central Arkansas Veterans Healthcare System, Little Rock, AR

Background/Purpose: Randomized controlled trials (RCTs) are considered the gold standard for assessment of healthcare interventions. Recently, there has been growing concerns about the quality of reporting of results in RCTs. Factors such as pharmaceutical industry sponsorship and financial conflicts of interest among authors are may create bias and influence study quality. No studies have addressed these issues in fibromyalgia RCTs. Our
The objective was to assess the quality of reporting in drug therapy randomized controlled trials (RCTs) of fibromyalgia and their effect on study outcome.

Methods: MEDLINE and Cochrane Central Register of Controlled Trials databases were searched to identify original fibromyalgia drug therapy RCTs published between 1997 and 2011. Eligible studies were identified by screening the title and abstract for original, randomized, parallel design drug trials with clinical primary outcome(s). Two reviewers independently assessed each RCT for study characteristics, outcome (positive [statistically significant result favoring experimental drug for the primary outcome] or not positive), and quality measures (sample size calculation, adequacy of randomization, allocation concealment, double-blinding, follow-up description, and intention-to-treat (ITT) analysis). RCTs with and without different types of quality measures were compared using Chi-square, Fisher’s exact or likelihood ratio test.

Results: 47 eligible RCTs were identified. In 21 (44.6%) RCT’s random sequence generation and allocation concealment were described adequately. Statistical power calculation was reported in 28 (62.2%) RCTs (2 RCTs were excluded as they were phase 2 studies). Double-blinding was reported in 21 (44.6%) of trials. In 30 (63.8%) RCTs, ITT analysis and prospectively defined follow-up schedule were also described. There were no significant associations between specific quality measures and study outcome (Table).

### Table. Association of positive study outcomes with types of study quality measures.

<table>
<thead>
<tr>
<th>Study Quality Measure</th>
<th>Quality measure present</th>
<th>Quality measure absent</th>
<th>n/N (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size Calculation</td>
<td>20/28 (71.4%)</td>
<td>14/17 (71.4%)</td>
<td>0.493</td>
<td></td>
</tr>
<tr>
<td>Randomization</td>
<td>18/21 (85.7%)</td>
<td>17/26 (65.4%)</td>
<td>0.179</td>
<td></td>
</tr>
<tr>
<td>Allocation concealment</td>
<td>16/20 (80.0%)</td>
<td>19/27 (70.4%)</td>
<td>0.517</td>
<td></td>
</tr>
<tr>
<td>Double-blinding</td>
<td>14/21 (66.7%)</td>
<td>21/26 (80.8%)</td>
<td>0.326</td>
<td></td>
</tr>
<tr>
<td>Description of follow-up</td>
<td>23/30 (76.7%)</td>
<td>12/17 (70.6%)</td>
<td>0.733</td>
<td></td>
</tr>
<tr>
<td>Intention-to-treat analysis</td>
<td>24/30 (80.0%)</td>
<td>11/17 (64.7%)</td>
<td>0.306</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Study quality measures are not consistently reported in fibromyalgia drug therapy RCTs. The presence of specific types of study quality measures in RCTs was not associated with higher likelihood of positive study outcome.

Disclosure: K. Yeter, None; W. Pang, None; N. A. Khan, None; K. D. Torralba, None.

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Clinical Characteristics and Health Care Utilization Patterns Among Patients with Fibromyalgia Newly Prescribed Amitriptyline, Duloxetine, Gabapentin or Pregabalin: A Large Cohort Study. Seoyoung C. Kim1, None; K. D. Torralba, None.

Methods: 47 eligible RCTs were identified. In 21 (44.6%) RCT’s random sequence generation and allocation concealment were described adequately. Statistical power calculation was reported in 28 (62.2%) RCTs (2 RCTs were excluded as they were phase 2 studies). Double-blinding was reported in 21 (44.6%) of trials. In 30 (63.8%) RCTs, ITT analysis and prospectively defined follow-up schedule were also described. There were no significant associations between specific quality measures and study outcome (Table).

### Table. Use of fibromyalgia-related drugs before and after the index date (%)

<table>
<thead>
<tr>
<th>Amitriptyline (n=13, 404)</th>
<th>Duloxetine (n=18, 420)</th>
<th>Gabapentin (n=23, 268)</th>
<th>Pregabalin (n=19, 286)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>After</td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Opioids</td>
<td>54</td>
<td>45</td>
<td>56</td>
</tr>
<tr>
<td>Anti-convulsants</td>
<td>10</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>55</td>
<td>100</td>
<td>68</td>
</tr>
<tr>
<td>COX2/NSAIDs</td>
<td>34</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td>Sleep disorder drugs</td>
<td>19</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>Muscle relaxants</td>
<td>30</td>
<td>24</td>
<td>31</td>
</tr>
</tbody>
</table>

Conclusion: Patients who were newly prescribed one of the four common drugs for FM similarly had multiple comorbidities, a great number of other medication use and high health care utilizations. Median daily dose for all four drugs remained the same during the follow-up.

Disclosure: S. C. Kim, Pfizer Inc; 2, Tokada Pharmaceuticals, 2; J. E. Landon, None; D. H. Solomon, Aung & Lilly, 2, Corrona, 5, Pfizer Inc.

1874

Genomic Categories of Fatigue in Women with Fibromyalgia. Nada Lukkahatari1, Brian T. Walitt2, Majors Benjamin1, Gelio Alves3 and Leorey Saligan1, 1National Institute of Nursing Research, National Institutes of Health, Bethesda, MD, 2Washington Hospital Center, Washington, DC, 3National Center for Biotechnology Information, National Library of Medicine, Bethesda, MD

Background/Purpose: FM is the chronic experience of body-wide pain, fatigue, cognitive dysfunction, and disordered sleep that occurs in the absence of any clear cause. Fatigue is a cause of significant morbidity and disability in FM. Most genomic studies in the FM population focus on pain symptoms. Only a few studies had investigated the fatigue experience in FM and no genomic studies investigated FM-specific fatigue symptoms. The purpose of this study is to identify genomic categories of fatigue in fibromyalgia (FM) and describe behavioral characteristics of these fatigue categories.

Methods: Under an active Medstar Research Institute protocol, FM participants diagnosed by 2010 diagnostic criteria and pain-free, race, age, and gender-matched controls were enrolled in the study. Participants completed questionnaires. RNA from peripheral blood samples collected using Paxgene tubes® were analyzed for differential gene expression using microarray technology with Affymetrix GeneChip® human genome U133 Plus 2.0. Cluster analysis was used to determine genotypic categories. The differences of symptoms between two clusters were analyzed by the analysis of variance (ANOVA).

Results: Thirty one Caucasian women diagnosed with FM, experiencing significant fatigue (MFI-general fatigue ≥ 13) and 20 pain and fatigue free, age-, race-, gender-matched controls were enrolled. Microarray data showed differential upregulated expression of centromere protein K (CENPK) gene after the probesets passed filtering criteria of 1% false discovery rate (FDR) and a slope of > log2 (over 2.0-fold change, p < 0.05). This CENPK gene is related to centromere function. Cluster analysis was conducted on the expressed genes from FM subjects which revealed two distinct clusters. Forty nine genes were differentially expressed over 2-fold change (p < 0.05) between the two clusters. One cluster showed significantly higher pain interference (p = 0.028) and higher depression (p = 0.027). Genes that upregulated in the high pain interference and high depression cluster include genes related to immune response, iron absorption and GABA transport. Genes related to calcium ion binding were differentially expressed in the other FM cluster with lower pain interference and depression.
Conclusion: Within FM women with high fatigue, there appears to be two distinct patterns of gene expression. These genomic patterns correspond with differences in behavioral characteristics. Further investigation of these genomic patterns may provide some insights into the mechanisms behind the relationship of fatigue with other FM behavioral symptoms.

Disclosure: N. Lukkakaii, None; B. T. Walitt, None; M. Benjamin, None; G. Alves, None; L. Saligan, None.

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A Patient and Physician Survey of Impact and Management of Fibromyalgia Across Latin America and Europe. Patricia Clark. Hospital Infantil de México Federico Gómez, Mexico City, Mexico

Background/Purpose: Differences in healthcare practices around the world have been reported; however any impact on management of chronic conditions is often unclear. We surveyed patients and physicians from three Latin American (LA) and six European countries to ascertain differences in journey to diagnosis and management of fibromyalgia (FM).

Methods: Data from 900 FM patients (300 LA; 600 Europe) and 1824 GPs/specialists (604 LA; 1220 Europe) were collected between 2008 and 2010. Patients and physicians completed separate questionnaires. Which included questions on symptoms (14 common symptoms), management, and impact of FM. Patient interviews (face-to-face or via telephone; 25min) were conducted in local languages (Spanish, Portuguese). Rating scales were used throughout. Data were analyzed using cross tabulations and descriptive statistics; no multivariate analysis. Significance determined at P<0.05 (indicated by *).

Results: Patients from LA reported FM symptoms for longer time (100.8 vs 83.7* months), took longer to be diagnosed (42.2 vs 31.1* months), and saw more physicians to receive a diagnosis (5.4 vs 4.0* vs European patients, respectively. FM was characterized by multiple symptoms in both regions, although a higher proportion of patients from LA vs Europe reported common FM symptoms, including widespread pain (92% vs 62%*), sleep problems (84% vs 40%*), and fatigue (88% vs 46%*). Patients from LA rated their pain higher on a 10-point scale vs European patients (8.0 vs 7.2*). Patients from both regions reported common FM symptoms as disruptive to their quality of life (pain: 86% vs 78%; sleep problems: 80% vs 76%; fatigue: 80% vs 75%). Patients from LA more often reported that FM had impacted their ability to work and/or earn an income vs patients from Europe. LA patients were managed by different healthcare professionals, while European patients were mostly treated by GPs (47% vs 96%*). Physicians principally considered widespread pain as a typical FM symptom and being disruptive to patient’s. Although >50% of patients considered them common symptoms, <10% of GPs or specialists from either region considered problems sleeping or fatigue typical FM symptoms. Physicians from LA more often considered problems sleeping*, difficulty concentrating*, anxiety*, depression*, numbness/tingling*, and leg cramps* disruptive vs European physicians.

Conclusion: Differences between FM characteristics, treatment practices, and opinions were noted by physicians and patients from LA and Europe. Improved understanding of these complexities involved in FM in different healthcare settings may help target educational/training programs towards improving aspects of chronic care. Improving alignment between perception of FM from the patient and physician’s perspective may also improve patient management.

Disclosure: P. Clark, Pfizer Inc, 5;

1876
The Assessment and Treatment of Nonsurgical Periarticular Post-Traumatic Soft Tissue Injuries of the Knee. Dan Nemes1, Elena Amarical, None; L. Catan, None; D. Popa, None; S. Cerbu, None; P. Bicov, None.

Background/Purpose: In spite of the fact that periarticular post-traumatic soft tissue injuries of the knee were considered less important than the knee joint pathology itself, they are disorders with a high risk of disability, with potential to affect functioning and quality of life causing thus important socioeconomic implications. The main objectives of our study are to point out the necessity of an ultrasonography score that can be correlated with a functional score (in order to quantify the evolution of nonsurgical periarticular post-traumatic soft tissue injuries of the knee) and to prove the importance of a long-term rehabilitation treatment of this pathology.

Methods: We included into 1-year randomized, prospective study a number of 159 patients diagnosed with different types of nonsurgical periarticular post-traumatic soft tissue injuries of the knee: soft tissues edema, quadriceps tendon lesions (tendinitis or partial tear), prepatellar or infrapatellar bursitis, bursitis of the pes anserinus, lesions of the patellar retinaculum (elongation or partial tear), lesions of the medial collateral ligament (elongation, partial or total tear) and lesions of the iliotibial band (friction syndrome with or without bursitis). Group A suffered traumatic events on healthy knee joint. Group B patients had pre-existing knee lesions. Group A1 (41 patients) and B1 (38 patients) followed a medical treatment, while group A2 (39 patients) and B2 (41 patients) followed both medical and rehabilitation therapy. All patients were assessed initially, after 6 months and after 1 year using functional evaluation (KOOS: Knee injury and Osteoarthritis Outcome Score) and knee ultrasonography (quantified in a self-developed ultrasonography score).

Results: At the beginning of the study we found no statistically significant difference of total US scores and of total KOOS scores between group A1 (US = 6.95 ± 1.378; KOOS = 143.71 ± 7.497) and A2 (US = 6.92 ± 1.403; KOOS = 143.33 ± 8.358), and between group B1 (US = 8.58 ± 1.328; KOOS = 187.26 ± 12.326) and B2 (US = 8.51 ± 1.287; KOOS = 187.17 ± 10.89). At the final assessment group A2 and B2 had significant decrease both of total US scores (p<0.01) and total KOOS scores (p<0.001) (US = 3.10 ± 1.142 and KOOS = 57.44 ± 5.702, respectively US = 4.54 ± 1.14 and KOOS = 95.8 ± 9.988) in comparison to group A1 (US = 3.76 ± 0.994; KOOS = 95.15 ± 8.519, respectively). B2 (US = 5.32 ± 1.068; KOOS = 130.89 ± 10.906). When compared to group B2, group A2 had statistically very significant decreased total US scores (U = 311; z = -4.83; p<0.001) and total KOOS scores (U = 3; z = -7.70; p<0.001). No statistic correlation between the two assessment scores (ultrasonography score and KOOS score) was revealed.

Conclusion: The best functional results were recorded in patients with post-traumatic soft tissue injuries on a healthy knee joint and that followed both a medical treatment and a long-term rehabilitation. We propose a self-ultrasonography protocol that can monitor the progression in time of this pathology. Both functional and ultrasonography assessment scores are necessary in evaluation of periarticular soft tissue injuries of the knee.

Disclosure: D. Nemes, None; E. Amarical, None; L. Catan, None; D. Popa, None; S. Cerbu, None; P. Bicov, None.

1877
Is the Amount of T and B Lymphocytes, Natural Killer Cells and Macrophages in Biopsies From Non-Ruptured Chronic Tendinopathic Achilles Tendons Predictive for Long Term Outcome? A >3 Years Prospective Study of 37 Patients. Patricia Clark. Hospital Infantil de México Federico Gómez, Mexico City, Mexico

Background/Purpose: Differences in healthcare practices around the world have been reported; however any impact on management of chronic conditions is often unclear. We surveyed patients and physicians from three Latin American (LA) and six European countries to ascertain differences in journey to diagnosis and management of fibromyalgia (FM).

Methods: Data from 900 FM patients (300 LA; 600 Europe) and 1824 GPs/specialists (604 LA; 1220 Europe) were collected between 2008 and 2010. Patients and physicians completed separate questionnaires. Which included questions on symptoms (14 common symptoms), management, and impact of FM. Patient interviews (face-to-face or via telephone; 25min) were conducted in local languages (Spanish, Portuguese). Rating scales were used throughout. Data were analyzed using cross tabulations and descriptive statistics; no multivariate analysis. Significance determined at P<0.05 (indicated by *).

Results: Patients from LA reported FM symptoms for longer time (100.8 vs 83.7* months), took longer to be diagnosed (42.2 vs 31.1* months), and saw more physicians to receive a diagnosis (5.4 vs 4.0* vs European patients, respectively. FM was characterized by multiple symptoms in both regions, although a higher proportion of patients from LA vs Europe reported common FM symptoms, including widespread pain (92% vs 62%*), sleep problems (84% vs 40%*), and fatigue (88% vs 46%*). Patients from LA rated their pain higher on a 10-point scale vs European patients (8.0 vs 7.2*). Patients from both regions reported common FM symptoms as disruptive to their quality of life (pain: 86% vs 78%; sleep problems: 80% vs 76%; fatigue: 80% vs 75%). Patients from LA more often reported that FM had impacted their ability to work and/or earn an income vs patients from Europe. LA patients were managed by different healthcare professionals, while European patients were mostly treated by GPs (47% vs 96%*). Physicians principally considered widespread pain as a typical FM symptom and being disruptive to patient’s. Although >50% of patients considered them common symptoms, <10% of GPs or specialists from either region considered problems sleeping or fatigue typical FM symptoms. Physicians from LA more often considered problems sleeping*, difficulty concentrating*, anxiety*, depression*, numbness/tingling*, and leg cramps* disruptive vs European physicians.

Conclusion: Differences between FM characteristics, treatment practices, and opinions were noted by physicians and patients from LA and Europe. Improved understanding of these complexities involved in FM in different healthcare settings may help target educational/training programs towards improving aspects of chronic care. Improving alignment between perception of FM from the patient and physician’s perspective may also improve patient management.

Disclosure: P. Clark, Pfizer Inc, 5;
Results: At baseline, the median age of the patients was 55 years (range: 32–69) and the median symptom duration was 12 months (range: 4–156). 18 patients (49%) had never received anti-inflammatory therapy. Patients were instructed to perform Achilles tendon eccentric loading exercises and were followed for a median time of 6 years (range: 3–11). During this period, the majority of patients (n = 31) received additional local tendon injections of steroid (n = 12), scleros (n = 6), TNF-α antagonist (n = 6) or interleukin-1 receptor antagonist (n = 6). 5 patients had an Achilles tendon operation.

At follow-up, the median VISA-A score was 75 (range: 41–94), and 15 patients (41%) reported having no Achilles tendon symptoms. No differences in presence of symptoms at follow-up were observed between patients receiving different injection treatments during follow-up (p = 0.81).

<table>
<thead>
<tr>
<th>IMMUNOHISTOCHEMICAL CELL MARKERS AT BASELINE</th>
<th>ASYMMPTOMATIC AT FOLLOW-UP</th>
<th>SYMPTOMATIC AT FOLLOW-UP N = 22</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>CD3</td>
<td>12 (0–45)</td>
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</tr>
<tr>
<td>CD4</td>
<td>10 (0–42)</td>
<td>18.5 (0–51)</td>
<td>0.63</td>
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<tr>
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<td>1 (0–35)</td>
<td>2 (0–22)</td>
<td>0.67</td>
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<tr>
<td>CD20</td>
<td>0 (0–2)</td>
<td>0 (0–6)</td>
<td>0.31</td>
</tr>
<tr>
<td>CD56</td>
<td>5 (0–73)</td>
<td>0 (0–26)</td>
<td>0.07</td>
</tr>
<tr>
<td>CD68-15</td>
<td>35 (0–158)</td>
<td>30.5 (0–84)</td>
<td>0.19</td>
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<td>9 (0–60)</td>
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<td>13 (0–53)</td>
<td>5.5 (0–24)</td>
<td>0.28</td>
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</tbody>
</table>

Presence of iron (yes/no) 7/8 3/19 0.06

Conclusion: 37 patients suffering from non-ruptured chronic Achilles tendinopathy were followed for more than 3 years. At follow-up, 15 patients (41%) had no Achilles tendon symptoms. When comparing the asymptomatic group of patients (n = 15) to the symptomatic group (n = 22), no differences in numbers per count of baseline immune competent cells in standard volume of Achilles tendon biopsies were observed.

Thus, the amount of immune competent cells at baseline cannot predict long term outcome of chronic Achilles tendinopathy.

Disclosure: M. S. Kragsnæs, None; U. Fredberg, None; K. Stribolt, None; S. G. Kjr, None; K. Bendix, None; T. Ellingsen, None.

1878
Cognitive Manifestations of Fibromyalgia and Lupus. Robert S. Katz and Frank Leavitt. Rush University Medical Center, Chicago, IL

Background/Purpose: Similar cognitive complaints for patients with fibromyalgia and systemic lupus erythematosus (SLE) have been reported; however, inherently different deficits can share superficial similarities. The major purpose of this study is to determine if the two syndromes have deficits in cognitive functioning in common as measured by the new Mental Clutter Scale.

In the 15 cases pleading aggravation of FM (14 female, mean age 50 ± 8 years), 5 were manual, 3 clerical, 7 health care or education workers. Thirteen injuries were acute, 2 occurred gradually, with low back or neck identified in 13, and the Tribunal accepted 10/15 (67%). In the 123 new on-set FM (104 female, mean age 52 ± 9 years), 60 were manual, 29 clerical, 30 health care or education workers, 4 unknown, with 32% reporting repetitive work activity. Time from injury to diagnosis of FM (available for 117) was 4.3 ± 4.1 years, with 6.3 ± 2.8 physicians cited for each worker. Previous psychological illness, injuries, neck pain or back pain were recorded as present for 17%, 22%, 10%, and 13% respectively, whereas there was no statement of pre-existing health status for 39%.

Injuries were a single event in 68%, and gradual in 32%, with location of injury in low back for 44%, and shoulder/upper limb in 40%. The FM diagnosis was based on report by a rheumatologist in 74%, and family physician in 13%, with 73 (59%) appeals accepted by the Tribunal.

Conclusion: Over half of appeals for aggravation of causation of FM following a work related soft tissue injury were upheld by the Tribunal. Claimants were demographics similar to other FM cohorts, although healthcare utilization was very high. Low back and upper limb injuries predominated as causation, with over two thirds reporting FM following a single incident. The attribution of causation of FM to a single workplace traumatic event is contentious and requires further examination.


1880
A Brazilian Portuguese Validation of the Revised Fibromyalgia Impact Questionnaire (FIQR). Eduardo S. Paiva1, Roberto E. Heymann2, Marcelo C. Rezende3, Milton Hellenstein Jr. 4, José E. Martinez5, José R. Provenza6, Aline Ranzolin7, Marcos Renato Assis6, Vivian D. Pasqualin9 and Robert M. Bennett10. 1Universidade Federal do Paraná, Curitiba, Brazil, 2Universidade Federal de São Paulo, São Paulo, Brazil, 3Santa Casa de Campo Grande, Campo Grande, Brazil, 4Universidade Federal de de São Paulo, São Paulo, Brazil, 5Pontifícia Universidade Católica de São Paulo, Sorocaba, Brazil, 6Pontifícia Universidade Católica de Campinas, Campinas, Brazil, 7Universidade Federal de Pernambuco, Recife, Brazil, 8Faculdade de Medicina de Marília, Marília, Brazil, 9Pontifícia Universidade Católica do Paraná, Curitiba, Brazil, 10Oregon Health & Science Univ, Portland, OR

Background/Purpose: General health evaluation questionnaires are important instruments in assessing the impact of disorders that affect multiple domains of a patient’s life. The Fibromyalgia Impact Questionnaire (FIQ) was specifically developed to assess disease severity and functional ability in are more prominent in fibromyalgia, providing strong support for the notion of fibrofog. Fog like features play less of a role in lupus, providing weak support for the notion of brain fog in most lupus patients.

Disclosure: R. S. Katz, None; F. Leavitt, None.

1879
Work Related Injuries Causing or Aggravating Fibromyalgia in the Medicolegal Arena: A Jurisprudential Analysis. Mary-Ann Fitzcharles1, Peter A. Ste-Marie2 and Yoram Shir. 3McGill University, Montreal, QC, 2University of Montreal, Montreal, QC

Background/Purpose: Up to 40% of persons report onset of fibromyalgia (FM) following a “triggering event”. Injuries, which may occur in the workplace, may be implicated in some, hence linking FM to compensation. In Ontario, Canada, work injury causing physical abnormality is compensated according to the American Medical Association guides, with apportionment for pain, whereas injury without body changes, ie soft tissue, is compensated according to a chronic pain policy. FM, without tissue damage, falls under this policy. The Workplace Safety and Insurance Appeals Tribunal (WSIAT) is the final level of appeal for workers who request compensation for a work-related injury as causation for FM, with decisions available in the public domain.

Methods: Between June 2006 and December 2011, 150 Tribunal decisions relevant to FM were examined by predetermined search protocol. Twelve did not meet inclusion criteria; FM was not the central issue in 4, and 8 were for increased awards. New onset FM was appealed in 123, and aggravation of pre-existing FM in 15. Information in the aggravation cases was supplemented.

Results: All injuries were of a soft tissue nature, without any persistent physical findings to explain continued symptoms. Of the 15 cases pleading aggravation of FM (14 female, mean age 50 ± 8 years), 5 were manual, 3 clerical, 7 health care or education workers. Thirteen injuries were acute, 2 occurred gradually, with low back or neck identified in 13, and the Tribunal accepted 10/15 (67%). In the 123 new on-set FM (104 female, mean age 52 ± 9 years), 60 were manual, 29 clerical, 30 health care or education workers, 4 unknown, with 32% reporting repetitive work activity. Time from injury to diagnosis of FM (available for 117) was 4.3 ± 4.1 years, with 6.3 ± 2.8 physicians cited for each worker. Previous psychological illness, injuries, neck pain or back pain were recorded as present for 17%, 22%, 10%, and 13% respectively, whereas there was no statement of pre-existing health status for 39%.

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Conclusion: Over half of appeals for aggravation of causation of FM following a work related soft tissue injury were upheld by the Tribunal. Claimants were demographics similar to other FM cohorts, although healthcare utilization was very high. Low back and upper limb injuries predominated as causation, with over two thirds reporting FM following a single incident. The attribution of causation of FM to a single workplace traumatic event is contentious and requires further examination.

fibromyalgia patients. Since its initial publication in 1991, it has been widely used in clinical trials and clinical practice, with many translated versions around the world. In 2009, a revised version of the FIQ was published, the FIQR; this attempted to correct some of the problems that had emerged in the use of the original FIQ over the ensuing 18 years in aiming to achieve a better balance among different domains (Function, Overall Impact, Symptoms) and provide an easier scoring system. Here we present the validity and reliability of the Brazilian version of the Revised Fibromyalgia Impact Questionnaire (FIQR).

Methods: Female fibromyalgia patients (n=106) completed an online survey consisting of demographic data, the SF-36 questionnaire, the original FIQ (both in validated Brazilian Portuguese Translation), and the Brazilian Portuguese FIQR, which was translated by a standard method. Validity was established with correlation analyses between FIQR, FIQ and SF-36 items. Three domains were established for FIQR (Function, Overall Impact, Symptoms) and their contribution for the SF-36 subscales was also scrutinized.

Results: The Brazilian Portuguese FIQR validation process showed that the questions performed in a very similar way to the English FIQR. Four new questions in the FIQR symptoms (memory, balance, tenderness and environmental sensitivity) showed strikingly similar results to the original FIQR, revealing a significant impact in FM patients. The Brazilian Portuguese FIQR demonstrated excellent reliability, with a Cronbach alpha of 0.96. The correlation with the original FIQ was also good (r=0.854, p<0.001). There was a gain in the weight of the function domain, with little change of the overall impact domain, and a decrease of the symptom domain, leading to a better balance among FM domains. FIQR predicted a great number of SF-36 subscales, showing both convergent and discriminant validity.

Conclusion: The Brazilian Portuguese version of the FIQR was validated, and found to be a reliable and easy-to-use and score FM specific questionnaire that should prove useful in routine clinical practice and FM-related research.

Disclosure: E. S. Paiva, Pfizer Inc, 5, Eli Lilly and Company, 8; R. E. Heymann, Pfizer Inc, 5, Eli Lilly and Company, 5; M. C. Rezende, Pfizer Inc, 5, Eli Lilly and Company, 5; M. Holleenstein Jr., Pfizer Inc, 5, Eli Lilly and Company, 8, Apsen, 8; J. R. Provenza, None; A. Ranzolin, Pfizer Inc, 5; M. R. Assis, None; V. D. Pasquelin, None; R. M. Bennett, None.

1882

Predictors of a Favorable Outcome in Patients with Fibromyalgia: Results From the 1-Year Follow-up. Dong-Jin Park1, Shin-Soek Lee2, Seong-Ho Kim3, Seong-Su Nah4, Ji Hyun Lee5, Seong-Kyu Kim6, Yeon-Ah Lee7, Seung-Jae Hong8, Hyun-Soo Kim9, Hye Soon Lee10, Hyoun Ah Kim11, Geum-Mi Youn12, and Sang-Hyun Kim13. 1Chonnam National University Medical School, Gwangju, South Korea, 2Inje University Haengduae Paik Hospital, Busan, South Korea, 3Soonchunhyang University, South Korea, 4Maryknoll Medical Center, Busan, South Korea, 5and Autoimmunity Research Center, Catholic University of Daegu School of Medicine, Daegu, South Korea, 6Kyung Hee University, Seoul, South Korea, 7Internal Medicine, Chosun University Hospital, Gwangju, South Korea, 8Hanyang University Guri Hospital, Guri, South Korea, 9Ajou University School of Med, Suwon, South Korea, 10Konyang University Medical School, Daejeon, South Korea, 11Dongsan Medical Center, Keimyung University, Daegu, South Korea

Background/Purpose: To determine the outcomes in Korean patients with fibromyalgia (FM) and identify the prognostic factors associated with improvement at 1-year follow-up.

Methods: Forty-eight patients with FM were enrolled and examined every 3 months for 1-year. We interviewed these patients using a structured questionnaire that included sociodemographic data, current or past FM symptoms, and current use of relevant medications at the time of enrollment. Tender point counts and scores were assessed by thumb palpation. Patients were treated to complete a Korean version of the Fibromyalgia Impact Questionnaire (FIQ), the Brief Fatigue Inventory, the SF-36, the Beck Depression Inventory, the State-Trait Anxiety Inventory, the Self-Efficacy Scale, and the Social Support Scale. During follow-up, tender points, FIQ, and current use of relevant medications were recorded during 1 year follow-up period.

Results: Of the 48 patients, 32 (66.7%) had improved FIQ scores 1 year after enrollment. The improved patients had higher baseline FIQ scores (68.4±13.9 vs 48.4±20.8, p=0.001) and higher Trait Anxiety Inventory scores (55.8±10.9 vs 11.5±1.5, p=0.022). The patients treated with pregabalin which was added during the follow-up period were more likely to be improved after 1-year (71.9 % vs 37.5 %, p=0.031). In multivariate logistic regression analyses, the additional use of pregabalin and higher Trait Anxiety Inventory scores at baseline were the predictor of improvement (p=0.026 and p=0.043) and this statistical significance persisted after adjustment for age, gender, and disease duration (p=0.016 and p=0.037).

Conclusion: Two-thirds of the Korean FM patients experienced some clinical improvement by 1-year after enrollment. The use of pregabalin and higher Trait Anxiety Inventory scores at baseline were the predictor of improvement. Other medications, particularly medications, may be associated with good outcome in a significant number of these patients.

Disclosure: D. J. Park, None; S. S. Lee, None; S. H. Kim, None; S. S. Nah, None; J. H. Lee, None; S. K. Han, None; Y. A. I., None; S. J. Hong, None; H. S. Kim, None; H. S. Lee, None; H. A. Kim, None; C. I. Young, None; S. H. Kim, None.
Efficacy and Safety of Joint and Soft Tissue Injections: A Retrospective Study, Jenny Cabas-Vargas1, Leah Alon2, Nina Ramessar3, Dimitre Stefanov4, Jose B. Toro and Deana M. Lazaro5. 1 SUNY Downstate Medical Center, Brooklyn, NY, 2 SUNY Downstate Medical Center, Brooklyn, NY, 3 Brooklyn VA, Brooklyn, NY, 4 SUNY Downstate Medical Center, Brooklyn, NY, 5 Brooklyn VA, Brooklyn, NY, 6 SUNY Downstate Medical Center, Brooklyn, NY.

Background/Purpose: Despite wide use of corticosteroid injection in the treatment of soft tissue and articular disorders, there is little data about its efficacy. We conducted a retrospective study to evaluate the effectiveness of corticosteroid (CS) and local anesthetic (LA) injections for treatment of musculoskeletal disorders (MSD).

Methods: The study was conducted at VA NYHHS; Brooklyn facility. Patients 18–85 years old who underwent CS or LA injection for MSD were identified by billing codes. The patients were invited to participate in a 28-question telephone survey. Information was collected regarding informed consent, impact on pain using pain score (PS 0–10), patient global assessment (PGA 0–100, 0 very poor-100 very well), functional status (M-HAQ) and side effects. Additional data was obtained by chart review. Descriptive analysis of all data collected and comparison of PS and PGA before and after the procedure were conducted.

Results: 116 patients were included in the final analysis. The average patient age was 60 years old, 85.3% men and 14% women. The procedures were performed by different specialties, Rheumatology (31.07%), Podiatry (28.45%), Orthopedics (17.24%), Physical Medicine and Rehabilitation (12.07%), and Pain Management (12.07%). The most common indications were knee osteoarthritis (20.68%), plantar fasciitis (15.92%), rotator cuff tendinitis/impingement (15.92%) and trigger finger (8.62%). LA were used in combination with CS in the majority of procedures (91.96%). Patients’ overall satisfaction with their procedure was 85%. The average PS prior to the procedure was 8.6; post-procedure average PS decreased to 2.8 (p<0.001Wilcoxon signed rank test). 69.93% of patients reported immediate relief after the injection. PGA before and after the procedure improved from an average 24 to 75 (p<0.001Wilcoxon signed rank test). 87.9% of patients reported that they experienced improvement in functional status; patients reported improvement in the ability to dress (34%), ability to get in and out of bed (45%), ability to lift a cup to their mouth (24%), ability to walk outdoors on flat ground (50%), ability to turn regular faucets (23%), ability to get in and out of a vehicle (49%). 57.76% of patients reported less analgesic use after the procedure; the average benefit of the injection was 6.18 months (range 0–24 months). 25.86% of the patients had a second injection and 12.93% of the patients underwent surgery for the same MSD. No serious adverse effects were reported; 3 patients reported bruising, 1 patient mild bleeding with the injection, 3 patients reported skin changes and 1 uncontrollable hypertension after the procedure. No infections were reported.

Conclusion: This retrospective study found that CS injections for MSD are associated with significant self-reported reduction in pain and improvement in functional status. There was high reported satisfaction with the procedures and benefits were long-lasting (average 6 months). Corticosteroid injections should be considered an important tool for clinicians treating musculoskeletal conditions. This study is limited by recall bias and diversity of procedures.

Disclosure: J. Cabas-Vargas, None; L. Alon, None; N. Ramessar, None; D. Stefanov, None; J. B. Toro, None; D. M. Lazaro, None.

1884

Fibromyalgia Patients Who Meet the ACR 1990 Criteria Have More Severe Disease. Carmen E. Gota1, Benjamin Nutter2 and William Wilke3. 1The Cleveland Clinic Desk A50, Cleveland, OH, 2 Cleveland Clinic, Cleveland, OH, 3 Cleveland Clinic Foundation, Cleveland, OH.

Background/Purpose: To compare the fibromyalgia patients who meet the 1990 ACR criteria for fibromyalgia with those who do not.

Methods: All new consecutive patients diagnosed with fibromyalgia that were seen in the Rheumatology Department at the Cleveland Clinic by two physicians between September 1st, 2008 and January 31st, 2011, were enrolled in the study.

Enrollment in the study was based on clinician’s overall impression of patient suffering from fibromyalgia.

Three hundred and six patients were enrolled.

Data collected included: demographics, detailed fibromyalgia symptoms, physical examination findings (tender points, brisk deep-tendon reflexes and carotid artery tenderness on palpation), family history of fibromyalgia and mood disorders and comorbidities. All patients were asked to complete the following questionnaires: Brief Patient Health Questionnaire Mood Scale (PHQ-9), Epworth Sleepiness Scale (ESS), Mood Disorders Questionnaire (MDQ), Fibromyalgia impact questionnaire (FIQ), Symptom Intensity Scale (SIS) and Health Assessment Questionnaire Disability Index (HAQ-DI).

Results: We compared 240 fibromyalgia patients who met the ACR 1990 criteria with the other 66 patients who did not (lacked widespread pain or had <11 tender points). Patients who met the ACR 1990 criteria, compared to the rest of the patients, had higher depression scores, PHQ-9 12 (7.75, 16) vs 9.5 (5, 14.7), p<0.03; higher regional pain scores 12 (9, 15) vs 9 (6, 12), p<0.001; higher VA fatigue 8 (7, 9) vs 7.25 (5, 9), p = 0.022; higher symptom intensity score SIS 7 (6.21, 8.25) vs 6.25 (5.25, 6.75), p < 0.001; higher FIQ score 69.03 (65.8, 80.8) vs 59.95 (46.11, 72.74), p = 0.001; higher difficulty with daily activities involving large muscle groups - FIQ-1 score 16 (7.24) vs 12 (7.20), p=0.039; less days when they felt well in the course of a week - FIG-2 score 10 (2.2) vs 2 (0.3), p = 0.003.

Conclusion: Fibromyalgia patients who meet the ACR 1990 criteria represent a more severe subset, manifested by more disability, and higher depression scores.

Disclosure: C. E. Gota, None; B. Nutter, None; W. Wilke, None.

ACR/ARHP Poster Session C

October 11, 2012, 9:00 AM–6:00 PM

Rheumatologists' Ultrasound Confidence and Interpretation of Normal Anatomy Are Improved by a Cadaver Based Sonoanatomy Course. Iain Goff1, David Wright2 and Debra Pattem1. 1 Newcastle University, Newcastle upon Tyne, United Kingdom, 2 Sunderland Royal Hospital, Sunderland, United Kingdom, 3 School of Medical Sciences Education and Development, Newcastle upon Tyne, United Kingdom.

Background/Purpose: Correct interpretation of musculoskeletal ultrasound (MSUS) requires thorough knowledge of normal 3D anatomy, but several authors report deficiencies in anatomy skills among rheumatologists. Cadaver-based anatomy review courses improve clinical and injection skills, but the value of such courses in MSUS training is unclear. During 2010-12 we delivered two cadaver based, MSUS anatomy courses for the British Society of Rheumatology (BSR), and a self assessment questionnaire was devised to measure confidence to perform key MSUS learning objectives before and after the course.

Methods: The two day course in March 2012 consisted of orientation lectures with MR imaging; expert led, small group workshops handling cadaveric specimens; simultaneous access to real-time ultrasound on live models; and ultrasound practice on patients with pathological anatomy. Ten item confidence logs based on BSR core competency outcomes and ability to diagnose EULAR pathologies were completed by the delegates before, after and four weeks following the course. Standardised imaging protocols with anatomy checklists devised by tutors from the BSR ultrasound special interest group were used to guide scanning technique and to assess delegate ability to locate specific anatomic structures with ultrasound.

Results: Twenty delegates attended the course. Delegate feedback rated the course very highly (Overall mean satisfaction score = 4.25, 1=poor, 5=excellent). Confidence logs collected from all 20 delegates demonstrated low levels of confidence in core domains pre-course (mean 3.5/10), improving to mean 5.5/10 immediately post-course (paired t test p<0.001) with significantly improved confidence at 4 weeks compared to baseline in 7/10 domains (paired t test p<0.05, see table).

Competency outcome

<table>
<thead>
<tr>
<th>Competency</th>
<th>Pre-Course</th>
<th>End of course</th>
<th>Four Weeks</th>
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<td>Perform structured assessment of each anatomic area</td>
<td>3.3</td>
<td>6.0</td>
<td>5.7*</td>
</tr>
<tr>
<td>Identify, demonstrate and interpret anatomy</td>
<td>3.4</td>
<td>6.0</td>
<td>6.0*</td>
</tr>
<tr>
<td>Identify, demonstrate and interpret pathology</td>
<td>3.2</td>
<td>5.5</td>
<td>6.0</td>
</tr>
<tr>
<td>Use US to guide aspiration and injection</td>
<td>3.4</td>
<td>5.1</td>
<td>5.8*</td>
</tr>
<tr>
<td>Correlate US with other imaging modalities</td>
<td>3.2</td>
<td>5.7</td>
<td>6.5*</td>
</tr>
<tr>
<td>Present a written report and archive image</td>
<td>2.7</td>
<td>4.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Understand clinical relevance and apply to patient management</td>
<td>5.3</td>
<td>6.3</td>
<td>7.8*</td>
</tr>
<tr>
<td>Correctly diagnose EULAR basic pathology</td>
<td>4.3</td>
<td>5.6</td>
<td>6.5</td>
</tr>
<tr>
<td>EULAR intermediate pathology</td>
<td>3.4</td>
<td>5.1</td>
<td>5.3*</td>
</tr>
<tr>
<td>EULAR advanced pathology</td>
<td>2.3</td>
<td>3.6</td>
<td>3.1*</td>
</tr>
</tbody>
</table>

* p<0.05
Anatomy checklists were completed and returned by 13 delegates. Most structures were located at the shoulder, elbow, wrist, knee and ankle (68–72% of structures located) though fewer structures were visualised at the hip (44%).

Conclusion: This cadaver based anatomy review course produced significant improvement in confidence across a range of MSUS competencies including interpretation of normal anatomy, which was maintained after 4 weeks. Expert led, small group workshops handling cadaveric specimens with simultaneous practice of MSUS on live models is an effective model for MSUS anatomy training. This method of teaching was highly regarded by the delegates, and imaging protocols and checklists are a useful tool for self-assessment.

Disclosure: I. Goff, None; D. Wright, None; D. Patten, None.

1886
Evaluation of a New Educational Tool: A Resident’s Guide to Pediatric Rheumatology. Tania Cellucci and Ronald M. Laxer. The Hospital for Sick Children, Toronto, ON

Background/Purpose: “A Resident’s Guide to Pediatric Rheumatology” was specifically designed to address a gap in pediatric rheumatology teaching resources. It was intended for medical students and residents who participate in pediatric rheumatology rotations as part of their training program. The aims of this study were to determine whether the Guide was reaching its target population and to evaluate its perceived utility, frequency of use, and user satisfaction.

Methods: The Guide was developed by rheumatology staff and fellows at The Hospital for Sick Children in 2011 and provides a summary of common pediatric rheumatology topics. It was distributed electronically at no cost to interested training programs. All individuals who requested a copy of the Guide were contacted via email to solicit their participation in an online survey. The survey collected information on: (1) participant demographics; (2) frequency and methods in which the Guide was used; (3) ratings of user satisfaction on a 5-point Likert scale (level 1 outcome of Kirkpatrick’s evaluation model); and (4) identification of perceived positive and negative features of the Guide.

Results: An invitation was sent to 261 recipients of the Guide and 81 (31% response rate) completed the survey. Participants included 45 staff pediatric rheumatologists, 18 residents, 7 pediatricians, 5 pediatric rheumatology fellows, 3 adult rheumatology fellows, 2 occupational therapists, and 1 nurse practitioner. The Guide was used for teaching by 63% of participants and for learning by 48%. As expected, no staff physicians used the Guide as a learning tool; however, fellows and residents reported using the Guide to study as well as to teach. Most teachers (90%) provide the Guide to trainees to read independently during rotations, while a smaller group use the Guide to stimulate discussion (37%) or as part of case-based teaching (35%). Frequency of use was described as weekly (20%), monthly (30%), or every few months (30%). Overall, participants were satisfied with the Guide as a teaching resource (69% very satisfied, 20% somewhat satisfied) and learning resource (65% very satisfied, 22% somewhat satisfied). The most commonly cited positive features were its’ free availability, and balance between comprehensive and concise information.

Conclusion: The Guide appears to fill an identified gap in pediatric rheumatology resources for non-rheumatology trainees. Uptake of the Guide as a learning tool was broader than the intended audience since fellows report using it for teaching and learning. Further study is required to determine if the Guide increased knowledge in non-rheumatology trainees (Kirkpatrick level 2 outcome) and changed teaching behaviours by pediatric rheumatology teachers (Kirkpatrick level 3 outcome).

Disclosure: T. Cellucci, None; R. M. Laxer, None.

1887
Facebook Support Groups in Systemic Lupus Erythematosus: Content Analysis. Evelyne Vinet1, William Shihaao Lao2, Christian A. Pineau2, Ann E. Clarke3 and Sasha Bernatsky4. 1McGill University Health Centre, Montreal, QC, 2McGill University, Montreal, QC, 3MUHC, Montreal, QC, 4Research Institute of the McGill University Health Centre, Montreal, QC

Background/Purpose: Facebook is the most important social network site, with over 600 million registered users worldwide. Many disease-specific groups exist on Facebook, offering a convenient way to exchange information and support, particularly for patients affected with a rare disease such as systemic lupus erythematosus (SLE). However, no one has explored the content of SLE-related groups on Facebook. We aimed to evaluate the purpose of the SLE-related groups on Facebook, and assess the patterns of use and the information shared on the groups dedicated to support.

Methods: We searched Facebook groups using the term “lupus”, from 10/08/2011 to 01/04/2012. We selected groups related to SLE, operating in English or French, and publicly accessible. We extracted information on the purpose of the group and its administrator, as well as on the number and type of user-generated contributions. We analyzed the content of support groups using a previously developed coding scheme.

Results: We found 173 SLE groups on Facebook containing a total of 42,240 members. Half (49%) of the groups were created for support, while 32% were for disease awareness and 14% for fundraising. The largest group included 30,972 members and was intended for awareness. 3469 members were found in support groups, representing 31% of the overall membership (when excluding the largest group), and the median number of members was 11 (interquartile range, IQR, 39). The most frequent support group locations of origin were the United States (46%), Canada (10%), and United Kingdom (10%). In support groups, the total number of user-generated contributions was 1932, including wall posts (54%), comments (32%), discussion posts (10%), and discussion threads (4%), while the median number of user-generated contributions was 5 (IQR 20).

Conclusion: Support groups represent a substantial proportion of Facebook groups dedicated to SLE. Given their convenience, accessibility, and potential audience, Facebook support groups might represent an efficient way to reach patients with SLE and improve their wellbeing. Further research should evaluate the effect of this type of support groups on patients with SLE.

Disclosure: E. Vinet, None; W. S. Lao, None; C. A. Pineau, None; A. E. Clarke, None; S. Bernatsky, None.

1888
Immunology for Rheumatology Residents: Working towards a National Curriculum Consensus. Shirley L. Chow1, Bharini Mahendra2, Sari Herman-Kideckel3 and Heather McDonald-Blumer4. 1University of Toronto, Toronto, ON, 2St Michael’s Hospital, Toronto, ON, 3University of Toronto, North York, ON, 4Mt Sinai Hospital, Toronto, ON

Background/Purpose: Immunologic mechanisms play an integral role in the understanding of rheumatic conditions. Currently, there is limited access to standardized formal instruction in immunology for trainees across Canada. A comprehensive immunology curriculum is essential for adult rheumatology trainees to meet the competencies required for practice and mandated by the national accrediting body.

The purpose of this project is to review the current immunology curriculum amongst adult rheumatology training programs across Canada. We will compare the self identified learning needs of rheumatology residents with the perceived learning needs of rheumatology program directors and will seek to integrate these needs into a focused nationwide immunology curriculum for rheumatology training programs

Methods: Rheumatology trainees and program directors from rheumatology programs across Canada were asked to complete an online questionnaire and rank a comprehensive list of immunology topics. A modified Delphi approach was used to obtain consensus on topics to be included in the curriculum.

Results: 38 rheumatology trainees and 15 program directors were contacted between March 1 to May 31 2012. 42% of trainees and 66% of program directors responded, with a total 49% response rate. Of the rheumatology trainees, 67% had prior experience in immunology, which consisted of undergraduate and graduate courses. Teaching formats and formal teaching hours varied between sites. Only 31% of trainees and 42% of program directors felt the current method of teaching immunology was effective. Preliminary results reveal high concordance between the majority of topics ranked by Trainees and Program Directors. However, discordance was seen with the topics of diagnostic laboratory immunology and therapeutics, immunomodulators and immunosuppressants.
Conclusion: There is a need to improve immunology teaching in rheumatology training programs. Preliminary results show a high concordance between the majority of topics ranked by trainees and program directors, however discordance is seen with others. Final completion of the Delphi will allow for a national consensus and more definitive conclusions. This study provides the groundwork for development of future national immunology curricula.

Disclosure: S. L. Chow, None; D. Mahendra, None; S. Herman-Kideckel, None; H. McDonald-Blumer, None.

1889

The Effects of Physical & Mental Health Rehabilitation Program (PMHRP) for Hemophilic Arthritis Patients. Won Sook BAK1, Myung Chul Yoo1, Nam Su Cho1, Sang Hack Lee1, Yoon Hee Kim2 and Ki Young Yoo1. 1Kyung Hee University Hospital at Gangdong, Seoul, South Korea, 2Seoul, South Korea

Background/Purpose: Most of the rehabilitation program for patients with hemophilic arthritis are focused on only the improvement of physical activities. However, the actual hemophilic arthritis patients are accompanied by mental problems as well as physical disabilities, so a rehabilitation program to improve physical and mental problems simultaneously is needed. PMHRP was developed to solve these problems through increasing the interpersonal relationship, developing each potentials, self-development and understanding others. PMHRP was analysed by two different groups to verify the clinical effectiveness.

Methods: This study used a nonequivalent control group quasi-experimental research based on data acquired through a pre-post test. The subjects for this study were a total of 53 patients with hemophilic arthritis who underwent lower extremity joint surgeries at the orthopedic. The experimental group(n=24)was attended PMHRP 5 times(4hours/time) for 4 weeks, and the control group(n=29) was not given any physical & mental health rehabilitation program. The measurement tools of this study were Numerical Rating Scale for 100mm Pain VAS, 100mm Fatigue VAS, self efficacy, self esteem, quality of life, SCL-90-R(Symptom Checklist-90-Revision) and WOMAC Scale. The data was analyzed with X^2-test and t-test using SPSS/Win18.0.

Results: After PMHRP application, self efficacy score increased significantly in the study group and self esteem score also increased (p<.001). On the contrary, these scores decreased after 4 weeks in the control group. 100mm Pain VAS & 100mm Fatigue VAS, and quality of life scores improved significantly in the study group(p<.001). SCL-90-R scores decreased significantly after the program (p<.001). Although there were no statistically significant differences in WOMAC scores between two groups, however, the average score was changed from pre-treatments(M=36.51) to post-treatment(M=30.08) and it revealed the alleviation of arthritic symptoms and improvement of activities.

Conclusion: In conclusion, PMHRP showed much more satisfactory results than the simple physical therapy to treat the physical and mental disabilities including psychosocial stresses in patients with hemophilic arthritis by increasing the self esteem and quality of life by themselves. These results suggest that PMHRP is highly recommended as a distinguished method of rehabilitation for patients with hemophilic arthritis.

Disclosure: W. S. BAK, None; M. C. Yoo, None; N. S. Cho, None; S. H. Lee, None; Y. H. Kim, None; K. Y. Yoo, None.

1890

The Current State of Mentoring Among Pediatric Rheumatology Fellows and Junior Faculty in the United States and Canada. Meredith P. Krieger,1 Eyal Muscal,2 Matthew M. Davis,2 Hermine Brunner,3 B. Anne Eberhard,4 C.J. Inman,5 Marisa S. Klein-Gitelman,6 Lakshmi N. Moorthy,7 Marc D. Natter,8 Sampath Prahalad,9 Rayfel Schneider10 and Peter A. Nigrovic11. 1University of Michigan Health System, Ann Arbor, MI, 2Baylor College of Medicine, Houston, TX, 3University of Michigan, Ann Arbor, MI, 4Cincinnati Children’s Hospital Medical Center and PRSGC, Cincinnati, OH, 5Cohen Children’s Hospital Medical Center, New Hyde Park, NY, 6University of Utah, Salt Lake City, UT, 7Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago, IL, 8Robert Wood Johnson-UMDNJ, New Brunswick, NJ, 9Children’s Hospital Boston, Boston, MA, 10Emory Children’s Center, Atlanta, GA, 11The Hospital for Sick Children, Toronto, ON, 12Brigham and Women’s Hospital, Boston, MA

Background/Purpose: Prior studies have shown that mentoring increases professional success among physicians. Many pediatric rheumatology (PR) divisions are small, which may limit options for mentoring. The ACR/Childhood Arthritis and Rheumatology Research Alliance (CARRA) Mentoring Interest Group (AMIGO) is a new collaborative effort to promote professional development within PR via cross-institutional mentoring. In this study, we describe the pre-AMIGO state of mentoring among PR fellows and junior faculty in the US and Canada.

Methods: A cross-sectional web-based survey of all pediatric rheumatologists in the US and Canada was conducted Nov 2011-Jan 2012. The survey was distributed via ACR, CARRA, and McMaster PR email lists. Where possible, survey items were drawn from validated scales. For this study, the analysis cohort was limited to include fellows and junior faculty, as AMIGO targets those groups. Independent variables included respondent demographics; dependent variables included the reported presence and location of mentors and overall satisfaction with mentoring received on a 5-point Likert scale. Chi square tests were used to assess associations.

Results: 135 respondents were included in the analysis cohort. 42% of the analysis cohort were fellows (estimated subgroup response rate 64%) and 58% were junior faculty (estimated subgroup response rate 70%). 74% of the analysis cohort were female; 95% were employed in academic institutions; and 96% were fellowship-trained. Most respondents had a clinical mentor, while fewer had mentors for important career-related tasks such as identifying funding sources, defining career goals, and understanding how to achieve career goals (Figure 1). Fellows and junior faculty were equally likely to have clinical mentors, but fellows were more likely to have research mentors; 5% of fellows and 26% of junior faculty reported no research mentoring (p<.01). Both fellows and junior faculty reported finding mentors outside their home PR divisions.

Overall, 74% of fellows and 64% of junior faculty were somewhat or very satisfied with the mentoring they receive. The presence of a mentor in any domain was associated with an increased likelihood of satisfaction with mentoring (all p<.01). This association was strongest for having a mentor who helped respondents understand how to achieve their career goals; 84% of those with a mentor in this domain were satisfied with mentoring, compared to only 17% of those without (p<.001).

Conclusion: Many PR fellows and junior faculty members lack mentors in specific areas of career development. Programs such as AMIGO may have a role in providing cross-institutional mentors in critical career-related domains. Future studies will assess changes in mentee satisfaction and academic achievement for pediatric rheumatologists engaged in the AMIGO program and for the PR community at large.

Disclosure: M. P. Riebschleger, None; E. Muscal, None; M. M. Davis, None; H. Brunner, None; B. A. Eberhard, None; C. J. Inman, None; S. Klein-Gitelman, None; L. N. Moorthy, None; M. D. Natter, None; S. Prahalad, None; R. Schneider, None; P. A. Nigrovic, None.

1891

Teaching Medical Students Principles of Chronic Disease: Medicine of the 4th and 5th Dimension At Weill-Cornell. Michael D. Lockshin1, Greg McDermott2, Lester Zambrana3 and Alana B. Levine1. 1Hospital for Special Surgery, New York, NY, 2Weill-Cornell Medical College, New York

Background/Purpose: Medical students learn about acute illness and sometimes have experience with longitudinal care, but they do not encounter concepts specific to the management of chronic, non-lethal, intermittent, disabling illness, such as the rheumatic diseases. Here we describe a novel curriculum designed to address this gap.
Methods: We initiated a pilot course on chronic illness at Weill-Cornell Medical College. Medicine of the 4th and 5th Dimension (time and communication). The course did not focus on biology or treatment. Each of 7 seminar sessions focused on one or more of the following themes: time scales (making decisions for immediate, short-term, and long-term needs); communication (patient priorities, hearing the unsaid, seeing the unseen, physician arrogance); living with disability; managing co-morbidity; decision-making when the evidence is imperfect; the patient for the patient disagrees; working with other medical personnel; attending to externalities (family, insurers, society); and maintaining an identity other than that of a person with a chronic illness. At the conclusion of the course students submitted essays on strengths and weaknesses of the course; patients were interviewed separately.

Results: Two first-year and one fourth-year students, one rheumatology fellow, one parent-patient advocate, one parent, and 9 patients participated. Patients had lupus, scleroderma, Sjogren’s with and without cryoglobulinemia, Wegener’s, kidney transplant, and undefined autoimmune illnesses. Patients were 17–60 years old, female, and of Caucasian, Hispanic, and Asian ethnicities (two African-Americans initially volunteered to participate but did not). All patients, recruited from rheumatology practices, were articulate and well-informed about their illnesses.

Students particularly valued the ability to learn from rather than about patients. They noted that: there is a distinction between “staying healthy” and “getting well”; patients are not defined by their disease; fear of future pain can be worse than current pain; humble and arrogant physicians have different effects on patients; lectures on empathy do not substitute for hearing a patient’s words and observing her body language; not all problems have right answers; external influences affect patients’ decisions.

Students asked for more didactic instruction on how to speak to a patient when knowledge is uncertain. They asked for a session how to manage stalled progress (keeping up patients’ hope) in a chronic illness. Because the patients had been selected for reliable attendance and for articulateness, students felt they did not get a sense of managing a patient across language, cultural, socioeconomic or intellectual barriers. They felt that video-taped interviews or on-line exercises would not substitute for face-to-face interviews.

Conclusion: This pilot program identified important needs of students with regard to learning about chronic illness. With a larger program (more students, more time per year, more years in medical school, broader patient base) these needs can be met.

Disclosure: M. D. Lockshin, None; G. McDermott, None; L. Zambrana, None; A. B. Levine, None.

Impact of a Lupus Patient Education Event On Knowledge about Systemic Lupus Erythematosus

Mithu Maheswaranathan1, Melissa A. Cunningham2, Sharon Wolf3 and Diane L. Kamen4. 1Medical University of South Carolina, Charleston, SC; 2MUSC, Charleston, SC; 3Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Charleston, SC

Background/Purpose: There is a need for educational interventions to boost chronic disease management skills among patients. To address this need, we created a lupus patient education event comprised of a panel of multidisciplinary experts to provide information to lupus patients. The study objectives were (1) to survey the local lupus population regarding their lupus-related questions and (2) to assess the impact of this event on patient knowledge about lupus.

Methods: A planning team including representatives from the community, medical school, and rheumatology division oversaw the creation and execution of the event. Patients with lupus (n=550) who had given permission to be contacted were invited to the event and those who registered were sent a pre- and post-event lupus knowledge survey via email. Rheumatologists presented topics including a lupus overview, cardiovascular health, reproductive health and contraception for teens and adults, clinical research trials, and answered questions submitted from the audience. A motivational speaker discussed ways to overcome challenges in managing a chronic disease, and a nurse educator presented material on speaking to your doctor about lupus.

Results: 91 individuals attended the Lupus Patient Education Event in October 2011. The pre- and post-event surveys were sent via email to all attendees, of which 39 individuals responded to the pre-test and 22 individuals responded to the post-test. The mean age of responders was 39 +/- 14 years. 81% of total responders were lupus patients. Respondents had limited awareness about belimumab as an FDA-approved medication for lupus (59% pre, 86% post), meaning of a positive ANA (64% pre, 73% post), malar rash as a symptom of lupus (67% pre, 91% post), and age groups most at risk (74% pre, 86% post).

Of 48 individuals who responded to the post-event evaluation, 91.3% said they felt we achieved the goal of providing information and education about lupus which will impact disease management and overall health.

Conclusion: The improvements in scores suggests efficacy of the patient education event in increasing awareness and knowledge about lupus in those who attended. The interactive nature of a symposium enables quality information to be disseminated to patients and families, and for patient questions to be answered. Future events will emphasize topics suggested by participants and provide more interactive sessions.

Disclosure: M. Maheswaranathan, None; M. A. Cunningham, None; S. Wolf, None; D. L. Kamen, None.

Eliciting Prescribing Choices of Anti-Tumour Necrosis Factor Therapy From Rheumatology Trainees

Rodney A. Hughes1 and Alison J. Carr2. 1St. Peters Hospital, Chertsey Surrey, United Kingdom, 2Hamell Communications, London, United Kingdom

Background/Purpose: A rheumatologist’s choice of anti-TNF prescription is likely to be influenced by a number of factors. Doctors believe their prescribing to be evidence-based, rational and justifiable. With greater understanding of health behaviour, it is likely that prescribing decisions about anti-TNF will involve conscious and sub-conscious factors. We conducted a clinical decision exercise with senior rheumatology trainees to try better to understand these influences and whether all doctors take into account patient perceptions and preferences.

Methods: 12 trainees were each given an iPad with details of 30 individual simulated patients, based on real patients with RA. For each individual ‘iPad’ patient doctors were asked to decide whether to start anti-TNF and which brand they would prescribe if they did. Each doctor was in training at a different hospital with different local anti-TNF guidelines for therapy although all purported to follow UK national guidelines for anti-TNF drug therapy. iPad patients differed in gender, age, disease duration and disease activity score, previous drug history and symptoms of stiffness and function. Work status varied as did quality of life measures and aspects of disease activity score. The analysis of results indicated that doctors could be fitted broadly into one of two categories; Evidence-based decision makers (EBDs) and Intuitive patient-focused decision makers (IPDs) according to the way that doctors in these two groups made decisions. Prescribing choice appeared independent of the background of the doctor and geographical area of training and extent of rheumatological experience.

EBD’s stuck rigidly to guidelines for initiation of anti-TNF therapy and took no account of subjective data or patient specific concerns of preferences. EBD’s were rigid in their choice of anti-TNF and chose the same product for all patients who were going to be initiated onto anti-TNF. EBD’s appeared not

Table 1. Pre-test and post-test results from participants

<table>
<thead>
<tr>
<th>Theme</th>
<th>Question</th>
<th>Pre-Test (%) Correct</th>
<th>Post-Test (%) Correct</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etiology</td>
<td>how lupus damages body</td>
<td>100</td>
<td>100</td>
<td>NS</td>
</tr>
<tr>
<td>Etiology</td>
<td>what is the cause of lupus*</td>
<td>100</td>
<td>95</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge/Acute</td>
<td>what SLE stands for</td>
<td>100</td>
<td>100</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge/Acute</td>
<td>meaning of a positive ANA</td>
<td>64</td>
<td>73</td>
<td>0.472</td>
</tr>
<tr>
<td>Knowledge/Acute</td>
<td>medications safe in pregnancy</td>
<td>89</td>
<td>86</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge/Acute</td>
<td>FDA-approved medication</td>
<td>59</td>
<td>86</td>
<td>0.036</td>
</tr>
<tr>
<td>Knowledge/Acute</td>
<td>malar rash</td>
<td>67</td>
<td>91</td>
<td>0.036</td>
</tr>
<tr>
<td>Knowledge/Acute</td>
<td>protein in urine</td>
<td>97</td>
<td>100</td>
<td>NS</td>
</tr>
<tr>
<td>Risk Factors</td>
<td>age group most at risk</td>
<td>74</td>
<td>86</td>
<td>0.275</td>
</tr>
<tr>
<td>Risk Factors</td>
<td>risk in men vs. women</td>
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<td>86</td>
<td>0.6375</td>
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<td>African Americans and SLE</td>
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<td>0.125</td>
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<td>Comorbidities</td>
<td>comorbidities (CVD, VD)</td>
<td>92</td>
<td>95</td>
<td>NS</td>
</tr>
</tbody>
</table>

*NS = non-significant
to feel that patients could make informed decisions or choices about treatment. EBD’s did not think that adherence would be a problem with anti-TNF therapy. In contrast IPD’s ignored guidelines around the threshold for starting anti-TNF in cases where they felt that patients would benefit from anti-TNF. With IPD’s patient factors were important in driving treatment decisions – quality of life and impact of RA on the ability to work strongly influenced decisions. IPD’s responded to patient requests, concerns and preferences in making prescribing choices and were more likely to tailor their choice to fit best with patient-specific characteristics. IPD’s felt that patients could and should make informed decisions about their treatment and recognised that adherence was potentially a problem even with anti-TNF drugs.

**Conclusion:** As many health care decisions there appear to be strong sub-conscious influences on anti-TNF prescribing that introduce variance into treatment decisions. Recognition of different groups of prescribers suggests that information given to doctors might be processed differently by different groups.

**Disclosure:** R. A. Hughes, None; A. J. Carr, None.

### 1894

**Factors Associated with Confidence Level of Rheumatology Fellows in Joint Procedural Skills.** Tara J. Rizvi, Min Xu and Nancy Searle. Baylor College of Medicine, Houston, TX

**Background/Purpose:** Rheumatology fellowship programs in the U.S. lack clear standardized criteria to train fellows in joint procedural skills. More recently, some programs are utilizing joint simulated anatomical models (JSM); some are introducing musculoskeletal ultrasound (MSUS) modalities. We sought to determine whether these instructional modalities, and/or other factors were associated with fellow’s confidence level in procedural skills.

The purpose of our study is to determine factors associated with overall level of confidence of rheumatology fellows in the United States, in joint procedural skills.

**Methods:** An online survey was sent to junior and senior fellows enrolled in rheumatology programs in the United States. Survey included questions pertaining to: fellowship year, training on joint simulated models, training with musculoskeletal ultrasound, other instructional methods employed for procedural skills, attending physician supervision during procedures, number of times 25 individual procedures were performed, fellow’s confidence level in 25 individual procedures and overall confidence level in procedural skills.

Statistical analysis including chi-square test and spearman correlation coefficient were performed using SPSS10.0.

**Results:** Data was obtained from 133 respondents: 63 junior and 76 senior fellows. 80 out of 103 accredited fellowship programs responded, so sample was representative of the majority of adult fellowship programs. 39/139 (28%) and 50/139 (36%) fellows reported being trained on JSM and MSUS respectively. Factors associated with fellow’s overall confidence level for joint procedural skills are: years of fellowship training and training on joint simulated anatomical models (Table 1). Confidence levels for individual joints significantly correlated with the number of times procedure had been performed (p<0.01). MSUS training, other instructional modalities, and attending physician supervision were not significantly associated with overall confidence level.

**Table 1. Factors associated with overall confidence level**

<table>
<thead>
<tr>
<th>ASSOCIATION WITH CONFIDENCE LEVEL</th>
<th>CHI-SQUARE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of fellowship*</td>
<td>15.451</td>
<td>0.004</td>
</tr>
<tr>
<td>Joint simulation models*</td>
<td>11.995</td>
<td>0.017</td>
</tr>
<tr>
<td>Musculoskeletal ultrasound</td>
<td>6.283</td>
<td>0.179</td>
</tr>
<tr>
<td>Videos</td>
<td>7.713</td>
<td>0.103</td>
</tr>
<tr>
<td>Cadavers</td>
<td>3.585</td>
<td>0.465</td>
</tr>
<tr>
<td>Demonstration on patients</td>
<td>2.186</td>
<td>0.702</td>
</tr>
<tr>
<td>Attending physician presence</td>
<td>24.146</td>
<td>0.086</td>
</tr>
</tbody>
</table>

**Conclusion:** Factors associated with higher confidence level of rheumatology fellows in joint procedures include: training on joint simulated models, year of fellowship training and the number of opportunities to perform individual procedures. To improve fellow’s level of confidence and hence improve procedural training, it may be suggested that training authorities encourage use of joint simulated models, and set standardized criteria to ensure adequate exposure for all fellows to procedures thought to be necessary for graduation.

**Disclosure:** T. J. Rizvi, None; M. Xu, None; N. Searle, None.

### 1895

**Safety Competences Knowledge and Behavioural Skills of Patients Treated by Biologics in Rheumatology.** Anne-Christine Rat, Bruno Fuart, Elisabeth Filipon, Laure Gossec, Benoît-Damien Cartey, Laurent Marguère, Henri Nataf, Beatrice Pallot Prades, Rose Marie Polverit, Valérie Royan, Pathia Sadi, Christelle Sordet, Corinne Thevenot and Catherine Beauvais. Université de Lorraine, Paris Descartes University, APEMAC, EA 4360, F-54 000, Nancy, France, 2APHP-Pitié Salpetrière Hospital/UPMC, Paris, France, 3Cochin hospital, Paris, France, 4Paris Descartes University, Cochin Hospital, Paris, France, 5Université de lorraine, Nancy, France, 6Institut Calot, Berck, France, 7Mantes-la-Jolie, France, 8Saint Etienne university hospital, Saint Etienne, France, 9Saint Antoine Hospital, Paris, France, 10Chartres, Chartres, 11Victor Jousselin Hospital, Dreux, France, 12Strasbourg University Hospital, Strasbourg, France, 13Laon hospital, Laon, France, 14Saint Antoine, Paris, France

**Background/Purpose:** Biologics are known to entail specific risks; therefore teaching patients safety skills, appropriate behaviours in situations of risks and what decisions to take in these situations is necessary. The level of knowledge of safety competences are not well known in patients treated by biologics. The objective of the study was to describe the safety competences of patients treated by biologics for inflammatory arthritis and to determine the factors associated with a lower level of competences.

**Methods:** Data were obtained from a national cross-sectional survey. To be as representative as possible of the patients treated by biologics, rheumatologists were randomly sampled from the national directory. They were invited to include 3 to 5 consecutive patients treated by biologics whatever their inflammatory arthritis diagnosis. All patients completed a 55-item questionnaire (BioSecure®) assessing patients’ self-care safety skills and sociodemographic characteristics, type of information received, quality of life and coping style data. Rheumatologists completed personal and practice data. The questionnaire measuring knowledge and skills regarding biologics was developed by health professional and patients using 3 steps: elaboration of an exhaustive list of competences, selection via a Delphi technique then elaboration of a questionnaire for the 26 competences selected. The questionnaire includes a series of multiple-choice questions on knowledge and on clinical situations grouped in dimensions.

**Results:** Of the 671 patients included, 67% were women, 62% had RA and 38% spondylarthitis, 63% were treated by subcutaneous anti-TNF. The mean age was 53±13 years old. Patients received information during a medical consultation (90%), a consultation with a nurse (30%), with a written booklet (59%) and during a therapeutic education program (11%). The median total score (percentage of right items) was 73 (interquartile 60–82). Knowledge items had not higher percentages of correct answers than behavioural skills items. Scores and number (%) of patients with a number of correct answers lower than 50% are described in the table. In multivariate analysis, several patients’ factors were associated with a lower level of competences: living alone, a lower education level, living in a big city, not to be employed and having not received written information or therapeutic education. Rheumatologists treating more than 80 patients with biologics had an increased risk of having their patients in the moderate skills group compared to the high skills group.

**Table:** 1895

<table>
<thead>
<tr>
<th>N° Items</th>
<th>Median</th>
<th>Q1</th>
<th>Q3</th>
<th>N %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biologics management</td>
<td>11</td>
<td>100.0</td>
<td>90.9</td>
<td>100.0</td>
</tr>
<tr>
<td>General knowledge</td>
<td>4</td>
<td>100.0</td>
<td>75.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Communication</td>
<td>4</td>
<td>100.0</td>
<td>100.0</td>
<td>17</td>
</tr>
<tr>
<td>When to consult</td>
<td>15</td>
<td>73.3</td>
<td>53.3</td>
<td>86.7</td>
</tr>
<tr>
<td>Fever</td>
<td>11</td>
<td>81.8</td>
<td>54.5</td>
<td>90.9</td>
</tr>
<tr>
<td>Infections</td>
<td>4</td>
<td>75.0</td>
<td>25.0</td>
<td>100</td>
</tr>
<tr>
<td>Vaccination. Injuries</td>
<td>8</td>
<td>62.5</td>
<td>50.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Dental care</td>
<td>2</td>
<td>100.0</td>
<td>50.0</td>
<td>100</td>
</tr>
<tr>
<td>Surgery</td>
<td>7</td>
<td>85.7</td>
<td>57.1</td>
<td>100</td>
</tr>
<tr>
<td>Planning child conception</td>
<td>2</td>
<td>50.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Sub-cutaneous injection</td>
<td>3</td>
<td>66.7</td>
<td>66.7</td>
<td>66.7</td>
</tr>
</tbody>
</table>

**Conclusion:** Safety competences can be improved, especially competences needed to deal with infectious symptoms, vaccinations, planned surgery and planning child conception. These results provide also elements to
help identifying patients who need therapeutic education or to adapt the messages given.


Disclosure: A. C. Rat, None; B. Fautrel, None; E. Filion, None; L. Gossec, None; B. D. Carrey, None; L. Marguerie; None; H. Nataf, None; B. Ballot Prades, None; R. M. Pollvert, None; V. Royant, None; F. Sadji, None; C. Sordet, None; C. Thevenot, None; C. Beauvais, None.

1896

Variation in US Pediatric Rheumatology Fellowship Training. Anjali Patwardhan, Michael Henrickson, Sandy D. Hong, Laura Laskosz and Charles H. Spencer. Nationwide Children's Hospital, Columbus, OH, *Cincinnati Children's Hospital Medical Center, Cincinnati, OH, ¹U of Iowa Children's Hosp, Iowa City, IA

Background/Purpose: Pediatric rheumatology (PR) became an American Board of Pediatrics subspecialty in 1990. This is the first survey to examine training differences between the 31 US PR fellowship programs. We hypothesize that there is infinite variation in the Pediatric Rheumatology Fellowship Training across North America.

Methods: Members of the American Academy of Pediatrics (AAP) Section of Rheumatology and its Executive Committee conducted this cross-sectional study. We developed the survey instrument through extensive literature research and the Delphi consensus technique. Following institutional human subjects research review and approval, we distributed the survey to PR trainees (n=82).

Results: We obtained a 57% response rate (n=47). Respondents’ training level followed a normal distribution: initial (8%); completion of 1st year (16%), 2nd year (34%), 3rd year (37%) and 4th year (5%). Their clinical commitments involved the following half-day sessions per week: 1 (28%), 2 (43%), 3 (13%), 5 (11%), and 6 (4%). Sixty percent provided care for either 4 (30%) or 5 (20%) patients per session. Procedural experience included joint injections and musculoskeletal ultrasound. Respondents’ average number of joint injections per month comprised 0–1 (55%), 2–4 (37%), and ≥5 (7%); 20% received formal ultrasound training. On-call experience at home involved nights and weekends; the latter also included inpatient rounds for 98% of respondents. The range of nights on-call was 0–15, distributed as: 0 (2%), 1 (3%), 2 (3%), 3 (9%) and 4 (9%). Educational session hours attended varied among trainees: 2 (13%), 3 (35%), 4 (29%) and ≥5 (22%). Sessions included journal club presentations (range=1–8/year), trainee-presented PR lectures (97%), resident education (88%), and attendance at specialty conferences with adult rheumatology (81%), radiology (59%), nephrology (48%) and histopathology (43%). Respondents’ research activity hours per week (range=20–60%) varied: ≤20 (43%), 21–40 (43%), 41–60 (11%), >60 (2%). Respondents presented abstracts at regional or national academic meetings in a range of 1 (32%) to 8 (6%). Regarding published papers, 41% had one, while 59% had none.

Table. Please indicate the average number of patients you have seen in each group during your fellowship.

<table>
<thead>
<tr>
<th>Disease Groups</th>
<th>Number of patients seen (subgroup numbers in italics)</th>
<th>Average % of respondents</th>
<th>Range of exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of patients seen (%)</td>
<td>Number of patients seen (%)</td>
<td>Number of patients seen (%)</td>
</tr>
<tr>
<td></td>
<td>0–5</td>
<td>6–10</td>
<td>11–20</td>
</tr>
<tr>
<td>Existing Diagnosis of SLE</td>
<td>123</td>
<td>136</td>
<td>318</td>
</tr>
<tr>
<td>SLE Nephritis</td>
<td>20.4</td>
<td>25.0</td>
<td>27.2</td>
</tr>
<tr>
<td>New Case of SLE</td>
<td>29.5</td>
<td>56.1</td>
<td>31.8</td>
</tr>
<tr>
<td>Existing Diagnosis of WG</td>
<td>68.5</td>
<td>22.7</td>
<td>4.3</td>
</tr>
<tr>
<td>New WG</td>
<td>38.8</td>
<td>8.0</td>
<td>0</td>
</tr>
<tr>
<td>Scleroderma</td>
<td>47.7</td>
<td>29.3</td>
<td>20.4</td>
</tr>
<tr>
<td>Sjogren’s syndrome</td>
<td>62.7</td>
<td>23.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Existing Diagnosis of JDM</td>
<td>36.8</td>
<td>28.2</td>
<td>25</td>
</tr>
</tbody>
</table>

Conclusion: Both clinical and research experience varies widely between US PR fellowship programs. Our survey data may identify areas for programmatic improvements, best practice benchmarks, and policy development for future training recommendations & workforce development. We hope programs will accomplish similar standards of excellence through the use of comparison data.

Disclosure: A. Patwardhan, None; M. Henrickson, None; S. D. Hong, None; Laskosz, None; C. H. Spencer, None.

1897

Pregnancy and Contraception in Adolescents and Teens with SLE: Are pediatric rheumatologists adequately Screening and Educating Their Patients?. Deirdre I. De Raniert, Karen Oneil; Linda Wagner-Wenner and Melissa S. Tesher. ¹University of Chicago, Chicago, IL, ²University of Chicago Hospital, Chicago, IL

Background/Purpose: Pregnancy in patients with systemic lupus erythematosus (SLE) is often complicated by both disease flares and risks to the fetus. It is important that young women with SLE be educated on both the risks of pregnancy and on safe and effective methods of contraception. We aimed to evaluate how often pediatric rheumatologists discuss sexual activity and contraception with their young female patients with SLE. We also aimed to assess the perception of our knowledge and how we educate our patients on both pregnancy risks and contraception in SLE. We compared these responses with those of a small cohort of providers in other medical fields.

Tuesday, November 13
Methods: All general pediatricians and nurse practitioners at the University of Chicago, all adult rheumatologists and trainees in Chicago who are registered with the ACR were identified. An online survey was sent to these providers to evaluate how often they take sexual histories in their adult and young adult female patients (ages 11–21) with SLE, the frequency with which they educate their patients on the risks of lupus in pregnancy, and if they offer contraceptive guidance.

Results: Responses were received by 56 pediatric rheumatologists, including 12 trainees, 12 nurse practitioners, 9 general pediatricians, and 7 adult rheumatologists, including 1 trainee. Relatively few pediatric rheumatologists consistently discuss sexual activity, pregnancy risks, or contraception with patients. 32% of pediatric rheumatologists were “very comfortable” taking a sexual history, compared to 16.7% of adult rheumatologists. 88.9% of general pediatricians reported taking a sexual history during at least 75% of adolescent visits, compared to pediatric rheumatologists (26.5%). Adult rheumatologists reported obtaining sexual histories the least often among those surveyed. Only 58.8% of pediatric rheumatologists surveyed discussed the risks of pregnancy in their young female patients with active lupus, although the majority expressed adequate knowledge of these risks. Only 50% of pediatric rheumatologists reported discussing contraception with patients on teratogenic medications during at least 57% of their clinic visits despite reporting adequate familiarity with medications that can cause birth defects. Written and web-based educational resources were identified as useful tools in educating patients about pregnancy and contraception in women with lupus.

Conclusion: This preliminary survey identified a discrepancy in pediatric rheumatologists’ knowledge of the complications of pregnancy in SLE, teratogenic drugs, and contraceptive methods, and their communication of this knowledge to their young female patients with SLE. Implementing tools to help providers feel more comfortable discussing these important topics is indicated in order to better serve this population. Surveyed physicians identified both online resources and paper handouts explaining the risks of pregnancy in young women with SLE and different methods of contraception as useful tools.

Disclosure: D. I. De Ranieri, None; K. Onel, None; L. Wagner-Weiner, None; M. S. Tesher, None.

1898

A Competence-Based Model for Teaching Rheumatology in Undergraduate Medical Students in Pontificia Universidad Católica De Chile: A Five Years Experience. Pamela Díaz, Carolina Cuellar, Miguel Gutiérrez and Marcela Cisternas. Pontificia Universidad Católica de Chile, Santiago, Chile

Background/Purpose: Several reports have demonstrated that Rheumatology disorders are increasingly arising. In USA, for example, three of the top eight primary diagnosis groups presenting to ambulatory care visits in 2007 were for musculoskeletal disorders.

In the meanwhile, medical student’s surveys have consistently demonstrated their lack of confidence in diagnosing and managing musculoskeletal problems.

Until 2005 the rheumatology teaching in our School of Medicine was predominantly based in lecture classes, some seminars and a written multiple choice test. Since then, in order to improve the rheumatology teaching, we introduced new learning objectives in this field with three domains of learning: knowledge, attitudes, and skills.

To achieve these domains, we added a program consisting of small group tutorials, the use of one-way-mirror offices to direct observation, personalized feedback, formative evaluations and objective structured clinical examination (OSCEs).

The aim of this study was to describe this novel assessment method, and evaluate the acquisitions of rheumatology teaching domains in undergraduate students with this program.

Methods: We implemented seven consultation offices with one-way mirror, with special audio and video systems.

The students are organized in small groups of six, with a rheumatology professor, and during two weeks they review the most common rheumatology problems: musculoskeletal diseases, osteoarthrits, rheumatoid arthritis, systemic lupus erythematosus, laboratory test and radiology.

Each day starts with a session discussion about the different diseases, then one student performed a real rheumatology patient evaluation being observed for the group, who is also filling a summary sheet of the interview with special emphasis in the attitudes and the skills observed. After a complete evaluation, the entire group discussed relevant aspects of the interview and of the patient’s disease, and gives feedback.

To determine the acquisitions of the contents and competences, we introduce a formative test at the beginning and the end of the program, and an OSCE. Also, each student completes a survey about the program and the methodology.

Results: In the last five years, over 500 students have completed this new curriculum program.

The student’s surveys about this methodology showed a high level of satisfaction. They estimated the objectives achievement in more than 90%, and evaluate the overall program with a mean score of 6.8 over 7 (range 6.6–7).

Three hundred and seventy one students filled the formative test at the beginning of the program, and 361 at the end. At the beginning, the percentage of correct answers was 62% vs 92% at the end of the program (p < 0.01). In the first formative test, there were 10% of non-respond answers, vs 0.5% at the second test (p < 0.01).

In the final OSCE, all the students had a good performance being all approved with over 60% of achievement in the three different domains evaluated.

Conclusion: This new assessment in rheumatology teaching is highly approved for the students, and it seems to be a good methodology to the acquisition of knowledge and trainee in competences in rheumatology patient’s evaluation.

Disclosure: P. Díaz, None; C. Cuellar, None; M. Gutiérrez, None; M. Cisternas, None.

1899

Factors Contributing to Non-Publication of Abstracts Presented At the American College of Rheumatology/Association of Rheumatology Health Professionals Annual Meeting. Jennifer M.P. Woo1, De Furst2, Deborah K. McCurdy1, Olivia I. Lund3, Rotem Eyal1, Cijin Piao3 and Gil Amarily1.

1Mattel Children’s Hospital, University of California, Los Angeles, Los Angeles, CA, 2University of California at Los Angeles, Los Angeles, CA, 3University of California at Los Angeles, Los Angeles, CA, 4David Geffen School of Medicine at UCLA, Los Angeles, CA

Background/Purpose: The American College of Rheumatology/Association of Rheumatology Health Professionals (ACR/ARHP) Annual Scientific Meeting (ASM) provides a premier forum for the rapid dissemination of novel clinical and basic science research in the fields of rheumatology and immunology. We recently investigated the publication outcomes of abstracts presented at the 2006 ACR/ARHP ASM in Washington, D.C. (November 12–16, 2006). We estimated that 59.1% of all abstracts presented at the meeting were published as full-length peer-reviewed manuscripts within 5 years of presentation. In order to assess the reasons behind non-publication of the remaining research, we administered a survey to a cross-section of authors who we previously identified as presenting abstracts that remained unpublished.

Methods: Of 2156 abstracts presented at the 2006 ACR/ARHP ASM, we classified 879 abstracts as “not published” following an extensive PubMed search for potential publication matches. Primary authors of non-published abstracts were anonymously surveyed via an internet questionnaire to identify factors that prevented presented research from reaching full-length publication status.

Results: A total of 713 primary authors had at least one abstract presented at the 2006 ACR/ARHP ASM that did not result in publication as a full-length manuscript. Abstracts that described studies in rheumatoid arthritis, systemic lupus erythematosus, and systemic sclerosis constituted approximately 39.7% of all presented abstracts and included 38.6% of all unpublished abstracts (non-publication rates: 38, 43, and 41%, respectively). A cross-section of 459 abstracts, who served as primary author on 590 unpublished abstracts was surveyed. Sixty-five authors (14.2%) responded to the questionnaire, reflecting 117 abstracts (19.5%). At the time of the survey, 10 abstracts (8.5%) were reported as being published as full-length manuscripts within the 5 years following their presentation and were supported by corresponding citations. Three additional abstracts were confirmed as being published, but reached this status during the period between January–June 2012, which was outside of the defined search period. The primary reasons reported for non-publication included: 1) Insufficient time to prepare manuscript (35.2%); 2) a co-author was responsible for authoring the manuscript (29.6%); and 3) the study was still ongoing (16.7%).
Conclusion: Although most of the abstracts presented at the 2006 ACR/ARHP ASM were eventually published in peer reviewed journals, data indicates that the lack of subsequent publication was related to the presence of time constraints or deferred responsibility for authorship rather than the quality of the data.

Disclosure: J. M. P. Woo, None; D. Durst, None; D. K. McCurdy, None; O. I. Lund, None; R. Eyal, None; C. Piao, None; G. Amarilyo, None.

1901

Chronic Gout. Improvement According to Outcome Measures in Rheumatology Domains in Daily Clinical Practice. Janitzia Vazquez-Mellado1, Betsabe Serrano1, Jaime Mendoza2, Sergio Garcia-Mendez2, V. Chantal Hernández3, Virginia Pascual Ramos4, Ruben Burgos-Vargas1 and Marina Rull-Gabayet1. 1Hospital General de Mexico, Mexico city, Mexico, 2Instituto Nacional de Ciencias Medicas y Nutricion Salvador Zubiran, Mexico City, Mexico

Background/Purpose: OMERACT has proposed domains to evaluate the effect of treatment in patients with acute and chronic gout. Their frequency, time to improve and percentage of change have not been evaluated in chronic gout patients under conventional treatment.

Methods: This is a prospective, longitudinal and observational cohort study. Since July 2010, we included all patients with Gout diagnosis (ACR criteria), attending for the 1st time to 2 Rheumatology departments. All signed informed consent and were evaluated by a rheumatologist in each visit. Variables: Demographic, clinical/ biochemical related to gout and associated diseases, previous treatments. Individualized, regular treatment was prescribed in 1st visit as recommended (Life style modifications, NSAID, ULT, prophylaxis and treatment for associated diseases). Response to treatment evaluations: Number of: painful, swollen, limited to motion joints, tophi and flares/6mo. Main tophi size, VAS pain, general health (patient and physician), HAQ and uricemia. Statistical analysis, Chi square and paired t test.

Results: 178 Gout patients had been included in this prospective study. This report includes 93 patients with baseline and 6 mo evalua- tions. Males 97%, mean ± SD age, age at onset and duration of the disease: 49.7 ± 11.68; 35.82 ± 12.84 and 13.7 ± 10.46 years respectively; in 40%, disease duration was <3 ys. Tophaceous gout: 61% (29%, ≥ 5 tophi). Most had been irregularly treated, 58% previous auto-prescribed glucocorticoids. More frequent associated diseases: Hypertpycliceridemia 53%, hypertension 52% and obesity 30%. Allopurinol prescribed doses were: 341.9 ± 280.7 and 382.4 ± 215.9 mg/day (baseline and 6mo respectively); although, at 6 mo 69% had uric acid >6 mg/dl, the group improved significantly in 7/11 outcome domains (see table).

Response to treatment

<table>
<thead>
<tr>
<th>Variable, mean ± SD</th>
<th>Baseline</th>
<th>6mo</th>
<th>Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flares/6mo</td>
<td>2.6 ± 3.6</td>
<td>0.6 ± 1.2</td>
<td>0.000 72</td>
</tr>
<tr>
<td>Painless joints</td>
<td>2.4 ± 4.5</td>
<td>2.2 ± 4.7</td>
<td>NS 29</td>
</tr>
<tr>
<td>Swollen joints</td>
<td>0.53 ± 1.2</td>
<td>0.25 ± 0.8</td>
<td>0.025 21</td>
</tr>
<tr>
<td>Limited joints</td>
<td>4.2 ± 7.9</td>
<td>3.5 ± 7.01</td>
<td>0.000 23</td>
</tr>
<tr>
<td>Tophi</td>
<td>5.8 ± 8.75</td>
<td>5.8 ± 8.5</td>
<td>NS 10</td>
</tr>
<tr>
<td>Main tophi size, cm</td>
<td>3.6 ± 4.06</td>
<td>3.0 ± 3.7</td>
<td>0.004 22</td>
</tr>
<tr>
<td>HAQ</td>
<td>0.45 ± 0.6</td>
<td>0.29 ± 0.5</td>
<td>0.012 39</td>
</tr>
<tr>
<td>Uric acid, mg/dl</td>
<td>7.9 ± 2.2</td>
<td>7.1 ± 1.9</td>
<td>0.001 34</td>
</tr>
<tr>
<td>VAS pain</td>
<td>4.6 ± 3.2</td>
<td>3.7 ± 3.2</td>
<td>0.024 36</td>
</tr>
<tr>
<td>VAS health, patient</td>
<td>3.8 ± 2.9</td>
<td>3.3 ± 2.9</td>
<td>NS 39</td>
</tr>
<tr>
<td>VAS health, physician</td>
<td>3.7 ± 2.6</td>
<td>3.6 ± 2.3</td>
<td>NS 47</td>
</tr>
</tbody>
</table>

Variables according to OMERACT domains.

Conclusion: Before uricemia is controlled and as soon as the first 6 months, patients with longstanding and severe disease under regular treatment, improve significantly in 7/11 OMERACT domains, particularly acute flares and HAQ score.

Disclosure: J. Vazquez-Mellado, None; B. Serrano, None; J. Mendoza, None; S. Garcia-Mendez, None; V. C. Hernandez, None; V. Pascual Ramos, None; R. Burgos-Vargas, Abbott Laboratories, BMS, MSD, Pfizer, ROCHE, 5, Abbott Laboratories, BMS, MSD, Pfizer, ROCHE, 8; M. Rull-Gabayet, None.

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Mormed Project: A New 21st Century Web Platform for Multilingual Communication in systemic Lupus Erythematosus and Antiphospholipid Syndrome. Oier Ateka-Barrutia1, Adriane Rinsche2, Maria Laura Bertolaccini1, Munther A. Khamashta1 and MORMED consortium1. 1Lupus Research Unit, The Rayne Institute, Kings College London School of Medicine, London, United Kingdom, 2Language Technology Center Ltd., Kingston, United Kingdom, 3EU

Background/Purpose: The internet is used nowadays as the preferred repository where people search for, access and publish information on any topic. However, language barriers prevent efficient international information exchange. This problem is further exacerbated by the fact that information for restricted and highly focused communities, e.g. communities with an interest in rare diseases, is not easily available or easy to find. An example of such a focused community is the community of individuals and stakeholders interested in lupus or antiphospholipid syndrome (Hughes Syndrome).

Language barriers impede the dissemination of interesting information and the exchange of valuable experiences between people from diverse cultures and backgrounds. Thus communication channels between the various stakeholders, e.g. between researchers and general practitioners (GPs), between specialists and GPs, and between GPs and patients, are cumbersome or even non-existent across countries due to language barriers of national languages and specific terminology.

Methods: MORMED (Multilingual Organic Information Management in the Medical Domain, www.mormed.eu) is a European Union-funded project that proposes a multilingual community platform combining Web 2.0 social software applications with semantic interpretation of domain-relevant content, enhanced with automatic translation capabilities and fine-tuned for a specific medical domain. It has been under development since March 2010 and piloted upon the community interested in lupus and Antiphospholipid Syndrome (Hughes Syndrome), involving researchers, medical doctors, general practitioners, patients and patient support groups, since spring 2012.

Organisations involved in this project include: King’s College London (UK); Language Technology Centre Ltd. (UK); South East European Research Medical and Health Science Centre, University of Debrecen (Hungary); Institute for Clinical Chemistry and Laboratory Medicine, University Hospital Mainz (Germany); Hospital Clinic Barcelona (Spain).

Results: The project promotes online collaboration, where people contribute content and evaluate and exchange information resources, and it supports the diffusion of knowledge within multilingual social networks and online communities. Efficient machine translation, supported by interactive computer-aided human post-editing ensures that all content is seamlessly offered in English, Spanish, German and Hungarian, and at a high quality. Thus, new and innovative translation methods, tools and processes emerge, which set the service offerings of the MORMED service provider apart from those of other providers. A trial version of the platform is available at http://lupus.mormed.eu. The final version of the platform will be released by autumn 2012.

Conclusion: The MORMED platform is a multilingual web-based platform focused on the lupus and antiphospholipid syndrome community. High quality translation tools and resources in four languages (English, Spanish, German and Hungarian), along with social-network applications, are proposed as a new tool for information and experience exchange for clinicians, researchers and patients involved in this field.

What Factors Are Associated with Target Serum Urate Concentrations in Patients with Gout? Nicola Dalbeth, Meaghan House, Anne Horne, Keith J. Petrie, Fiona M. McQueen and William Taylor. University of Auckland, Auckland, New Zealand

Background/Purpose: Long term serum urate (SU) lowering to a target of <6mg/dL is recommended for effective gout management. However, many studies have reported low achievement of SU targets. The aim of this study was to examine the clinical and psychological factors associated with SU targets in patients with gout.

Methods: Patients with gout for <10 years were recruited from primary and secondary care settings. SU target was defined as SU concentration <6mg/dL at the time of the study visit. Both clinical and psychological factors associated with SU target were analysed. The relationship between SU target and measures of gout activity including flare frequency in the preceding three months was also analysed.

Results: Of the 273 patients enrolled into the study, 89 (32.6%) had SU concentration <6mg/dL. Urate-lowering therapy (ULT) use was strongly associated with SU target (p<0.001). In those patients prescribed ULT (n=181), allopurinol dose, patient confidence to keep SU under control, female sex, and ethnicity were independently associated with SU target (Table). Other patient psychological factors and health-related behaviours, including adherence scores, were not independently associated with SU target in those taking ULT. Creatinine clearance, diuretic use, age, and body mass index were not associated with SU target. Patients at SU target reported lower gout flare frequency, compared with those not at target (p=0.03).

Table 1. Forward stepwise logistic regression analysis of factors associated with SU target in those taking ULT. Model included all factors with p<0.15 between groups in univariate analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>4.34</td>
<td>1.65–11.44</td>
<td>0.003</td>
<td>Adjusted R²=0.35, p&lt;0.001</td>
</tr>
<tr>
<td>Māori or Pacific ethnicity</td>
<td>0.19</td>
<td>0.07–0.52</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Allopurinol dose (per every 100mg/day)</td>
<td>2.22</td>
<td>1.43–3.44</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Confidence to keep serum urate under control (per every point on 0–10 Likert scale)</td>
<td>1.02</td>
<td>1.007–1.044</td>
<td>0.006</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: ULT prescription and dosing are key modifiable factors associated with achieving SU target. These data support interventions focusing on improved use of ULT to optimise outcomes in patients with gout.

Disclosure: N. Dalbeth, None; M. House, None; A. Horne, None; K. J. Petrie, None; F. M. McQueen, None; W. Taylor, None.

Oxidation of Urate to Allantoin by Myeloperoxidase in Gout. Lisa K. Stamp, Irada Khalilova, Mei Zhang, Rufus Turner and Anthony Kettle. University of Otago, Christchurch, Christchurch, New Zealand

Background/Purpose: Hyperuricaemia is critical for the development of gout and may play a pivotal role in the pathophysiology of hypertension, metabolic syndrome, and cardiovascular disease. Urate is a substrate for the neutrophil enzyme myeloperoxidase (MPO) and is oxidized to reactive intermediates that breakdown to allantoin. Monosodium urate (MSU) crystals promote a painful and acute inflammatory response within joints. Our hypothesis is that during inflammation MPO will be released from neutrophils and oxidize urate to reactive intermediates that will contribute to the adverse effects of hyperuricaemia. The aims of this study were to determine whether MPO is released from neutrophils and urate is oxidized in patients with gout and if these effects are attenuated by allopurinol.

Methods: 50 patients with gout and 37 healthy controls were recruited. 10/50 gout patients were commencing allopurinol and had samples collected at baseline and after 4 weeks of allopurinol. 33 of the remaining 40 patients were receiving allopurinol and these 40 patients had samples collected on one occasion only. Serum urate (SU) and plasma oxyurpin (OXYH) were measured by HPLC. Plasma MPO activity was measured by ELISA and allantoin by mass spectrometry.

Results: 43/50 gout patients were male, mean age was 58.2 years (30–91). Mean SU was 6.6mg/dL (3.0–10.6mg/dL). Mean allopurinol dose was 275.8mg/d (50–500mg/d). Plasma MPO activity was significantly higher (p<0.001) in patients with gout not receiving allopurinol (12.9 ng/ml IQR 10.5–41.2; n=18) compared to healthy controls (7.5 ng/ml IQR 4.7–9.4; n=37). Plasma allantoin concentrations were significantly higher (p<0.001) in patients with gout not receiving allopurinol (5.5 μM IQR 3.3–7.3; n=18) compared to healthy controls (2.0 μM IQR 1.4–3.5; n=37) (Figure). There was a significant correlation between MPO activity and plasma allantoin concentrations (r=0.54, p=0.0001; n=54). In the ten patients starting allopurinol there was a significant reduction after four weeks in SU (571 ± 48 μM vs. 480 ± 55 μM; p<0.001) and plasma allantoin (4.1 ± 1.6 μM vs. 2.9 ± 1.3 μM; p<0.001). Those patients receiving allopurinol with plasma OXYH concentrations >50μmol/l had significantly lower MPO protein (18.6 ng/ml IQR 12.3–33.2, n=31 vs. 30.9 ng/ml IQR 19.3–39.2, n=27; p=0.027) but paradoxically higher allantoin (9.9 μM IQR 6.0–12.5, n=31 vs. 4.6 μM IQR 2.9–6.5, n=29; p<0.001) compared to those with OXYH <50μmol/l.

Conclusion: During episodes of gout neutrophils release MPO which oxidizes urate. The interaction of MPO and urate will exacerbate oxidative stress in inflamed joints. At low concentrations, oxyurpin should dampen oxidative stress by lowering MPO and urate but at high concentrations it will increase oxidative stress presumably because hydrogen peroxide is also produced when allopurinol is metabolised by aldehyde oxidase.

Disclosure: L. K. Stamp, None; I. Khalilova, None; M. Zhang, None; R. Turner, None; A. Kettle, None.


Background/Purpose: Study patterns of gout treatment and related outcomes in US community rheumatology practices, specifically the relation between likelihood and severity of gout flares, time in treatment with current physician, serum uric acid (sUA) level and urate lowering therapy (ULT), which included, at any dosage level, allopurinol, febuxostat, pegloticase, probenecid.

Conclusion: During episodes of gout neutrophils release MPO which oxidizes urate. The interaction of MPO and urate will exacerbate oxidative stress in inflamed joints. At low concentrations, oxyurpin should dampen oxidative stress by lowering MPO and urate but at high concentrations it will increase oxidative stress presumably because hydrogen peroxide is also produced when allopurinol is metabolised by aldehyde oxidase.

Disclosure: L. K. Stamp, None; I. Khalilova, None; M. Zhang, None; R. Turner, None; A. Kettle, None.
Methods: Fifty practices completed retrospective chart abstraction on their 25 most recently seen patients with gout. Data, abstracted from all visits in 2010-2011 using standardized case report forms, included demographics, gout history, co-morbidities, sUA, gout treatment, and visit type (flare-related or follow-up). This report includes all data from the subset of the total cohort which was available at time of abstract submission. Final dataset will comprise 1,250 patients.

Data were analyzed using logistic regression, with visit type (coded as severe flare, mild/moderate flare, non-flare related) as an ordinal response variable, and 3 predictor variables: time in treatment with current rheumatologist at start of chart abstraction (TxTime: new patient vs. > 2 months), ULT (absence vs. presence at time of visit) and sUA (≥ 6.0 vs. < 6.0).

Results: The study population consisted of 479 gout patients from 21 sites, 79% male, 77% Caucasian, mean age 62 years, median disease duration 5.5 years.

Patients had a total of 2,460 visits during study period. Of these, 1,465 (59.6%) included all analysis variables and constitute the analysis sample. 273 (18.6%) of visits were flare-related. All 3 main effects were significant.

Increased likelihood of a flare was associated with 1) shorter TxTime, 2) absence of ULT, and 3) higher sUA. Data are summarized in the table.

<table>
<thead>
<tr>
<th>Type of Visit (%)</th>
<th>Flare-Related: Severe</th>
<th>Flare-Related: Mild</th>
<th>Moderate</th>
<th>Not Flare-Related</th>
<th>Any Flare vs. Non-Flare</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>565</td>
<td>96</td>
<td>16.6</td>
<td>73.8</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>≥ 2 mos</td>
<td>900</td>
<td>82</td>
<td>8.7</td>
<td>80.1</td>
<td>1.62 (1.22–2.15)</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>277</td>
<td>18.1</td>
<td>29.2</td>
<td>52.7</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>1188</td>
<td>43</td>
<td>77.7</td>
<td>69.0</td>
<td>0.79 (0.52–1.15)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>sUA ≥ 6.0</td>
<td>729</td>
<td>9.9</td>
<td>15.9</td>
<td>87.4</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>&lt;6.0</td>
<td>736</td>
<td>3.9</td>
<td>7.6</td>
<td>88.5</td>
<td>1.04 (1.21–2.22)</td>
<td></td>
</tr>
</tbody>
</table>

The only significant interaction effect was ULT by TxTime (p < .01). Patients who were already on ULT when referred to the current rheumatologist were no more likely to flare than the physician’s current ULT patients. For patients not on ULT, however, new patients had triple the odds of flaring compared with current patients (OR=3.04, 95%CI=1.86–4.95).

Conclusion: Data depict aspects of current usage of gout therapy in US community practices and underscore importance of managing sUA levels. All patients regardless of sUA levels or treatment had some risk of flare, but risk was greatly mitigated by ULT therapy. These data suggest that failure to treat hyperuricemia in gout patients is associated with a greatly increased likelihood of a flare.

Disclosure: M. I. Hamburger, Savient Pharmaceuticals, Inc., 5; A. M. Herrero-Beites, 5; Bristol-Myers Squibb, 5; Novartis Pharmaceuticals Corporation, 5; Pfizer Inc., 5; A. M. Herrero-Beites, None.

1906 Changes in Gout Patient’s Clinical Profile in the Last Two Decades. Fernando Perez-Ruiz1 and Ana M. Herrero-Beites2. 1Hospital Universitario Cruces, Baracaldo, Spain; 2Hospital de Gorliz, Gorliz, Spain

Background/Purpose: to assess whether changes in the clinical profile of gout are observed in a large cohort of gout patients over the last 20 years.

Methods: a total number of 904 patients have been prospectively included in a cohort of patients with gout from June 1992 to June 2012 with a gout-specific dataset (time from onset, joints involved, flares per year, X-ray involvement, presence of tophi, previous urate-lowering therapy–ULT, ongoing ULT, average serum urate while on therapy in addition to general characteristics of subjects (age, gender, body mass index), and comorbidities (diabetes, chronic kidney disease, hypertension, hyperlipidemia, renal lithiasis, previous vascular events). For statistical analysis, patients have been stratified in two decades, from 1992 to 2002 (349 patients) and from 2002 to 2012 (555 patients).

Results: For the second decade, an statistically significant increase in age (57±12 vs. 61±13 years), in the number of flares (2.8±0.1 vs. 4.0±1.2 per patient-year), in BMI (27.5±3.2 vs. 28.2±4.2 kg/sm²) were observed. Serum urate at baseline and time from onset of gout to referral were not statistically different. Polyarticular—> 4 joints—involvement (29.8 vs. 39.5%) and presence of subcutaneous tophi (26.6 vs. 36.4%) were significantly more frequent in the second decade, although the percentage of patients naive to ULT (63.8 vs. 59.3%) or allergic to allopurinol (49.4 vs. 57.7%) were similar. Hypertension (33.4 vs. 51.9%), diuretic prescription (17.6 vs. 30.8%), and previous vascular events (20.7 vs. 31.8%) were significantly more common in the second decade. Although the mean clearance of creatinine was not statistically different, the percentage of patients with CKD stages 3–5 was close to significance (20.1 vs. 25.6%, p=0.059).

Figure 1. Correlation between baseline and final TSH

Conclusion: febuxostat increases TSH levels, both baseline TSH and febuxostat dose being associated with the increase. No patient with TSH above UNLs showed altered T4 levels or symptoms of thyroid dysfunction.

Disclosure: F. Perez-Ruiz, Menarini, 5; Ardea Biosciences, 5; Novartis Pharmaceutical Corporation, 5; Savient, 5; Menarini, 8; Ardea Biosciences, 8; Savient, 8; Novartis Pharmaceutical Corporation, 8; A. M. Herrero-Beites, None.
Interestingly, while the mean baseline serum urate was numerically higher, the mean reduction and the percentage reduction from baseline were greater in the second decade (3.4 vs. 3.7 mg/dl and 38 vs. 45%, respectively), so that the percentage of patients averaging serum urate < 6 mg/dl while on follow-up remained pretty good (87 and 89%, respectively). This can reflect a trend to more intense therapy due to more severe disease in the second decade.

Conclusion: the profile of patients with gout seems to have changed over the last two decades as they are older, more commonly hypertensive, on diuretics, with a previous vascular event, and they show more commonly tophaceous and polyarticular gout.

Disclosure: F. Pérez-Ruiz, Menarini, 5, Ardea Biosciences, 5, Novartis Pharmaceutical Corporation, 5, Savient, 5, Menarini, 8, Ardea Biosciences, 8, Savient, 8, Novartis Pharmaceutical Corporation, 8; A. M. Herrera-Beites, None.

1907
Pharmacological Management of Gout in Italy in the Years 2005–2009: A Nationwide, Population-Based Study, Lorenzo Cavagna1, Gianluca Trifrò, Roberto Caporalì, P. Morabito2, C. Ferrajolo, S. Pecchioli2, M. Simonetti3, G. Medea3, C. Cricelli, A. Caputi3, G. Mazzaglia and Carlo-maurizio Montecucco4. 1University and IRCCS Foundation Policlinico S. Matteo, Pavia, Italy, 2University of Messina, Italy, 3Division of Rheumatology, IRCCSPoliclinico S. Matteo Foundation, Pavia, Italy, 4Second University of Naples, Naples, Italy, 5Italian College of General Practitioners, Italy, 6Italian College of General Practitioner, Italy, 7Italian College of General Practitioner, Pavia (Italy), 8University of Pavia School of Medicine, IRCCS Policlinico San Matteo Foundation, Pavia, Italy

Background/Purpose: Despite the increasing interest on gout, only few nationwide drug utilization studies have been conducted on this topic. The aim of this study was to investigate the Italian prescribing pattern of medications for gout in the years 2005–9.

Methods: The data source of the study was the national Database of the Italian College of General practitioner, covering about 1.5 million patients from all around Italy. Patients with incident gout (years 2005–9) were identified using specific IC9D-CM codes and related key words for free text search. In this cohort of patients, we measured the yearly prevalence of use of the following drugs: allopurinol (ATC: M04AA01); colchicine (M04AC01); NSAIDs (M01A*). Moreover, systemic corticosteroids (H02*) were taken into account, because frequently used during acute attacks. Drugs not marketed in Italy, or not reimbursed by National Health System (probenzedix, sulfinpyrazone and benzbranome) were not taken into account. For allopurinol rate and predictors of persistence and adherence to the treatment have been evaluated too.

Results: During the study period, 3,069 patients with incident gout were identified. Allopurinol prescription in these patients decreased from 45.2% in 2005 to 41.1% in 2009. Among drugs for the acute attack of gout, NSAIDs (from 41.9% in 2005 to 39.8% in 2009) were significantly more prescribed than colchicine (from 4.5% in 2005 to 4.9% in 2009). Corticosteroids were prescribed in a significant proportion of patients (from 12.3% in 2005 to 12.4% in 2009) during the whole study period. Only 22.7% of patients continued allopurinol after three months from the beginning of the therapy (6.6% after 6 months, 1.6% after one year). For allopurinol, the proportion of days covered (PDC) was on average equal to 39%. The proportion of patients prescribed in a significant proportion of patients (from 12.3% in 2005 to 41.1% in 2009). Among drugs for the acute attack of gout, NSAIDs (from 41.9% in 2005 to 39.8% in 2009) were significantly more prescribed than colchicine (from 4.5% in 2005 to 4.9% in 2009). Corticosteroids were prescribed in a significant proportion of patients (from 12.3% in 2005 to 12.4% in 2009) during the whole study period. Only 22.7% of patients continued allopurinol after three months from the beginning of the therapy (6.6% after 6 months, 1.6% after one year). For allopurinol, the proportion of days covered (PDC) was on average equal to 39%. The proportion of patients continued allopurinol after three months from the beginning of the therapy (6.6% after 6 months, 1.6% after one year). For allopurinol, the proportion of days covered (PDC) was on average equal to 39%. The proportion of patients continued allopurinol after three months from the beginning of the therapy (6.6% after 6 months, 1.6% after one year). For allopurinol, the proportion of days covered (PDC) was on average equal to 39%. The proportion of patients continued allopurinol after three months from the beginning of the therapy.

Conclusion: to our knowledge, this is the first drug-utilization study on pharmacological management of gout in Italian general population. Our results were quite similar to that recently described in US population, although in this study the prevalence of colchicine (16.7%) and corticosteroids (21%) prescription was higher than those we observed. Our data show very low levels of persistence and adherence to allopurinol treatment; non-adherence was particularly common in younger patients, with lower serum urate levels and burden of comorbidities, as suggested in a recent survey. Clinicians should motivate low risk patients to increase the level of adherence to the treatment for the prevention of gout.

Disclosure: L. Cavagna, None; G. Trifrò, None; R. Caporalì, None; P. Morabito, None; C. Ferrajolo, None; S. Pecchioli, None; M. Simonetti, None; G. Medea, None; C. Cricelli, None; A. Caputi, None; G. Mazzaglia, None; C. Montecucco, None.
Use of Uric Lowering Therapies within a Large Health Care System. Robert A. Overman, Brian F. Mandell and Chad L. Deal. Cleveland Clinic Foundation, Cleveland, OH, The Cleveland Clinic, Cleveland, OH, Cleveland Clinic, Cleveland, OH.

Background/Purpose: Guidelines for initiating urate lowering therapy (ULT) in the treatment of gout recommend treatment to a target serum urate (SUA) level of ≤6mg/dl with monitoring of SUA.

Methods: We reviewed the use of ULT with allopurinol (allop) or febuxostat (febux) in a large health care system between June 2010 and April 2012. Eligible subjects were >18 years at ULT initiation, had a diagnosis of gout, and had ≥ two outpatient prescriptions for a ULT after June 1, 2010. Analytical laboratory data were evaluated. Subjects were stratified by whether they were treated by a rheumatologist (60.6%) vs non-rheumatologist (42.0%) were compared. The starting dose of allop was ≤70mg/dl in 32.4% and 101–300mg in 65.0% of subjects. Maximum dose of allop was ≥70mg/dl in 7.0mg/dl, yet only 2.3% were prescribed a daily dose of >300mg. Subjects treated by a rheumatologist (60.6%) vs non-rheumatologist (42.0%) were more likely to achieve a SUA ≤6mg/dl, odds ratio 2.1 (95% CI 1.7–2.7). The starting dose of allop was <100mg (1.0%), 100mg (59.6%), 101–300mg (38.8%). For subjects prescribed allop the maximum daily dose was ≤100mg in 32.4% and 101–300mg in 65.0% of subjects. Maximum dose of allop was greater than 300mg in 2.7% of subjects seen by a rheumatologist and 2.6% of non-rheumatologists. The starting dose of febux was ≤ 40mg in 87.9% of subjects. Of those who did not achieve a SUA level ≤60mg/dl, 38.4% had ULT adjusted to a higher dose (ULT adjustment to target may not have been completed by the time of analysis). Only 11.3% of subjects started on febux had documented allop intolerance. A statistically significant difference was found in the mean creatinine level closest to the initiation of ULT (1.3 allop vs 1.5 febux p<0.001) which may indicate renal insufficiency as a perceived reason for febuxostat.

Conclusion: Only 45.9% of patients started on ULT achieved recommended SUA levels, only 38.4% of those not meeting target had a documented dose adjustment and >97% of patients on allop were on <300mg per day. This demonstrates a persistent care gap in the treatment of gouty arthritis.

Disclosure: R. A. Overman, None; B. F. Mandell, Regeneron, 5; Pfizer Inc, 5; Novartis Pharmaceutical Corporation, 5; Savient, 5; C. L. Deal, Amgen, Lilly, 5; Amgen, Lilly, 8.

1910

Regulation of Microrna 223 Expression in Gouty Arthritis. Gianina Statache1, Ashleigh-Ann Rainey1, Seth Masters1, Andra Balanescu2, Iain B. McNenes1 and Mariola Kurowska-Stolarska3. 1University of Glasgow, Glasgow, United Kingdom, 2Trinity College Dublin, Dublin, United Kingdom, 3University of Medicine and Pharmacy, Bucharest, Romania.

Background/Purpose: Gout is an inflammatory chronic disease caused by deposition of uric acid crystals in the joint and connective tissues causing pain and disability. Current data suggest that gout is mediated by IL-1β that is produced due to the activation of the inflammasome pathway by uric acid crystals. In addition, neutrophil influx in the joint is the key initiator of a gout flare. miR-223 has been identified as a masterswitch molecule limiting neutrophil activation. In addition, we showed previously that this miR negatively regulates NLRP3 (an inflammasome component) and IL-1β production in human macrophages. To investigate miR-223 expression and regulation in monocytes and neutrophils of gout patients.

Methods: CD14+ cells and neutrophils were isolated from gout patients (n=10) and healthy donors (n=6) peripheral blood using CD14 microbeads and polymyxoprep gradient buffer, respectively. CD14+ from healthy donors were stimulated with LPS (10 ng/ml) IL-1beta (100–10mg/ml), IL-6 (100 ng/ml), TNF alpha (10–100mg/ml) or monosodium urate crystals MSU (1mg-1ug/ml) for different time points (24–72h). Cells were harvested and miRNA extracted. Expression of miR-223 and endogenous control snRNA U1 was assessed by qPCR.

Results: miR-223 expression in peripheral blood monocytes of patients with chronic gout was lower compared to healthy controls. This suggest that overproduction of IL-1β in chronic disease might be partially mediated by low levels of miR-223. In vitro studies revealed that MSU, IL-1β, TNFα and IL-6 significantly inhibited miR-223 expression in monocytes in all time points (24–72h). In contrast, IL-10 strongly increased miR-223 expression. Interestingly, the levels of miR-223 in peripheral blood neutrophils were higher in gout patients compared to healthy controls.

Conclusion: A decrease in miR-223 expression in monocytes of chronic gout patients may contribute to uric acid crystals induced inflammasome activation and chronicity of disease. Upregulation of miR-223 expression in gout neutrophils may reflect the activation of mechanisms that limits neutrophils activation and lead to the resolution of gout flares.

Disclosure: G. Statache, None; A. A. Rainey, None; S. Masters, None; A. Balanescu, None; I. B. McNenes, None; M. Kurowska-Stolarska, None.

1911

Efficacy and Safety of Canakinumab Vs Triamcinolone Acetonide in Patients with Gouty Arthritis Unable to Use Nonsteroidal Anti-Inflammatory Drugs and Colchicine, and On Stable Urate Lowering Therapy (ULT) or Unable to Use ULT. T. Bardin1, A. So2, R. Alten3, M. Bloch4, M. R. John5, G. Krammer6, J. M. Nebeský7, A. Tao8 and N. Schlesinger9. 1Service de Rhumatologie, Hôpital Lariboisière, Paris, France, 2Centre Hospitalier Universitaire Vaudois, University of Lausanne, Lausanne, Switzerland, 3Charité Univ Medicine, Berlin, Germany, 4Holdsworth House Medical Practice, Sydney, Australia, 5Novartis Pharma AG, Basel, Switzerland, 6Novartis Pharmaceuticals Corporation, East Hanover, NJ, 7UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ.

Background/Purpose: The primary treatment goals for gouty arthritis (GA) are rapid relief of pain and inflammation during acute attacks, and long-term hyperuricemia management. A post-hoc analysis of 2 pivotal trials was performed to assess efficacy and safety of canakinumab (CAN), a fully human monoclonal anti-IL-1β antibody, vs triamcinolone acetonide (TA) in GA patients unable to use NSAIDs and colchicine, and who were on stable urate lowering therapy (ULT) or unable to use ULT.

Methods: In these 12-week, randomized, multicenter, double-blind, double-dummy, active-controlled studies (β-RELIEVED and β-RELIEVED II), patients had to have frequent attacks (≥ 5 attacks in previous year) meeting preliminary GA ACR 1977 criteria, and were unresponsive, intolerant, or contraindicated to NSAIDs and/or colchicine, and if on ULT, ULT was stable. Patients were randomized during an acute attack to single dose CAN 150 mg s.c. or TA 40 mg i.m. and were redosed “on demand” for each new attack. Patients completing the core studies were enrolled into blinded 12-week extension studies to further investigate on-demand use of CAN vs TA for new attacks. The subpopulation selected for this post-hoc analysis was (a) unable to use NSAIDs and colchicine due to contraindication, intolerance or lack of efficacy for these drugs, and (b) currently on ULT, or contraindication or previous failure of ULT, as determined by investigators. Subpopulation comprised 101 patients (51 CAN; 50 TA) out of 454 total.

Results: Several co-morbidities, including hypertension (56%), obesity (56%), diabetes (18%), and ischemic heart disease (13%) were reported in 90% of this subpopulation. Pain intensity (VAS 100 mm scale) was comparable between CAN and TA treatment groups at baseline (least-square LS mean 74.6 and 74.4 mm, respectively). A significantly lower pain score was reported with CAN vs TA at 72 hours post dose (1st co-primary endpoint on baseline flare; LS mean, 23.5 vs 33.6 mm; difference ~ −10.2 mm; 95% CI, −19.9, −0.4; P=0.0208 [1-sided]). CAN significantly reduced risk for their first new attack by 61% vs TA (HR 0.39; 95% CI, 0.17–0.91, P=0.0151 [1-sided]) for the first 12 weeks (2nd co-primary endpoint), and by 61% vs TA (HR 0.39; 95% CI, 0.19–0.79, P=0.0047 [1-sided]) over 24 weeks. Serum urate levels increased for CAN vs TA with mean change from baseline reaching a maximum of +0.7 ± 2.0 vs +0.1 ± 1.8 mg/dl at 8 weeks, and +0.3 ± 2.0 vs +0.2 ± 1.4 mg/dl at end of study (all had GA attack at baseline). Adverse Events (AEs) were reported in 33 (66%) CAN and 24 (47.1%) TA patients. Infections and infestations were the most common AEs, reported in 10 (20%) and 5 (10%) patients treated with CAN and TA respectively. Incidence of SAEs was comparable between CAN (gastritis,
gastroenteritis, chronic renal failure) and TA (aortic valve incompetence, cardiomyopathy, aortic stenosis, diastole, neurea, vomiting, bicuspid aortic valve) groups (2 [4.0%] vs 2 [3.9%]).

Conclusion: CAN provided superior pain relief and reduced risk of new attack in highly-comorbid GA patients unable to use NSAIIDs and colchicine, and who were currently on stable ULT or unable to use ULT. The safety profile in this post-hoc subpopulation was consistent with the overall β-RELIEVED and β-RELIEVED II population.

Disclosure: T. Bardin, Menarini, 2, Novartis, Ipsen, Menarini, Areda, Biocyst, 5; A. So, Novartis, 2, Novartis, Areda, 5, Novartis, Menarini, 8; R. Alten, Novartis, 2, Novartis, 5, Novartis, 8; M. Bloch, Novartis, 2; M. R. John, Novartis Pharma AG, 1, Novartis Pharma AG 3; G. Krammer, Novartis Pharma AG, 1, Novartis Pharma AG 3; J. M. Nesbisky, Novartis Pharma AG 3; A. Tao, Novartis Pharmaceutical Corporation, 3; N. Schlesinger, Novartis, 2, Novartis, URL Pharma, Savient, Takeda, Rx Ezyname, 5, Novartis, Takeda, Savient, 8.

1912
Colchicine, As Assessed by Target Joint Pain Scores, Is Effective At 16 Hours in Patients with Acute Gout Flares.
Suman Wason, Thomas Lauterio, Steve Crockett and Matthew W. Davis. URL Pharma, Philadelphia, PA

Background/Purpose: The management of patients with gout remains suboptimal, leading to increasing frequency and severity of recurrent flares that eventually lead to joint destruction and deformity, with patients experiencing a severely compromised quality of life. Colchicine is considered the standard of care in the treatment and prophylaxis of patients with gout flares. The AGREE (Acute Gout Flare Receiving Colchicine Evaluation) trial established that low-dose (LD) colchicine is as effective as high-dose (HD) colchicine in achieving flare control, by reducing the median time to 50% joint pain reduction (HD colchicine 24.5 hrs; LD colchicine 24.5 hrs). Patients in both colchicine grps achieved significant reductions (>2 units) in mean pain scores relative to placebo (PBO) at 24 and 32 hrs after the initial dose. This post-hoc analysis from AGREE examination improved in target joint pain scores at 16 hours after the initial dose versus PBO, time-to-response, and use of rescue medication.

Methods: 184 patients experiencing an acute gout flare (ACR criteria) were randomly assigned to HD colchicine (4.8 mg: 1.2 mg initially, then 0.6 mg at 1 hr; n=74), or PBO (n=58). Mean baseline pain scores were 6.8 for PBO and 6.9 for both HD and LD colchicine (0 to 10 Likert scale). After confirmation of gout flare, pain intensity scores, as well as adverse events (AEs), were recorded over the next 72 hrs. Rescue medications, such as NSAIIDs, were permitted if intolerable pain continued after taking at least 1 dose of study drug. Uric acid-lowering therapy was not to be discontinued at the onset of flare.

Results: At 16 hrs there was a significant treatment response in the LD colchicine grp (1.7 unit reduction from baseline in target joint pain score; P=0.0366) versus PBO. After 24 hrs, reductions in target joint pain scores were consistently superior to PBO (mean 2.0 and 2.2 unit reductions in the HD and LD colchicine grps, respectively; 0.7 unit reduction for PBO). For time-to-response, the median time to 50% reduction from baseline in target joint pain score was 32 hrs for HD colchicine and 24.5 hrs for the LD colchicine grp. An insufficient number of patients in the PBO grp achieved this target. A significantly greater number of patients (P=0.0273) assigned to placebo used rescue medication through the 24 hour post-dose assessment compared to those received LD colchicine (50% and 31.1%, respectively). The time to the use of rescue medication was also earlier in the PBO grp (24 hrs) versus 36.5 hrs for LD colchicine. Rates of AEs were similar between LD and PBO grps, but greater than PBO in the HD grp.

Conclusion: This study establishes that LD colchicine provides significant pain relief as soon as 16 hr after dosing. By contrast, NSAIIDs commonly prescribed for gout flares (Naprosyn, Indomethacin) have shown significant pain reduction by 48 hrs at the earliest. In addition, in this study, use of rescue medication was significantly lower in LD vs PBO grps while the safety profile for LD colchicine was comparable to PBO. These results further support the use of low dose colchicine for treatment of acute gout flares.

Disclosure: S. Wason, URL Pharma, 3; T. Lauterio, URL Pharma, 3; S. Crockett, URL Pharma, 5; M. W. Davis, URL Pharma, 3.

1913
Complete Tophus Response in Patients with Chronic Gout Initiating Pegloticase Treatment.
Michael A. Becker1, Neil J. Gonter2, Janet E. Pope3, Raymond L. Malamer1 and Herbert S. B. Baraf4. 1University of Chicago, Chicago, IL, 2Rheumatology Associates of North Jersey, Teaneck, NJ, 3Univ of Western Ontario, London, ON, 4Savient Pharmaceuticals, Inc., East Brunswick, NJ, 5Arthritis & Rheumatism Associates, Wheaton, MD

Background/Purpose: Pegloticase, a recombinant modified mammalian uricase that acts via enzymatic degradation of uric acid to allantoin, is approved in the US for the treatment of refractory chronic gout (RCG). Of 212 patients with RCG enrolled in two 6-month randomized, placebo-controlled trials (RCTs) of q2wk or q4wk pegloticase therapy, 157 (73%) had baseline tophi. All tophi were assessed during RCT and subsequent open-label treatment (OLE; up to 2.5 additional years) with regard to the time course of complete resolution by serial, quantitative digital photography evaluated by blinded and experienced central readers. Patients treated with placebo during the RCTs provided an additional opportunity to evaluate long-term tophus response upon initiation of pegloticase in the OLE study.

Methods: Photographs of patients’ hands and feet (and up to 2 other sites of tophi) were made at baseline, at weeks 13, 19 and 25 of RCT treatment, and at weeks 13, 25, 53, 77, 101 and final visit of the OLE. Each patient had up to 5 measurable tophi and 2 additional tophi tracked. A complete response (CR) was defined as 100% decrease in the area of the target tophus (or complete disappearance of the additional tophus) in the absence of any new or enlarging tophi.

Results: CR of at least one tophus was significantly more frequent among patients receiving pegloticase q2wk vs placebo at 13 weeks of treatment and at all subsequent times of measurement in the RCTs. Tophus CR was achieved by 40% of patients after 6 months of q2wk pegloticase (vs. 7% with placebo; p=0.002). Although more patients treated with q4wk pegloticase had tophus CR (21%) vs placebo (7%) at the final RCT visit, this difference was not statistically significant. During the RCTs, 21 patients showed a new incident tophus (all among patients manifesting baseline tophi). New tophi were seen in 6% (4/62), 11% (7/64) and 35% (10/29) of patients receiving biweekly pegloticase, monthly pegloticase, and placebo treatment, respectively.

After 1 year in the OLE study, CR of at least one tophus was recorded for 74% (50/68) of patients receiving q2wk pegloticase. The Kaplan Meier curve below shows the time to first tophus CR for patients treated with placebo during the RCT followed by pegloticase in the OLE study. Despite receiving no urate-lowering therapy during the 6 months of RCT enrollment, approximately one-half of placebo-treated patients had a tophus CR within 6 months of initiation of q2wk pegloticase treatment in the extension study.

Conclusion: A significant rate of CR of at least one baseline tophus was achieved for patients treated with biweekly pegloticase within 13 weeks (compared with placebo treatment). Tophus CR rates over time are consistent and rapid for patients initiating pegloticase in both the RCTs and OLE study. The proportion of patients with a tophus CR continued to increase over time for up to 2.5 years of additional pegloticase treatment.


S812
Background/Purpose: The introduction of novel treatment modalities for gout has escalated interest and education on this topic. Although gout is the most common inflammatory arthropathy encountered, it still remains a diagnostic and therapeutic challenge for many. We surveyed a large cohort of North American Rheumatologists (Rheums) for their views, practices and treatment of gout.

Methods: 2401 adult Rheums from the USA and Canada (138) were invited (via emails) to partake in an online survey in early 2012. The survey included 39 questions regarding respondent demographics, practice type, diagnosis of gout, choice of therapy and safety concerns. On-line responses were tabulated using the CSV file download to Excel spreadsheets and verify data coding for outliers.

Results: There were 318 respondents (13.2% response), 78.8% male; with a mean age of 57.7 yrs. Responses came from private practice (56%), academic (31%), government (4%); with an overall mean of 25 years in practice (52% > 25 yrs). They see an average of 5.3 gout patients per week and follow 86.4 gout patients in their practice, with 62% seen every 3–6 months. 92% can see an acute gout referral in less than 1 week. Only 8% are followed for asymptomatic hyperuricemia. 22% for acute gout/flare, 70% for intercritical or chronic inactive gout. 78% are PCP referred, 2/3 for acute gout and 24% for hospitalized gout. 37% view gout a metabolic disorder and 34% as a uric acid overload disorder. For the diagnosis of gout, Crystal ID (98%) and clinical hx (96%) were most important and alcohol and family history (40%) least important. 77% have a polarizing microscope and 96% routinely follow urate levels. Indications forurate lowering therapy (ULT) included tophi (72%), > 2 attacks/y (71%) or gouty erosions (68%). Uricosurics were seldom chosen (< 20%) and allopurinol therapy predominated (> 95%). Surprisingly 28% felt no allopurinol dose adjustments were needed with creatinine levels of 2.5–3.5mg/dl. When initiating ULT, prophylaxis with colchicines (90%) was preferred over NSAID (43%) or prednisonse (10%). The primary goal of Rx is attack prevention (94%) more so than urate level (< 6.0 (66%). However, acute gout is preferably managed with steroids (86%), NSAID (82%) over colchicines (65%). 57% use less Colcrys and 47% use more NSAID and prednisone. Febuxostat is indicated with allopurinol failure/intolerance (93%) or sensitivity (82%). Pegloticase is indicated for allopurinol failure/persistence (69%/44%) febuxostat failure/intolerance (65%) or multiple tophi or attacks (58%/46%). Overall, 76.5% achieve a urate < 6.0 and 25% have tophi. Most disappointing is patient noncompliance (78%), management by nonrheumatologist (54%) and confusion between hyperuricemia and gout (41%). The greatest safety concerns were for NSAID or colchicine with renal dz (98% or 54%) and allopurinol with azathioprine (80%). While cherries, febuxostat and allopurinol were ranked as safest, NSAID and pegloticase had the most safety concerns.

Conclusion: Tradition continues to dominate Rheum practice standards in gout with the majority relying on MSU crystal ID and clinical features for diagnosis. Prevention of attacks, targeting urate < 6.0, and reliance on ULT continue to guide management.


1915 Elevated Serum Homocysteine Levels Were Related Not with Serum Uric Acid Levels but with Decreased Renal Function in Chronic Gouty Patients. Sang Tae Choi1, Jung-Soo Song2, Jin Su Kim3, Eun-Jin Kang4, Kwang-Hoon Lee5 and You-Jung Ha6.1 Chung-Ang University School of Medicine, Seoul, South Korea; 2, Chung-Ang University College of Medicine, Seoul, South Korea; 3, Busan Medical Center, Busan, South Korea; 4, Dongguk University Ilsan Hospital, Goyang, South Korea, 5, Kwandong University College of Medicine, Goyang, South Korea

Background/Purpose: Hyperhomocysteinemia, which is related with cardiovascular diseases and metabolic syndrome, is regarded as one of the important factors in endothelial cell damage processes. It is well known that gout is associated with metabolic syndrome, and cardiovascular diseases are major causes of mortality that are found in gouty patients. However, there are few reports about the serum homocysteine levels in gouty patients, and moreover their results showed discrepancy. In this study, we investigated whether or not serum homocysteine levels are elevated in the patients with chronic gout and which factors are associated with the elevated homocysteine levels.

Methods: This cross-sectional study included 91 male patients with chronic gout and 97 age-matched healthy male controls. The averages of age were 51.19 ± 15.08 and 51.57 ± 17.01 years old, respectively. Serum uric acid, blood urea nitrogen (BUN), creatinine (Cr) and other laboratory findings were tested for all participants. Serum homocysteine levels were measured by a competitive immunoassay using direct chemiluminescent (Siemens Centaur Immunoassay Systems, USA). The estimated glomerular filtration rate (eGFR) was up-tained using modification of diet in renal disease (MDRD) formula, then the stages of chronic kidney disease (CKD) were classified according to eGFR levels as follows: stage 1, more than 90 mL/min/1.73m²; stage 2, 60–89 mL/min/1.73m²; stage 3, 30–59 mL/min/1.73m²; stage 4, 15–29 mL/min/1.73m²; stage 5, less than 15 mL/min/1.73m².

Results: The chronic gout group were not significantly different from the control group in serum uric acid levels (6.15 ± 2.23 mg/dl vs 5.82 ± 2.22 mg/dl, p = 0.224). However, the patients with chronic gout showed much higher serum homocysteine levels than healthy controls (13.96 ± 4.05 μmol/L vs 12.67 ± 3.52 μmol/L, p = 0.021). Serum homocysteine levels showed the positive correlations with serum BUN and Cr levels, and the negative correlation with eGFR (r = 0.429, p < 0.001; r = 0.435, p < 0.001; r = −0.413, p < 0.001, respectively) in the chronic gouty group. However, serum homocysteine levels are uncorrelated with serum uric acid levels or cholesterol profiles. The patients at stages 1 or 2 of CKD had significantly lower serum homocysteine levels than the patients at stage 3 of CKD (12.99 ± 4.81 μmol/L, 13.17 ± 2.97 μmol/L, and 17.45 ± 4.68 μmol/L, p < 0.001). Serum homocysteine levels were not different between the groups that are treated with allopurinol and with benzbromarone. In multiple linear analyses, serum homocysteine level was affected by eGFR (β = −0.385, p < 0.01), however, was not affected by the serum uric acid level (β = 0.035, p = 0.435), which is the same as the healthy controls. In the healthy controls, serum homocysteine level was affected by eGFR (β = −0.435, p < 0.01) and age (β = 0.413, p < 0.01). Serum homocysteine levels were higher in the male patients with chronic gout than in the healthy male controls. Hyperhomocysteinemia in gouty patients could be related not with serum uric acid levels, but with decreased renal function.

Conclusion: Serum homocysteine levels were higher in the male patients with chronic gout than in the healthy male controls. Hyperhomocysteinemia in gouty patients could be related not with serum uric acid levels, but with decreased renal function. Types of uric acid lowering agents did not affect the serum homocysteine levels.

Disclosure: S. T. Choi, None; J. S. Song, None; J. S. Kim, None; E. J. Kang, None; K. H. Lee, None; Y. J. Ha, None.

1916 Serum Uric Acid As A Biomarker for Mitigation of Infusion Reactions in Patients Treated with Pegloticase for Refractory Chronic Gout. Herbert S. B. Baraf1, Robert A. Yood2, John S. Sundy3, Faith D. Ottery4 and Michael A. Becker5. 1Arthritis & Rheumatism Associates, Wheaton, MD, 2Reliant Medical Group, Worcester, MA, 3Duke University Medical Center, Durham, NC, 4Savient Pharmaceuticals, Inc., East Brunswick, NJ, 5University of Chicago, Chicago, IL

Background/Purpose: Using data pooled from the randomized, placebo-controlled trials (RCTs) of pegloticase, post-hoc analyses of urate-lowering, antibody titers and the patterns of infusion-related reactions (IRs) were carried out to evaluate predictors of risk for IRs. These analyses eventually led to guidance on monitoring uric acid (UA) levels as a biomarker of response to therapy1. Here we describe the basis and outcomes of these risk mitigation analyses.

Methods: The 2 RCTs enrolled patients at 56 centers in the US, Mexico and Canada. Patients were > 18 yrs of age, had baseline UA > 8 mg/dl, and at least one of the following: ≥3 self-reported gout flares during the prior 18 mos; ≥1 tophi; or gouty arthropathy; and contraindication to allopurinol or failure to normalize UA during the prior 18 mos at the maximum medically appropriate dose. Pegloticase was administered as 8 mg infusions q2wk or q4wk; plasma UA was sampled at baseline and immediately preceding each q2wk infusion. All patients received prophylaxis for IRs and flares. A responder was defined by plasma UA < 6 mg/dl for 80% of time during mos 3 and 6. IR was defined as any adverse event occurring during or within 2 hours after infusion.

Results: IRs were experienced by 26% and 42% of patients receiving pegloticase q2wk and q4wk, respectively. Postulated that the majority of these IRs (91% of IRs with q2wk dosing and 71% with q4wk dosing) occurred when UA exceeded 6mg/dl—suggesting that loss of urate-lowering response was predictive of risk for IRs. This relationship was
not apparent to investigators during the 6 mos of RCT treatment because they were blinded to the pre-infusion UA levels.

Multiple benefit/risk scenarios were tested using UA concentration cut points and IRs to determine the most effective stopping rule for maximizing both safety and efficacy. The Table shows the number of patients reaching the two endpoints in the pooled trial population (no stopping rules) and the number of patients that would have reached these 2 endpoints if the specific stopping rule had been applied to the RCT population. Among the options tested, discontinuation of drug when patients had 2 consecutive serum UA levels >6 mg/dL appears to reduce the proportion of patients with IRs from 26% (observed) to 14% (estimated) with little impact on efficacy.

Table. Risk mitigation scenarios for patients treated with q2wk pegloticase in Phase 3 placebo-controlled trials

<table>
<thead>
<tr>
<th>Stopping Rule</th>
<th>Pts with IRs</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Stopping Criteria</td>
<td>22 (26%)</td>
<td>36 (42%)</td>
<td></td>
</tr>
<tr>
<td>One UA &gt;6 mg/dL</td>
<td>7 (8%)</td>
<td>31 (36%)</td>
<td></td>
</tr>
<tr>
<td>One UA &gt;7 mg/dL</td>
<td>7 (8%)</td>
<td>32 (38%)</td>
<td></td>
</tr>
<tr>
<td>One UA &gt;8 mg/dL</td>
<td>9 (11%)</td>
<td>33 (39%)</td>
<td></td>
</tr>
<tr>
<td>Two consecutive SUA &gt;6 mg/dL</td>
<td>12 (14%)</td>
<td>35 (41%)</td>
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<tr>
<td>Two consecutive SUA &gt;7 mg/dL</td>
<td>12 (14%)</td>
<td>35 (41%)</td>
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<td>Two consecutive SUA &gt;8 mg/dL</td>
<td>13 (15%)</td>
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</tbody>
</table>

Conclusion: Post-hoc assessments from the 2 RCTs provided valuable information on the relationship between UA levels and IR risk that was not available during the trials. Multiple benefit/risk analyses informed the recommendation that patients discontinue pegloticase when serum UA is >6 mg/dL, particularly at 2 consecutive time points. Ongoing post-marketing surveillance will be important to assess the risk of IRs in clinical practice and adherence to these recommendations.


1917

Long-Term Follow-up of IgG4-Related Diseases Presenting with Lacrimal and Salivary Gland Involvement. Hiroki Takahashi1, Motohisa Becker, Takeshi Fukuda. Dokkyo Medical University, Mibu, Tochigi, Japan

Background/Purpose: IgG4-related disease (IgG4-RD) is a recently recognized disease entity that is characterized by tumefactive and hyperplastic lesions in various organs including the lacrimal and salivary glands, pancreas and kidneys. Because patients with IgG4-RD have elevated serum IgG4 levels and characteristic histopathological features including dense infiltration of IgG4-positive plasma cells and storiform fibrosis, such lesions are assumed to have a common etiology and pathogenesis. Organ dysfunction is rarely severe in patients with IgG4-RD at diagnosis and responsiveness to corticosteroid therapy is frequently positive. Although the prognosis of IgG4-RD seems favorable, no long-term follow-up study has been reported. Data regarding the prognosis of IgG4-RD is essential when considering the introduction of intensive immunosuppressive therapy. We describe the clinical characteristics and prognosis of patients who have had IgG4-RD for ≥10 years.

Methods: This retrospective study at Sapporo Medical University Hospital analyzed clinical data at onset, involved organs during the clinical course and prognosis of 15 patients (5 men, 10 women) who had lived with IgG4-RD for ≥10 years. They were basically diagnosed according to the diagnostic criteria for IgG4-related Mikulicz’s disease determined by the Japanese Society for Sjögren’s syndrome.

Results: The average age at onset was 59 years and the average disease duration was 158 months. The lacrimal and salivary glands were the most frequently involved organs at onset in 12 of the 15 patients. Other initially involved organs included the mammary glands, pancreas and optic nerve. Only the lacrimal and salivary glands were affected in 6 patients during the clinical course (Mikulicz type). The others had multiple lesions (systemic type) of the retroperitoneum (n = 4), pancreas (n = 3), kidney (n = 2), lung (n = 2), liver (n = 1) and pituitary gland (n = 1). However, other lesions developed within 5 years in most patients with the systemic type and autoimmune pancreatitis developed in 1 patient 19 years after onset. The average levels of serum IgG4 at diagnosis in the Mikulicz and systemic types were 703 and 1,111 mg/dL, respectively. All patients initially responded well to corticosteroid therapy. Two patients required additional immunosuppressants due to recurrence during corticosteroid tapering. None of the patients died, progressed to end-stage organ failure or developed malignant lymphoma during the clinical course.

Conclusion: Patients with IgG4-RD presenting with lacrimal and salivary lesions at onset often developed other involved lesions within 5 years. However, only the lacrimal and salivary glands remained affected in a third of the patients over a period of about 10 years. Because the prognosis in terms of both life and function for patients with IgG4-RD is favorable when supported by corticosteroid therapy, careful consideration is required before introducing intensive immunosuppressive therapy.

Disclosure: H. Takahashi, None; M. Yamamoto, None; T. Tabeya, None; C. Suzuki, None; Y. Naishiro, None; Y. Shinomura, None; K. Imai, None.

1918

Cluster Analysis of Organ Involvements Patients with Serum IgG4 Elevation; IgG4–related Disease Is a Distinct Subtype of Patients with Hyper-IgG4. Masamitsu Tatewaki, Kazuhiro Kurasa, Ayate Tanaka, Junya Nagasawa, Satoko Arai, Reika Maezawa, Takayoshi Owada and Takeshi Fukuda. Dokkyo Medical University, Mibu, Tochigi, Japan

Background/ Purpose: IgG4-related disease (IgG4-RD) is a multi-organ affecting disease characterized by fibroinflammatory lesions with an abundant IgG4-positive plasma cells infiltration. This disorder includes many conditions such as autoimmune pancreatitis, Mikulicz disease and retroperitoneal fibrosis. Elevation of serum IgG4 levels is frequently found and is a key clue for diagnosis of IgG4-RD. However, there are patients who do not have fibroinflammatory lesions, characteristics of IgG4-RD, but revealed elevation of serum IgG4. To determine whether IgG4-RD is a distinct subtype of diseases with hyper-IgG4, we conducted cluster analysis of patients with elevation of serum IgG4 levels and examined clinical features of each cluster.

Methods: Subjects were 86 patients with elevation of serum IgG4 (>100mg/dl) among 350 patients whom received IgG4 examination for diagnosis of mass lesions or inflammation. Cluster analysis of organ involvement of the patients were performed through Ward’s method. Clinical features of patients in each cluster were examined through reviewing medical records retrospectively.

Results: Through cluster analysis, 5 clusters were identified: cluster 1; patients with multiple organ involvements including salivary glands, eyes, pancreas and retroperitoneum (typical IgG4 RD), cluster 2; patients with autoimmune pancreatitis alone (a subset of IgG4-RD), cluster 3; patients with lung involvement alone, cluster 4; patients with pleuritis alone, and cluster 5; patients without specific organ involvements. Renal involvement was found in patients in cluster 1; generalized lymphadenopathy was detected in those in cluster 1, and pulmonary involvement was seen in those in cluster 1. Serum IgG4 level were significantly high in patients in cluster 1 compared to those in other clusters. In addition, serum IgG4 levels were increased in correlation with numbers of affected organs in cluster 1. Hypergammaglobulinemia occurred frequently in cluster 1. Serum CRP elevation was not found in cluster 1 and 2. IgG4 plasma cell rich infiltration was found in some biopsy samples from patients in all clusters. Glucocorticoid was effective on inflammatory lesions and systemic inflammation in most cases of all clusters.
Conclusion: Typical IgG4-RD (cluster1) is a distinct subtype of diseases with serum IgG4 elevation, which is characterized by multiple organ involvements, particularly salivary glands, eyes and retroperitoneum, generalize lymphadenopathy, marked IgG4 elevation with hypergamaglobulinemia and absence of systemic inflammation.

Disclosure: M. Tatewaki, None; K. Kurasa, None; A. Tanaka, None; J. Nagasawa, None; S. Arai, None; R. Maeza, None; T. Owada, None; T. Fukuda, None.

1919

Regulatory T Cells in IgG4-Related Disease Patients Presenting with Sclerosing Sialadenitis and Dacryoadenitis. Winnie K. Pang, Ya Liu, Julie Wang, Song Guo Zheng, Kiran Qidwai, Russell K. Brynes and Francisco P. Quismorio Jr., University of Southern California Keck School of Medicine, Los Angeles, CA

Background/Purpose: IgG4-Related Disease (IgG4-RD) is characterized by inflammation and fibrosis of various organ systems. Its diverse clinical presentations include autoimmune pancreatitis, retroperitoneal fibrosis, sialadenitis, and dacryoadenitis. The etiology and pathogenesis are not well understood; however, the role of regulatory T cells (Treg) has been suggested. We evaluated the phenotype and function of Treg in IgG4-RD patients with salivary gland involvement.

Methods: Three untreated IgG4-RD patients with chronic lacrimal and salivary gland enlargement underwent clinical evaluation at the Los Angeles County Medical Center Rheumatology clinic. Peripheral blood mononuclear cells were obtained from healthy controls and the untreated IgG4-RD patients. Treg subsets were identified with a combination of monoclonal antibodies (anti-CD4, -CD25, -CD45RA, -Foxp3, -CCR7) conjugated to phycoerythrin (PE), allophycocyanin (APC), and FITC. PE/Cy7-labeled antibodies (anti-CD3, -CD8) were added for cell gating. Intracellular cytokine staining for IFN-γ, IL-4, IL-17A, and IL-10 was performed. The frequency of Treg was calculated as the proportion of CD4+ T cells expressing Foxp3. Statistical analysis was performed using Mann-Whitney or Wilcoxon tests.

Results: The patients, initially referred to rheumatology for Sjögren’s Syndrome, had clinical and histopathologic features consistent with IgG4-RD. Patient 1 was a 50-year-old Caucasian female with submandibular and lacrimal gland swelling for 3 years. She also had an enlarged right submandibular gland excised in 1989. Patient 2 was a 60-year-old African American female with bilateral parotid and lacrimal gland swelling since 2007. Patient 3 was a 33-year-old Filipino male with a history of hemimandibular osteoma and ameloblastoma in 1989 who presented with painless enlargement of the lacrimal and parotid glands for 18 months. All patients underwent PET-CT scan, which showed diffuse lymphadenopathy and metabolically active, enlarged lacrimal and salivary glands. Excisional biopsies were performed. Histopathologic analysis excluded lymphoma but revealed diffuse fibrosis, lymphocytic infiltration, and elevated IgG4/IgG plasma cell staining ratio (>50%) consistent with the diagnosis of IgG4-RD. Serum IgG4 levels were elevated in two patients.

Compared to healthy controls, the frequency of Treg (CD4+CD25+FOXP3+) cells was remarkably decreased in IgG4-RD patients, whereas naïve Treg cells (population with naïve phenotype, CCR7+CD45RA+) were increased. IgG4-RD patients were also characterized by increased circulating Th2 (including CD4+IL-4+, CD4+IL-5+) cells compared to healthy controls, while Th1 (CD4+IFN-g+) and Th17 (CD4+IL-17+) cells did not differ significantly.

Conclusion: IgG4-related sclerosing dacryoadenitis and sialadenitis may mimic Sjögren’s Syndrome, prompting referral to rheumatologists. Histopathologic evaluation is essential for diagnosis. Untreated IgG4-RD patients were found to have a higher percentage of Th2 and a lower percentage of Treg, suggesting that correcting the balance of Treg/Th2 cells may be a potential therapeutic approach.

Disclosure: W. K. Pang, None; Y. Liu, None; J. Wang, None; S. G. Zheng, None; K. Qidwai, None; R. K. Brynes, None; F. P. Quismorio Jr., None.

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Spectrum of IgG4-Related Disease and Diagnostic Value of Serum IgG4 Determinations. Emma Kotisalmi1, Tom Pettersson2, Aaro Piettiliinen2, Johanna Arola2 and Matti Färkkilä2. 1University of Helsinki, Helsinki, Finland, 2Helsinki University Central Hospital, Helsinki, Finland

Background/Purpose: IgG4-related disease is a recently described systemic inflammatory and fibrosing condition that may mimic various other systemic rheumatic diseases. We studied the occurrence of IgG4-related disease over a one year period at a university hospital serving a population of 1.5 million, and assessed the diagnostic significance of a serum IgG4 concentration higher than the upper level of the reference interval.

Methods: Files were scrutinized for a diagnosis of IgG4-related disease over a one year period (May 2010 to May 2011). The diagnosis rested on the combination of a clinical picture consistent with IgG4-related disease and histopathological features showing a characteristic appearance with a dense lymphoplasmacytic infiltration, a pattern of fibrosis, and variable numbers of IgG4 positive plasma cells. In addition, the files of all patients with a serum IgG4 concentration higher than 1.40 g/l, determined for various reasons during the same time period, were examined and the diagnoses were recorded. IgG subclasses in serum were analysed with a BN II nephelometer using N AS IgG1, N AS IgG2, N Latex IgG3, and N Latex IgG4 reagents (Siemens, Marburg, Germany). The reference interval for IgG4 at our laboratory is 0.08–1.4 g/l.

Results: 14 patients (12 men and 2 women, mean age 61 years, range 40–78 years) were diagnosed with IgG4-related disease during the one-year study period. In 3 patients the disease was confined to a single organ, whereas the other 11 had multigorgan involvement. The presenting features and major manifestations were autoimmune pancreatitis in 10, autoimmune cholangitis in 10, Mikulicz disease in 3, Riedel’s thyroiditis in 2, retroperitoneal fibrosis in 1, and mediastinal fibrosis in 1. Three had a diagnosis of bronchial asthma. Median serum IgG4 concentration at diagnosis was 7.75 g/l with a range of 1.50–18.20 g/l. No patients with a diagnosis of IgG4-related disease and normal serum IgG4 concentrations were identified. Major diagnoses suspected at referral included pancreatic carcinoma, liver disease, primary Sjögren’s syndrome, sarcoidosis, lymphoma, and vasculitis. Over the same time period no less than 238 additional patients with a serum IgG4 concentration higher than 1.40 g/l (median 2.22 g/l, range 1.41–11.50 g/l) were recorded. The most common diagnoses among these patients were bronchial asthma, chronic sinusitis and various allergic conditions, but high values were observed in a wide range of other diseases including sclerosing cholangitis, inflammatory bowel disease, and vasculitis.

Conclusion: We confirmed previous observations that IgG4-related disease occurs predominantly in middle aged or elderly men. Awareness of this newly recognized condition is essential since it constitutes a major differential diagnosis against various systemic inflammatory diseases and other diseases including lymphoma and other neoplasia. In our series a high serum IgG4 concentration was a regular finding among patients with IgG4-related disease. However, serum IgG4 concentrations higher than normal also occurred in a great variety of other diseases.

Disclosure: E. Kotisalmi, None; T. Pettersson, None; A. Piettiliinen, None; J. Arola, None; M. Färkkilä, None.

1921

Diagnostic Utility of Serum IgG4 in IgG4-Related Disease. Mollie Cartwright1, Tamara Augustine2, John H. Stone3 and Arezou Khosroshahi4. 1Massachusetts General Hospital, Boston, MA, 2Internal Medicine, Northshore Medical Center, Salem, MA

Background/Purpose: IgG4-related disease (IgG4-RD) is a recently recognized fibro-inflammatory disease with multi-organ system involvement, often but not always characterized by elevated serum IgG4 concentrations. The aim of this study was to determine the sensitivity, specificity, and positive and negative predictive values of serum IgG4 levels for the diagnosis of IgG4-RD.

Methods: This study was approved by the Institutional Review Board of our hospital. We searched the Massachusetts General Hospital database using the Research Patient Data Registry tool. Since March, 2001, 193 serum samples from unique patients were found to have elevated serum IgG4 concentrations (normal < 135 mg/dL). We reviewed the electronic medical record to determine the reason for the serum IgG4 assay and the underlying diagnosis in every case. The diagnostic criteria of IgG4-RD were determined according to the IgG4-RD international symposium consensus guidelines. In addition, we randomly selected 193 separate patients with normal serum IgG4 concentrations (from a pool of 3360 patients with normal results) in order to evaluate the test characteristics of IgG4 measurement.

Results: Among the 386 patients analyzed, 73 had either probable or definitive diagnoses of IgG4-RD. Sixty-six of these 73 patients had elevated serum IgG4 concentrations (mean: 404 mg/dL), for a sensitivity of 90%. In contrast, 313 (82%) of the patients analyzed did not have IgG4-RD diagnoses. Among those, 127 had elevated IgG4 concentrations (mean: 232 mg/dL; p <0.0001), for a specificity of 59%. The non-IgG4-RD diagnoses associated
with elevated serum IgG4 levels are shown in the Figure. Common causes of false-positive results were chronic sinusitis, recurrent pneumonia, and connective tissue diseases such as lupus, Sjögren’s, and vasculitides. The negative predictive value of a serum IgG4 assay was 96%, but the positive predictive value was only 34%.

**Background/Purpose:** Relapsing polychondritis (RP) is a relatively rare, but progressive disease with predilection for cartilage, with few data available regarding the arthritis in this setting. Purpose: To assess the type of articular involvement and its clinical associations of RP.

**Methods:** Systematic retrospective analysis of all patients diagnosed with RP in the Rheumatology Department, a tertiary care facility, over a 12-year period (2000 to 2012) using the hospital and outpatient databases. The McAdam diagnostic criteria for RP were employed. The patients were interviewed by the rheumatologist using a standard protocol. Patients self-taking pictures of the ear, eye or other involved organs during the painful episodes was encouraged.

**Results:** We identified 34 patients (67% women), age of onset 44.8 ± 16.9 years. The mean time to diagnosis was 36 months (1–168), after consultations of 4 other specialists (1–8). Most frequent autoimmune disease associated were vasculitis (10 cases, 2 with Behcet’s/MAGIC syndrome), SLE (5), Sjögren’s syndrome (2) and psoriatic arthritis (2). Hematological malignancies were seen in 5 cases. The arthritis was present in 30/34 (88%) cases and was intermittent, but symmetric in 17 (56%) cases and asymmetric in 13 (43%), mimicking microcrystalline arthritis in 9/30 (30%) cases. Mutilating arthritis was seen in 3 patients (2 with dissecting osteochondritis) and avascular necrosis in 3. Chondrosternal and manubriosternal arthritis were noted in 61% (21/34) and 44% (15/34) cases, respectively; when inaugural, pointed to a diagnosis of Tietze or SAPHO syndrome. In 3 patients signs of vertebral chondritis were present, mimicking anklosing spondylitis or vertebral chondrocalcinosis. Three patients diagnosed with Lyme disease had acute intermittent arthritis attributed initially to borreliosis, before the appearance of chondrosternal arthritis and later of the ENT involvement. The symmetric arthropathy was associated with a shorter time from onset to diagnosis (2.43 vs 4.3 yr, p = 0.03) than the asymmetric one. Symmetric arthritis was also correlated with more serious ENT involvement, auricular deformities (p = 0.028) and also with ocular inflammation (p = 0.03), pericarditis (p = 0.02), leukopenia (p = 0.02) and glomerulonephritis (p = 0.02). Rheumatoid factor was present in only 4 cases, rather reflecting the presence of cryoglobulinemia or hematological malignancies.

**Conclusion:** Even in the presence of auricular or nasal chondritis, RP could still be a tricky diagnosis, several consultants being seen before diagnosis. In our series symmetric arthritis was associated with a more complicated disease course, possibly reflecting the underlying pathology. The diagnosis of RP should be considered in recurrent paroxysmic chest pain and also in vertebral acute relapsing pain. The instruction of patients to self-report and to document by pictures an evanescent inflammation could add to a better recognition of disease.

**Disclosure:** L. O. Damian, None; L. Ghib, None; I. Felea, None; A. Maniu, None; N. Radics, None; S. Falaus, None; I. Filipescu, None; S. P. Simon, None; S. Rednic, None.

### 1923

**Biologies in Relapsing Polychondritis: A Single Center Case-Series.**

Guillaume Moulin1, Laurent Sailler2, Grégory Pugnet2, Leonardo Astudillo1 and Philippe Arlet1, 1Toulouse University Hospital, University of Toulouse, Toulouse, France, 2University of Toulouse Hospital, University of Toulouse, INSERM U1027, Toulouse, France, 3Toulouse University Hospital, University of Toulouse, INSERM UMR 1027, Toulouse, France

**Background/Purpose:** First-line treatment for relapsing polychondritis (RP) is costicosteroids (CS). Dapsone and methotrexate have been proposed as second-line therapies. Only few reports have been published on the use of biologics in RP. There may be a publication bias favouring successful issues. This work was aimed at colligating and describing the effects of biologics in RP patients in our Department.

**Methods:** Diagnosis codes are given and registered in a computerized medical file for each patient treated in our department since 1993. We performed the extraction of all cases encoded as “RP”. The diagnosis was confirmed using Damiani’s McAdam-modified criteria. All patients treated with biologics were evaluated for efficacy and adverse drugs reactions until the 20th June 2012 (last follow-up date).

**Results:** Among 22 patients encoded “RP”, 17 fulfilled Damiani’s criteria. Among them, 8 were exposed to 19 biologics as CS-sparing drugs. Mean age at diagnosis was 45.7 years and male:female sex-ratio was 1:4. All patients had chondritis and seronegative polyarthritis, 4 had cochlear or vestibular dysfunction and 2 had ocular inflammation. Biologics were used at the same doses as in rheumatoid arthritis. Seven patients were treated with TNF-alpha antagonists (adalimumab, n = 7, etanercept, n = 3, infliximab, n = 2, certolizumab, n = 1), 2 with anakinra, 2 with abatacept and 2 with tocilizumab. Treatments used before biologics were CS (all patients), methotrexate (n = 3), dapsone (n = 2), hydroxychloroquine (n = 4), azathioinone (n = 1). In 3 cases (patients 4, 6 and 8), biologics were used because of a cortico-dependant and severe disease (tracheal inflammation). Mean delay from diagnosis to first biologic use was 9.75 months. Outcomes are described in table 1. Seven adverse drug reactions were considered as drug-related: reactions at injection site occurred in 2 patients (1 on anakinra, 1 on adalimumab), and infections in 3 patients (1 pneumonia on adalimumab, sinusitis and otitis followed by herpes zoster on tocilizumab, 1 cellulitis on abatacept).

**Table 1. Outcomes of the 19 biologic therapies**

<table>
<thead>
<tr>
<th>Patients</th>
<th>Drug</th>
<th>Efficacy</th>
<th>Duration (months)</th>
<th>Reason for withdrawal, if any</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eanecrept</td>
<td>Partial</td>
<td>3</td>
<td>Insufficient efficacy</td>
</tr>
<tr>
<td>2</td>
<td>Adalimumab</td>
<td>Partial</td>
<td>3</td>
<td>Insufficient efficacy, pain at injection sites</td>
</tr>
<tr>
<td>3</td>
<td>Etanercept</td>
<td>Yes</td>
<td>15</td>
<td>Loss of efficacy</td>
</tr>
<tr>
<td>4</td>
<td>Infliximab</td>
<td>No</td>
<td>0.5</td>
<td>Systemic reaction</td>
</tr>
<tr>
<td>5</td>
<td>Abatacept</td>
<td>Partial</td>
<td>12</td>
<td>Insufficient efficacy</td>
</tr>
<tr>
<td>6</td>
<td>Tocilizumab</td>
<td>Yes</td>
<td>2</td>
<td>Ongoing</td>
</tr>
<tr>
<td>7</td>
<td>Eanecrept</td>
<td>Yes</td>
<td>12</td>
<td>Loss of efficacy</td>
</tr>
<tr>
<td>8</td>
<td>Adalimumab</td>
<td>Yes</td>
<td>26</td>
<td>Inactive disease</td>
</tr>
<tr>
<td>9</td>
<td>Eanecrept</td>
<td>Yes</td>
<td>9</td>
<td>Loss of efficacy</td>
</tr>
<tr>
<td>10</td>
<td>Adalimumab</td>
<td>Partial</td>
<td>6</td>
<td>Loss of efficacy</td>
</tr>
<tr>
<td>11</td>
<td>Infliximab</td>
<td>Yes</td>
<td>10</td>
<td>Loss of efficacy</td>
</tr>
<tr>
<td>12</td>
<td>Anakinra</td>
<td>No</td>
<td>1.5</td>
<td>Inefficacy</td>
</tr>
<tr>
<td>13</td>
<td>Abatacept</td>
<td>Yes</td>
<td>33</td>
<td>Minor loss of efficacy</td>
</tr>
<tr>
<td>14</td>
<td>Certolizumab</td>
<td>No</td>
<td>3</td>
<td>Inefficacy</td>
</tr>
<tr>
<td>15</td>
<td>Abatacept again</td>
<td>Yes</td>
<td>10</td>
<td>Ongoing</td>
</tr>
<tr>
<td>16</td>
<td>Tocilizumab</td>
<td>Yes</td>
<td>5</td>
<td>Ongoing</td>
</tr>
<tr>
<td>17</td>
<td>Adalimumab</td>
<td>Yes</td>
<td>20</td>
<td>Inactive disease</td>
</tr>
<tr>
<td>18</td>
<td>Adalimumab</td>
<td>Yes</td>
<td>60</td>
<td>Ongoing</td>
</tr>
<tr>
<td>19</td>
<td>Adalimumab</td>
<td>Yes</td>
<td>1</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
Conclusion: All biologics but anakinra and certolizumab in one patient had a consistent effect. Loss of efficacy occurred frequently. Switching from a TNF-alpha antagonist to another TNF-alpha antagonist was frequently efficacious and may be proposed before switching to abatacept or tocilizumab. The benefit-to-risk ratio of biologics compared with immunosuppressive drugs should be evaluated prospectively in RP.

Disclosure: G. Moulis, None; L. Sailler, None; G. Pugnet, None; L. Astudillo, None; P. Arlet, None.

1924

What Do Patients with Polymyalgia Rheumatica Mean When They Describe Stiffness? A Qualitative Study. Rodney A. Hughes1, Sarah Mackie2, John R. Kirwan3, Colin T. Pease4, Margaret Walsh5 and Marianne Morris.1 1St. Peters Hospital, Chertsey Surrey, United Kingdom, 2University of Leeds, Leeds, United Kingdom, 3Bristol Royal Infirmary, Bristol, United Kingdom, 4Leeds Teaching Hospitals NHS Trust, Harrogate, United Kingdom, 5University of the West of England, Bristol, United Kingdom

Background/Purpose: Patients with PMR report significant symptoms of pain and stiffness. Stiffness has usually been included in diagnostic criteria for PMR but has never been clearly defined. Stiffness can prove difficult to measure and to distinguish from pain. To try to establish both a definition and a clearer understanding of stiffness in PMR, we have performed a qualitative study designed to elicit appropriate patient experience and perception of stiffness.

Methods: We have conducted 8 focus groups in 3 rheumatology centres in the UK involving 50 patients with PMR. We included one city and two semi-urban units in three regions in the UK to try to explore differences in language or communication across areas. Patients all had English as a first language. Each focus group ran for 1.5 hours, data were transcribed and thematically analysed into codes, sub-themes and themes. Two expert patients with PMR were included in the research from the start of the study. Sample size was designed to reach saturation of themes.

Results: Themes have emerged in response to direct questioning that relate specifically to definitions of stiffness and measurable outcomes for PMR (deductive thematic analysis). Through inductive analysis additional themes have emerged; that pain and stiffness were inextricably linked, the use of metaphors to describe PMR symptoms, and an in depth understanding of the cognitive and behavioural impact of polymyalgia.

PMR emerges as a disease of ‘two halves’ with a very close relationship between pain and stiffness. For some, stiffness appears before pain is experienced and can serve as a warning of pain should the person move—‘freezing up in anticipation of pain’. From the data set it appears that patients are dominated either by pain, fatigue or stiffness but there is always a background of stiffness. Metaphorical descriptions of disease relating to stiffness have included ‘tim soldier’, ‘rusty hinge’, ‘2 bricks cemented on my shoulders’ and being ‘trapped in a coffin’. Patients report stiffness in association with sleep disturbance, loss of confidence, mood and stress disorders and a clear temporal variation of symptoms worse at night and in the early morning ‘my 24 hour problem’, ‘a cycle’. Although patients report a very significant improvement in stiffness and pain after treatment with corticosteroids data suggest that they almost always continue to experience stiffness although they may not report this to their physicians. Stiffness both before and after treatment impacts on function, independence and social and working life.

A thematic model of stiffness in PMR

Conclusion: This work has led us towards a clearer definition of the meaning, experience and impact of stiffness. We have devised an initial thematic model of symptoms in polymyalgia that emerges from our work that will enable us to proceed further towards an adequate definition of stiffness ways of measuring it.

Disclosure: R. A. Hughes, None; S. Mackie, None; J. R. Kirwan, Horizon Pharma (formerly Nitec Pharma), AstraZeneca, CombinatoRx, GlaxoSmithKline, Merck, and Wyeth; 5 C. T. Pease, None; M. Walsh, None; M. Morris, None.

1925

Patient Satisfaction and Experience with Golimumab, Adalimumab, and Etanercept for the Treatment of Rheumatoid Arthritis, Psoriatic Arthritis, and Ankylosing Spondylitis. Susan Bolge1, Helen Eldridge2, Dilesh Doshi1, Lorie Ellis1, Barbara Roland3 and John Woelfel1. 1Janssen Scientific Affairs, LLC, Horsham, PA, 2Janssen Pharmaceuticals, Inc, Titusville, NJ, 3The Dominion Group, Reston, VA

Background/Purpose: Golimumab (GLM), adalimumab (ADA), and etanercept (ETN) are subcutaneous (SQ) anti-TNF therapies available for the treatment of rheumatoid arthritis (RA), psoriatic arthritis (PsA), and ankylosing spondylitis (AS). The purpose of this study was to explore satisfaction with effectiveness and injection experience with GLM, ADA, and ETN from the patient perspective.

Methods: In 2012, RA, PsA, and AS patients currently receiving SQ biologic therapy participated in telephone interviews. Patients rated satisfaction with current SQ therapy on a 7-point Likert scale (1 = extremely dissatisfied and 7 = extremely satisfied). Patients also described their most recent injection experience. Propensity weights were applied to adjust for differences in duration of therapy and prior intravenous (IV) biologic use of GLM patients vs. ADA and ETN patients.

Results: A total of 69 GLM, 143 ADA, and 181 ETN patients participated in the study. Before adjustment, GLM patients had shorter duration of therapy than ADA and ETN patients (less than one year GLM: 51% vs. ADA: 21%, p<0.05 and ETN: 17%, p<0.05). Also, a greater proportion of GLM patients had prior IV biologic exposure (GLM: 41% vs. ADA: 14%, p<0.05 and ETN: 13%, p<0.05). When propensity weights were applied to adjust for differences in duration of therapy and prior IV biologic experience, GLM patients reported high satisfaction with effectiveness (6–7 on 7-point scale) at similar rates to ADA and ETN patients for prevention/treatment of condition (GLM: 55%, ADA: 55%, ETN: 56%), symptom relief (GLM: 45%, ADA: 51%, ETN: 57%), and time to onset (GLM: 44%, ADA: 42%, ETN: 50%). GLM patients reported lesser degrees of discomfort, pain, stinging, and burning during injection than ADA or ETN patients.

Table 1. Most Recent Injection Experience (Adjusted using Propensity Weights)

<table>
<thead>
<tr>
<th></th>
<th>GLM</th>
<th>ADA</th>
<th>ETN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discomfort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>49%</td>
<td>32%*</td>
<td>18%*</td>
</tr>
<tr>
<td>Moderate</td>
<td>10%</td>
<td>23%†</td>
<td>23%*</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>49%</td>
<td>44%</td>
<td>23%*</td>
</tr>
<tr>
<td>Moderate</td>
<td>7%</td>
<td>23%*</td>
<td>15%</td>
</tr>
<tr>
<td>Stinging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>41%</td>
<td>16%*</td>
<td>12%</td>
</tr>
<tr>
<td>Moderate</td>
<td>4%</td>
<td>28%*</td>
<td>26%*</td>
</tr>
<tr>
<td>Burning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>58%</td>
<td>41%</td>
<td>40%*</td>
</tr>
<tr>
<td>Moderate</td>
<td>9%</td>
<td>20%</td>
<td>24%*</td>
</tr>
</tbody>
</table>

*p<0.05 compared to GLM; †p<0.10 compared to GLM

Conclusion: Patient reported satisfaction with effectiveness is comparable among patients treated with GLM, ADA and ETN, and less discomfort, pain, burning, and stinging with injection is reported by GLM patients. Patient injection experience may be an important consideration in selection of biologic treatment. Future research should explore potential effects of patient injection experience on treatment adherence and patient outcomes.

Disclosure: S. Bolge, Janssen Scientific Affairs, LLC, 3; H. Eldridge, Janssen Pharmaceuticals, Inc, 3; D. Doshi, Janssen Scientific Affairs, LLC, 3; L. Ellis, Janssen Scientific Affairs, LLC, 3; B. Roland, Janssen Scientific Affairs, LLC, 5; J. Woelfel, Janssen Scientific Affairs, LLC, 5.

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Evaluation of Strategies to Taper Anti-TNF Drugs in Patients with Inflammatory Rheumatic Disease (Rheumatoid Arthritis, Ankylosing Spondylitis, Psoriatic Arthritis, Adult-age Juvenile Idiopathic Arthritis) in Long-Term Remission. Jakub Zavada, Katarina Hviscova, Katerina Jarosova, Janka Foretova, Jiri Stolfa, Liliana Sedova, Dana Tegzova, Jiri Vencovsky and Karel Pavelka. Institute of Rheumatology, Prague, Czech Republic

Background/Purpose: While abrupt discontinuation strategies of anti-TNF drugs have been shown to result in frequent disease flares, tapering of dose may be a feasible option for patients with inflammatory rheumatic disease in long-term remission. We aimed to assess the feasibility to taper anti-TNF drugs (either by dose reduction or by prolongation of dosing interval) in patients with inflammatory rheumatic disease (RA, AS, adult-age JIA, PsA) in long-term remission.

Methods: Patients with RA, AS, PsA or adult-age JIA in long-term remission of the disease (>6 months) were eligible for this prospective observational cohort study. Baseline and 3-monthly follow-up visits data concerning medication and activity of the disease were recorded prospectively by a questionnaire. The decisions whether and how to taper (or increase in case of flare) anti-TNF therapy were left solely to the discretion of the treating physician, without any pre-specified protocol. Survival analyses, performed using a Cox proportional hazards model, were used to assess the predictors of failure of the tapering strategies (failure was defined as reinstitution of the usual/baseline dose of the anti-TNF drug).

Results: 132 patients (AS: 55, RA: 45, adult-age JIA: 22, PsA: 10) with at least one follow-up visit after tapering of anti-TNF therapy (corresponding to 176 patient-years of follow-up) have been analyzed. Median time of follow-up per analyzed patient was 189 days (IQR 98–343 days). 70 (53%) patients were treated by etanercept, 37 (28%) by adalimumab, and 25 (19%) by infliximab. 50% fraction (or less) of the baseline dose was reached in 81 (62%) patients. Within respective diagnoses, 50% fraction (or less) of the baseline dose was reached in 34 (62%) pts with AS, 17 (77%) with JIA, 5 (50%) with PsA, and 25 (50%) with RA. In 25 (19%) patients the subsequent flare of the disease activity required increase of the anti-TNF drug back to the baseline dose (i.e. the tapering strategy failed). Within the diagnoses, failures were observed in 7 (13%) of pts with AS, 1 (5%) with adult-age JIA, 3 (30%) with PsA, and 14 (31%) with RA. In univariate survival analyses, the risk of the tapering strategy failure was numerically higher in RA patients (HR 2.39, 95% CI 0.96–5.97), PsA pts (HR 2.38, 95% CI 1.02–9.24), and lower in JIA pts (HR 0.32, 95% CI 0.04–2.60) as compared to AS patients (referent); the risk of failure was also numerically greater in pts treated with infliximab (HR 2.49, 95% CI 0.95–6.58) as compared to etanercept (referent), or adalimumab (HR 1.41, 95% CI 0.55–3.58).

Conclusion: This observational study from one academic center on patients with inflammatory rheumatic disease (RA, AS, PsA, adult-age JIA) in long-term remission showed that, after tapering of the anti-TNF drug dose (or prolongation of the dosing interval) 19% of pts required reinstitution of the usual/baseline dose of the anti-TNF drug within the limits of the relatively short-term follow-up.

Disclosure: J. Park, None; E. Kedar, None; I. Sacksen, None; J. Henson, None; G. C. Gardner, None.

1928

Evaluating the Therapeutic Effects of B Cell Depletion Therapy with Rituximab in a Longitudinal Cohort of Mixed Connective Tissue Disease Patients. Ragnar Gunnarsson, Inge-Margrethe Gilboe, Torhild Garen and Oyvind Molberg. Oslo University Hospital Rikshospitalet, Oslo, Norway

Background/Purpose: Even though 40 years have passed since MCTD was defined as a distinct disorder, there is still no evidence based therapy available. The choice of treatment is based on data from related connective tissue diseases. Biological agents have been used in a few patients with disease resistant to conventional immune-modulating drugs. Tumor necrosis factor alpha (TNFα) inhibitors have had limited efficacy and/or adverse effects (1, 2). B cell depletion therapy with rituximab (RTX) has only been reported in three MCTD patients, two of these responded to the treatment (3, 4), whereas the last had a treatment related complications (5).

Methods: A retrospective chart review of all the 19 MCTD patients who were treated with RTX at the Rheumatology unit at the Oslo University Hospital from the 1st of June 2006 to the 15th of June 2012 and fulfilled at least one of the four MCTD criteria sets (Kasukawa’s, Alarcón-Segovia’s, Kahn’s and/or Sharp’s criteria) were performed.

Results: Four female MCTD patients, all fulfilling all the four MCTD criteria sets, were treated with RTX according to the rheumatoid arthritis protocol with two 1.000 mg RTX infusions two weeks apart. Two of these patients were retreated with RTX after 10 and 21 months. At the start of the RTX treatment, the patient’s mean age was 44 years (37 to 65) and their mean disease duration was 8.7 (5 to 12) years. The mean observation time was 46 (23 to 70) months. So far, no adverse effects have been identified.

Patient 1: Therapy resistant thrombocytopenia over years. Normalization of platelets 15 weeks after RTX and currently uses low dose prednisolone (GC).

Patient 2: Therapy resistant myositis with high serum creatinine kinase (CK, max 4605 U/L) reduced proximal muscle strength and increased signal intensity on MRI (STIR and T1).

After RTX, normalization of CK and reduced MRI changes and was able to reduce GC dose. She had two minor relapses, the first 12 months after RTX and is currently treated with methotrexate (MTX) and low dose GC.

Patient 3: Therapy resistant myositis with high CK (max 7076 U/L); MRI changes and reduced muscle strength. Two courses of RTX, ten months apart, with the background of MTX, GC, Hydroxychloroquine (HCQ) led to normalization of CK and increased muscle strength.
Randomized controlled trials are needed to further evaluate the effects of RTX in thrombocytopenia, myositis and arthritis. Ranibizumab is a vascular endothelial growth factor (VEGF) inhibitor that has shown significant clinical effects in treatment of dry macular degeneration. The treatment was well tolerated and had significant clinical effects on thrombocytopenia, myositis and arthritis. Randomized controlled trials are needed to further evaluate the effects of RTX in MCTD.

References

Disclosure: R. Gunnarsson, None; I. M. Gilboe, None; T. Garen, None; Molberg, None.

1929

Pernicious Anemia and Vitamin B-12 Deficiency in Autoimmune Disease: Neglecting the Feet Will Lead You Astray. Michael R. Lovy Desert Oasis Healthcare, Palm Springs, CA

Background/Purpose: The occurrence of multiple autoimmune disorders in individual patients is commonly observed. Rarely, this is explained by recently recognized genetically based autoimmune polyendocrine syndromes. Pernicious anemia accompanies other autoimmune disorders both in patients with and without these discrete syndromes. The purpose of this study was to detect possible underlying vitamin B-12 (B-12) deficiency or pernicious anemia in a rheumatology clinic based on a simple neurologic exam of the feet.

Methods: Patients seen in a rheumatology clinic over a six month period were examined for evidence of peripheral neuropathy. If typical findings of stocking sensory loss at the ankle level were found a B-12 level was obtained. If B-12 levels were low an antiparietal cell or intrinsic factor antibody titer was obtained. Methylmalonic acid (MMA) levels were obtained in patients without either antiparietal cell or intrinsic factor antibodies. Clinical features of antibody positive patients as well as those with B-12 deficiency and elevated MMA levels were reviewed.

Results: 38 patients with low B-12 levels were positive for antiparietal cell or intrinsic factor antibodies. An additional 10 patients with low B-12 and elevated methylmalic acid levels were indentified. Diagnosis among antibody positive patients included: rheumatoid arthritis 9-including one with vitiligo; one with Grave’s disease, 2 with Hashimoto’s; lupus; primary Sjogren’s 3-including one with stiff man syndrome; primary Raynaud’s 4; polycystic CPPD 3; tophaceous gout 3; vasculitis 2; ankylosing spondylitis 1; and pyoderma gangrenosum 1. Diagnosis among antibody negative patients included osteoporotic fracture 4, osteoarthritis 4, lupus 2, rheumatoid 2, ankylosing spondylitis 2, tophaceous gout 1, CPPD 1. Among the lupus and Sjogren’s patients there were 2 positive for both SS-A and SS-B, 3 for SS-A, 1 for SS-B, 3 with antiparadiclonin antibody, and 3 with false positive VDRL. Paraproteinemia was present in 3 patients. Among the 15 male patients, 7 were being treated for hypogonadism. Four patients had 25-OH vitamin D levels below 10 ng/ml, 9 patients had thyroid disease, 7 had diabetes, and 13 had a positive family history for either diabetes or an autoimmune disease. The MCV level and hemoglobin level was normal in all but 1 patient who drank alcohol excessively.

Conclusion: Pernicious anemia and B-12 deficiency was observed in a wide spectrum of autoimmune and arthritic diseases, especially SS-A and SS-B positive individuals. Other components of autoimmune polyendocrine syndrome including diabetes, thyroid disease, male hypogonadism, and low vitamin D levels, suggesting the possibility of celiac disease, occurred frequently in this study group. Recognition of pernicious anemia should alert the clinician to the possible presence of other components of autoimmune polyendocrine syndrome and vice versa. Also, B-12 deficiency can cause elevated MCV, foot complaints, constitutional symptoms, neuropathy that could be mistaken as a complication of the underlying disease or its therapy, and is associated with osteoporotic fractures. A simple 30 second neurologic exam can lead to the diagnosis of this potentially treatable deficiency.

Disclosure: M. R. Lovy, None.

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Progranulin Plays a Protective Role in the Pathogenesis of Inflammatory Bowel Disease. Fanhua Wei1, Jinlong Jian1, Yuying Zhang2, Jiqiang Lin3, Juan Lafailie4, Michael Dustin5, Lloyd Mayer6 and Chuanju Liu5. 1NYU School of Medicine, New York, NY, 2Mount Sinai Medical Center, New York, NY, 3NYU School of Medicine, New York, NY, 4Mount Sinai University, New York, NY, 5New York University, New York, NY

Background/Purpose: Progranulin (PGRN) is a growth factor with multiple functions. We recently reported that PGRN and its derived engineered protein Atstrin directly bound to TNF receptors, inhibited TNF-α activity and exhibited potent anti-inflammatory effect in inflammatory arthritis models (Tang, W., et al, Science, 2011 Apr 22:332(6028):478–484). TNF-α is also known to play a critical role in the pathogenesis of inflammatory bowel disease (IBD), and blockage of TNF-α represents an effective therapeutic option in the treatment of IBD. Thus the objective of this project is 1) to examine the expression profiling of PGRN in the course of IBD, 2) to define the role of endogenous PGRN in IBD, and 3) to determine whether recombinant PGRN or its derivatives represents novel therapeutic interventions for IBD.

Methods: The expression of PGRN in the course of IBD was detected using immunohistochemistry. To elucidate the effects of endogenous PGRN on the initiation and progression of colitis, various colitis models, including DSS- and TNBS-induced colitis model, CD4+CD45RBhi T cell transfer model were established with WT and PGRN-deficient mice. To determine the therapeutic effect, recombinant PGRN or Atstrin at a dosage of 5mg/kg body weight was injected into various experimental colitis models. Body weights were recorded and the colon tissues were collected for histological and immunohistochemical assays.

Results: PGRN was highly expressed in the epithelial cell layer and smooth muscle of colon in WT mice, and its expression was significantly induced in the course of DSS- or TNBS-induced colitis. PGRN KO mice suffered from accelerated body weight loss, and exhibited more severe transmural inflammation with extensive ulceration and necrosis compared to WT mice. Transfer of PGRN+CD4+ CD45RBhi T cells into RAG1 recipient mice led to an accelerated onset of disease and to more severe signs of inflammation. In addition, all mice died 35 days after T cell transfer in this group, whereas all mice were still alive following T cell transfer from WT donor mice up to 56 days. These results indicate that CD4+ CD45RBhi T cells-derived PGRN is critical for the augmented inflammation of IBD. Importantly, injection of recombinant PGRN, or its derived engineered molecule Atstrin, was able to effectively ameliorate the symptoms of colitis, as revealed by significantly delayed body weight loss and less tissue inflammation. In addition, the application of PGRN restored the survival rate in the T cell transfer model.

Conclusion: PGRN plays a protective role in the pathogenesis of inflammatory bowel disease. PGRN, specially its derived engineered molecules, may be used as new anti-TNF/TNFRI therapeutic interventions for inflammatory bowel disease.

Disclosure: F. Wei, None; J. Jian, None; Y. Zhang, None; J. Liu, None; J. Lafailie, None; M. Dustin, None; L. Mayer, None; C. Liu, None.

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Influence of Trough Serum Drug Level and ImmuneReactivity On the Lack of Response to Adalimumab Therapy in Inflammatory Bowel Disease Patients. Shui Long Wang1, Scott Hauenstein1, Linda Ohmundo1, Rukmini Reddy1, Kevin McCowen1, Shawn Shah1, Steven Lockton1, Emil Chuang1 and Sharat Singh1. 1Prometheus Laboratories, San Diego, CA

Background: Anti-TNF-α therapy is effective for the treatment of inflammatory bowel disease (IBD). Nevertheless, over 30% of IBD patients fail to respond to anti-TNF-α therapy and approximately 60% of the patients who respond initially to the therapy will lose the response over time and will need to either dose escalation or switch to another agent to maintain response. Low serum drug levels and/or anti-drug antibody (ADA) generation may be a role for the failure of anti-TNF-α treatment. Recent data suggest monitoring of patients for serum drug and ADA levels is an important strategy for optimal patient management. Here, we report the application of the homogeneous mobility shift assay (HMSA) method for monitoring of adalimumab (ADL) and
human antibodies-to-adalimumab (ATA) in serum samples from patients who lost response to ADL treatment.

**Methods:** Serum samples were collected from 100 patients who initially responded to ADL therapy for at least three months but were beginning to lose response. ATA and ADL levels in the serum samples were measured by ATA- and ADL-HMSA as described previously, except that in the ATA-HMSA Alexa Fluor 488 labeled ADL (ADL-488) was used as antigen and rabbit anti-ADL serum as standard. Full analytical method validation of both the ATA- and the ADL-HMSA was performed, and cut points for ADL and ATA levels were established with 100 drug-naive healthy controls. The relationship of the ADL drug level and ATA generation in these patients was analyzed.

**Results:** Validation of the ATA- and ADL-HMSA revealed a lower limit of detection to be 0.026 U/mL for ATA and 0.018 µg/mL for ADL in the serum samples. The intra-assay and inter-assay precision determination yielded a coefficient of variation of less than 15%, and the accuracy of the assay is within 20% for both assays. ADL drug tolerance in ATA-HMSA is up to 40 µg/mL in the test serum. Serum samples from 100 drug-naive healthy subjects were tested to set up the cutoff point of 0.55U/mL (Mean +3.0xSD) for ATA and 0.66 µg/mL for ADL. Analysis of 100 serum samples from patients who were losing response showed that 36% of the patients had an ADL level < 3 µg/mL, of these 58.3% were ATA positive. However, only 18% of the patients (4/22) had ATA when their ADL level was over 20 µg/mL. Overall, 40% of the patients (40/100) were positive for ATA.

**Conclusion:** Analysis of ADL and ATA levels in non-responding IBD patients showed a high incidence of ATA generation and the ADL levels were inversely correlated with the level of ATA generation. Drug and ADA levels are important determinants of patient response to the therapy.

Disclosure: S. L. Wang, Prometheus Laboratories, 3; S. Hauenstein, Paonnetes Laboratories, 3; L. Ohrmund, Prometheus Laboratories, 3; R. Shringarpure, Prometheus Laboratories, 3; D. C. Wolf, None; I. A. Dia, None; J. Salbato, Prometheus Laboratories, 3; R. Reddy, Prometheus Laboratories, 3; K. McCoven, None; S. Shub, None; S. Lockton, Prometheus Laboratories, 3; E. Chuang, Prometheus Laboratories, 3; S. Singh, Prometheus Laboratories, 3.

**1932**

**Clinical Features of an Aromatase Inhibitor Associated Syndrome Presenting As Rheumatoid Arthritis**

Ronald J. Anderson, MD, Brigham & Women’s Hospital, Boston, MA

**Background/Purpose:** The aromatase inhibitors (AI): anastrozole, letrozole and exemestane are used in the treatment of postmenopausal women with estrogen receptor positive breast cancer. Arthralgias occur in close to 30% of patients taking these agents and are a major reason for their discontinuation. Published reports on these arthralgias are primarily in the oncology literature and describe the prevalence of these symptoms but not their clinical features.

**Methods:** During the five year period, 2005–2010, all new patients taking AI presenting to the practice of the author, a rheumatologist, were prospectively evaluated. Fourteen out of a total of 1,149 new patients were taking AI. The source of referral was: oncologists (8), internists (4) and rheumatologists (2).

**Diagnostic studies were performed on the basis of clinical care needs. The diagnosis of a joint abnormality was based on a physical exam which demonstrated soft tissue swelling and limitation of motion. Tenderness, alone, was used as a sign of involvement only in the MTP joints. If the cause of a joint deformity could not be explained by physical exam, radiographs were obtained to exclude osteoarthritis or other structural abnormalities.**

**Results:** The ultimate diagnoses in this group of 14 patients were as follows: osteoarthritis (2), idiopathic frozen shoulder (2), bilateral palmar flexor tenosynovitis (2), fibromyalgia (1), Charcot joints (1) and previously undiagnosed chronic rheumatoid arthritis (RA) (1). The remaining 5 patients presented with a unique syndrome of morning stiffness, joint swelling, limited motion and dysfunction in a pattern consistent with early RA. All 5 patients met both the 1987 ACR and the 2010 ACR/EULAR Classification Criteria for RA. All were negative for ANA and CCP. One patient had a borderline positive RF. ESRs were normal and only one patient had an elevated CRP. Joints involved were wrists and MCPs (5), MTPs (4), shoulder and elbows (3), hips (2) and the knee in one patient. No joint effusions sufficient for aspiration were seen in this group of patients. All patients with this syndrome were followed for at least one year. Four of the five patients stopped the AI and underwent a complete remission in 3 months. The remission persisted in the 2 patients who did not resume an AI. Two patients restarted another AI and both developed a similar RA syndrome within 3 months. Of these 2 patients, one remitted on stopping the second AI and the other elected to stay on the agent with persistence of the syndrome. One of the five patients chose to stay on the original AI and has had persistent mild disease for over 2 years. The 5 patients had used AI for a mean of 3 months prior to the onset of symptoms. Remissions occurred within 3 months of stopping the drug.

**Conclusion:** A syndrome with clinical features resembling RA may be seen in association with the use of AI. The patients described in this study fulfilled both the 1987 ACR and 2010 ACR/EULAR criteria for RA. The condition may remit on stopping the agent but can recur on switching to another agent in the same class.

Disclosure: R. J. Anderson, None;
Improvement in Cryoglobulin Detection Employing a Temperature Controlled Sample Transporter, W. Winn Chatham, Moon Nahm and William H. Benjamin Jr., University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Optimal conditions for detecting serum cryoglobulins in patients with suspected vasculitis requires drawn blood samples remain at 37 degree F or higher temperature until the sample has clotted and the serum is removed. Failure to maintain these temperature conditions during sample transport to the processing laboratory may lead to failure to detect cryoglobulins and false negative test results. We determined the utility of a custom-designed sample transporter for optimizing the quality of blood samples submitted for cryoglobulin detection.

Methods: A quality study was undertaken in a hospital-based clinical immunology lab to assess the frequency of samples sent to the lab for cryoglobulin analysis that were deemed acceptable for optimal cryoglobulin analysis (sample temperature at or greater than 37 degrees C). Following the study, a specially designed blood tube carrier (Cryocab) containing a 300 gram 1:1 mixture of n-docosane and n-eicosane was developed for use in the hospital/clinic pneumatic tube transport systems. The mixture in the carrier melts at 38 degrees C, with a high heat of fusion when solidifying and maintaining a temperature of 38°C for several hours as the material undergoes phase transition. Following implementation of Cryocab use, a subsequent study to determine the frequency of acceptable samples arriving to the clinical immunology lab was undertaken.

Results: During a ten month time period prior to routine use of the Cryocab, only 146/226 (34%) of samples arriving in the clinical immunology lab for cryoglobulin assessment had a temperature at or exceeding 37 degrees C. During a four month time frame following implementation of routine Cryocab use by the hospital and clinic phlebotomy services, the percentage of samples arriving to the clinical immunology lab at 37 degrees or higher improved dramatically—87/90 (97%).

Conclusion: Use of a gel-based transporter to maintain blood samples at temperatures conducive to optimal detection of cryoglobulins can dramatically improve the quality of samples arriving to the analyzing lab, and may improve cryoglobulin detection rates.

Disclosure: W. W. Chatham, None; M. Nahm, None; W. H. Benjamin Jr., None.

ACR/ARHP Poster Session C
Muscle Biology, Myositis and Myopathies: Genetics, Autoantibodies and other Molecular Aspects of Idiopathic Inflammatory Myopathies and Models
Tuesday, November 13, 2012, 9:00 AM–6:00 PM

Longitudinal Peripheral Blood Lymphocyte Subsets Correlate with Decreased Disease Activity in Juvenile Dermatomyositis. Floranne C. Ermentrout1, Cynthia S. Crosswold, Consuelo Lopez de Padilla2, Molly Hein2, Abigail B. Green3 and Ann M. Reed2.1 Mayo Clinic Rochester, Rochester, MN, 2 Mayo Clinic, Rochester, MN

Background/Purpose: Perturbations in peripheral blood lymphocyte (PBL) subsets in juvenile dermatomyositis (JDM) are variably and inconsistently reported in active and inactive disease. Decreased PBL CD8+ T cells and increased CD4+ T cells, and CD19+ B cells have been correlated with disease activity in JDM. Increased numbers of CD56+ NK cells have been found in inflamed muscle of JDM patients. Untreated JDM patients have decreased levels of CD3-CD16-CD56- plasmacytoid dendritic cells (pDCs) cells negatively correlated with change in muscle VAS (p=0.08). The change in the percentage of CD16+CD56+ mDCs was positively correlated with the change in extramuscular VAS (p=0.08) and global VAS (p=0.08). The change in the percentage of CD16+CD56+ NK cells and of HLA-DR+ CD86+ mDCs was positively correlated with the change in extramuscular VAS (p=0.08, and p=0.09, respectively). In addition, the change in percentage of CD16+ CD56- NK cells was inversely correlated to the change in global VAS (p=0.09).

Results: The mean age was 9.5 (min: 3, max: 19) years and 15 (63%) were female. The figure shows significant correlations between the change in VAS scores between visits and change in percentage of lymphocyte subsets. The change in the percentage of CD3+ CD69+ T cells was positively correlated with the change in global VAS (p=0.037). The change in the percentage of HLA-DR+ CD11c+ myeloid dendritic cells (mDCs) was positively correlated with change in extramuscular VAS (p=0.040). The change in the percentage of HLA-DR+ CD123+ plasmacytoid dendritic cells (pDCs) cells negatively correlated with change in muscle VAS (p=0.028). Although the results did not reach statistical significance, some trends were noted. The change in the percentage of HLA-DR+ CD11c+ mDCs was positively correlated to the change in muscle VAS (p=0.08) and global VAS (p=0.08). The change in the percentage of CD16+CD56+ NK cells and of HLA-DR+ CD86+ mDCs was positively correlated with the change in extramuscular VAS (p=0.08, and p=0.09, respectively). In addition, the change in percentage of CD16+ CD56- NK cells was inversely correlated to the change in global VAS (p=0.09).

Conclusion: This is the first prospective study in JDM patients to identify the relationship of disease activity with PBL subsets: CD3+ CD69+ T cells, HLA-DR+ CD11c+ mDCs, and HLA-DR+ CD123+ pDCs. Additionally, our findings suggest that NK cells do not correlate with disease activity level in JDM. There is a trend toward decreased levels of CD3+CD16+CD56- NK cells with decreased extramuscular vascular, and increased CD 16+CD56- NK cells with decreased global VAS.

Disclosure: F. C. Ermentrout; None; C. S. Crosswold, None; C. Lopez de Padilla, None; M. Hein, None; A. B. Green, None; A. M. Reed, None.

The human leukocyte antigen DRB1*13:02-DQBI*06:04-DPBI*04:01 haplotype is inclusively associated with dermatomyositis patients with Anti-CADM-140 (melanoma differentiation-associated protein 5: MDA5) Antibody. Yuji Hosono, Chiaki Terno, Ran Nakashima, Yoshitaka Imura, Naohiro Yurawa, Hajime Yoshifujii, Motomu Hashimoto, Koichiro Ohmura, Takao Fujii and Tsuneo Mimori. 1Graduate School of Medicine, Kyoto University, Kyoto, Japan, 2Kyoto University, Kyoto, Japan

Background/Purpose: Recent studies have revealed that anti-CADM-140 (MDA5/IFIH1)-antibody positive dermatomyositis (DM) patients frequently develop acute or subacute progressive interstitial pneumonia (A(S)IP) with poor prognosis. However, genetic background of anti-CADM-140-antibody positive DM is currently unclear. Here, we intended to analyze the relationship between specific human leukocyte antigen (HLA) alleles in anti-CADM-140-positive DM patients.

Methods: Anti-CADM-140-antibody positive DM patients (CADMs, N=20) and healthy controls (HCs, N=2972) were enrolled in this study.
Autoantibodies were screened using immunoprecipitation with [32P]methionine-labelled HeLa cells. HLA class I (A, B, and C) and class II (DRB1, DQA1, DQB1, and DPB1) genotyping was carried out with a high-throughput, high-resolution genotyping method (WAKFLOW WAKUNAGA) by combining PCR and sequence-specific oligonucleotide probe protocols with the Luminex 100 XMAP flow cytometry dual-laser system to quantify fluorescently labelled oligonucleotides attached to colour-coded microbeads. Allele frequency was compared between CADMs and HCs by chi-square test or Fisher’s exact test. Haplotypes with frequency more than 10% in CADMs were analyzed for comparison between CADMs and HCs with chi-square test.

Results: No specific HLA class I alleles show significant associations with CADMs. CADMs demonstrated higher allele frequencies of DRB1*1302 (15% vs 5.5%; with OR = 2.3 (95%CI 1.05–5.05), DRB1*0604 (12.5% vs 5.5%; with OR = 2.5P = 0.0114), and DBP1*0401 (12.5% vs 5G with OR = 2.5P = 0.03469) than HCs. However, no specific HLA alleles reached a significant difference between CADMs and HCs due to lack of power. The observed distribution of HLA class II alleles among patients and controls suggested the notion that specific combinations of alleles at the DRB1, DQB1, and DPB1 loci are associated with the risk for CADMs. Haplotype analysis showed the frequency of the haplotype DRB1*13:02-DQB1*06:04-DPB1*04:01 was higher in CADMs than HCs (12.5% vs 3.6%; OR 3.79, 95%CI 1.47–9.76, P = 0.0030).

Conclusion: HLA-DRB1*13:02-DQB1*06:04-DPB1*04:01 haplotype is closely associated with CADMs, suggesting that the production of anti-CADM-140 may be associated with a certain immunogenetic background.

Disclosure: Y. Hosono, None; C. Terao, None; R. Nakashima, None; Y. Imura, None; N. Yukawa, None; H. Yoshifjui, None; M. Hashimoto, None; K. Ohmura, None; M. Fujii, None; K. Mimori, Medical & Biological Laboratories Co., Ltd., 2 Medical & Biological Laboratories, Co., Ltd., 8.

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HLA-DRB1*0101/*0405 Is Associated with Susceptibility to Anti-MDA5 Antibody-Positive Dermatomyositis in the Japanese Population. Takahisa Gono1, Yashitaka Imura2, Miinae Seto3, Akihiro Murakami3, Yuji Hosono3, Kizuku Watanabe3, Tomohiro Handa3, Michiaki Mishima3, Michito Hirakata3, Tsutomu Takeuchi3, Keishi Fujio4, Kazuhiko Yamamoto4, Hitoshi Koshaska4, Yoshinari Takanashii5, Hanaoka K. Ohmura4, Y. Imura2, None; H. Yoshifjui, None; M. Hashimoto, None; K. Ohmura, None; M. Fujii, None; K. Mimori, Medical & Biological Laboratories Co., Ltd., Ina, Japan, 3 Department of Respiratory Medicine, Graduate School of Medicine, Kyoto University, Kyoto, Japan, 4 Graduate School of Medicine, Kyoto University, Tokyo, Japan, 5 Keio University School of Medicine, Tokyo, Japan, 6 Keio University School of Medicine, Tokyo, Japan, 7 Graduate school of Medicine, The University of Tokyo, Tokyo, Japan, 8 Graduate School of Medicine, The University of Tokyo, Tokyo, Japan, 9 Keio University School of Medicine, Tokyo, Japan, 10 Keio University School of Medicine, Tokyo, Japan, 11 Hamamatsu University School of Medicine, Hamamatsu, Japan, 12 Department of Respiratory Medicine, Tohoku University Graduate School of Medicine, Sendai, Japan

Background/Purpose: The complication of interstitial lung disease (ILD) is associated with the anti-aminoacyl tRNA synthetase antibody (ARS) ab or anti-ARS ab-positive DM (ARS-DM). Anti-ARS ab (ARS) are the most frequent myositis-specific antibodies and they are useful in the diagnosis and management of polymyositis (PM) and dermatomyositis (DM) and interstitial pneumonia (IP). However, routine detection of all of them at once is not available. We developed an enzyme-linked immunosorbent assay (ELISA) system using a mixture of recombinant ARS antigens to detect them easily and simultaneously. We tested the usefulness of this system for diagnosing PM/DM and IP in the multiclass study.

Methods: We prepared recombinant ARS antigens; GST-Jo-1, His-PL-12, His-EJ and GST-KS expressed in Escherichia coli, and His-PL-7 and His-OJ expressed in Hi-5 cells. After confirming antigenic activity of all the recombinant proteins except His-OJ, using immunoblotting or ELISA, we made the ELISA system mixing the five recombinant ARS antigens. Efficiency was confirmed using the sera from 549 Japanese patients with various connective tissue diseases (PM/DM 273, systemic lupus erythematosus (SLE) 91, systemic sclerosis (SSc) 70, rheumatoid arthritis (RA) 75, Sjögren’s syndrome (SS) 27 and other diseases 13). 170 idiopathic IP (IP) and 30 healthy controls collected from 8 institutes. IIP was classified into two groups according to the radiologic pattern, usual interstitial pneumonia (UIP) (n = 36) and non-UIP (n = 112). Results were compared with those of the standard RNA immunoprecipitation assay.

Results: All of the ELISA results were consistent with those of the immunoprecipitation assay, except for one false-positive sample. Sensitivity and specificity were 100% and 99.8%, respectively when compared with the RNA immunoprecipitation. Anti-ARS antibodies were detected in 34.8% of PM/DM, 2.2% of SLE, 2.9% of SSc, 4% of RA, 0% of SS and 10.6% of IIP. None of the healthy controls were positive for anti-ARS antibodies. The frequency of each anti-ARS antibodies was compatible with previous reports. Anti-ARS-positive PM/DM patients had IP much more frequently than anti-ARS-negative PM/DM patients (87.3% vs. 48.6% respectively, P < 0.001). IIP, anti-ARS-positive antibody were positive in 5.6% of UIP and 12.1% of non-UIP. Anti-ARS-positive IIP patients were younger and more frequently treated with corticosteroids and/or immunosuppressants than anti-ARS-negative patients.
Conclusion: A newly established anti-ARS ELISA system detected anti-ARS antibodies as efficiently as RNA immunoprecipitation. This system will enable the easier and wider detection of anti-ARS antibodies in patients with PM/DM and IP in daily practice.

Disclosure: R. Nakashima, None; Y. Imura, None; M. Seto, Medical & Biological Laboratories, Co., Ltd.; 3; A. Murakami, Medical & Biological Laboratories, Co., Ltd.; 3; Y. Hosono, None; K. Watanabe, None; T. HANDA, None; M. Mishima, None; M. Hiraoka, None; T. Takeuchi, None; K. FUJO, None; K. Yamamoto, None; H. KOSAKA, Chugai Pharma, Ajinomoto Pharma & Teijin Parma, 5; Y. TAKIKASHI, None; N. Enomoto, None; K. CHIDA, None; T. NUKIWA, None; T. MILMORI, Medical & Biological Laboratories, Co., Ltd.; 2, Medical & Biological Laboratories, Co., Ltd., 8.

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Overexpression of Ankyrin Repeat Domain Containing Protein 1 Gene (ANKRD1) in Dermatomyositis Muscle Biopsies Is Correlated to Hypoxia and Perifascicular Atrophy

Background/Purpose: ANKRD1 codes for ankyrin repeat domain containing protein 1, which belongs to the muscle ankyrin repeat protein family involved in a mechano-signaling pathway that links myofibrillar stress response to muscle gene expression. In addition, ANKRD1 has an important role in transcriptional regulation, myofibrillar assembly, cardiogenesis, myogenesis, and angiogenesis. Therefore, we analyzed ANKRD1 expression in muscle biopsies of DM patients and correlated with other hypoxia parameters.

Methods: RNA was extracted from frozen muscle biopsies samples of 30 untreated adult DM patients (Bohan and Peter’s criteria, 1975). As a control group, we analyzed 20 muscle biopsies with no histological change from untreated adult patients with non-inflammatory myopathy diseases. The gene coding for hypoxia-inducible factor 1, alpha subunit (HIF1A) was analyzed to estimate hypoxia degree. The ANKRD1 and HIF1A transcript expression levels were determined by quantitative real time PCR using Sybr Green method. Perifascicular atrophy was analyzed histologically by semi-quantitative method of HE stained biopsies. Expression and localization of ANKRD1 and HIF1A in muscle biopsies was accessed by immunohistochemistry.

Results: Higher ANKRD1 and HIF1A expressions levels were observed in DM relative to control group (p<0.001 and p<0.001). In addition, the expression levels of both genes were correlated (r=0.703, P=0.0001). We also observed a positive correlation of both genes to perifascicular atrophy (r=0.420, p=0.023 and r=0.404, p=0.030, respectively). However, ANKRD1 and HIF1A expression levels did not correlate to demographic, clinical and laboratory features (p>0.05). Immunohistochemistry showed that ANKRD1 and HIF1A were expressed mainly by atrophic muscle cells.

Conclusion: Our results demonstrated ANKRD1 is overexpressed, correlated to HIF1A in perifascicular atrophic fibers of DM muscle specimens. ANKRD1 involvement in myogenesis and angiogenesis mechanism will be further investigated.

Disclosure: S. K. SHINJO, Federcro Foundation, 2; S. M. OBA-SHINJO, None; M. UNO, None; S. K. N. MARIE, None.

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A Comprehensive Study of Novel Serum Markers of ILD Associated with Inflammatory Myopathies

Background/Purpose: To investigate and compare the association between serum markers and Interstitial Lung Disease (ILD) in patients with connective tissue diseases at this hospital. Of them, 62 patients had PM/DM, 39 had systemic lupus erythematosus (SLE), 31 had rheumatoid arthritis (RA), 21 had Sjögren’s syndrome (SjS), 12 had progressive systemic sclerosis (SSc), 11 had mixed connective tissue disease (MCTD), 7 had vasculitis syndrome, 5 had Behçet’s disease, 4 had adult-onset Still’s disease, and 5 had other diseases. Determination of anti-ARS antibodies was carried out using Mysitis Profile 3 Euroline Blot Test Kit commercially available from EUROMUN (Lubeck, Germany), in accordance with the manufacturer’s instructions. For each clinical entity concerned, anti-ARS antibody positivity rate, antinuclear antibody staining pattern, the presence/absence of concurrent interstitial pneumonia (IP), and dose level of the corticosteroids or immunosuppressants used were assessed.

Results: Anti-ARS antibodies were detected with a significantly higher frequency among PM/DM patients with concurrent IP. Positivity for anti-ARS antibodies was observed even among RA patients with clinical signs of IP. Patients with PM/DM in whom cytoplasmic stain with antinuclear antibody was evident were frequently positive for anti-ARS antibodies other than anti-Jo-1 antibody even if they had negative results for this autoantibody. In patients negative for cytoplasmic staining, however, no other anti-ARS antibodies were detected. In patients with PM/DM complicated by IP positive for anti-ARS antibodies, the dosage of corticosteroids and percentage of patients receiving immunosuppressant therapy tended to be higher as compared with those negative for anti-ARS antibodies.

Conclusion: The present data suggest that the determination of serum anti-ARS antibody levels is clinically useful even in patients with IP-complicated connective tissue disease other than PM/DM. A strong association of the antinuclear antibodies with pulmonary lesions was noted particularly in RA patients. The results also suggest that determination of serum anti-ARS antibody levels may be less necessary in myositis patients showing no positive cytoplasmic staining in the antinuclear antibody test using HEp-2.

Disclosure: M. MATSUSHITA, None; T. KAWAMOTO, None; K. YAMAJI, None; N. TAMURA, None; Y. TAKASAKI, None.
Increased Levels of Eotaxin and MCP-1 in Juvenile Dermatomyositis

Median 17 Years After Diagnosis; Associations with Disease Activity, Duration and Organ Damage. Helga Sanner1, Thomas Schwartz2, Berit Flato3, Maria Vistnes3, Geir Christensen1 and Ivar Sjøastad1. 1 Oslo University Hospital, Oslo, Norway; 2University of Oslo, Oslo, Norway

**Background/Purpose:** Juvenile dermatomyositis (JDM) is a systemic vasculopathic disease of childhood affecting skeletal muscle, skin and other organs. Increased abundance of pro-inflammatory cytokines has been shown in JDM patients in the active phase of the disease. We now wanted to compare cytokine profiles in JDM patients after medium to long-term follow-up with matched controls, and to examine associations between cytokine levels and disease activity, disease duration and organ damage in JDM.

**Methods:** Inclusion criteria were a probable or definitive diagnosis of Dermatomyositis (DM) according to the Bohan/Peter criteria for DM, disease onset before 18 years and minimum 24 months disease duration. A retrospective inception cohort of JDM patients was established; 54 patients were clinically examined median 16.8 years (range 2–38 years) after disease onset and compared with 54 age- and sex-matched controls (randomly drawn from the Norwegian population register). Concentrations of 26 cytokines in plasma were quantified by Luminex technology or ELISA. In patients, disease activity score (DAS), myositis damage index (MDI) and other disease parameters were collected by clinical examination (at follow-up) or chart review (from one year post-diagnosis).

**Results:** Serum levels of eotaxin, monocyte chemotactic protein 1 (MCP-1) and interferon inducible protein 10 (IP-10) were higher in JDM patients compared to controls (31.5%, 37.2% and 43.2%, respectively, all P < 0.05). Levels of eotaxin and MCP-1 correlated with disease duration (r= 0.47 and r= 0.64, both P < 0.001) and age in patients, but not with age in controls. MCP-1 levels were associated with MDI, DAS, physical health and cumulative prednisolone dose at follow-up (standardized β = 0.43, 0.29, 0.28 and 0.33 respectively, all P < 0.020), after adjusting for disease duration and sex in a multivariate linear regression model. High MDI 1 year post-diagnosis predicted high levels of eotaxin and MCP-1 at follow-up (standardized β = 0.24 and β = 0.29, both P < 0.05) after adjusting for disease duration and sex.

**Conclusion:** Patients with JDM had higher eotaxin, MCP-1 and IP-10 levels than controls after median 17 years follow-up. High eotaxin and MCP-1 was predicted by early disease parameters and MCP-1 was associated with disease activity and damage at follow-up. It is not clear whether eotaxin and MCP-1 per se cause sustained inflammation; they might also be markers for disease damage as a result of disease activity caused by other unknown mechanisms. Either way, the novel knowledge on these substances can improve insight and treatment modalities of JDM.

Disclosure: H. Sanner, None; T. Schwartz, None; B. Flato, None; M. Vistnes, None; G. Christensen, None; I. Sjøastad, None.

**1943**

Autophagy Expressions Were Decreased in Circulating T Cells in Inflammatory Myopathies Patients. Fang Chen, Xiaoming Shu, Xin Lu and Guochun Wang. China-Japan Friendship Hospital, Beijing, China

**Background/Purpose:** The autophagy in circulating lymphocytes in IIM patients has not been clarified yet. Our research is aimed to study the autophagy in circulating T cells in IIM patients and to explore the possible role of aberrant autophagy contributing to the pathogenesis of IIM.

**Methods:** circulating T cells were isolated from 27 IIM patients and 19 normal controls. The expressions of protein and mRNA level of autophagy-related molecules (LC3, Beclin1) were examined by western blot and quantitative PCR. Transmission electron microscope was applied to detect the formation of autophagosome in circulating T cells.

**Results:** The formation of autophagosome in circulating T cells of IIM patients was decreased than those of normal controls (P<0.01). The expression of LC3 and Beclin 1 proteins and mRNA level in circulating T cells of IIM patients (Beclin protein: 0.34±0.08; LC3 protein: 0.08±0.03; Beclin mRNA: 0.014±0.07; LC3 mRNA: 0.11±0.046) were both significantly lower in IIM patients than those in healthy controls (Beclin protein: 0.52±0.13; LC3 protein: 0.13±0.05; Beclin mRNA: 0.021±0.01; LC3 mRNA: 0.17±0.095) (all p<0.05).

**Conclusion:** Autophagy expression was decreased in circulating T cells in IIM patients. Further study is needed to explore the possible role of aberrant autophagy contributing to the pathogenesis of IIM.

Disclosure: F. Chen, None; X. Shu, None; X. Lu, None; G. Wang, None.

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Expression of Human Leukocyte Antigen-G in Polymyositis or Dermatomyositis, Xiaolian Tian, Xiaoming Shu, Xin Lu, Qinglin Peng and Guochun Wang. China-Japan Friendship Hospital, Beijing, China

**Background/Purpose:** Human leukocyte antigen-G is a non-classical MHC-I molecule that may be involved in the pathogenesis of autoimmune diseases, but the significance of HLA-G in polymyositis/dermatomyositis (PM/DM) remains to be determined. The aim of this study was to determine HLA-G expression in patients with PM/DM.

**Methods:** Consecutive cryosections of muscle biopsies obtained from 30 PM/DM patients(22 DM, 8 PM) and 8 healthy controls were detected by immunohistochemical analysis. Serum soluble HLA-G (sHLA-G) levels of 96 patients (26 PM, 70 DM) and 35 matched healthy controls were measured by ELISA. The relationship between sHLA-G levels and clinical or laboratory variables in PM/DM patients was analyzed.

**Results:** HLA-G had a higher expression in 18 of 30 cases of PM/DM (60%) than that in 0 of 8 healthy controls (P = 0.000). Spearman rank correlation analysis showed serum sHLA-G levels were negatively correlated with CD3+T cells (r = 0.233, P = 0.047) and CD4+T cells (r = −0.287, P = 0.015) in peripheral blood in patients with PM/DM.

**Conclusion:** HLA-G was found to be highly expressed in muscle tissues and sera from patients with PM/DM. Serum sHLA-G is increased in PM/DM patients and is associated with lower level of CD3+ T cells and CD4+ T cells. These data support the notion that HLA-G overexpression has a role in the progression of PM/DM through T cells.

Disclosure: X. Tian, None; X. Shu, None; X. Lu, None; Q. Peng, None; G. Wang, None.

**1945**

Anti-Transcription Intermediary Factor 1-Gamma (TIF1-γ) Autoantibody Detection by ELISA and Immunoprecipitation in a Prospective Myositis Cohort: Predictive Value for Cancer Associated Myositis. Rohit Aggarwal, Noreen Fertig, Danielle Goudeau, Chad Stephans, Qi Zengbiao, Diane Koontz, Mary Lucas, Marc C. Levesque and Chester V. Oddis. University of Pittsburgh, Pittsburgh, PA

**Background/Purpose:** Myositis [particularly dermatomyositis (DM)] is associated with cancer and anti-transcription intermediary factor-1 gamma (TIF1-γ) is a serologic risk factor for cancer associated myositis (CAM). Anti-TIF1-γ detection by immunoprecipitation (IP) is costly, time-consuming and research-based. We used a validated anti-TIF1-γ ELISA to determine the frequency of this marker in a large prospective myositis cohort, to compare it with the identification of TIF1-γ by IP and to determine whether quantitative anti-TIF1-γ levels could identify CAM patients.

**Methods:** We analyzed a prospectively collected computer and serum database of adult myositis (n=856) patients to identify CAM patients with a non-skin (bursal/squamous cell) cancer within 3 years (CAM3) or 5 years (CAM5) (before or after) the myositis diagnosis. A control group of polymyositis (PM), DM and overlap myositis (OM) patients without CAM matched 2:1 by gender and age (+/-10 years) and with a minimum 5 year follow up was selected. Serum was assessed for anti-TIF1-γ by ELISA and IP.

**Results:** Using anti-TIF1-γ detection by IP as the gold standard, the ELISA had 91% sensitivity, 96% specificity, 93% positive predictive value (PPV) and 95% negative predictive value (NPV) for anti-TIF1-γ detection. There were 34 and 22 PM CAM5 and CAM3 cases (26F/8M), respectively, and 69 PM (53F/16M) controls, who were anti-TIF1-γ (−) by IP (n=32) and ELISA (n=22). Six OM CAM5 cases (4F/2M), 3 being CAM3, were also anti-TIF1-γ (−) by IP and ELISA (n=3) and 15 OM controls were anti-TIF1-γ (−) by IP and ELISA (n=14) except for 1 SSC-PM overlap patient. Of 45 CAM3 DM patients (31F/14M), 34 (24F/10M; mean age 58) had anti-TIF1-γ IP and ELISA testing along with 95 DM controls (59F/36M; mean age 47). Anti-TIF1-γ by IP was (+) in 47% CAM3 and 23% controls with...
Conclusion: This data indicates that transcriptional alterations in genes involved in muscle tissue structure are taking place during immunosuppressive treatment. The treatment down-regulates the muscle inflammation to some extent but the local milieu might be accountable for the preserved expression of inflammatory cells and mediators seen in treated PM/DM patients.

Disclosure: 1. M. Loell, None; Y. W. Chen, None; M. Korotkova, None; K. Nagaraju, None; I. E. Lundberg, None.

1947

Muscle Wasting in HTNFGt tg Mice, an Animal Model for Rheumatoid Arthritis, Due to Increased Cathepsin L and LC3B Expression. Martin Willburger1, Birgit Niederreiter1, Ewald Unger1, Josef S. Smolen1, Kurt Redlich1 and Silvia Hayer1. 1Medical University of Vienna, Vienna, Austria; 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria.

Background/Purpose: To investigate the impact of systemic inflammation on skeletal muscles in human tumor necrosis factor transgenic (hTNFGt) animals.

Methods: We isolated triceps surae, quadriceps, tibialis anterior as well as rectus abdominis muscles from hTNFGt animals at different time-points of disease starting at week 4 after birth. Muscle weight and body weight were assessed from these animals. Age and sex-matched wildtype (wt) animals served as controls. We performed quantitative real-time PCR for Cathepsin L, B, S, H, D, LC3-B, MMP-9 and Interleukin (IL)-1 and IL-6 from mRNA isolated from muscle tissues of hTNFGt and wt animals. Moreover, hTNFGt animals were treated for 5 days with anti-TNF ab (Infliximab) and anti-LC3B ab (Velinasa). Animals were killed either at week 6 or week 10 after birth. Muscle tissue sections were also stained for macrophages, neutrophils, T cells and B cells. Mobility of animals was assessed by video-analysis using Ethovision Software (from Noldus, The Netherlands). Functionality of triceps surae muscle was evaluated by electro-stimulation.

Results: We could demonstrate that hTNFGt mice significantly lost muscle weight when compared to sex- and age-matched wt animals. Reductions in muscle weight became already manifest at early stages of the disease, at week 4, and continuously progressed until week 16. Bodyweight was also significantly lower in hTNFGt animals compared to their wt littermates. Next, we found significantly increased mRNA expression levels of Cathepsin L, a lysosomal endopeptidase responsible for muscle protein degradation, in muscles from hTNFGt compared to their wt littermates. In contrast, other proteases such as cathepsin B, S, H, D did not significantly increased differ. In addition, we also found LC3B, an enzyme for autophagy-lysosome-mediated proteolysis, to be upregulated in hTNFGt mice compared to wt animals. Moreover, proinflammatory cytokines such as IL-1 and IL-6 were also significantly upregulated in muscles from hTNFGt mice. Interestingly, we observed an increased presence of macrophages and granulocytes in the muscle vascular system but no accumulation of inflammatory cells into the muscle tissue. We also investigated the rectus abdominis muscle, which is not located between inflamed articular joints, and found elevated levels of Cathepsin L and LC3B in this muscle, indicating that hTNFGt mice suffer from a systemic muscle proteolysis due to systemic inflammation. In addition, functionality of muscles was impaired as observed by markedly reduced maximal strength and faster fatigue in triceps surae from hTNFGt mice compared to wt animals. Remarkably, mobility of hTNFGt animals was already significantly reduced at week 6 indicating reduced use of muscles at early stage of TNF driven disease. TNF blockade at both early and late time points could completely rescue mobility to wildtype levels, whereas muscle atrophy could not be prevented by treatment at late stage of arthritis.

Conclusion: Despite spontaneous development of chronic inflammatory, erosive arthritis, chronic overexpression of TNF leads to skeletal muscle atrophy due to increased tissue-degrading cathepsin L and LC3B and reduced mobility starting at early phase of arthritis disease in hTNFGt animals.

Disclosure: M. Willburger, None; B. Niederreiter, None; E. Unger, None; J. S. Smolen, None; K. Redlich, None; S. Hayer, None.
Decreased C4A Gene Copy Numbers in Children with Juvenile Dermatomyositis: Association with Decreased C4 Protein and Lower Absolute Number of CD3 Negative CD16+56+ Natural Killer Cells. Lauren M. Pachman1, Katherine E. Lintner1, Yee Ling Wu1, Lori J. Ferguson2, Gabrielle A. Morgan3, Chi-Ching Huang4, and C. Yung Yu4. 1Division of Pediatric Rheumatology, Northwestern University Feinberg School of Medicine, Chicago, IL, 2The Research Institute at Nationwide Children’s Hospital and The Ohio State University, Columbus, OH, 3Children’s Hospital of Chicago Research Center, Cure JM Myositis Center, Chicago, IL, 4Department of Preventive Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL.

Background/Purpose: Juvenile Dermatomyositis (JDM), a systemic vasculopathy, is member of the family of autoimmune diseases. In 56% of untreated JDM, a decrease in the absolute number of natural killer cells reflects immune activation and increased disease activity. JDM is also associated with B*08, DRB1*03, DQA1*0301, C4B1, C4AQ0 (null), and TIF1-308A polymorphism, in linkage disequilibrium on chromosome 6. In the families of children with JDM, there is a significant increase in the history of systemic lupus erythematosus (SLE). Patients with SLE, have an overrepresentation of C4A null alleles, with associated decreased levels of the C4 protein. The frequency of C4A deficiency in children with JDM is unknown.

Objective: To determine the association of C4 protein and other clinical parameters with C4A gene copy number in JDM.

Methods: A cross-sectional cohort of children, n=91, with definite/probable JDM (overlap syndromes excluded) were enrolled (IRB# 2008–H9253). There were 78% (71/91) girls, 96.7% (88/91) White, mean age of 5.06 yrs, and 35% (32/91) were untreated at time of first visit. Genomic DNA was assessed for gene copy number (GCN) for total C4, C4A and C4B by real time qPCR; EDTA-plasma was used to determine C4A and C4B polymorphisms and validate genotype data. Data for C4 protein concentrations, disease activity scores (DAS) for skin involvement and muscle weakness were obtained, along with nailfold capillary end row loop number, and absolute cell count of CD3negative, CD56/16 positive natural killer (NK) cells at time of first visit. NHANES normative data obtained from 523 subjects for C4A gene copy number were used as a comparator.

Results: Patients with JDM have lower C4A GCN than the general population (30% vs. 17% with 0–1 copy, p=0.009, Chi-square test). The level of C4A protein was significantly associated with the C4A total gene copy number, p<0.001; the C4 protein levels increases by 3.61 unit/year C4 copy number. The C4 protein concentration was not significantly associated with any of the following: nailfold capillary end row loop number, DAS skin or DAS muscle. However, there was a significant association of the C4A GCN with the absolute number of circulating CD3negative NK cells in JDM (p=0.02).

Conclusion: Children with JDM have decreased levels of C4 protein as a function of significantly decreased GCN of C4. Although the decreased C4 was not associated with nailfold capillary end row loop numbers, or clinical disease activity markers, the C4A GCN appeared to be associated with the absolute levels of circulating NK cells, suggesting a locus of control on chromosome 6. We speculate that the decrease in C4 as a consequence of C4A GCN may contribute to the pathogenic mechanisms of damage in JDM.

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Antit-TIF1-γ antibody ELISA Development and Validation. Rohit Aggarwal, Chester V. Oddis, Noreen Fertig, Danielle Goudeau, Diane Koontz, Chad Stephens, Zengbiao Qiu and Marc C. Levesque. University of Pittsburgh, Pittsburgh, PA

Background/Purpose: Anti-transcription intermediary factor 1-gamma (TIF1-γ) autoantibody is disease-specific for myositis and identifies a subset of dermatomyositis patients at risk of cancer. Currently non-quantitative immunoprecipitation (IP) is used to identify anti-TIF1-γ. IP has several limitations and development of a quantitative ELISA would improve anti-TIF1-γ detection, especially for cancer screening in myositis. Our aim was to develop and validate a quantitative anti-TIF1-γ ELISA.

Methods: The ELISA utilizes recombinant purified full length human TIF1-γ (Origene Technologies, Rockville MD) coated on the solid surface of a high-binding ELISA plate (Costar, Corning, NY). Patient serum (dilution 1:100) was incubated with TIF1-γ coated ELISA plates and a horseradish peroxidase conjugated secondary antibody that binds human IgG detected anti-TIF1-γ binding. 3′,5′-tetramethylbenzidine was the horseradish peroxidase enzyme substrate, and the optical density of the resulting chromagen was measured. Units/ml of anti-TIF1-γ were determined using a standard serum sample. Values below the detection range (< 4 U/ml) were considered negative and were assigned a value of 2.

Results: We identified 55 myositis patients with anti-TIF1-γ by IP and 111 myositis patients without anti-TIF1-γ from our connective tissue disease database. Anti-TIF1-γ positivity by ELISA significantly correlated with IP results (p<0.001) with strong agreement between both methods (kappa 0.867). Median (IQR) anti-TIF1-γ levels in patients with (+) and (−) anti-TIF1-γ IP results was 42 (16–95) and 2 (2–2) units/ml, respectively (p<0.001) (figure 1). The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), ROC curve and area under the curve (AUC) were evaluated. Mann-Whitney tests were used to compare levels of anti-TIF1-γ. Agreement between ELISA and IP was tested. Test-retest reliability was measured. Myositis patients with positive and negative anti-TIF1-γ by IP and non-myositis patients (scleroderma, lupus and RA) and healthy samples were analyzed.

Conclusion: We developed a quantitative ELISA for detecting anti-TIF1-γ autoantibodies and validated the assay using serum samples from patients with myositis and other autoimmune disorders. The anti-TIF1-γ ELISA is simple, sensitive and highly specific. The availability of a validated, quantitative ELISA should improve the detection of anti-TIF1-γ antibodies in myositis and malignancies in these patients.

Disclosure: R. Aggarwal, None; C. V. Oddis, Genentech and Biogen IDEC Inc.; N. Fertig, None; D. Goudeau, None; D. Koontz, None; C. Stephens, None; Z. Qiu, None; M. C. Levesque, None.
Background/Purpose: Anti-signal recognition particle (SRP) autoAb identifies a myositis subset with a necrotizing myopathy and poor prognosis. Currently, immunoprecipitation (IP) is used to identify anti-SRP. Our aim was to develop and validate a quantitative anti-SRP ELISA to streamline anti-SRP detection.

Methods: The anti-SRP ELISA utilized recombinant purified full length human SRP54 (DiaRect AG product number 18401) coated on a high-binding ELISA plate (Costar, Corning, NY). Patient (pt) serum (dilution ≥ 1:100) was incubated with ELISA plates and a horseradish peroxidase conjugated secondary antibody that binds human IgG quantified anti-SRP binding. Units/ml of anti-SRP were determined using a standard serum sample. Values below the detection range (<4 U/ml) were considered (−) and assigned a value = 2. Values >128 U/ml were assigned a value = 128. Assay validation utilized IP as the gold standard. The following test characteristics were evaluated: sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, ROC curve and sensitivity analysis, and area under the curve (AUC). Mann-Whitney tests compared anti-SRP levels and kappa statistics tested agreement between ELISA and IP. Controls included a) anti-SRP (+) and (−) myositis pts by IP, b) scleroderma (SSc) and lupus pts, and c) other SRP (−) necrotizing myopathy pts. Serial samples from 7 SRP (+) pts by IP were also tested.

Results: We identified 26 SRP (+) myositis pts by IP. 77 SRP (−) myositis pts by IP were evaluated as controls (including 37 pts with necrotizing myopathy). Non-myositis control pts included SLE (n=4) and SSc (n=7). Anti-SRP positivity by ELISA correlated with IP results (p<0.001) with strong agreement between both methods (kappa 0.94). Median (IQR) anti-SRP levels in pts with (+) and (−) anti-SRP by IP was 113.3 (15.6–128) and 2 (2–2) units/ml, respectively (p<0.001). The sensitivity, specificity, PPV, NPV and accuracy of the ELISA was 88%, 100%, 100%, 96% and 97%, respectively. The AUC of a ROC curve was 0.94. Serial samples showed that anti-SRP levels decreased consistent with clinical improvement in 3 pts, were unchanged at low levels in 2 pts with stable disease, and increased in 1 pt with a myositis flare. Inter-assay coefficient of variance (CV) was 23%.

Conclusion: We developed a quantitative ELISA for anti-SRP autoAbs, validating the assay in myositis and other rheumatic disease pts including a group of SRP (−) necrotizing myopathy pts. The ELISA is simple to perform, sensitive and highly specific. The availability of a validated, quantitative, easy to perform ELISA should improve anti-SRP autoAb detection in myositis pts facilitating early identification of pts with a refractory necrotizing myopathy necessitating aggressive therapy.

Disclosure: R. Aggarwal, None; C. V. Oddis, Genentech and Biogen IDEC Inc., 9; D. Goudeau, None; C. Stephan, None; N. Fertig, None; Q. Zengbiao, None; D. Koontz, None; M. C. Levesque, None.

1951
Elevated Level of Tumor Necrosis Factor-Like Weak Inducer of Apoptosis in Patients with Polymyositis or Dermatomyositis.

Background/Purpose: TNF-like weak inducer of apoptosis (TWEAK), a member of the tumor necrosis factor (TNF) family, has emerged as a cytokine that regulates multiple cellular responses, including proinflammatory activity, angiogenesis and cell proliferation. Increased levels of TWEAK were observed in many types of autoimmune diseases, such as rheumatoid arthritis, multiple sclerosis, and systemic lupus erythematosus. However, information about TWEAK in polymyositis and dermatomyositis is limited. The aim of the present study was to investigate the expression of TWEAK in patients with polymyositis and dermatomyositis.

Methods: Twenty four patients with polymyositis, twenty two dermatomyositis patients and twenty four healthy controls were recruited in the study. Serum levels of TWEAK were measured by ELISA. TWEAK messenger RNA (mRNA) expression in skeletal muscle from 19 out of 46 PM/DM patients and 11 healthy controls was detected by relative quantification RT-PCR. The results of two groups were compared using unpaired t test.

Results: Serum levels of TWEAK in PM/DM patients were significantly higher compared to healthy controls [(555.34±124.05) pg/ml vs (346.22±146.29) pg/ml, P<0.05]. However, there was no statistically significant difference between PM patients and DM patients [(533.34±119.67) pg/ml vs (579.25±127.06pg/ml, P>0.05). TWEAK mRNA in skeletal muscle showed a higher level in skeletal muscle of PM/DM patients than healthy controls, using GAPDH gene as reference gene.

Conclusion: The present study shows that serum levels and mRNA expression of TWEAK were elevated in patients PM/DM. TWEAK may possibly be enrolled in pathogenesis of PM/DM.

Disclosure: Q. Peng, None; X. Lu, None; N. Zu, None; L. Zhang, None; G. Wang, None.

1952
The Effect of CXCL10 Blockade in C Protein-Induced Myositis.

Background/Purpose: CXCL10 (also called interferon-γ-inducible protein 10 [IP-10]) is a chemokine that plays a critical role in the infiltration of T cell in autoimmune disease such as RA and SLE. CXCL10 is reported to be expressed in muscle tissue of polymyositis, thus we investigated the role of CXCL10 and the effect of CXCL10 blockade in C protein-induced myositis, an animal model of polymyositis.

Methods: C protein-induced myositis model was induced with human skeletal C protein fragment in 8-week-old female C57BL/6 mice. Immunohistochemistry was performed to detect CXCL10 and CXCR3, its receptor in muscle tissue. CXCR3 in mouse spleenocyte was investigated by flow cytometry. Migration assay of mouse spleenocyte was performed with 5 μm pore transwell system. Mice with C protein-induced myositis were treated with anti-CXCL10 antibody or control IgG 8 days after the induction of myositis and the inflammation in muscle tissue was assessed 3 week after the induction.

None.
**Results:** Immunohistochemistry showed the expression of CXCL10 and CXCR3 in the muscle of C protein-induced myositis. Flow cytometry demonstrated increased CXCR3+CD4+ T cells (normal mice, 14.14% ± 1.09% vs. C protein-induced myositis, 37.50% ± 5.63%) and CXCR3+CD8+ T cells (normal mice, 35.55% ± 2.41% vs. C protein-induced myositis, 79.00% ± 0.89%) in C protein-induced myositis. Migration of splenocyte was increased in response to CXCL10 (chemotactic index = 1.91 ± 0.45). Treatment with anti-CXCL10 antibody (n = 10) showed lower inflammation score in muscles than treatment with control (lg = 10; median [range], anti-IP-10, 0.75 [0.25–2.00] vs. control IgG, 1.43 [1.125–4.25], p = 0.045).

**Conclusion:** CXCL10 was expressed in the inflammation of C protein-induced myositis model and its blockade suppressed inflammation in muscle.

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## 1953

**Antibodies to NXP-2 and Transcriptional Intermediary Factor-Gamma Identification Patients with Cancer-Associated Dermatomyositis**

Fiorentino1, Lisa Christopher-Stine2, Lorinda Chung3, Bharathi Lingala4, Andrew L. Mammen5, Antony Rosen6 and Livia Casciola-Rosen2. 1Stanford University School of Medicine, Redwood City, CA, 2Stanford Univ Medical Center, Palo Alto, CA, 3Stanford University, Redwood City, CA, 4Johns Hopkins, Baltimore, MD, 5Johns Hopkins, Baltimore, MD, 6The Johns Hopkins University, Baltimore, MD.

**Background/Purpose:** Dermatomyositis (DM) is known to be associated with internal malignancy, and identifying patients at high risk is a high priority. Recently, several groups have shown that patients with circulating autoantibodies directed against transcriptional intermediary factor (TIF) isoforms are at increased risk of malignancy. In these studies, anti-TIF antibody positive patients were identified by immunoprecipitation of 140 kD and/or 155 kD proteins from radiolabeled cell lysates. However, this methodology can have suboptimal sensitivity and specificity. This might explain why the sensitivity and specificity of such assays for detecting those patients with cancer-associated DM varies widely in the literature. We wished to use novel sensitive assays to test if anti-TIF-g (or other) autoantibodies were associated with malignancy.

**Methods:** We designed, optimized and validated novel, sensitive, and highly specific assays to detect antibodies, including those against TIF-g and NXP-2. To detect TIF-g antibodies, HeLa cells were transiently transfected with the appropriate cDNA, resulting in expression levels 33–62 fold above endogenous levels. Immunoprecipitations were performed using these transfected lysates, electrophoresed on SDS-polyacrylamide gels, transferred to nitrocellulose and immunoblotted with an anti-TIF-g monoclonal antibody. NXP-2 antibodies were assayed by immunoprecipitation using 35S-methionine labeled NXP-2 generated by in vitro transcription-translation as source material. Patient sera from a large DM cohort at the Stanford University Dermatology Outpatient Clinic (n = 111) were tested for antibodies against TIF-g and NXP-2 using these assays. In order to maximize stringency and clinical utility, we compared the features of patients with a specific autoantibody to those without the antibody (as opposed to those with another antibody). Dichotomous variables were evaluated using Fisher exact tests. We used unpaired t tests (two-tailed) to evaluate differences between continuous variables.

**Results:** Antibodies to TIF-g and NXP-2 were detected in 37% and 14% of patients, respectively. When compared to those without antibodies to TIF-g, anti-TIF-g patients were associated with female sex, positive ANA, absence of arthralgia, V sign, and difficulty with controlling skin inflammation. Antibodies to NXP-2 were associated with male sex, internal malignancy, malignancy cutis, absence of alopecia/ulceration/Gottron’s papules/elbow and knee rash, positive response to hydroxychloroquine, and satisfactory control of skin disease. In the non-amyopathic subgroup, patients with antibodies to TIF-g were significantly associated with lower maximal CK values than those without (488 vs 3467, respectively, p = 0.05).

**Conclusion:** Over 50% of our Stanford DM cohort can be typed by antibodies to either NXP-2 or TIF-g. NXP-2 antibodies are associated with cutis malignans, and a benign course of skin disease, while TIF-g antibodies are characterized by absence of arthralgia, V sign, relatively low CK values, and skin inflammation that is difficult to control.

Disclosure: D. Fiorentino, None; L. Chung, Gilead and Actelion; 5; L. Gilead, Actelion, Pfizer, United Therapeutics; 2; L. Zaba, None; B. Lingala, None; A. Rosen, None; L. Casciola-Rosen, None.

## 1954

**Immune Responses to NXP-2 and TIF-g Are Associated with Distinct Clinical Phenotypes and Prognosis for Skin Disease in Dermatomyositis Patients**

Fiorentino1, J., Lorinda Chung1, Lisa Zaba3, Bharathi Lingala1, Antony Rosen4, and Livia Casciola-Rosen5. Stanford University School of Medicine, Redwood City, CA, 2Stanford Univ Medical Center, Palo Alto, CA, 3Stanford University, Redwood City, CA, 4The Johns Hopkins University, Baltimore, MD, 5The Johns Hopkins University, Baltimore, MD.

**Background/Purpose:** Myositis-specific antibodies have been proposed as tools for disease classification as they are correlated with certain clinical and genetic features. Recently, two new DM-specific autoantibodies have been described—TIF-g and NXP-2. Detection of autoantibodies to these proteins has largely been assessed by immunoprecipitation from radiolabeled cell lysates, and thus may not have characterized the patients’ immune responses with maximal sensitivity and specificity. We hypothesized that development of sensitive assays for detection of these specificities would enable us to see different patterns of skin and systemic disease associated with these antibodies when applied prospectively to a large DM cohort.

**Methods:** We designed, optimized and validated novel, sensitive, and highly specific assays to detect antibodies against TIF-g and NXP-2. To detect TIF-g antibodies, HeLa cells were transiently transfected with the appropriate cDNA, resulting in expression levels 33–62 fold above endogenous levels. Immunoprecipitations were performed using these transfected lysates, electrophoresed on SDS-polyacrylamide gels, transferred to nitrocellulose and immunoblotted with an anti-TIF-g monoclonal antibody. NXP-2 antibodies were assayed by immunoprecipitation using 35S-methionine labeled NXP-2 generated by in vitro transcription-translation as source material. Patient sera from a large DM cohort at the Stanford University Dermatology Outpatient Clinic (n = 111) were tested for antibodies against TIF-g and NXP-2 using these assays. In order to maximize stringency and clinical utility, we compared the features of patients with a specific autoantibody to those without the antibody (as opposed to those with another antibody). Dichotomous variables were evaluated using Fisher exact tests. We used unpaired t tests (two-tailed) to evaluate differences between continuous variables.

**Results:** Antibodies to TIF-g and NXP-2 were detected in 37% and 14% of patients, respectively. When compared to those without antibodies to TIF-g, anti-TIF-g patients were associated with female sex, positive ANA, absence of arthralgia, V sign, and difficulty with controlling skin inflammation. Antibodies to NXP-2 were associated with male sex, internal malignancy, malignancy cutis, absence of alopecia/ulceration/Gottron’s papules/elbow and knee rash, positive response to hydroxychloroquine, and satisfactory control of skin disease. In the non-amyopathic subgroup, patients with antibodies to TIF-g were significantly associated with lower maximal CK values than those without (488 vs 3467, respectively, p = 0.05).

**Conclusion:** Over 50% of our Stanford DM cohort can be typed by antibodies to either NXP-2 or TIF-g. To detect TIF-g antibodies, HeLa cells were transiently transfected with the appropriate cDNA, resulting in expression levels 33–62 fold above endogenous levels. Immunoprecipitations were performed using these transfected lysates, electrophoresed on SDS-polyacrylamide gels, transferred to nitrocellulose and immunoblotted with an anti-TIF-g monoclonal antibody. NXP-2 antibodies were assayed by immunoprecipitation using 35S-methionine labeled NXP-2 generated by in vitro transcription-translation as source material. Patient sera from a large DM cohort at the Stanford University Dermatology Outpatient Clinic (n = 111) were tested for antibodies against TIF-g and NXP-2 using these assays. In order to maximize stringency and clinical utility, we compared the features of patients with a specific autoantibody to those without the antibody (as opposed to those with another antibody). Dichotomous variables were evaluated using Fisher exact tests. We used unpaired t tests (two-tailed) to evaluate differences between continuous variables.

Disclosure: D. Fiorentino, None; L. Chung, Gilead and Actelion; 5; Gilead, Actelion, Pfizer, United Therapeutics; 2; L. Zaba, None; B. Lingala, None; A. Rosen, None; L. Casciola-Rosen, None.

## 1955

**Is the Pattern of Capillary Deposition of Complement Membrane Attack COMPLEX Useful in the Differential Diagnosis of Inflammatory?**

Patrick Gordon1, Nuria Villagrá2, Istvan Bodí3, Andrew King3, Stefan Buk3, Tibor Hortobagyi4 and Safa Al-Sarraj1. 1Department of Rheumatology, King’s College London, London, United Kingdom, 2Department of Clinical Neuropathology, King’s College Hospital, London, United Kingdom.

**Background/Purpose:** Inflammatory myopathies are a heterogeneous group of diseases. We investigated if the location and pattern of deposition of complement membrane attack complex (MAC) can be used in the differential diagnosis of inflammatory myopathies.

**Methods:** We reviewed histological sections of 227 cases of muscle biopsies in which MAC was requested for diagnosis and analysed 145 cases with clear clinical and pathological diagnosis; 88 inflammatory myopathies, 31 muscular dystrophies and 26 controls. We reviewed the immunohistological evaluation of MAC, HLA Class I, CD4, CD8, CD3 and CD20 and together with the standard histological sections of the muscle biopsies.

**Results:** MAC deposition was demonstrated in 86.2% of dermatomyositis (DM), 86.5% of inclusion body myositis (IBM) and about 50% of patients with...
polymyositis (PM) and mixed connective tissue disease (MCTD). Most of the DM cases (55%) showed continuous solid and strong staining pattern in the capillary wall (pattern 1) with clear tendency of perifascicular depositions but with no sarcoclemmal labelling. Samples from muscles with IBM, PM and MCD showed lighter granular segmental staining (pattern 2) in the capillaries, which is frequently associated with frequent granular staining in sarcoclemmal of muscle fibres across the fascicile. About 31% of DM biopsies showed a mixture of patterns 1 and 2.

There were frequent granular and infrequent granular deposits in the capillaries in about 13% of muscular dystrophies and 11% in control cases. **Conclusion:** Pattern 1 deposition of MAC in capillaries appears to be more frequent in DM and could contribute to the diagnosis, in addition to other criteria. This pattern of deposition may indicate of primary humoral mechanism involving capillaries in DM. Pattern 2 deposition of MAC in capillaries and sarcoclemmal of other inflammatory diseases, such as IIBM and PM, could suggest complement system activation secondary to the inflammatory process and muscle necrosis.

**Disclosure:** P. Gordon, None; N. Villagra, None; I. Bodi, None; A. King, None; S. Buk, None; T. Hortobagyi, None; S. Al-Sarraj, None.

**1956**

**A New Linked Set of Autoantibodies in Dermatomyositis: Anti-Mi-2 and Anti-Transcription Intermediary Factor (TIF) 1alpha.** Minoru Satoh1, Jason YF Chan2, Yi Li3, Monica Vázquez-Del Mercado4, Marcelo Petr5, Luis J. Jara6, Miguel A. Saavedra7, Claudia Cruz-Reyes7, Eric S. Sobel8, Western Biomedical Sciences and Roswell Park Cancer Institute, Buffalo, New York, 1University of Florida, Gainesville, FL, 2Universidad de Guadalajara, Guadalajara, Jalisco, Mexico, 3Universidad de Guadalajara, Guadalajara, Jalisco, Mexico, 4Hospital de Especialidades Centro Medico La Raza, Mexico City, Mexico, 5Centro Médico La Raza Instituto Mexicano del Seguro Social Mexico D.F., Mexico D.F., Mexico, 6Centro Medico La Raza Instituto Mexicano del Seguro Social Mexico D.F., Mexico D.F., Mexico

**Background/Purpose:** Myositis specific autoantibodies (MSA) produced in patients with polymyositis/dermatomyositis (PM/DM) are clinically useful biomarkers in diagnosis and management. Anti-Mi-2 antibodies that recognize nucleosom remodeling deacetylase complex are classic marker of DM. Anti-p155/p140 (transcription intermediary factor 1 gamma and alpha, respectively) antibodies are one of the new MSA that have been studied actively because of their tight link to cancer-associated DM. A well known but poorly explained characteristic in MSA production is the rare coexistence of more than one MSA in each individual patient. We here report frequent coexistence of anti-Mi-2 and anti-TIF1alpha antibodies as an exception for this concept.

**Methods:** Sera of patients with PM/DM from United States, Mexico, Italy, and Japan were screened for their autoantibody specificities by immunoprecipitation (IP) of 35S-labeled K562 cells extract sera. Sera with anti-Mi-2 and anti-p155/140 were further characterized by IP-western blot (IP-WB) using monoclonal antibodies to TIF1alpha and TIF1gamma. Antibodies to TIF1alpha, gamma, and Mi-2 were also tested by ELISA using recombinant proteins. Clinical information was from the database and chart review.

**Results:** Forty-one anti-Mi-2 and 18 anti-p155/140 positive sera were identified and their characteristics are summarized in Table. Anti-Mi-2 positive sera immunoprecipitated a 140kD protein that comigrates exactly with TIF1alpha. Forty-one anti-Mi-2 and 18 anti-p155/140 positive sera were positive for TIF1gamma in human anti-Mi-2 sera based on 1) disappearance of the 140kD protein from human anti-Mi-2 IP by preincubation of cell extract with anti-TIF1alpha mAb, 2) mAb to Mi-2 and rare anti-TIF1alpha coexisting with anti-Mi-2 has not been considered in the past. This protein was determined as TIF1alpha that was immunoprecipitated by sera immunoprecipitated a 140kD protein that comigrates exactly with TIF1alpha. Autoantibodies to TIF1gamma in human anti-Mi-2 sera appeared uncommon based on 1) the 155kD protein that comigrates with TIF1gamma is not seen in human anti-Mi-2 IP, 2) lack of anti-TIF1gamma reactivity in ELISA, 3) although many human anti-Mi-2 sera were also positive for TIF1gamma, the levels of TIF1gamma immunoprecipitated by human anti-Mi-2 sera are very little compared with those by human anti-p155/140 sera, suggesting that they are via co-IP with TIF1alpha.

**Table 1. Reactivity of anti-Mi-2 and p155/140 sera**

<table>
<thead>
<tr>
<th></th>
<th>Anti-Mi-2</th>
<th>anti-p155/140</th>
<th>control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>88%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>TIF1gamma-IP-WB</td>
<td>88%</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Conclusion:** Majority of human sera with anti-Mi-2 also have antibodies to TIF1alpha but not TIF1gamma. This is a new linked set of autoantibodies in DM and an exception of the rare coexistence of MSA in individual patient. This finding will affect identification and classification of PM/DM based on serology and may require reevaluation of clinical significance of anti-TIF1alpha antibodies as an exception for this concept.

**Disclosure:** M. Satoh, None; J. Y. Chan, None; Y. Li, None; M. Vazquez-Del Mercado, None; M. Petr, None; L. J. Jara, None; M. A. Saavedra, None; C. Cruz-Reyes, None; E. S. Sobel, None; W. H. Reeves, None; A. Cerbelli, None; E. K. L. Chan, None.

**ACR/ARHP Poster Session C**

**Osteoporosis and Metabolic Bone Disease**

**Tuesday, November 13, 2012, 9:00 AM—6:00 PM**

**1957**

**Prevalence and Associated Factors of Vitamin D Insufficiency and Deficiency in 4,793 Japanese Patients with Rheumatoid Arthritis.** Takefumi Furuya1, Takayuki Hosoi2, Eiichi Tanaka3, Ayako Nakajima4, Atsuo Taniguchi5, Shigeiki Momoohara6 and Hisashi Yamanaaka1. 1Department of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan, 2National Center for Geriatrics and Gerontology, Aichi, Japan

**Background/Purpose:** Vitamin D [25(OH)D] insufficiency and deficiency is reported to be common in patients with rheumatoid arthritis (RA) and is associated with increased disease activity of RA, although there are limited reports of Japanese RA patients in the literature. Among osteoporosis patients treated with bisphosphonates, vitamin D status and concomitant use of active vitamin D3 analogs are both reported to affect the increase in bone mineral density (BMD). Our purpose was to define the prevalence and associations of 25(OH)D insufficiency and deficiency with clinical characteristics in Japanese patients with RA.

**Methods:** Serum 25(OH)D levels, laboratory data, and clinical data were obtained from 4,793 patients with RA (4,075 women, 718 men, mean age 59.7 years) who participated in the Institute of Rheumatology Rheumatoid Arthritis (IORRA) observational cohort study in April and May of 2011. Their serum vitamin D levels were evaluated using radioimmunoassays. Insufficiency was defined as a concentration < 20 ng/mL and deficiency as < 10 ng/mL. Associations of 25(OH)D insufficiency and deficiency with patient characteristics were examined using multivariate logistic regression.

**Results:** The mean (SD) serum 25(OH)D level was 16.9 (6.1) ng/mL. The prevalence of 25(OH)D insufficiency and deficiency among all the patients in the study were 71.8% and 11.5%, respectively. Serum 25(OH)D levels were significantly different (P < 0.05) between the patients with (n = 507, 10.6%) and without active vitamin D3 analogs. Among the patients treated with bisphosphonates (n = 1,130), insufficiency and deficiency were 71.5% and 10.4%, respectively. In multivariate analyses, female gender (odds ratios [OR] 2.98, 95% confidence interval [CI] 1.88-2.92 and OR 2.01, 95% CI 1.41-2.91), age (per 10 years, OR 0.72, 95% CI 0.68-0.77 and OR 0.67, 95% CI 0.62-0.73), Japanese health assessment questionnaire (J-HAQ) disability scores (OR 1.20, 95% CI 1.07-1.36 and OR 1.63, 95% CI 1.40-1.92), serum total cholesterol levels (per 10 mg/100mL, OR 0.96, 95% CI 0.94-0.98 and OR 0.95, 95% CI 0.92-0.98), serum alkaline phosphate level (per 10 IU/L, OR 1.01, 95% CI 1.00-1.02 and OR 1.02, 95% CI 1.00-1.03), and use of non-steroidal anti-inflammatory drugs (NSAIDs) (OR 1.27, 95% CI 1.11-1.46 and OR 1.25, 95% CI 1.02-1.54) were associated (P < 0.05) with vitamin D deficiency alone. The Disease Activity Score including 28 joints (DAS28) was not significantly associated with either vitamin D insufficiency or deficiency in this patient population.

**Conclusion:** Vitamin D insufficiency and deficiency are common in Japanese patients with RA, as previously reported for patients of other ethnicities. Female gender, younger age, high HAQ disability score, serum levels of total cholesterol and alkaline phosphate and NSAID use appear to be associated with both vitamin D insufficiency and deficiency in Japanese patients with RA. Low BMI and disuse of active vitamin D3 analogs, however, appear to correlate only with vitamin D deficiency in Japanese patients with RA.

**Disclosure:** T. Furuya, None, T. Hosoi, None; E. Tanaka, None; A. Nakajima, None; A. Taniguchi, None; S. Momohara, None; H. Yamanaka, Abbott Japan Co. Ltd.; Astazeneca K.K., Bristol-Myers Squibb, Ltd., Eisai Co. Ltd., Janssen Pharmaceutical K.K., Japan, Mitsubishi Tanabe Pharma Corporation, Pfizer Japan Inc., Takeda Pharmaceutical Co. Ltd., Teijin Pharma Limite, S.
1958

Bone Mineral Density in Lupus Erythematosus Women One Year After Rituximab Therapy. Claudia Mendoza-Pinto1, Mario García-Carrasco2, Mario Jiménez-Hernández2, Alma Rodríguez-Gallegos2, Socorro Méndez-Martínez1, Manuel Avila Camacho, Instituto Mexicano del Seguro Social, Puebla, Mexico, 1Laboratorios Clínicos de Puebla, Puebla, Mexico, 2Delegación Estatal, Instituto Mexicano del Seguro Social, Puebla, Mexico

Background/Purpose: Low bone mineral density (BMD) and osteoporosis may be significant complications in patients with systemic lupus erythematosus (SLE). Recent studies have shown that biologic therapy could arrest general bone loss, however, the role of rituximab on BMD in SLE patients has not been analyzed. The aim of this prospective study was to assess the effects of rituximab on BMD at the lumbar spine and femoral neck in women with SLE, one year after rituximab therapy.

Methods: Thirty active female SLE patients treated with rituximab were compared with control SLE women not treated with rituximab. In those patients, rituximab 1 g was administered on days 1 and 15 in addition to current immunosuppressive treatment, which was maintained until disease remission. Since all patients were using steroids when rituximab therapy began, they were all taking calcium and vitamin D. Historical controls included forty-six SLE women with similar lupus activity treated with conventional therapy azathioprine, methotrexate, mycophenolate mofetil, leflunomide and cyclophosphamide) without rituximab therapy. BMD at the femoral neck and lumbar spine was measured using dual energy x-ray absorptiometry before initiating conventional and biologic therapy and after one year.

Results: Seventy-six patients were studied. The mean age was 38.5 ± 2.1 SD, median disease duration was 7 years (range 1 to 26). Thirty patients received rituximab and forty-six controls received conventional treatment. Baseline BMD measurements were higher in the rituximab group. In the rituximab group, after 1 year of follow up femoral neck BMD decreased from 0.980 ± 0.130 g/cm2 to 0.809 ± 0.139 g/cm2 (−17.4%; p = 0.001). Similarly, lumbar spine BMD decreased from 1.062 ± 0.137 g/cm2 to 0.893 ± 0.194 g/cm2 (−15.8%; p = 0.001). In controls, femoral neck BMD decreased from 0.914 ± 0.193 g/cm2 to 0.890 ± 0.135 g/cm2 (−2.6%; p = 0.001) and lumbar spine BMD decreased from 0.926 ± 0.128 g/cm2 to 0.867 ± 0.139 g/cm2 (−6.2%; p = 0.09). BMD loss was higher in postmenopausal rituximab patients than in postmenopausal controls (0.324 ± 0.128 g/cm2 vs 0.088 ± 0.099 g/cm2). There was a significant difference in BMD at the femoral neck between responders and nonresponders (p = 0.014) but not in BMD at the lumbar spine.

Conclusion: After one year of follow up, SLE patients who received rituximab had lower BMD at both the femoral neck and lumbar spine, but the loss was greater in patients receiving rituximab than in patients receiving conventional treatment, and in postmenopausal women. Postmenopausal candidates for rituximab should be evaluated closely to prevent further BMD loss.

Disclosure: C. Mendoza-Pinto, None; M. García-Carrasco, None; M. Jiménez-Hernández, None; A. Rodríguez-Gallegos, None; S. Méndez-Martínez, None; A. Lopez-Colombo, None.

1959

Low Fracture Incidence Is Maintained in Postmenopausal Women ≥75 Years with Osteoporosis with Long-Term Denosumab Treatment. So-crates Papapoulos1, Michael R. McClung2, Nathalie Franchimont3, Jonathan D. Adachi4, Henry G. Bone5, Claude-Laurent Benhamou6, Jordi Farreron7, Steven Boonen13. 1Leiden University Medical Center, Leiden, Netherlands, 2Oregon Osteoporosis Center, Portland, OR, 3Amgen Inc., Thousand Oaks, CA, 4Charlot Medical Centre, Hamilton, ON, 5Michigan Bone and Mineral Clinic, Detroit, MI, 6EA 4708 University Orleans, Orleans, France, 7Hospital de la Santa Creu i Sant Pau, Barcelona, Spain, 8Creighton University Medical Center, Omaha, NE, 9Osteoporoselinnkaken, Oslo, Norway, 10University Hospital, Bern, Switzerland, 11Sapienza, Università di Roma, Rome, Italy, 12Karolinska Institutet Sodersjukhuset, Stockholm, Sweden, 13Leuven University, Leuven, Belgium

Background/Purpose: In the pivotal fracture trial, FREEDOM, denosumab increased bone mineral density (BMD) and reduced the incidence of new vertebral, nonvertebral, and hip fractures in postmenopausal women with osteoporosis (Cummings SR et al, NEJM 2009). Denosumab reduced the risk of hip fracture in high-risk subgroups, including a 62% reduction in patients ≥75 years old (Boonen S et al, JCEM 2011). The effects of long-term denosumab treatment up to 10 years are being evaluated in the FREEDOM extension study. As fracture incidence increases with age, and in particular, hip fracture in women ≥75, we have further characterized the fracture incidence and BMD gains in women ≥75 who have been treated with denosumab for a total of 6 years.

Methods: During the extension, each woman has received 60 mg denosumab every 6 months and supplemental calcium and vitamin D daily. We evaluated the fracture incidence and BMD gains in women who completed 6 years of denosumab treatment (overall long-term group) and in the subset of these women who were ≥75 at FREEDOM baseline (higher-risk group).

Results: The FREEDOM baseline characteristics for the overall long-term denosumab group (N=2343) and the higher-risk group (N=662) were similar except that those subjects in the higher-risk group were older (mean age: 72 years for overall and 78 years for higher-risk), and had a lower mean total hip BMD T-score (−1.9 for overall and −2.1 for higher-risk). Despite the increase in age of the subjects, denosumab treatment during years 4 to 6 continued to be associated with a low incidence of new vertebral, nonvertebral, and hip fractures. Furthermore, the incidence of fractures in the higher-risk group during years 4 to 6 was similar to what was originally observed in years 1 to 3 in women ≥75 treated with denosumab (Figure).
BMD progressively increased over 6 years at the lumbar spine and total hip and was similar in women ≥75 compared with women in the overall long-term group. Despite advanced age, adverse events (AEs) and serious AEs in the higher-risk group in the extension were similar to the higher-risk group from FREEDOM, and these events did not increase over time with denosumab treatment.

**Conclusion:** Patients aged ≥75 are at higher risk of fracture than younger patients. Denosumab is a therapeutic option for the women ≥75 in whom the high risk of hip fracture is of particular concern. These results amplify the robust and consistent anti-fracture efficacy and safety profile of continued denosumab treatment over 6 years.


1960

**Initiation of Tumor Necrosis Factor Alpha (TNFα) Antagonists and Risk of Fractures in Patients with Selected Rheumatic and Autoimmune Diseases,** Vivian K. Kawai1, Carlos Grijalva1, Patrick Arbogast1, Jeffrey R. Curtis2, Daniel H. Solomon1, Elizabeth S. Delzell1, Daniel R. Wagman1, Vivian K. Kawai1, Carlos Grijalva1, Patrick Arbogast1, Jeffrey R. Curtis2, Daniel H. Solomon3, Elizabeth S. Delzell2, J. D. Adachi1, J. Gallagher3, J. Halse4, K. Lippuner1, A. S. Minisola1, O. Töring5, N. Daizadeh1, A. Wang3, R. B. Wagman1, S. Boonen1, S. Minisola1, O. Töring5, N. Daizadeh1, A. Wang3, R. B. Wagman1, S. Boonen1

**Methods:** Using four large administrative databases we assembled a retrospective cohort of patients with RA from 1998 to 2005 enrolled in Tennessee’s Medicaid Program (TennCare), Kaiser Permanente Northern California (KPNC), Pennsylvania Pharmaceutical Assistance Contract for the Elderly (PACE), and multi-State Medicaid programs (MAX) and identified patients who initiated either a TNFα antagonist (n=20,814) or a non biologic disease modifying anti-rheumatic drug (DMARD): hydroxychloroquine (HCQ), sulfasalazine (SSZ) and/or leflunomide (LEF) (n=8,964). We used baseline covariate data to calculate propensity scores (PS) to match treatment groups, and Cox regression to calculate hazard ratios (HRs) and 95% confidence intervals (95% CIs). We compared the risk of the first fracture (hip, radius/ulna, humerus, or pelvic); first hip fracture; and first clinical vertebral fracture between

**Results:** We identified 9,020 new PS matched episodes of TNFα antagonist and non biologic DMARD use. The risk of fractures was similar between new users of TNFα antagonists and non biologic DMARDs: HR:1.17, 95%CI [0.91–1.51] for combined fracture outcome (Figure 1); HR:0.87, 95%CI [0.60–1.27] for hip fracture (Figure 2); and HR:0.71, 95%CI [0.43–1.19] for clinical vertebral fracture (Figure 3). The risk of the combined fracture outcome was associated with an average daily dose of prednisone equivalents >10 mg/day at baseline compared with no glucocorticoid (HR: 1.54, 95%CI [1.03, 2.30]).

**Conclusion:** The risk of fracture did not differ between new users of TNFα antagonists and non biologic DMARDs in patients with RA. The use of >10mg/day of prednisone equivalents at baseline increased the fracture risk.

**Disclosure:** V. K. Kawai, None; C. Grijalva, None; P. Arbogast, None; J. R. Curtis, Roche/Genetech, UCB, Centocor, CORRONA, Amgen Pfizer, BMS, Crescendo, Abbott, 5; Roche/Genetech, UCB, Centocor, CORRONA, Amgen Pfizer, BMS, Crescendo, Abbott, 2; D. H. Solomon, Amgen & Lilly, 2, Corrona, 5, Pfizer Inc, 9; E. S. Delzell, Amgen Inc., 2; L. Chen, None; L. Herrinton, Procter and Gamble, Centocor, Genentech, 2; L. Liu, None; E. F. Mitchell Jr., None; C. M. Stein, None; M. Griffin, None.
In Postmenopausal Women with Osteoporosis, Denosumab Significantly Improved Trabecular Bone Score (TBS), an Index of Trabecular Microarchitecture. Michael R. McClung1, Kurt Lappun1, Maria Luisa Brandi1, Jean-Marc Kaufman2, Jose R. Zanchetta3, Marc-Antoine Krieg4, Henry G. Bone1, Roland Chapurlat5, Didier Hans6, Andrea Wang7, Jung Yun8, Carol Zapalowski9 and Cesar Libanati9. 1Oregon Osteoporosis Center, Portland, OR, 2University of Berne, Berne, Switzerland, 3University of Florence, Florence, Italy, 4University Hospital of Ghent, Ghent, Belgium, 5Instituto de Investigaciones Metabólicas and University of Salvador, Buenos Aires, Argentina, 6Lausanne University Hospital, Lausanne, Switzerland, 7Michigan Bone and Mineral Clinic, Detroit, MI, 8Hôpital Edouard Herriot, Lyon, France, 9Amgen Inc., Thousand Oaks, CA

Background/Purpose: The trabecular bone score (TBS), a novel gray-level texture index determined from lumbar spine DXA scans, correlates with 3D parameters of trabecular bone microarchitecture known to predict fracture. TBS may enhance the identification of patients at increased risk for vertebral fracture independently of bone mineral density (BMD) (Boutroy JBMIR 2010; Hans JBMIR 2011). Denosumab treatment for 36 months decreased bone turnover, increased BMD, and reduced new vertebral fractures in postmenopausal women with osteoporosis (Cummings NEJM 2009). We explored the effect of denosumab on TBS over 36 months and evaluated the association between TBS and lumbar spine BMD in women who had DXA scans obtained from eligible scanners for TBS evaluation in FREEDOM.

Methods: FREEDOM was a 3-year, randomized, double-blind trial that enrolled postmenopausal women with a lumbar spine or total hip DXA T-score < -2.5, but not < -4.0 at both sites. Women received placebo or 60 mg denosumab every 6 months. A subset of women in FREEDOM participated in a DXA substudy where lumbar spine DXA scans were obtained at baseline and months 1, 6, 12, 24, and 36. We retrospectively applied, in a blinded-to-treatment manner, a novel software program (TBS Insight® v1.9, Med-Imaps, Pessac, France) to the standard lumbar spine DXA scans obtained in these women to determine their TBS indices at baseline and months 12, 24, and 36. From previous studies, a TBS >1.35 is considered as normal microarchitecture, a TBS between 1.35 and >1.20 as partially deteriorated, and ≤1.20 reflects degraded microarchitecture.

Results: There were 285 women (128 placebo, 157 denosumab) with a TBS value at baseline and ≥1 post-baseline visit. Their mean age was 73, their mean lumbar spine BMD T-score was -2.79, and their mean lumbar spine TBS was 1.20. In addition to the robust gains in DXA lumbar spine BMD observed with denosumab (9.8% at month 36), there were consistent, progressive, and significant increases in TBS compared with placebo and baseline (Table & Figure). BMD explained a very small fraction of the variance in TBS at baseline (r^2<0.07). In addition, the variance in the TBS change was largely unrelated to BMD change, whether expressed in absolute or percentage changes, regardless of treatment, throughout the study (all r^2<0.06); indicating that TBS provides distinct information, independently of BMD.

Conclusion: In postmenopausal women with osteoporosis, denosumab significantly improved TBS, an index of lumbar spine trabecular microarchitecture, independently of BMD.


The Specific Role of Glutaredoxin2 Isoform b (Glrx2b) in RANKL-Induced Osteoclastogenesis Through Activation of the p38-MAPK Signalling Pathway. Chang-Hoon Lee1, Wan-Hee Yoo2, Jin-Jung Choi3, Myong-Joo Hong2, Ji-Min Kim4 and Jeong-Ta Yeon1. 1Department of Internal Medicine, School of medicine, Wonkwang university, Iksan, Chonbuk, South Korea, 2Department of Internal Medicine, Chonbuk National University Medical School and Research Institute of Clinical Medicine, Jeonju, South Korea, 3CHA University Hospital, Seongnam, South Korea, 4Division of Rheumatology, Department of Internal Medicine, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, Yangsan, South Korea, 5Department of anatomy, school of medicine, Wonkwang university, Iksan, Chonbuk, South Korea

Background/Purpose: Recently, reactive oxygen species (ROS) and antioxidant enzymes were shown to be closely associated with RANKL-mediated osteoclast differentiation. Although glutaredoxin2 (Glrx2) plays a role in cellular redox homeostasis, its role in RANKL-mediated osteoclastogenesis is unclear.

Objectives: The aim of this study was to examine the effect of Glrx2 on osteoclast differentiation.

Methods: Osteoclast formation was evaluated in bone marrow cells (BMC) in specific condition with over-expression of Glrx2 or down-regulation of Glrx2 during receptor activator of NF-κB ligand (RANKL)-mediated osteoclastogenesis. The expression of c-fos and NFATc1 mRNA in osteoclast precursor were assessed by RT-PCR. The levels of c-fos and NFATc1 protein were assessed by western blot. Also the mitogen-activated protein (MAPKs) pathways were measured using Western blot analysis.

Results: We found that Glrx2 isoform b (Glrx2b) expression is induced during RANKL-mediated osteoclastogenesis. Over-expression of Glrx2b strongly enhanced RANKL-mediated osteoclastogenesis. In addition, Glrx2b transduced BM6s enhanced the expression of key transcription factors c-Fos and NFATc1, but pre-treatment with SB203580, a p38-specific inhibitor, completely blocked this enhancement. Conversely, down-regulation of Glrx2b decreased RANKL-mediated osteoclastogenesis and the expression of c-Fos and NFATc1 proteins. Also, Glrx2b down-regulation attenuated the RANKL-induced activation of p38.

Conclusion: Taken together, these results suggest that Glrx2b enhances RANKL-induced osteoclastogenesis via p38 activation. It may be very useful information for treatment of bone-resorbing disorders, such as rheumatoid arthritis and osteoporosis.

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1963

Fracture Sites, Frequencies and Causes in 9,720 Japanese Patients with Rheumatoid Arthritis: A Prospective Observational Cohort Study. Ken-suKe Ochi, TaKeFumi Furuya, EiSUke Inoue, KatsuNori Ikari, Atsuo Taniguchi, ShiGeki Momohara and HitSui Yamamka. Institute of Rheumatology, To-kyo Women’s Medical University, Tokyo, Japan.

Background/Purpose: Although rheumatoid arthritis (RA) is a risk factor for osteoporosis and fracture, limited data exist in the literature concerning fracture site and frequency in patients with RA. We previously reported clinical risk factors for both incident vertebral and nonvertebral fractures in Japanese RA patients using our Institute of Rheumatology Rheumatoid Arthritis (IORRA) cohort study. Herein we expanded our previous study to evaluate fracture sites, frequencies, and causes in Japanese RA patients.

Methods: The IORRA is a prospective observational cohort study of Japanese RA patients at the Institute of Rheumatology, Tokyo Women’s Medical University (Tokyo, Japan) that was started in 2000. A total of 9,720 patients (82% female; mean age, 56 years) with RA were enrolled in the IORRA cohort study from 2000 to 2010. All participants self-reported whether they had a fracture event within the previous 6 months, the site of fracture (ankle, arm, cervical spine, clavicle, elbow, femoral neck, foot, hand, knee, leg, nose, pelvis, rib, shoulder, thoracic spine, lumbar spine, wrist, and others), and the reasons for fracture (accident, fall, spontaneous event, or sports injury) every 6 months from October 2000 to October 2010. We then analyzed the sites, frequencies, and causes of the fractures to clarify the epidemiology of fractures in Japanese RA patients.

Results: During a mean (SD) duration of 5.2 (3.3) years, 1357 patients reported a total of 2076 incident fractures. Among them, 837 (61.7%) reported a single fracture, 520 (38.3%) reported two fractures, 203 (23.2%) reported three fractures, and 217 (16.0%) reported more than three fractures. Overall, 537 (12.8%) vertebral fractures and 1469 (66.2%) nonvertebral fractures (head: n=35, 1.7%; trunk: n=508, 24.5%; and lower limb: n=742, 35.7%) were reported. The most frequent nonvertebral fracture was rib (n=368, 20.6%), followed by toe (n=276, 15.4%), femoral neck (n=178, 9.9%), ankle (n=132, 7.4%), wrist (n=122, 6.8%), hand (n=117, 6.5%), shoulder (n=105, 5.9%), arm (n=86, 4.8%), knee (n=84, 4.7%), elbow (n=78, 4.4%), pelvis (n=71, 4.0%), leg (n=57, 3.2%), clavicle (n=56, 3.1%), and head including nose (n=35, 2.0%). Causes of overall fractures were fall in 55.5% of patients, followed by spontaneous events in 33.2%, accident in 7.8%, and sports injury in 1.0%; the major causes of vertebral fractures were spontaneous events (63.5%) and fall (27.4%), while fall (60.0%) and spontaneous events (28.3%) were the major causes of nonvertebral fractures.

Conclusion: Fourteen percent of Japanese patients with RA reported one or more incident fractures within a mean duration of 5.2 years. Unlike non-RA elderly subjects, spontaneous events were a major cause of fractures. Differences between RA patients and non-RA patients should be at least in some part due to the significant osteoporosis seen in RA patients.

Disclosure: K. Ochi, None; T. Furuya, None; E. Inoue, None; K. Ikari, None; A. Taniguchi, None; S. Momohara, None; H. Yamanaka, Abbott Japan Co. Ltd., 5; Astellas Pharma, 5; Bristol-Myers Squibb, 5; Case Pharmaceutic Co. Ltd, 5; Eisai Co. Ltd., 5; Janssen Pharmaceutical K.K. Japan, 5; Mitsubishi Tanabe Pharma Corporation, 5; Pfizer Japan Inc., 5; Takeda Pharmaceutical Co. Ltd., 5; Teijin Pharma Limited, 5; UCB Japan Co. Ltd., 5.

1964

Rolofylline, an Adenosine A1R Antagonist, Acts As an Inverse Agonist to Inhibit Osteoclast Differentiation. Wenjie He1, Amitabha Mazumder2 and Bruce N. Cronstein3. 1NYU, New York, NY, 2NYU School of Medicine, Division of Rheumatology, New York, NY.

Background/Purpose: Previous work from our laboratory has uncovered a critical role of adenosine A1 receptor (A1R) in osteoclast formation both in vivo and in vitro. Adenosine may be generated by hydrolysis of extracellular adenine nucleotides including ecto-nucleoside triphosphate diphosphohydrolase 1 (CD39), ecto-5'-nucleotidase (CD73) and nucleotide pyrophosphatase phosphodiesterase 1 (NPP-1). Interestingly selective A1R agonists neither affect basal osteoclast formation nor do they reverse A1R-mediated inhibition of osteoclast formation. In this study, we determined whether ecto-5'-nucleotidase-mediated adenosine production was required for osteoclast formation and, when we saw no effect, determined whether the A1R was constitutively activated and the antagonist was acting as an inverse agonist to mediate its effects on osteoclast formation.

Methods: Osteoclasts were generated from bone marrow mononuclear cells (BMMs) extracted from wildtype, CD39KO, CD73KO and NPP-1KO mice using differentiation factors macrophage colony-stimulating factor (M-CSF) and RANKL. The A1R specific antagonist, Rolofylline, was added to the culture media. TRAP+ staining was performed and Acp5 and Ctsk mRNA expression were examined to study osteoclast differentiation. Intracellular cAMP concentration by ELISA.

Results: A1R blockade inhibits osteoclast differentiation of BMMs derived from wildtype mice in a dose-dependent manner (IC50 = 1μM p<0.05, n=3). A1R blockade similarly inhibits osteoclast formation by marrow precursors from CD37KO, CD39KO and NPP-1KO mice in a dose-dependent manner (IC50 = 1μM, and 1μM, and 0.1μM, respectively, p<0.05 for all, n=3) for all three knockouts, although baseline osteoclast formation was significantly less (310 in CD73 KO vs 91 in wildtype, p<0.05, n=3) in precursors from CD73KO mice. Moreover, in the absence of agonist, A1R antagonist, rolofylline (1μM) caused an increase of cAMP content of BMMs by 9.9 fold (p<0.05, compared with control: M-CSF + RANKL, n=3). Similarly, rolofylline (1μM) leads to increased cAMP production in human healthy BMMs by 3.6 fold (n=1, compared with control: M-CSF + RANKL), which is consistent with our findings that A1R blockade by rolofylline inhibits human BMMs-derived osteoclast formation (p<0.001, n=3; IC50 = 1μM).

Conclusion: Based on these findings we hypothesize that the A1R is constitutively activated in osteoclast precursors, thereby diminishing basal adenylyl cyclase activity, and that the A1R antagonist acts as an inverse agonist to release the A1R-mediated inhibition of basal adenylyl cyclase activity. The constitutive activity of A1R promotes osteoclast formation and downregulation of this activity blocks osteoclast formation.

Disclosure: W. He, None; B. N. Cronstein, Canfite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Artirius Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.,

1965

Adenosine Regulates Bone Metabolism Via A1, A2a and A2b Receptors in Bone Marrow Cells From Normal and Patients with Multiple Myeloma. Wenjie He1, Amitabha Mazumder2 and Bruce N. Cronstein3. 1NYU, New York, NY, 2NYU Cancer Center, New York, NY, 3NYU School of Medicine, Division of Rheumatology, New York, NY.

Background/Purpose: Multiple myeloma is a haematologic malignancy that is characterized by osteolytic bone lesions, wherein coupled bone remodeling is disrupted with increased osteoclast activation and decreased osteoblast differentiation. In this study, we examined the effect of adenosine on osteoblast and osteoclast differentiation derived from multiple myeloma (MM) patients.

Methods: Human bone marrow was collected from multiple myeloma patients. Bone marrow stromal cells (BMSCs) and bone marrow derived mononuclear (BMMs) cells were isolated and osteoblasts and osteoclasts were cultured, respectively. Adenosine A1 receptor agonist CHA and antagonist Rolofylline, A2a receptor agonist CGS and antagonist ZM, and A2b receptor agonist BAY and antagonist MRS 1754, A2b receptor agonist IB-MECA and antagonist MRS 1191; and dipyridamole, a nucleoside transport inhibitor, were added to the culture media. Alkaline phosphatase (ALP) activity assay was used to quantify the osteoblast differentiation. In vitro osteoblast calcification was determined by alizarin red staining. TRAP+ staining was used to examine the osteoclast differentiation and bone resorption assay was used to study the osteoclast activity.

Results: We found that A1R blockade by rolofylline and A2aR ligation by CGS21680 inhibited differentiation of both normal and MM BMSCs into bone TRAP+ multinucleated cells (IC50 = 1μM for A1R, IC50 = 10μM for A2aR; p<0.001, n=3 for both). The A2bR receptor agonist completely reversed the effects of CGS21680 on osteoblast differentiation. Moreover, enhanced adenosine accumulation in the presence of dipyridamole (0.5μM) and A2bR activation promoted the differentiation of BMSCs into osteoblasts shown by Alizarin red staining and ALP activity assay (by 1.8 ± 0.41 and 1.57 ± 0.26 fold, respectively, p<0.05, compared with osteogenic media only, n=3 for both).

Conclusion: These results indicate that adenosine receptors may be useful targets for the treatment and prevention of MM-induced bone disease.

Disclosure: W. He, None; A. Mazumder, None; B. N. Cronstein, Canfite BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Artirius Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.,
1966

Background/Purpose: Bazedoxifene is a novel selective estrogen receptor modulator (SERM) in development for the prevention and treatment of osteoporosis. In all cases a marked hypophosphatemia with elevated alkaline phosphatase (mean symptom duration 14 months) The general characteristics are shown on the Table. In all cases a marked hypophosphatemia with elevated alkaline phosphatase (ALP) and deficiency of vitamin D 25-OH were in 3 patients. Bone scan and MRI showed multiple insufficiency fractures. Histopathological study of iliac bone biopsy (patients 1, 2 and 3) showed increased bone formation and an increased osteoid thickness (more than 5 slides) with laminar structure. There were two osteoblasts, and resorption was diminished with no presence of osteoclasts. The diagnosis was osteomalaclia in all patients. The clinical diagnosis was hipoprophosphatic osteomalacia induced by tenofovir. In all patients, tenofovir was stopped. This was supplemented with oral vitamin D and calcium supplements. Two patients required oral phosphate salts. A few weeks after starting treatment showed gradual resolution of bone pain (6–8 weeks) and normalization of walking without support. Furthermore, 8–12 weeks later, blood test were strictly normal in all patients.

Methods: The cost-effectiveness of treatment for 3-years with bazedoxifene was compared with raloxifene using an updated version of a previously validated Markov microsimulation model. Analyses were conducted from a healthcare payer perspective and, the base-case population was women (aged 70 years) with bone mineral density T-score ≤−2.5. The effects of bazedoxifene and raloxifene on fracture risk were derived from the 3-year results of a randomized, double-blind, placebo- and active-controlled study, including postmenopausal women with osteoporosis.

Results: The cost-effectiveness analysis based on efficacy data from the overall clinical trial indicated that bazedoxifene and raloxifene were equally cost-effective. When the results were examined based on the subgroup analysis of women at higher risk of fractures, bazedoxifene was dominant (lower cost for higher effectiveness) compared with raloxifene in most of the simulations. Sensitivity analyses confirmed the robustness of the results, which were largely independent of starting age of treatment, fracture risk, cost and disutility. In addition, when the cost of raloxifene was reduced by half, bazedoxifene remained cost-effective, at a threshold of $35,000 per quality-adjusted life-years gained, in 85% of the simulations.

Conclusion: Under the assumption of improved anti-fracture efficacy of bazedoxifene over raloxifene in women with high risk of fractures, this study suggests that bazedoxifene can be considered cost-effective, and even dominant, when compared with raloxifene in the treatment of postmenopausal osteoporotic women.

Disclosure: M. Hiligsmann, Angen, Novartis, Pfizer, Servier, SMB, 2, SMB, Servier, 5; W. Ben Sedrine, None; J. Y. Regnier, Servier, Novartis, Negma, Lilly, Wyeth, Angen, GlaxoSmithKline, Roche, Merckle, Nycomed, NPS, Theramex, UCB, Merck-Sharp and Dohme, Rottapharm, JBSA, Genevrier, Tejum, Teva, Ebeew pharma, Zodiac, Analis, Novo Nordisk, 5, Bristol Myers Squibb, Merck Sharp & Dohme, Pfizer, Rottapharm, Teva, Lilly, Novartis, Roche, GlaxoSmithKline, Angen, Servier, 2.

1967
Hypophosphatemic Osteomalacia Induced by Tenofovir in Patients with Human Immunodeficiency Virus Infection. Beatrix Tejera1, Lourdes Mateo-Soria1, Susana Holgado1, Luisa Marin˜oso2, Ricard Pe´rez1, Anna Bonjoch3, Anna Bonjoch, None; A. Martinez-Morillo, None; D. Grados, None; A. Ollivé, None.

Background/Purpose: treatment of human immunodeficiency virus (HIV) infection has dramatically changed survival prognosis of these patients. New drugs included in antiretroviral therapy are much more effective. Tenofovir disoproxil fumarate (TDF) was approved for the treatment of HIV infection in highly active antiretroviral therapy (HAART) combinations in 2001. Increasing evidence has emerged relating TDF use and the development of kidney proximal tubular dysfunction, Fanconi syndrome and renal insufficiency.

Objective: to describe 4 cases of Tenofovir induced hypophosphatemic osteomalacia.

Methods: we describe 4 cases of tenofovir-treated HIV patients from HIV Section setting University Academic Hospital reference area 800,000 inhabitants, who were referred to Rheumatology Service. All patients were having by multiple disabling bone pain. We present clinical manifestations, laboratory and imaging studies, and the results of iliac bone biopsy performed in 3 cases, after labeling with tetracycline.

Results: Four patients, 2 men and 2 women, mean age of 48.2 years, mean duration of HIV infection of 20.2 years. All patients were on Tenofovir in combination therapy with a median duration of 7 years. All patients complained of severe and increasing pain of the lower extremities with considerable functional impairments. Sensitivity to walk without assistance during the last 6–8 months (mean symptom duration 14 months) The general characteristics are shown on the Table. In all cases a marked hypophosphatemia with elevated alkaline phosphatase (ALP) and deficiency of vitamin D 25-OH were in 3 patients. Bone scan and

Conclusion: We described an uncommon complication of HIV patients treated with tenofovir. A high index of suspicion is required to diagnose hypophosphatemic osteomalacia. Serum P and ALP should be monitored to prevent the development of osteomalacia.

Disclosure: B. Tejera, None; L. Mateo-Soria, None; S. Holgado, None; L. Marin˜oso, None; R. Pérez, None; A. Bonjoch, None; A. Martinez-Morillo, None; D. Grados, None; A. Ollivé, None.

1968
The Specific Role of Vesicle-Associated Membrane Protein-Associated Protein B/C(YapB) as A Regulator of Osteoclastogenesis Via Modulation of Phospholipase C (PLC)Ca2+-NFAT Signaling. Chang-Hoon Lee1, Wan-Hee Yoo2, Jin-Jung Choi3, Myong-Joo Hong4, Ji-Min Kim5 and Sik-Won Choi6. 1Department of Internal Medicine, School of medicine, Wonkwang university, Iksan, Chonbuk, South Korea, 2Department of Internal Medicine, Chonbuk National University Medical School and Research Institute of Clinical Medicine, Jeonju, South Korea, 3CHA University Hospital, Seongnam, South Korea, 4Division of Rheumatology, Department of Internal Medicine, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, Yangsan, South Korea, 5School of medicine, Wonkwang university, Iksan, Chonbuk, South Korea

Background/Purpose: Recently, Vesicle-Associated Membrane Protein-Associated Protein B/C(YapB) has been shown to regulate calcium homeostasis in myeloid lateral sclerosis. Calcium signaling is also important in metabolic bone diseases, but the role of YapB in the generation of osteoclasts for bone resorption during osteoclastogenesis is not known. Therefore, we investigated the role of YapB in RANKL-induced osteoclast differentiation

Methods: Osteoclast formation was evaluated in bone marrow cells (BMC) in specific condition with over-expression of YapB or down-regulation of YapB during receptor activator of NF-κB ligand (RANKL)-mediated osteoclastogenesis. The expression of c-fos and NFATc1 mRNA in osteoclast precursor were assessed by RT-PCR. The levels of c-fos and NFATc1 protein were assessed by western blot. Also the mitogen-activated protein (MAPK)s pathways were measured using Western blot analysis.

Results: We found that YapB is induced during osteoclastogenesis, and regulates osteoclast differentiation by modulating NFATc1. The results suggest that YapB regulates osteoclastogenesis via of Phospholipase Cγ (PLCγ2-Ca2+-NFAT signaling. The involvement of PLCγ2-Ca2+-NFAT signaling in YapB-regulated osteoclastogenesis was confirmed by a pharmacological study.

Conclusion: Taken together, these results indicate that YapB positively regulates RANKL-mediated osteoclastogenesis via PLCγ2-Ca2+-NFAT signaling and may provide a basis for exploring the therapeutic potential of YapB silencing for metabolic bone diseases, such as osteoporosis and rheumatoid arthritis.

Disclosure: C. H. Lee, None; V. H. Yoo, None; J. J. Choi, None; M. J. Hong, None; J. M. Kim, None; S. W. Choi, None.
Correction of Vitamin D Insufficiency with the Fixed Daily Combination Strontium Ranelate 2 g/Vitamin D3 1000 IU Over 12 Months. Rene Rizzoli1, Bess Dawson-Hughes2, Jean-Marc Kaufman3, Patrice Fardellone4, Marie, Luisa Brandi5, Bruno Vellas5, Julien Collette5 and Jean-Yves Reginster6, 8.1Geneva University Hospitals and Faculty of Medicine, Geneva, Switzerland, 2Bone Metabolism Laboratory, Tufts University, Boston, MA, 3University Hospital of Ghent, Ghent, Belgium, 4Hôpital Nord, C.H.U. d’Amiens, Amiens, France, 5University of Florence, Firenze, Italy, 6CHU La Grave, Toulouse, France, 7Labo RIA, CHU Sant Tilman, Liege, Belgium, 8University of Liege, Liege, Belgium.

Background/Purpose: To assess the efficacy and safety over 1 year of a daily oral administration of the fixed combination of strontium ranelate (SrRan) 2 g/Vitamin D3 (vitD3) 1000 IU on the correction of vitamin D insufficiency in the treatment of osteoporotic men and postmenopausal women.

Methods: Prospective, international study, with a 6-month double blind SrRan/vitD3 vs SrRan parallel group period (ratio 4:1), followed by a 6-month open-SrRan/vitD3 extension period in a subgroup of patients. All patients were supplemented with calcium 1 g/d during the whole study. Men and postmenopausal women included were osteoporotic (BMD T-score ≥ −2.5 SD). 80% of the patients had to present insufficient levels of 25-hydroxyvitamin D (25-OHID), i.e. ≥ 22.5–50 nmol/L, and 20% ≥ 50 nmol/L. 25-OHID level was assessed at 3 months (primary endpoint) and 6 months among assessable patients according to intent-to-treat principle, and in the group of patients treated 12 months with SrRan/vitD3. Other criteria were: BMD, falls, PTH, 1,25-(OH)2D and safety.

Results: 518 patients were randomized: 413 to SrRan/vitD3, 105 to SrRan. Of these, 218 were selected for the 6-month extension period期M6-M12: 53 patients switched from SrRan to SrRan/vitD3 while 204 remained on SrRan/vitD3. 242 patients completed the study at M12. Baseline characteristics were similar between groups. At inclusion, mean age (±SD) was 66.8 ± 8.3 years, mean L1-L4 T-score BMD was −2.85 ± 0.86 and mean 25-OHID was 44.1 ± 14.6 nmol/L. The proportion of patients with 25-OHID ≥ 50 nmol/L at END (i.e. last post-baseline value over M0-M3) was significantly higher in SrRan/vitD3 group than in SrRan group: 83.8% vs 44.2% (p < 0.001). Adjusted odds ratio was 6.7 (95% CI [4.2; 10.9]). Mean 25-OHID reached 65.1 ± 49.5 nmol/L at M3, and 66.9 ± 45.4 nmol/L at M6, in SrRan/vitD3 and SrRan groups respectively.

The correction of vitamin D insufficiency was maintained over 12 months of SrRan/vitD3 treatment (N = 198) with an increase in the proportion of patients with 25-OHID ≥ 50 nmol/L from 21.2% at baseline to 81.1% at M12. The mean concentration of 25-OHID increased from baseline (44.3 ± 13.8 nmol/L) to M3 (64.3 ± 14.6 nmol/L), then remained stable until M12 (60.8 ± 13.9 nmol/L).

BMD significantly increased at all assessed sites in patients treated with SrRan/vitD3 during one year (+5% at L1-L4, +4% at femoral neck and +3% at total hip), consistent with annual BMD changes reported with SrRan in previous studies.

There was a trend to fewer patients falling with SrRan/vitD3 (16.5%) as compared to SrRan (20.2%) at M6. PTH evolution over time was inversely correlated with 25-OHID. Increase in mean L1-L4 (25-OHID) was higher with SrRan/vitD3 than in SrRan group. Safety of SrRan/vitD3 was good, comparable to that of SrRan over M0-M6 and in accordance to that expected with SrRan over M6-M12.

Conclusion: The study demonstrates the efficacy and safety of the fixed combination of SrRan 2 g and vitD3 1000 IU on the correction of vitamin D insufficiency in osteoporotic men and postmenopausal women aged ≥50 years. The efficacy observed after 3 months was maintained after 6 and 12 months of treatment.

Disclosure: R. Rizzoli, Merck Sharp and Dohme, Eli Lilly, Amgen, Wyeth, Novartis, Servier, Nycomed, Nestle and Dunone, 5, Merck Sharp and Dohme, Eli Lilly, Amgen, Wyeth, Novartis, Servier, Nycomed, Nestle and Dunone, 9, B. Dawson-Hughes, Cytochroma, Dunone, Eli Lilly, Merck, Pfizer, Wright Medical, and Servier, 5, J. M. Kaufman, Amgen, Eli Lilly, Glaxo Smith Kline, Merck & Dohme, Novartis, Roche, Sanofi Aventis, Servier, Warner Chilcott, 5, Amgen, Eli Lilly, Glaxo Smith Kline, Merck Sharp & Dohme, Novartis, Roche, Sanofi Aventis, Servier, Warner Chilcott, 5; P. Fardellone, None, 5, M. L. Brandi, Servier, Amgen, MSD, 5, Servier, Stroder, Amgen, MSD, Novartis, NPS, SPA, Eli Lilly, Roche, 2, Servier, Stroder, Amgen, MSD, Novartis, NPS, SPA, Eli Lilly, Roche, 9, B. Vellas, None, 2, J. Collette, None, 2, J. Y. Register, Servier, Novartis, Negma, Lilly, Novartis, Genentech, GlaxoSmithKline, Roche, Merckle, Nycomed, NPS, SPA, Theraneux, UCB, 5, Merck Sharp and Dohme, Lilly, Rottapharm, IBSA, Genevrier, Novartis, Servier, Roche, GlaxoSmithKline, Tejini, Teva, Ebewe Pharma, Zodiac, Analis, Theramex, Nycomed, Novo Nordisk, Bristol Myers Squibb, Merck Sharp and Dohme, Rottapharm, Teva, Lilly, Novartis, Roche, GlaxoSmithKline, Amgen, Servier, 2.

Utility of Spine Bone Mineral Density in Fracture Prediction within the Fracture Risk Assessment Tool (FRAX). Tristan Blackburn, 1, Diantha Howard2 and Edward S. Leib3, 1Fletcher Allen Health Care, University of Vermont College of Medicine, Burlington, VT, 2Vermont Center for Clinical and Translational Science, Burlington, VT.

Background/Purpose: Predicting which individuals are at risk to experience a fracture and modify that risk is important in preventative health. The WHO’s Fracture Risk Assesement (FRAX) defines osteopenia and osteoporosis in terms of the femoral neck T-score and allows use of total proximal femur, but the lumbar spine site is frequently used in clinical practice and its use in diagnosis is supported by the International Society of Clinical Densitometry and the National Osteoporosis Foundation. Our study aim is to quantify the impact of spine bone mineral density (BMD) on fracture risk prediction and determine the positive predictive value of fracture prediction by using the lowest BMD value at the femoral neck, total hip, or lumbar spine and compare this to the femoral neck alone.

Methods: We performed a retrospective cross-sectional analysis of our database of 15,033 post-menopausal women combining clinical risk factors (CRF) and bone density (BMD) results collected over 9.2 years utilizing a GE Lunar densitometer. We validated our database by showing that age, low BMD and CRFs in our population correlate with presence of fracture. We performed a logistic regression to assess the contribution of age, BMI, number of CRFs, T-score, and WHO osteoporosis classification category to the presence of fracture. T-scores were differentiated as femoral neck and total hip, and lumbar spine.

Results: The percent of subjects with fracture was lower than that reported in other studies. In individuals with normal BMD at the femoral neck, there were few who were osteoporotic at the lumbar spine (0.7%) and more who were osteopenic at the femoral neck and osteoporotic at the lumbar spine (9.7%). In patients whose T-scores are 1 or 2 osteoporosis categories lower at the lumbar spine than femoral neck, there is an approximately 30% increased risk of fracture when compared with the femoral neck alone. For patients less than 60 years old, the odds ratio of having a fracture based on presence of lumbar spine osteoporosis was greater than the odds ratio based on femoral neck osteoporosis. This reversed for those ≥ 65 compared with those <65 years old. For each age category, the presence of osteoporosis measured at the total hip correlated best with presence of hip fracture and was better than taking the lowest T-score at any of the three sites (femoral neck, total hip, or lumbar spine).

Conclusion: It is most important to measure BMD at the lumbar spine in younger, post-menopausal women for fracture prediction. In our population total hip BMD is the best predictor of fracture. The spine BMD appears to be a better predictor of fracture than femoral neck in women 60 years and younger. When using the WHO Fracture Prediction Tool (FRAX), we recommend that the 10 year fracture prediction be adjusted when the lumbar spine T-score is 1–2 osteoporosis categories lower than the femoral neck T-score.

Disclosure: T. Blackburn, None; D. Howard, None; E. S. Leib, None.

1971
Resolution of Effects On Bone Turnover Markers and Bone Mineral Density After Discontinuation of Long-Term Bisphosphonate Use. Kenneth G. Saag1, Claude-Laurent Benhamou2, Tobias De Villiers3, C. Conrad Johnston Jr.4, Bente Langdaλl5, Andrew Denker6, Annypey Pong7, John P. McGinniss8, Elizabeth Rosenberg9 and Arthur Santora9. 1Univ of Alabama-Birmingham, Birmingham, AL, 2EA 4708 University Orleans, Orleans, France, 3Mediclinic Panorama, Cape Town, South Africa, 4Indiana University School of Medicine, Indianapolis, IN, 5Aarhus University Hospital, Aarhus, Denmark, 6Merck Sharp & Dohme Corp., Whitehouse Station, NJ.

Background/Purpose: While bisphosphonates (BP) have been well studied in long-term trials of up to 4 years’ duration, relatively less is known about the immediate consequences of continuing vs. interrupting long-term treatment. This report describes changes in bone turnover and BMD in a 1-year trial of the calcium-sensing receptor antagonist MK-5442 in postmenopausal women who, after taking BP for ≥3 years, were randomized to continued alendronate (ALN) 70 mg weekly, switch to placebo (PBO), or switch to MK-5442. Primary and secondary endpoints are presented separately.

Methods: 526 postmenopausal women who had taken ALN for ≥12 months preceding the trial and an oral BP for ≥3 of the 4 years before the trial, with spine or hip BMD T-scores ≤ −2.5 or ‘−1.5 with ≥1 prior
fragility fracture) and >4.0, were recruited into a dose-finding study of MK-5442. Statistical tests of within-group changes and comparison between the PBO and ALN groups were performed post-hoc.

Results: At baseline, women switched from ALN to PBO (n=88) or continued on ALN (n=70) were of mean age 67 years and had mean T-scores at lumbar spine of -2.5 and total hip of -1.6, and mean baseline urine NTx/Cr= 26.6 mmolBCE/mmolCr and serum P1NP= 26.0 ng/mL. Median length of previous BP use was 5.2 years. After 12 months of PBO, least squares mean concentrations of NTx/Cr and P1NP rose to 42.2 mmol BCE/mmolCr and 40.1 ng/mL (both p<0.0001). The markers were unchanged from baseline with continued ALN. After 12 months, the women who continued ALN had an increase in lumbar spine BMD while those switched to PBO experienced no change; total hip BMD did not change in those remaining on ALN but was reduced in women switched to PBO. BMD at both sites was significantly lower in women who switched to PBO vs. those who stayed on ALN (Table).

Conclusion: Discontinuation of alendronate after a median of 5 years resulted in an increase in NTx/Cr as early as 1 month and P1NP by 3 months. After 1 year, both bone turnover markers returned to levels similar to those expected in untreated postmenopausal women. These increases were accompa-


table

<table>
<thead>
<tr>
<th>12 Month Changes in Bone Density</th>
<th>0w</th>
<th>12w</th>
<th>24w</th>
<th>48w</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar Spine BMD DEXA F-Neck (g/cm²)</td>
<td>0.29</td>
<td>0.62</td>
<td>0.87</td>
<td>1.12</td>
</tr>
<tr>
<td>Total Hip BMD DEXA F-Neck (g/cm²)</td>
<td>0.29</td>
<td>0.62</td>
<td>0.87</td>
<td>1.12</td>
</tr>
<tr>
<td>10-Year Probability of Major Osteoporotic Fracture</td>
<td>16.2%</td>
<td>7.9%</td>
<td>11.2%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

Moreover, the 10-year probability of hip fracture was 7.4% for the patients treated with GCs and 2.5% for those without it, and the risk of hip fracture in the patients treated with GCs was significantly higher than those without it. The 10-year probability of major osteoporotic fracture and hip fracture were 16.2% and 7.9% for the patients with vertebral fracture, as well as 11.2% and 3.9% for those without it, respectively. There was no significant difference between the patients who had radiographic fractures and those without it regarding FRAX® scores.

Conclusions: These findings suggest that GCs use increased the risk of osteoporotic fracture in postmenopausal women with RA. Although our data do not support the use of FRAX® scores to predict the presence of vertebral osteoporotic fracture in clinical practice, further large-scale research is needed to confirm these results.

Disclosure: S. Esmaeilzadeh, None; N. Eskiyurt, None; E. Sen, None; M. Akpinar, None.

1973

Effect of Aladimambum On the Serum Level of Undercarboxylated Osteoclastic (ucOC), Bone Biochemical Markers and Bone Mineral Density, Yoshitada Sakai1, Akira Hashimamoto1, Takaihih Okano1, Yoshihiko Kawasasaki1, Nao Shibanuma1 and Masahiro Kurosaka1. Kobe University Hospital, Kobe, Japan. 3The Center for Rheumatic Diseases, Kobe University Hospital/Department of Orthopaedic Surgery, Kobe Kaisei Hospital, Kobe, Japan, 1Kobe University Graduate School of Medicine, Kobe, Japan.

Background/Purpose: The osteoporotic fracture in patients with rheumatoid arthritis (RA) is caused by systemic osteoporosis as well as periarticular osteoporosis. On the other hand, the serum level of undercarboxylated osteoclastic (ucOC) has been recognized as being a sensitive marker of vitamin K deficiency in bone. A prospective large cohort study showed that increasing the serum level of ucOC predicted hip fracture risk independently of femoral neck bone mineral density (BMD).

Treatments with Aladimambum, a biologic TNF-α inhibitor, reduced the hand bone loss of RA patients (PREMIER study), however, the effect of aladimambum on systemic bone metabolism is still unknown.

In this study, we have evaluated the effect of aladimambum on serum ucOC, bone biochemical markers and bone mineral density in patients with RA.

Methods: 20 patients with RA were enrolled; 6 females, 4 males, average age 54.5 ± 19.2 yrs, average stage 2.4 ± 1.3 and average class 2.1 ± 0.3. Serum levels of ucOC, cross-linked N-teropeptide of type I collagen (NTx), bone alkaline phosphatase (BAP) and osteocalcin (OC) were evaluated at 0, 12, 24, 48 weeks after the administration of aladimambum. BMD were also examined by using dual energy X-ray absorptiometry (DXA) with lumbar spine and femoral neck. Patients’ disease activities were evaluated by DAS28 score and mHAQ. The statistical analysis was performed using one-way repeated measures ANOVA followed by Turkey’s post hoc test.

Results: The serum levels of ucOC and OC were increased time-dependently and significantly by the administration of aladimambum: ucOC (p=0.018; 0w vs. 24w, 0w vs. 48w, 12w vs. 48w, OC: p=0.001; 0w vs. 48w, 12w vs. 48w) The serum levels of NTx was decreased significantly by the administration of aladimambum (p=0.048), whereas the serum levels of BAP (p=0.221) and bone mineral density (L-spine: p=0.334, Femoral neck: p=0.009) did not changed (Table 1). Variability of disease activity, DAS28 and mHAQ scores did not correlate to bone biochemical markers.

Table 1.

<table>
<thead>
<tr>
<th>ucOC (ng/ml)</th>
<th>0w</th>
<th>12w</th>
<th>24w</th>
<th>48w</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3 ± 2.1</td>
<td>5.3 ± 1.6</td>
<td>6.0 ± 2.3</td>
<td>6.1 ± 2.7</td>
<td>7.5 ± 2.5</td>
<td>0.010</td>
</tr>
<tr>
<td>NTx (nmol BCE/ml)</td>
<td>16.7 ± 5.3</td>
<td>15.9 ± 3.9</td>
<td>15.4 ± 5.5</td>
<td>14.9 ± 3.2</td>
<td>0.038</td>
</tr>
<tr>
<td>BAP (U/ml)</td>
<td>13.8 ± 7.2</td>
<td>12.9 ± 5.9</td>
<td>14.7 ± 8.4</td>
<td>15.3 ± 6.8</td>
<td>0.221</td>
</tr>
<tr>
<td>DXA L-Spine/cm3 (0.732 ± 0.097)</td>
<td>0.732 ± 0.097</td>
<td>0.726 ± 0.117</td>
<td>0.724 ± 0.109</td>
<td>0.069</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Treatments with aladimambum increased the serum levels of OC, decreased NTx and thus arrested the systemic bone loss at 48 week. The increased serum ucOC is caused by the increase of the Vitamin K demand in the bone, presumably due to up-regulation of OC production. Therefore, during treatments with aladimambum, the vitamin K supplementation is required especially in cases with increased serum ucOC.

Disclosure: Y. Sakai, None; A. Hashiramoto, None; T. Okano, None; Y. Kawasaki, None; N. Shibanuma, None; M. Kurosaka, None.

Methods: With assistance of a reference librarian, a search of MEDLINE (1948–2012), and the Cochrane Library (2012) for studies that reported incidence of atypical femoral fractures among subjects exposed to bisphosphonates for osteoporosis. We also reviewed reference lists and consulted experts. We excluded studies evaluating bisphosphonates in malignancy. We used no language restrictions. Two reviewers independently extracted data. Disagreements were resolved through consensus. Fracture rates were summarized according to study characteristics.

Results: Of 257 initial studies identified, 12 met all inclusion criteria and included three randomized controlled trials, six retrospective cohorts, and three population-based case-control studies. Among a total of 205,466 subjects followed over a range of less than 1 to 10 years of bisphosphonate exposure, there were 1440 subtrochanteric or diaphyseal fractures identified by ICD-9 or 10 coding, of which 160 were also confirmed radiographically. The incidence of atypical femoral fractures per 1000 patient-years of treatment with a bisphosphonate for osteoporosis ranged from 0.02 to 1 in studies that required radiographic verification of atypical nature, 0.23 to 3.4 in observational studies or randomized controlled trials, and 1.55 to 3.4 in studies of secondary prevention.

Conclusion: Currently available evidence suggests the incidence of atypical femoral fractures among patients receiving bisphosphonates for osteoporosis is low. In addition, even at the highest reported estimate of 3.4 per 1000 patient-years, the rate is considerably lower than estimates for recurrent osteoporotic fractures, which occur at approximately 100 per 1,000 patients per year. Discussions regarding bisphosphonate therapy should put both benefits and harms in appropriate context so that decisions are driven by evidence, not fear.

Disclosure: J. N. Mecchella, None; J. A. Batsis, None; R. J. Larson, None; G. Suresh, None.

Mortality After Fragility Hip Fracture in Middle Aged and Elderly Men and Women in Southern Norway. Andreas P. Diamantopoulou 1, Mari Hoff 2, Marc C. Hochberg 3 and Glenn Haugeberg 1.

Background/Purpose: The mortality of the fragility hip fracture patients has been reported to be higher compared to the general population for both men and women, and higher in men than in women. The highest incidence of fragility hip fracture has been reported from Norway. Our aim was to study mortality rates in patients with fragility hip fracture in Southern Norway after 1 and 5 years and compare them with the general background population.

Methods: The hip fracture patients were identified in the two most southern counties in Norway, Vest-Agder and Aust-Agder County. Six hospitals from the same geographic area was randomly selected from Norway's national register. Standardized mortality ratio (SMR) was calculated comparing with mortality rates in the Norwegian population using the SPSS version 17.0 (SPSS, Chicago, IL, USA). Statistical significance was defined as p<0.05.

Results: In the two year period, the final number of fragility hip fractures in the geographic area was 951 (271 men and 680 women). Mean age for all included patients was 81.2 years (men 80.0 years and women 81.8 years). The SMR for men and women compared to the Norwegian population for the 1st year was 2.78 (95% CI 2.24–3.31) and 2.08 (95% CI 1.77–2.38) and after 5 years 3.10 (95% CI 2.21–3.98) and 1.82 (95% CI 1.41–2.22) respectively. The overall mortality rates for patients with a fragility hip fracture older than 80 years at the end of 1st year were 29.4% (44.6% for men and 24.0% for women, p<0.005) and at the end of 5th year 69.2% (85.4% for men and 63.5% for women, p<0.005). The mortality rates in patients with a fragility hip fracture after one year were higher in men than in women (men 32.1% and women 19.0%, p<0.005). The corresponding figures for the controls were 6.5% for men and 5.0% for women (p<0.1). After 5 years the mortality rate was 69.9% for men and 54.3% for women (p<0.005) with a fragility hip fracture and for the controls 24.0 % for men and 21.5 % for women (p<0.1).

Conclusion: Mortality rates in patients with a fragility hip fracture are elevated compared to matched controls and the background population at the first year and continues to be elevated after 5 years, especially in men. Future research should focus on identifying risk factors for this increased mortality in hip fracture patients.

Disclosure: A. P. Diamantopoulou, None; M. Hoff, None; M. C. Hochberg, None; G. Haugeberg, None.

1976


Background/Purpose: Greater satisfaction has been reported with subcutaneous injections of denosumab compared with oral alendronate tablets in a randomized, cross-over study where subjects received both treatments (Freeman 2012). This was a multicenter, randomized, open-label, parallel-group study in which postmenopausal women aged 55 and older were randomized 1:1 to receive open-label denosumab 60 mg subcutaneously every 6 months or ibandronate 150 mg orally every month for 12 months. The treatment satisfaction questionnaire for medication (TSQM) version 1.4 was given at baseline and months 6 and 12 or at time of early termination. TSQM is a validated tool that measures the subject’s perception of the 4 domains of treatment satisfaction: the medication’s effectiveness, convenience, side effects, and global satisfaction (Atkinson Health Qual Life Outcomes 2004). Each TSQM domain score is between 0 and 100 and a higher score indicates a more preferred health status. Treatment comparisons of change in TSQM from baseline to months 6 and 12 were analyzed using an ANCOVA model fitted with treatment group and adjusted for baseline TSQM domain score.

Results: The study population included 833 women (417 denosumab; 416 ibandronate) with a mean (SD) age of 66.7 (8.0) years and mean (SD) BMD T-scores of –1.8 (0.7) at the total hip, 2.1 (0.7) at the femoral neck, and –2.5 (0.8) at the lumbar spine. Compared with the TSQM scores at baseline, subjects in both treatment groups reported greater satisfaction in all domains of the TSQM at month 6 and at month 12. However, subjects who transitioned to denosumab therapy had significantly greater improvements among all domains than did subjects who transitioned to ibandronate therapy at month 6 (P < 0.0004 in all domains; data not shown) and at month 12 (P < 0.0003 in all domains; Table 1).
Conclusion: In summary, postmenopausal women with low BMD who were sub-optimally treated with prior biphosphonate therapy reported greater satisfaction if they transitioned to denosumab vs ibandronate in an open-label study. Greater treatment satisfaction may lead to better adherence to therapy and thus improvements in treatment efficacy.


1977

Relationship Between Baseline Bone Turnover Marker Levels and Bone Mineral Density Changes in Men with Low Bone Mineral Density Receiving Denosumab or Placebo. Eric Orwell,1 Ugis Gruntmanis,2 Steven Boonen,3 Yu-Ching Yang4, Rachel B. Wagman5, Jesse W. Hall4 and Paul D. Miller.1 Oregon Health and Science University, Portland, OR, 2Dallas in BMD at all measured skeletal sites and reductions in serum CTX body to RANKL, has been shown to increase bone mineral density (BMD) and thus improvements in treatment efficacy. Study. Greater treatment satisfaction may lead to better adherence to therapy if they transitioned to denosumab vs ibandronate in an open-label study. S. Bonnick, Amgen Inc., 1, Amgen Inc., 3; 30 to 85 years; had a BMD T-score −2.5 at the lumbar spine or femoral neck. Subjects received placebo. As previously reported, 12 months of denosumab treatment of 3.5 at the lumbar spine or femoral neck. Subjects received placebo. As previously reported, 12 months of denosumab treatment.

Table 1. TSQM Change From Baseline to Month 12

<table>
<thead>
<tr>
<th>TSQM Domain</th>
<th>Treatment</th>
<th>n</th>
<th>LS Mean</th>
<th>95% CI</th>
<th>P-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness</td>
<td>Ibandronate</td>
<td>332</td>
<td>17.9</td>
<td>15.6, 20.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Denosumab</td>
<td>378</td>
<td>24.1</td>
<td>22.0, 26.3</td>
<td></td>
</tr>
<tr>
<td>Convenience</td>
<td>Ibandronate</td>
<td>338</td>
<td>16.7</td>
<td>14.9, 18.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Denosumab</td>
<td>384</td>
<td>26.3</td>
<td>24.6, 28.0</td>
<td></td>
</tr>
<tr>
<td>Side Effects</td>
<td>Ibandronate</td>
<td>337</td>
<td>4.2</td>
<td>2.7, 5.8</td>
<td>0.0003</td>
</tr>
<tr>
<td></td>
<td>Denosumab</td>
<td>385</td>
<td>8.1</td>
<td>6.7, 9.6</td>
<td></td>
</tr>
<tr>
<td>Global Satisfaction</td>
<td>Ibandronate</td>
<td>337</td>
<td>14.9</td>
<td>12.3, 17.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Denosumab</td>
<td>382</td>
<td>26.4</td>
<td>24.4, 28.4</td>
<td></td>
</tr>
</tbody>
</table>

n = number of subjects with non-missing TSQM domain at baseline and at month 12. LS = least squares. CI = confidence interval. *P-value from treatment comparison based on an ANCOVA model fitted with treatment group and adjusted for baseline TSQM domain score.

Conclusions: Denosumab, a fully human monoclonal antibody to RANKL, has been shown to increase bone mineral density (BMD) in postmenopausal women with high or low bone turnover,1 and reduce the risk for new vertebral, non-vertebral, and hip fractures.2 ADAMO evaluated denosumab in men with low BMD and demonstrated increases in BMD at all measured skeletal sites and reductions in serum CTX (sCTX).3 We assessed the efficacy of denosumab to increase BMD in men across a range of baseline bone turnover levels in ADAMO, a placebo-adjusted, double-blind, placebo-controlled study. Subjects were randomized 1:1 to receive either 60 mg denosumab or placebo administered subcutaneously once every 6 months over a 12-month period. Subjects were included if they were aged 30 to 85 years; had a BMD T-score ≤ −2.5 at the lumbar spine or femoral neck, or had a prior major osteoporotic fracture and a T-score ≤ −3.5 at the lumbar spine or femoral neck. Subjects received ≥1000 mg calcium and ≥800 IU vitamin D supplementation daily. Percentage change in sCTX was assessed at day 15. Percentage change in BMD from baseline to month 12 at the lumbar spine, total hip, femoral neck, trochanter, and 1/3 radius was assessed according to baseline tertile of sCTX.

Results: A total of 242 subjects (121, placebo; 121, denosumab) were enrolled. As previously reported, 12 months of denosumab treatment significantly increased BMD from baseline at the lumbar spine, total hip, femoral neck, trochanter, and 1/3 radius compared with placebo (all p<0.02, adjusted for multiplicity). Denosumab reduced sCTX by 81% from baseline vs 7% for placebo at day 15. For each tertile of baseline sCTX, subjects treated with denosumab, compared with placebo, demonstrated greater gains in lumbar spine and total hip BMD at month 12 (Figure). Subjects in the highest tertile of baseline sCTX had the numerically greatest gains in BMD when compared with subjects in the lowest tertile, although differences were not statistically significant. Associations between baseline sCTX and 12-month BMD improvements were weaker at the femoral neck and 1/3 radius, sites with greater variability in BMD measurements.4

1978

A Web-Based Intervention Aimed to Improve Bone Health Among Individuals On Chronic Glucocorticoids. Amy H. Warriner,1 Ryan C. Outman,1 Nathan Markward,1 Ronald Aubert4, Jeffrey R. Curtis4, Robert Epstein,3 Felix Freuh,2 Julia McEachern,2 David T. Redden,1 Monika M. Safford,1 Eric Stanek,2 Amy Steinke5 and Kenneth G. Saag,1 University of Alabama at Birmingham, Birmingham, AL, 2Medco, Bethesda, MD, 3Univ of Alabama-Birmingham, Birmingham, AL

Background/Purpose: Despite a significant associated fracture risk, previous population-based studies document low osteoporosis treatment rates for individuals treated with chronic glucocorticoids (GCs) at risk for glucocorticoid-induced osteoporosis (GIOP). We evaluated the influence of a direct-to-patient web-based educational video on the rates of anti-osteoporosis prescription medication use among chronic GC users who filled GCs online.

Methods: Using integrated medical and pharmacy data, we identified members of a pharmacy benefits management company who were prescribed ≥5 milligrams of prednisone (or an equivalent) for ≥90 days, but not prescribed GIOP therapies in the prior year. We developed an online video of osteoporosis risk-factors, treatment options, and real-life patient stories. Through an interrupted time series design, the video was automatically shown for 45 days to GC users following completion of an online GC refill. During the subsequent 45-day period, the video was inactivated. Those refilling GCs during the initial 45-days were the exposure group ("Video On") and those refilling GCs during the second 45-day period were the comparison group ("Video Off"). For 3 months following the completion of two Video On/Video Off cycles, the incidence of GIOP prescription use was assessed. Multivariable logistic regression was used to examine the influence of the video on GIOP prescription rates.

Results: Of the 4,659 patients that refilled their GC during the study, 2017 had the potential to view the intervention video. Among these, 59% had measurable video viewing time and 3% self-initiated the video. Most patients were between the ages of 50–70 (53.6%) and were female (56.8%). Commonly associated medical conditions in these patients included gastrointestinal illness (37.6%), history of organ transplant (29.9%), rheumatoid arthritis (17.5%), anxiety or depression (10.7%), and gout (9.2%).
During the 3-month follow-up, the overall GIOP prescription rate in the exposure group was 2.9% compared to 2.7% for the control group. GIOP prescription rates were slightly higher in those patients that self-initiated the video rather than in the automated manner (5.7%, p = 0.1). GIOP prescription rates were higher among older patients (50–70 years old: OR 2.1, 95% CI 1.3 – 3.5 and >70 years old: OR 1.8, 95% CI 1.0–3.2) when compared to those <50 years old and were lower among men (OR 0.2, 95% CI 0.2–0.4) when compared to women.

Conclusion: Among high-risk individuals, GIOP treatment rates were not affected greatly by an online educational video presented at the time of glucocorticoid refill. Women and persons aged 50–70 years old were more likely to be initiated on GIOP medications during the study period. This novel method of approaching patients may be more accepted by certain populations and further tailoring of the intervention could improve effectiveness.

Disclosure: A. H. Warriner, Anylin, 2, NIH, 2, AHRO, 2; R. C. Outman, None; N. Markward, Medco, 3, Medco, 1; R. Aubert, Medco, 1, Medco, 3; J. Curtis, Roche/Genetech, UCB, Centocor, CORRONA, Arogen, Pfizer, BMS, Crescendo, Abbott, 5, Roche/Genetech, UCB, Centocor, CORRONA, Arogen Pfizer, BMS, Crescendo, Abbott, 2; R. Epstein, Medco, 1, Medco, 3; F. Freuh, Medco, 1, Medco, 3; J. McEachern, Medco, 1, Medco, 3; D. T. Redden, None; M. M. Safford, None; E. Stanek, Medco, 1, Medco, 3; A. Steinikellner, Medco, 1, Medco, 3; K. G. Saag, Amgen, 2, Eli Lilly and Company, 2; Merck Pharmaceuticals, 2, Novartis Pharmaceutical Corporation, 2, Amgen, 5, Eli Lilly and Company, 5; Merck Pharmaceuticals, 5, Novartis Pharmaceutical Corporation, 5.

1979
Care Gap in the Treatment of Patients with High Risk for Fractures in a Single Canadian Academic Center. Arthur N. Lau1, Michael Branch2, Robert Bensen3, Jonathan D. Adachi4, Alexandra Papaioannou1, William Wong-Pack5 and William G. Bensen6. 1McMaster University, Hamilton, ON, 2Charlton Medical Centre, Hamilton, ON, 3St. Joseph’s Hospital and McMaster University, Hamilton, ON, 4Charlton Medical Centre, Hamilton, ON, 5Hospital for Sick Children, Toronto, ON, 6St. Joseph’s Rheumatology Clinic, Hamilton, ON, 7Hamilton, ON, 8St. Joseph’s Hospital and McMaster University, Hamilton, ON, 9McMaster University, Hamilton, ON

Background/Purpose: A number of clinical prediction tools are available to stratify patients into low, moderate and high risk for fractures in future. These tools are valuable in determining which patients should be initiated on an anti-resorptive agent. Bone Destiny is a validated tool which can accurately predict a patient’s 10 year fracture risk. Patients are stratified into colours (green, yellow, orange, red and purple) which range from low to high 10 year risk. Patients in the purple and red range are deemed to be at very high and high risk respectively (10 year fracture risk >20%), and should be treated with an anti-resorptive agent. The goal of this study is to assess if a care gap exists in patients deemed at high risk of fractures using the Bone Destiny tool, and also if a similar gap exists in patients with a T-score in the osteoporosis range.

Methods: At a large single academic center in Hamilton, Canada, all patients who received a BMD from May 1, 2011 to April 30, 2012 were assessed using the Bone Destiny assessment tool and assigned a colour according to their fracture risk. All prevalent fragility fractures were recorded. We also assessed for the percentage of patients in each colour group being treated with either Prolia, Actonel, Fosavance, Evista, Aclasta or Forteo.

Results: At our center, 26,213 patients received a DXA scan and a Bone Destiny assessment. 3,643 patients were in the purple group, 4,501 patients were in the red group. Overall, 1805/3643 (49.5%) patients in the purple group and only 1817/4501 (40.4%) patients in the red group were on treatment. The younger patients (age<60 years) in the purple group were less likely to be started on treatment compared to older patients in this group (32.5% in age<60 years, while 46.1% in age 60–69 years, 53.6% in age 70–79 years, and 51.7% in age>80 years). The same trend was seen in the patients in the red group, where 32.9% of patients <60 years were on treatment, 41.4% in age 60–69 years, 44.3% in age 70–79 years, and 41.4% in age>80 years.

Conclusion: Among high-risk individuals, GIOP treatment rates were slightly higher in those patients that self-initiated the video rather than in the automated manner (5.7%, p = 0.1). GIOP prescription rates were higher among older patients (50–70 years old: OR 2.1, 95% CI 1.3 – 3.5 and >70 years old: OR 1.8, 95% CI 1.0–3.2) when compared to those <50 years old and were lower among men (OR 0.2, 95% CI 0.2–0.4) when compared to women.

Conclusion: It is important for clinicians to use a risk assessment tool to predict which patients are at high risk for fractures and start them on appropriate treatment. At our center; only 49.5% of patients in the purple group were on appropriate treatment and only 40.4% of patients in the red group. This is quite alarming, as the 67% (2443/3643) of patients in the purple group, and 33.4% (1502/4501) in the red group have a prevalent fragility fracture. This study suggests that a care gap indeed exists in patients at high risk for fractures, despite having the Bone Destiny tool to identify which patients require treatment. These results suggest more education is required to educate physicians and other healthcare providers about the availability and usefulness of such tools.

Disclosure: A. N. Lau, None; M. Branch, None; R. Bensen, None; J. D. Adachi, Amgen, Eli Lilly, GSK, Merck, Novartis, Procter & Gamble, Roche, Sanofi Aventis, 2, Amgen, Eli Lilly, GSK, Merck, Novartis, Procter & Gamble, Roche, Sanofi Aventis, Warner Chilcott, 5, Amgen, Eli Lilly, GSK, Merck, Novartis, Procter & Gamble, Roche, Sanofi Aventis, Warner Chilcott, 8; A. Papaioannou, None; W. Wong-Pack, None; W. G. Bensen, Abbott, Amgen, AstraZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Procter and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 2, Abbott, Amgen, Astra-Zeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proct and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 5, Abbott, Amgen, AtrasZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proct and Gamble, Roche, Sanofi-Aventis, Servier, UCB, Warner Chilcott, 8.

1980
Intermittent Nitrate Use and Risk of Hip Fracture. Devyani Misra1, Christine Pelouquin1, Hyon Choi1, Tuhina Neogi2 and Yuqing Zhang2. 1Boston University School of Medicine, Boston, MA, 2Boston Univ School of Medicine, Boston, MA

Background/Purpose: Nitrates are commonly used anti-anginal medications which have also been found to promote bone formation and decreases bone resorption. Intermittent nitrate use has been associated with increased bone mineral density; however, its effect on fracture risk has been conflicting. Because of potential tachyphylaxis with frequent use and challenge of defining regular vs. intermittent use in an observational study, we conducted a cohort study to examine the relation of incident short-acting nitrate use, a proxy for intermittent use, to the risk of hip fractures among older subjects without a history of hip fracture.

Methods: The Health Improvement Network (THIN) is an electronic medical records database containing anonymized clinical and prescription data entered by general practitioners in the UK. We included participants from THIN followed between 1986–2010 who were ≥ 60 years old with ischemic heart disease, without history of hip fracture prior to prescription of short-acting nitrates, no concomitant long-acting nitrate use, and continuously enrolled in the database for ≥12 months. Intermittent nitrate use was defined by incident nitrate use of short-acting formulations only (Glyceryl Trinitrate sublingual/patch or Isosorbide Dinitrates injection/sprays) using Drug Codes, with ≥2 prescriptions in 1 year. Each intermittent nitrate user was matched by age, sex and enrollment year with a non-user (Never nitrate use). Follow-up started 1 year after the first nitrate prescription. Hip Fractures were identified using Read Codes. We plotted Kaplan-Meier survival curves to determine cumulative incidence rate for hip fracture by intermittent nitrate use. Hazard ratios (HR) of hip fracture related to intermittent nitrate use was also estimated using Cox proportional hazards regression models, adjusting for BMI, recurrent falls, heart failure, smoking, alcoholism, use of beta-blockers, bisphosphonates, diuretics, estrogens and glucocorticoids.

Results: Included were 14 925 intermittent nitrate users (median 1 prescriptions in 1 year: 3.0) and 14 925 non-users (mean age 73±7.6, 41% women for each cohort). Hip fracture occurred in 267 intermittent nitrate users and 332 non-users, respectively. Cumulative incidence of hip fracture increased rapidly among non-users compared with intermittent nitrate users (Fig 1). Compared with non-users, rate of hip fracture was 30% lower and did not change substantially after adjusting for other potential confounders (adjusted HR=0.69, 95% CI 0.55–0.86, p=0.001).
Interruption (short-acting) nitrate use was associated with significant reduction presented in the table with significant differences highlighted.

African-Americans (AA) 66 patients had normal BMD. Low bone density was seen in 77.21% of AA and 69.62% of W males tested. The prevalence results are frequently under-recognized. There are a number of known demographic factors such as age, race, and BMI as well as secondary causes of low bone density (BMD). There were no racial differences in prevalence of low BMD and was seen in 5.3% of AA and 5.2% of W males. However, AA males are significantly more prevalent than normal BMD with low BMD. Similarly, medication use was more prevalent in the male patients with low BMD as compared to those with normal BMD in patients undergoing bone mass measurement. This may have significant implications on decision to consider screening for OP in males.

Results: A total of 237 charts were analyzed. There were 158 whites (W), 79 African-Americans (AA) 66 patients had normal BMD. Low bone density was prevalent and seen in 171 patients (75.9%). Amongst these 61 had T-score < −2.5 (osteoporosis) and 110 had T-score > −2.5 and < −1.0 (osteopenia) BMD. There were no racial differences in prevalence of low BMD and was seen in 77.21% of AA and 69.62% of W males tested. The prevalence results are presented in the table with significant differences highlighted.

In this cohort of patients undergoing DEXA scan, a number of underlying factors are present with low BMD. Amongst these, low BMI, overall medication use, smoking and respiratory disorders were found to be significantly more prevalent than others. No difference was found with older age or race but there was significantly higher prevalence of low BMI with low BMD. Secondary medical disorders were prevalent in the cohort (>70%). But, there was no difference in their prevalence except for asthma/COPD among those with low versus normal BMD. Similarly, medication use was more prevalent in the male patients with low BMD and was significantly more prevalent with low BMD. Steroid use (>5 mg) was more frequently under-recognized. There was no difference in their prevalence except for asthma/COPD among those with low versus normal BMD. Similarly, medication use was more prevalent in the male patients with low BMD and was significantly more prevalent with low BMD. Steroid use (>5 mg) was more frequently under-recognized. There was no difference in their prevalence except for asthma/COPD among those with low versus normal BMD.

Conclusion: Low BMI, asthma/COPD, smoking and overall medication use were found to be more prevalent in the male patients with low BMD as compared to those with normal BMD in patients undergoing bone mass measurement. This may have significant implications on decision to consider screening for OP in males.

Disclosure: V. J. Vedanarayanan, None; A. V. Jones, None; V. Majithia, None.

1982

Five Years of Treatment to Target in Early Active Rheumatoid Arthritis: Prevalence and Predictors of Vertebral Fractures, L. Dirven1, M. van den Broek2, A. J. Peeters3, N. Ryaz3, P.J.S.M. Kerstens4, T.W.J. Huizinga5, C.F. Allaart1 and W. F. Lems6. 1Leiden University Medical Center, Leiden, Netherlands, 2Reinier de Graaf Gasthuis, Delft, Netherlands, 3Haga Hospital, The Hague, Netherlands, 4Jan van Bremen Research Institute | Reade, Amsterdam, Netherlands, 5VU University medical center, Amsterdam, Netherlands

Background/Purpose: Vertebral fractures (VFs) are more common in patients with rheumatoid arthritis (RA) compared to the general population. It is suggested that an appropriate control of disease, generally more effectively achieved with disease activity score (DAS)-steered treatment strategies, may prevent the development of vertebral fractures. The prevalence of vertebral fractures after 5 years of DAS-steered treatment in patients with early active RA was determined and the association of VFs with disease activity, functional ability and bone mineral density (BMD) over time was investigated.

Methods: Five-year radiographs of the lateral thoracic and lumbar spine of 275 patients in the BeSt study, a randomized trial comparing four treatment strategies, were available. Treatment adjustments were made every 3 months aiming at a DAS<2.4. Vertebral fractures were assessed using the Genant method, with a fracture defined as loss of height reduction >20% in one vertebra. BMDs of the spine and hip were measured with dual energy X-ray absorptiometry. With linear mixed models, DAS and Health Assessment Questionnaire (HAQ) scores over 5 years were compared for patients with and without VFs. With GEE the association between BMD and VFs was determined.

Results: At baseline patients were on average 54 years old and most were female (67%), of whom 18% were postmenopausal. Mean DAS was 4.4 and mean HAQ score was 1.3. After 5 years of DAS steered treatment, VFs were observed in 41/275 patients (15%). No difference in prevalence was found when stratified for gender, treatment with prednisone and menopausal status. Disease activity over time was higher in patients with VFs, with a mean difference of 0.20 (95% CI:0.05–0.36). HAQ scores were higher in patients with VFs, independent of disease activity, with a mean difference of 0.12 (95% CI:0.02–0.2). Although values were slightly lower over time in patients with vertebral fractures, mean BMDs in the spine and hip over time were not independently associated with VFs (OR 0.99, 95%CI:0.78–1.25 and 0.94, 95%CI: 0.65–1.36, respectively). Higher age was independently associated with VFs (OR 1.06, 95%CI:1.02–1.10).

Conclusion: After 5 years of DAS-steered treatment, 15% of these RA patients had vertebral fractures (VFs). Higher age was associated with the presence of VFs, but mean BMDs in the hip and spine were not. VFs are associated with more disability, independent of disease activity. Patients with VFs have a slightly higher disease activity over time, suggesting that optimal disease activity suppression may prevent VFs.

Disclosure: L. Dirven, None; M. van den Broek, None; A. J. Peeters, None; N. Ryaz, None; P. J. S. M. Kerstens, None; T. W. J. Huizinga, None; C. F. Allaart, None; W. F. Lems, None.

1982

Prevalence and Predictors of Vertebral Fractures, L. Dirven1, M. van den Broek2, A. J. Peeters3, N. Ryaz3, P.J.S.M. Kerstens4, T.W.J. Huizinga5, C.F. Allaart1 and W. F. Lems6. 1Leiden University Medical Center, Leiden, Netherlands, 2Reinier de Graaf Gasthuis, Delft, Netherlands, 3Haga Hospital, The Hague, Netherlands, 4Jan van Bremen Research Institute | Reade, Amsterdam, Netherlands, 5VU University medical center, Amsterdam, Netherlands

Background/Purpose: Vertebral fractures (VFs) are more common in patients with rheumatoid arthritis (RA) compared to the general population. It is suggested that an appropriate control of disease, generally more effectively achieved with disease activity score (DAS)-steered treatment strategies, may prevent the development of vertebral fractures. The prevalence of vertebral fractures after 5 years of DAS-steered treatment in patients with early active RA was determined and the association of VFs with disease activity, functional ability and bone mineral density (BMD) over time was investigated.

Methods: Five-year radiographs of the lateral thoracic and lumbar spine of 275 patients in the BeSt study, a randomized trial comparing four treatment strategies, were available. Treatment adjustments were made every 3 months aiming at a DAS<2.4. Vertebral fractures were assessed using the Genant method, with a fracture defined as loss of height reduction >20% in one vertebra. BMDs of the spine and hip were measured with dual energy X-ray absorptiometry. With linear mixed models, DAS and Health Assessment Questionnaire (HAQ) scores over 5 years were compared for patients with and without VFs. With GEE the association between BMD and VFs was determined.

Results: At baseline patients were on average 54 years old and most were female (67%), of whom 18% were postmenopausal. Mean DAS was 4.4 and mean HAQ score was 1.3. After 5 years of DAS steered treatment, VFs were observed in 41/275 patients (15%). No difference in prevalence was found when stratified for gender, treatment with prednisone and menopausal status. Disease activity over time was higher in patients with VFs, with a mean difference of 0.20 (95% CI:0.05–0.36). HAQ scores were higher in patients with VFs, independent of disease activity, with a mean difference of 0.12 (95% CI:0.02–0.2). Although values were slightly lower over time in patients with vertebral fractures, mean BMDs in the spine and hip over time were not independently associated with VFs (OR 0.99, 95%CI:0.78–1.25 and 0.94, 95% CI: 0.65–1.36, respectively). Higher age was independently associated with VFs (OR 1.06, 95%CI:1.02–1.10).

Conclusion: After 5 years of DAS-steered treatment, 15% of these RA patients had vertebral fractures (VFs). Higher age was associated with the presence of VFs, but mean BMDs in the hip and spine were not. VFs are associated with more disability, independent of disease activity. Patients with VFs have a slightly higher disease activity over time, suggesting that optimal disease activity suppression may prevent VFs.

Disclosure: L. Dirven, None; M. van den Broek, None; A. J. Peeters, None; N. Ryaz, None; P. J. S. M. Kerstens, None; T. W. J. Huizinga, None; C. F. Allaart, None; W. F. Lems, None.
Comparative Risk of Fracture in Men and Women with Human Immunodeficiency Virus. Lydia Gedmintas1, Elizabeth Wright2, Jeffrey N. Katz3, Elena Losina1 and Daniel H. Solomon4. 1Brigham’s Women’s Hospital, Boston, MA, 2Orthopedic and Arthritis Center for Outcomes Research, Brigham and Women’s Hospital, Boston, MA, 3Brigham and Women’s Hospital, Boston, MA, 4Brigham & Women’s Hospital and Harvard Medical School, Boston, MA.

Background/Purpose: A growing body of evidence suggests that HIV-positive patients have an increased risk of osteoporosis compared to HIV-negative patients, with some studies suggesting a higher risk of fracture as well. Antiretroviral therapy (ART) is thought to contribute to this increased risk as certain therapies are linked to decreased bone mineral density, but the etiology of the higher risk of osteoporosis in HIV-positive patients is likely multifactorial. Expert recommendations suggest screening for osteoporosis in HIV-positive patients starting at age 50, in both men and women. However there is an insufficient evidence as to whether HIV-infected men have fracture rates similar to HIV-infected women.

Methods: We identified HIV-positive adult patients who had been prescribed ART and were seen at least annually at two large tertiary hospitals. An institutional electronic patient registry was used to identify these patients, as well as to identify the outcome of interest - fracture at any site – indicated by diagnosis code or the patient problem list. We reviewed 50 medical records of patients identified by the patient registry having fracture in order to assess the positive predictive value (PPV) of the algorithm for identifying fracture in the registry database. We estimated the IR per 1,000 person-years of fracture for the entire cohort as well as the IR for fractures occurring at sites associated with osteoporosis (hip, wrist, vertebrae) and the IR for all other fractures. IR of fracture was then calculated stratified by age and gender. As well, IR ratios between men and women were calculated.

Results: We identified a cohort of 3,182 HIV-positive patients prescribed ART (883 men and 2,399 women) with a total of 15,317 person-years of follow-up. 966 total fractures were found in this population. The PPV of a fracture identified in the electronic patient registry was 90% (95% CI 78–97%) as compared with medical record review. The IR of fractures occurring at osteoporotic sites among men of all ages was 15.9 (95% CI 13.6–18.4) compared with women which was 12.2 (95% CI 9.1–15.9), giving an incidence rate ratio of 1.3 (95% CI 0.95–1.80) (see Table). Men had similar or higher incidence rates of fractures at osteoporotic sites than women across most age groups until age 66, when women had higher rates, although this difference was not statistically significant. In addition, IR of fracture at all other sites were similar in men (IR 29.4, 95% CI 26.4–32.8) and women (IR 33.6, 95% CI 28.4–39.4), with IR ratio of 0.88 (95% CI 0.72–1.07).

Conclusion: Fractures in HIV-positive patients on ART occur at similar rates in men and women. Recent expert recommendations suggest screening all HIV patients with osteoporosis for fracture. Our data offer support for this recommendation and can be used to further refine evidence-based recommendations for osteoporosis screening in HIV.

Disclosure: L. Gedmintas, None; E. Wright, None; J. N. Katz, None; E. Losina, None; D. H. Solomon, Amgen & Lilly, 2, Corrona, 5, UptoDate, 7.


Background/Purpose:PTH is a potent anabolic agent for bone, but patient acceptance is difficult due to the need for daily injections. A solid dosage enterico-coated formulation has been developed that enables oral peptide delivery by a unique mechanism that includes an organic acid as a prodrug and acylcarnitine as a permeation enhancer. Based on results from phase 1 studies, we tested a 5 mg tablet dose of a differentiated PTH(1–31)NH2 in a Phase 2 proof-of-concept study.

Methods: The Phase 2 study was a 24-week double blind, randomized, repeat dose parallel group study of rhPTH(1–31)NH2, or placebo tablets, compared to opened Forsteo® [teriparatide, PTH(1–34)OH] in 97 postmenopausal women with osteoporosis. The primary endpoint was to characterize percent change from baseline in BMD by DXA. The secondary endpoint was to determine the effect on bone markers. Plasma samples were collected to characterize the PK profiles of the tablets and the Forsteo® after the first dose and at the end of treatment. Blood samples were collected prior to and at intervals up to 5.75 hr after tablet administration and up to 2 hr after injection.

Results: The trial met the primary endpoint with an increase of 2.2% in LS BMD with PTH(1–31)NH2 compared to baseline (p = 0.004). Placebo LS BMD decreased by ~0.17% (p = NS) and LS BMD for teriparatide increased by 5.1% (p < 0.001). There were statistically significant increases from baseline in the total hip BMD for PTH(1–31)NH2 and teriparatide, with no significant differences between these two groups. CTx-1, a marker of bone resorption, increased by 12.7% (p = NS) in the PTH(1–31)NH2 group and by 124.6% in the teriparatide group at week 24. The increase in the bone formation marker P1NP was similar for the PTH(1–31)NH2 group, whereas osteocalcin, another formation marker, increased 23.3% (p = 0.015) compared to baseline. This is in contrast to 4.9% (p = 0.87) in placebo and 169.3% (p < 0.0001) in the teriparatide group at week 24. No clinically significant hypercalcemic events or elevated urine calcium were seen in the oral PTH(1–31)NH2 arm. The PK profile for PTH(1–31)NH2 showed a pulsatile peak with durations of at least 1 hr but less than 5 hr, which is consistent with the requirements for the anabolic activity. The median Cmax of PTH(1–31)NH2 measured at weeks 0 (n = 32) and 24 (n = 28) was 295 pg/mL and 207 pg/mL, respectively. The mean Cmax at for patients receiving Forsteo® at weeks 0 and 24 was 120 pg/mL. Thus, the 5 mg dose resulted in higher mean Cmax values than Forsteo®. The median Cmax and AUC values were equivalent to those of Forsteo®. The most common adverse event in the oral PTH and placebo arms was GI pain or distress, and these events were mostly mild or moderate.

Conclusion: The efficacy data and safety profile in this study demonstrate that orally delivered PTH(1–31)NH2 offers the potential for a bone anabolic treatment with greater physician and patient acceptance, and warrants evaluation in further late stage clinical studies.

Disclosure: M. A. Karsdal, Nordic Bioscience Diagnostic, 4; N. M. Mehta, Unigene Laboratories, Inc., 3; W. Stern, Unigene Laboratories, 3; A. M. Sturmer, Unigene Laboratories, Inc., 3; S. J. Mitta, Unigene Laboratories, Inc, 3; R. Tavakkol, Unigene Laboratories, Inc., 3; A. Bolat, Unigene Laboratories, Inc., 3; J. Giacchi, Unigene Laboratories, Inc., 3; K. Henriksen, None; L. A. Fitzpatrick, None; C. Christiansen, Nordic Bioscience A/S, CCRB/Synarc, Roche, Eli Lilly, Novartis, Novo Nordisk, Proctor and Gamble, Groupe Fournier, Besins EscoVesco, Merck Sharp and Dohme, Chiesi, Bohringer Mannheim, Pfizer, GlaxoSmithKline, Amgen., 5; J. A. Wald, None; A. J. Nino, None; P. Alexandersen, None; B. J. Riis, None; J. Andersen, None; I. Valter, None; B. Nedergaard, None; C. Teglbjaerg, None; F. Cosman, Lilly, Novartis, 2, Lilly, Merck, Amgen and Unigene, 5; J. M. Trang, Unigene laboratories, Inc, 5.
1985

The Effect of Calcium and Vitamin D On Bone Loss in an Epileptic Population. Philip Dussault1, Samuel Davis Jr.2 and Antonio A. Lazzari2.
1Boston VA HCS, Boston, MA; 2Boston VA Medical Center, Boston, MA

Background/Purpose: Accelerated rate of bone loss leading to osteopenia and osteoporosis is a well recognized adverse effect of long term anticonvulsant use, particularly phenytoin, phenobarbital, sodium valproate or carbamazepine. Futher, compared to the general population, epileptics experience a two-fold increase in the incidence of vertebral and non-vertebral fractures.

In this trial, we sought to evaluate whether a bisphosphonate in addition to calcium and vitamin D supplementation can prevent bone loss and fractures in an epileptic population chronically treated with phenytoin, phenobarbital, sodium valproate or carbamazepine.

Methods: This was a phase IV randomized, two year double blinded, placebo-controlled trial of an epileptic male population of veterans. This study involved 80 patients with various types of seizures who were being treated in an epileptic population chronically treated with phenytoin, phenobarbital, sodium valproate or carbamazepine for a minimum of two years. At initial visit, patients underwent DXA scan on 25th generation GE IDXA. Subjects who had a T-score > -2.5 at AP spine or hip were randomized into two of one two groups. Group R received calcium and vitamin D supplementation along with riseredrone 35mg weekly, while Group P received calcium and vitamin D supplementation along with a matching placebo tablet weekly. We excluded those subjects who had been found to be osteoporotic according to WHO criteria (BMD T-score < -2.5 at spine or hip) or were found to be vitamin D deficient.

BMD of bilateral proximal femur, LVA, A-P lumbar spine, total body and forearm were evaluated utilizing a GE Lunar Bone Densitometer or an IDXA instrument and had measurements of 25-OH Vit D, NTX, serum calcium and blood chemistries.

Results: 80 patients were randomly enrolled in either the B or P groups. Baseline characteristics of both groups were similar. Average age was 60+/−13 years. Average bilateral total proximal femur mean BMD was 0.991+/−0.122 for the B group and 0.992+/−0.123 g/cm2 for the P group. Lumbar spine baseline BMD was 1.284+/−0.190 for the B group and 1.237+/−0.249 g/cm2 for the P group. Total body BMD was 1.229+/−0.107 for the P group and 1.185+/−0.110 for the B group. A total of 56 patients competed the study. At the end of the study 12 out 28 patients from group B and 10 out 28 patients from group P had a significant increase of BMD as determined at the total proximal femur which was above the LSC for our site; further, 18 out 28 of group B and 22 out of 28 on group P demonstrated a significant increase of BMD at the L-Spine. Improvement of BMD at different sites was observed in more than 78% of patients who completed the study taking calcium and vit D both in the P or B groups. Five new vertebral fractures were observed only on the P group.

Conclusion: In this cohort, supplementation with calcium and vitamin D or use of calcium, vitamin D and bisphosphonates decrease rate of bone loss and at the same time increased bone mass associated with chronic treatment with phenytoin, phenobarbital, sodium valproate or carbamazepine. Prevention of new vertebral fractures was not observed in the group receiving only calcium and vitamin D.

Disclosure: P. Dussault, None; S. Davis Jr., None; A. A. Lazzari, None.

1986

Impaired Endothelial Function in Post-Menopausal Women with Osteoporosis. Auleen M. Millar1, Aaron McCann2, Vivian McClennahan2, Paul Hamilton2, Caroline Bleakley2, Kristopher Lyons2 and Gary McVeigh2.
1Musgrave Park Hospital, Belfast, United Kingdom; 2Belfast, United Kingdom

Background/Purpose: Although traditionally viewed as separate disease entities that increase in prevalence with aging, accumulating evidence indicates that similar pathophysiological mechanisms may underlie cardiovascular disease and osteoporosis. Endothelial dysfunction is the initial step in the atherosclerotic process. The aims of this study were to determine if women with post-menopausal osteoporosis have impaired endothelial function.

Methods: We used non-invasive Doppler ultrasound to assess endothelial function in sixty women with post-menopausal osteoporosis and compared results to 30 age, sex matched controls. After measurement of traditional cardiovascular risk factors, we measured flow mediated dilation (FMD) of the brachial artery in subjects. Flow mediated dilation is a dynamic assessment of endothelium-dependent and -independent dilation of an artery. Subjects were further assessed using radial artery tonometry. Isoprostane levels, which are a marker of oxidative stress, were compared between groups.

Results: Groups were equally matched for age, weight, blood pressure, cholesterol profile and smoking history. Results from radial artery tonometry indicated that cardiac output (p=0.03), large artery elasticity index (p=0.03) and small artery elasticity index (p=0.03) readings were significantly higher in the healthy control group. Systemic vascular resistance (p=0.005) and total vascular impedance (p=0.032) was statistically significantly higher in patients with osteoporosis compared to controls. Flow mediated dilation of the brachial artery showed a statistically significant better dilatation of the brachial artery post cuff deflation in healthy controls (p=0.006), although there was no difference in endothelium-independent dilation ie. brachial artery dilation after administration of GTN. Isoprostane levels were statistically significantly higher in the osteoporosis group.

Conclusion: The differences in flow mediated dilatation between healthy controls and post-menopausal women with osteoporosis may indicate impaired endothelial function and reflect the local distensibility of the brachial artery or the distal microcirculation’s response to the ischaemic stimulus. Radial artery tonometry results also support a difference in endothelial function between groups. Changes in vascular reactivity are likely to be multi-factorial but may be related in part to differences in levels of oxidative stress between groups. This study demonstrates that further work is required on the assessment of potential structural remodelling in small arteries and vascular beds that may precede clinically detectable cardiovascular disease in women with post-menopausal osteoporosis. Further work is also required on the complex interaction of common risk factors and genetic or molecular determinants of both conditions.

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1987

A Comparison of Unilateral and Bilateral Hip BMD. Steven C. Schaub1, Edward S. Leib2 and Diantha Howard2. 1University of Vermont College of Med, Burlington, VT; 2Vermont Center for Clinical and Translational Science, Burlington, VT

Background/Purpose: The utility of bilateral hip dual energy x-ray absorptiometry scanning for identifying low bone mineral density has been a cause of debate. Intraperson differences in density at the hip can affect categorization of a patient as osteoporotic. Our study was designed to assess the correlation between sides of the hip in individual patients and to compare different sites of the hip for osteoporosis categorization.

Methods: Bilateral hip measurement data on postmenopausal women over age 40 from a single facility scanned on a GE Lunar Prodigy or Prodigy Advance were retrospectively reviewed. Data included patient demographics, bilateral scan BMD and T-score, presence of historical fragility fractures and data to determine clinical risk.

Results: Scans were evaluable for both proximal femurs in 12,741 women. We found lower density values, reported as T-scores, on the right side of the hip at all regions of interest that were statistically significant. Agreement in osteoporosis categorization between sides of the hip ranged by anatomic site from 82.7%–87.6%. Mean values showed improved agreement (91.0%–93.5%) over the lowest obtained T-score at each hip site. The total hip had the highest correlation in categorization and the closest association to previous fracture at each region of interest. Those categorized as osteoporotic by the mean value were as or more likely to have had a fracture than those with the lowest BMD. Using logistic regression models the adjusted odds ratio for fracture was 3.00 in the osteoporosis category compared to normals. Bilateral scanning effectively eliminated significant differences within an individual patient, but values were minimally divergent from unilateral measurements.

Conclusion: Our study demonstrates that, although there is a small difference between WHO classification of osteoporosis comparing the mean values of the hip to the lowest, the use of the mean value was as good as or better for predicting fractures as the lowest value. This supports the use of bilateral hip scanning for diagnosis of osteoporosis and identifying individuals at risk for fractures.

Disclosure: S. C. Schaub, None; E. S. Leib, None; D. Howard, None.
1988

Zoledronate Efficacy and Safety in Active Paget’s Disease Long-Term Follow-up and Retreatment in Clinical Practice. Elsa Vieira-Sousa1, Ana M. Rodrigues1, Joana Caetano-Lopes2, Susana Capela1, Filipa Ramos1. Ricardo Figueira1, Joaquim Polido-Pereira1, Cristina Ponte1, Raquel Campanhilo-Marques1, Rita Barros1, JC Romeu1 and José A. Pereira da Silva1. 1Rheumatology and Metabolic Bone Diseases Department, Hospital de Santa Maria, CHLN and Rheumatology Research Unit, Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal; 2Rheumatology Research Unit, Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal; 3Rheumatology and Metabolic Bone Diseases Department, Santa Maria Hospital, CHLN, Lisbon, Portugal.

Background/Purpose: Bisphosphonates are first line therapy in the treatment of Paget’s disease (PD). Zoledronate, a third generation bisphosphate, has showed high efficacy in the inhibition of bone resorption. The objective of this observational study was to assess short and long-term efficacy and safety of zoledronate in the treatment of active PD, in clinical practice.

Methods: Patients with active PD treated with zoledronate 5 mg were consecutively recruited between 2005 and 2011 and followed prospectively. Clinical (bone and joint pain attributed to PD) and laboratory parameters (alkaline phosphatase (ALP), bone specific alkaline phosphatase (BSALP), procollagen type 1 N-terminal propeptide (PINP), collagen type 1 beta C-terminal telopeptide (b-CTX), seric and urinary calcium and phosphorus and parathormone levels) were determined before, at 3 and then every 6 months after treatment, up to a maximum of 60 months of follow-up. Remission was defined as normalization of ALP. Retreatment was considered when ALP levels increased more than 25% of the upper limit of normal period after zoledronate infusion was of 37 months (minimum of 12 and maximum of 111 months). All patients (6%) required retreatment, on average 30 months after the first zoledronate infusion. A marked reduction of ALP (261,6±22,2) (p<0.001) was observed at 6 months and 7 months after zoledronate infusion, being maximal at 12 months (75%±6,3±22,2) (p<0.001). The difference of the mean values of ALP between 3 and 6 months was also significant (p<0.05). At 3 and 6 months, 95% and 96% of patients respectively, achieved remission. Maximum effect was obtained at 12 months after treatment with 98% of patients being in remission. Significant reductions of the mean levels of BSALP, PINP, and b-CTX (p<0.0001) were also verified at 3, 6 and 12 months after treatment. 47% of patients reported pain improvement: 89% at 3 months, 75% at 6 months and 4% at 12 months. Transitory side effects were registered in 15 patients, 18% referred flu-like symptoms, 10% showed asymptomatic hypocalcaemia and 30% asymptomatic hyperphosphorsemia. The prevalence of vertebral fractures was 45.5% and 30% in the RA and volunteer groups, respectively. Significantly more RA patients than volunteers had semiquantitative (SQ) grade 2 or more (15.2% vs. 5%). Bone mineral density, urine pentosidine, homocysteine and bone specific alkaline phosphatase (BAP) significantly correlated with vertebral fractures among the patients and urinary pentosidin levels in the RA patients with fractures were significantly higher than without fractures. Patients using bisphosphonates was 33.3% in patients with rheumatoid arthritis. Bone mineral density was lower and more vertebral fractures was found in patients using bisphosphonates than in patients without bisphosphonates.

Conclusion: The incidence of vertebral fractures was higher in patients with RA than in volunteers. Bone quality markers and vertebral fractures are closely linked with RA. We will continue to prospectively investigate the incidence of new vertebral fractures and the progression of osteoporosis in patients with RA.

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1990

Risk of Falling Is Equivalent Between Patients with Rheumatoid Arthritis and Healthy Individuals—the Tomorrow Study. Kenji Mamoto, Tat-suya Koike, Tadashi Okano, Atsuko KAmiyama, Yuko Sugio, Masahiro Tada and Hiroaki Nakamura. Osaka City University Graduate School of Medicine, Osaka, Japan.

Background/Purpose: Patients with rheumatoid arthritis (RA) who have muscle weakness and stiff or painful joints might be at increase risk of falling. The present study prospectively determines the incidence of new vertebral fractures and their risk factors in patients with RA who participated in the TOMORROW (Total Management Of Risk factors in Rheumatoid arthritis patients to IOW er morbidity and mortality; clinical trial registration number: UMIN000003876) study that was started in 2010.

Methods: We evaluated anthropometric parameters, muscle volume, bone mineral density (BMD), disease activity, general health status and the occurrence of falls for a period of two years in 202 patients with RA (mean age: 58.4 years, 54% administered with biological agents) and 202 age- and sex-matched healthy volunteers (HV, mean age: 57.4 years).

Results: Among the patients with RA and HV, 29.6% and 26.7% respectively reported one or more falls during two years. These values did not significantly differ in the two groups. The fall group had higher age, lower BMD (p<0.01), higher whole % Fat mass (p<0.01) and tended to have induced walking time. After adjusting for risk factors of falls such as age, gender, smoking and BMI, multiple logistic regression analysis identified that a history of falls was the most significant parameter associated with falls.


Results: Lumbar spine areal BMD % change from baseline at 1 year (primary endpoint) was statistically significantly greater for ODN than PBO (3.49% treatment difference, p<0.001). After 2 years, there were significantly greater improvements with ODN than PBO in total, trabecular, and cortical volumetric BMD; cortical thickness; and estimated strength (failure load) of the distal radius using HR-pQCT-based finite element analysis (exploratory endpoints, FIGURE). At the radius, odanacatib attenuated the increase in cortical porosity that was seen in the placebo group (treatment difference in least squares mean % change from baseline −7.68, p<0.066). At the distalibia, changes in volumetric BMD and cortical thickness were similar to changes at the radius. Safety and tolerability were similar between treatment groups. Conclusion: Odanacatib increased cortical and trabecular density and improved cortical thickness of the distal radius and distal tibia, and improved the estimated bone strength in the distal radius compared to placebo.

Methods: In order to determine the effect of ODN on cortical geometry and to estimate bone strength, we conducted a randomized, double-blind placebo-controlled trial, using high resolution quantitative computerized tomography (HR-pQCT) of the distal radius and distal tibia. A total of 214 postmenopausal women, of mean age 64.0 ±6.8 years and baseline lumbar spine T-score −1.81 ±0.83, were randomized to oral ODN 50 mg or PBO weekly for 2 years.

Background/Purpose: The cathepsin K inhibitor odanacatib (ODN), a novel antiresorptive that preserves bone formation, is currently in phase 3 development for postmenopausal osteoporosis. In a phase 2 study, 5 years of ODN 50 mg once weekly progressively increased areal BMD at the lumbar spine and total hip (11.9 % and 8.5% from baseline, respectively). ODN 50 mg once weekly progressively increased areal BMD at the lumbar spine T-score /H11002

and periosteal bone formation at the central femur and femoral neck. In an OVX primate model, ODN has been shown to increase cortical thickness of the spine and total hip (11.9 % and 8.5% from baseline, respectively). ODN

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Results: Lumbar spine areal BMD % change from baseline at 1 year (primary endpoint) was statistically significantly greater for ODN than PBO (3.49% treatment difference, p<0.001). After 2 years, there were significantly greater improvements with ODN than PBO in total, trabecular, and cortical volumetric BMD; cortical thickness; and estimated strength (failure load) of the distal radius using HR-pQCT-based finite element analysis (exploratory endpoints, FIGURE). At the radius, odanacatib attenuated the increase in cortical porosity that was seen in the placebo group (treatment difference in least squares mean % change from baseline −7.68, p<0.066). At the distalibia, changes in volumetric BMD and cortical thickness were similar to changes at the radius. Safety and tolerability were similar between treatment groups.

Conclusion: Odanacatib increased cortical and trabecular density and improved cortical thickness of the distal radius and distal tibia, and improved the estimated bone strength in the distal radius compared to placebo.

Methods: In order to determine the effect of ODN on cortical geometry and to estimate bone strength, we conducted a randomized, double-blind placebo-controlled trial, using high resolution quantitative computerized tomography (HR-pQCT) of the distal radius and distal tibia. A total of 214 postmenopausal women, of mean age 64.0 ±6.8 years and baseline lumbar spine T-score −1.81 ±0.83, were randomized to oral ODN 50 mg or PBO weekly for 2 years.
increased in 1 subject. Among the 2 patients with a decrease in BMD, 1 had an increase and 1 had a decrease in RANKL levels. The remaining subject with no change in BMD also had no change in RANKL level. No relationship was noted between BMD at the LS and OPG levels.

**Conclusion:** Anti-TNF therapy improves BMD at the lumbar spine in a subset of RA patients. The increase in BMD is associated with a decrease in disease activity and may be mediated by a suppression of serum RANKL levels.

**Disclosure:** A. P. Anandarajah, Abbott Immunology Pharmaceuticals; 8; J. H. Ancoli, Abbott Immunology Pharmaceuticals.

**1993**

**Contribution of Lifestyle Factors to Healthy-Adherer Bias in Prevalent Users of Osteoporotic Drugs**, Mitsuyo Kinjo and Daniel H. Solomon.

Okinawa Chubu Hospital, Uruma City Okinawa, Japan, 2Bigham & Women’s Hospital and Harvard Medical School, Boston, MA

**Background/ Purpose:** Adherence to drug therapy may be a surrogate marker for overall healthy behaviors leading to healthy-adherer bias in epidemiologic studies. This might be particularly emphasized in osteoporosis supplements and medications. However, individual factors contributing to healthy-adherer effects and their quantitative impacts are not well described. We assessed the association between prevalent use of and adherence to osteoporotic supplements or medications and healthy lifestyle factors in a population-based sample from the National Health and Nutrition Examination Survey, 1999–2008.

**Methods:** We identified subjects who used calcium plus vitamin D supplements and/or osteoporotic medications (bisphosphonate, calcitonin or raloxifene). We estimated the magnitude of association between prevalent use of these osteoporotic drugs and demographic, lifestyle and comorbid illness factors. Demographic, lifestyle, and comorbid factors of interest included body mass index, exercise, smoking, alcohol consumption, self-reported health status, comorbidities (cancer, coronary artery disease, COPD and diabetes), and steroid use. We also examined the subset of subjects with a history of fracture in the hip, wrist or spine, or those with osteoporosis who were advised to take treatments.

**Results:** Among 25,290 subjects, 1,529 were users and 23,761 were nonusers of calcium, vitamin D or an osteoporosis medication. Users and nonusers were similar in age (mean age 57 years), but were more likely to be women (64% vs 52%; P<0.0). After adjustment for age, prevalent female users 50 years or older had significantly less severe obesity (odds ratio 0.7, 95% CI: 0.6, 0.9), current or past smoking (OR 0.8, 95% CI: 0.5, 1.0), more moderate exercise (OR 1.4, 95% CI:1.1, 1.8), lower self-reported poor health (OR 0.8, 95% CI: 0.7, 0.9), less diabetes (OR 0.7, 95% CI:0.6, 0.9) and acute coronary syndrome (OR 0.8, 95% CI:0.7, 1.0). Among subjects with previous fracture or osteoporosis, a similar trend was seen between users and nonusers.

**Conclusion:** In a large representative US population, prevalent use or adherence to osteoporotic drugs was associated with healthier lifestyle factors. The results suggest that healthy user or adherer can be explained, in part, by the healthier lifestyles in prevalent users or adherers in the elderly.

**Disclosure:** M. Kinjo, None; D. H. Solomon, Aangen & Lilly, 2, Corona, 5, Pfizer Inc, 9.

**1994**


1Lancaster University, Lancaster, United Kingdom, 2Royal Lancaster Infirmary, Lancaster, United Kingdom

**Background/ Purpose:** Low Body Mass Index (BMI) is associated with low Bone Mineral Density (BMD) and subsequent risk of fragility fracture. Percentage body fat (%BF), which is measured by most DEXA scanners, has a correlation with BMD, however the relative contribution of %BF on osteoporosis has not been examined in detail. A higher %BF may be associated with a higher BMD when BMI is accounted for. Previous work from this unit has shown that the threshold for poor bone health is a BMI of 22.

Our aim was to determine the relationship between %BF and BMD in a population at risk of fracture.

**Methods:** Patients with a BMI of less than 22 were identified from a total population of 25896 who had been referred for Dual-Energy X-Ray Absorptiometry (DEXA) scanning between June 2004 and August 2010. The relationship between %BF (as measured by DEXA) and the mean BMD at both the femoral neck and lumbar spine were analysed using Stata 9.0 for Windows. Linear regression was used to determine the relationship between %BF and the BMD at both the lumbar spine and the femoral neck, adjusting for BMI.

**Results:** 2634 patients were included in the analysis which consisted of 2333 females; 88.6% of the population. Although there was a correlation between %BF and BMI (coeff, 0.06; 95% CI, 0.05, 0.07), the variance explained was low (adjusted R squared value 0.07). When examining %BF and BMD and adjusting for BMI, there was a statistically significant negative association at the lumbar spine (coeff. −0.004; 95% CI, −0.006, −0.004) and the femoral neck (coeff, −0.005; 95% CI, −0.007, −0.004). This relationship was also observed in an only female cohort. A sensitivity analysis was performed using %BF alone, which still showed a negative correlation.

**Conclusion:** BMD was negatively influenced by %BF in this population with a low BMI, after adjusting for baseline BMI. A possible hypothesis is that body fat in this group has a paradoxical effect on bone health. Further work investigating this relationship in patients with a higher BMI will be performed.

**Disclosure:** A. Blanshard, None; M. Bukhari, None.

**1995**


1University of Alaska at Birmingham, Birmingham, AL, 2University of Wisconsin, Madison, WI, 3San Francisco Coordinating Center, CPMC Research Institute, San Francisco, CA, 4University of Maryland, Baltimore, MD, 5Fred Hutchinson Cancer Research Center, Seattle, WA, 6New Mexico Clinical Research & Osteoporosis Center, Albuquerque, NM, 7Park Nicollet Health Services, Minneapolis, MN, 8Division of Rheumatology, Brigham & Women’s Hospital, Boston, MA, 9University of Iowa, Iowa City, IA

**Background/ Purpose:** Pragmatic clinical trials (PCTs) allow for study of real world patients using efficient study designs, facilitating comparative effectiveness research in resource constrained settings. Although the need for osteoporosis PCTs is clear, it is unclear what study questions will most impact the field.

**Methods:** We conducted a Delphi meeting with 9 experts in osteoporosis trial design and patient care to consider PCT designs with aims of understanding the relative efficacy and safety of osteoporosis drugs. We asked the expert panel to review 2 osteoporosis PCT concepts in a practice-based setting with pre-specified study arms and drugs of interest including 1) active comparator osteoporosis initiation PCT that included 3-arm and 2-arm studies, and 2) osteoporosis therapy discontinuation/swITCHing PCTs that included 2-arm and 3-arm designs among chronic bisphosphonate (BP) users (Table). The primary outcome of both concepts was non-vertebral fracture risk reduction. Participants ranked the clinical significance and feasibility (four domains) of each design (Table). Initial rankings were cast after independent review of the scenarios followed by a webinar discussion and re-ranking of each design.

**Results:** Rankings associated with initiation studies did not change appreciably pre and post discussion. With 1 being the least and 5 being the most clinically significant, experts ranked the design that compared the fracture reduction of alendronate (ALN), zoledronic acid (ZA), and denosumab (Dmb) as the most clinically significant initiation PCT. The median score was 5 compared to 3.5 for comparing ALN to two strategies of ZA administration (single dose once vs. annual dosing for 3 years), and 3.0 for comparing any oral BP to ZA (Table). Although clinical significance was lower, the panel ranked designs that did not incorporate Dmb as more feasible for recruitment, and human ethics and regulatory approvals (Table). The panel ranked the clinical significance of discontinuation studies with 2-arms higher than designs that incorporated switching (Table). In consideration of switching designs, the panel ranked switching to Dmb more clinically significant than other switching designs. The median recruitment feasibility scores ranged from 2.5 – 4, lowest designs associated with switching to teriparatide and highest associated with 2-arm studies. The panel ranked human ethics and regulatory concerns greater with switching designs and felt these designs would require more site training and monitoring than 2-arm designs.
Conclusion: The study designs with the highest clinical significance included the 3-arm initiation PCT comparing ALN, ZA, and Dmbab and the 2-arm discontinuation PCT that compared continuing any BP or ALN to discontinuation therapy. The 2-arm discontinuation PCTs were also ranked as the most feasible, whereas feasibility was higher in other initiation designs.

Disclosure: N. C. Wright, Amgen, 2; A. Oliveira, None; A. R. Warriner, Amynlin, 2; NIH, 2; AHRQ, 2; J. Curtis, Roche/Genetech, UC/Center, Coronan, Amgen, Pfizer, IMS, Crescendo, Abbott, 2; Roche/Genetech/UCB, Center, CORRONA, Amgen, Pfizer, BMS, Crescendo, Abbott, 3; N. Binkley, Merck, Amgen, Lilly, Tarsa, 5, Merck, Amgen, Tarsa, 2; S. B. Cummings, None; M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Bioiberica S.A., Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma AG, Pfizer Inc., Stryker LLC, Xoma., 5; A. LaCroix, None; E. M. Lieleweld, None; J. T. Schousboe, None; D. H. Solomon, Amgen, 2; Abbott Immunology Pharmaceuticals, 2, Eli Lilly and Company, 2; Pfizer Inc., R. B. Wallace, Merck Pharmaceuticals, 5; Novartis Pharmaceutical Corporation, 5, K. G. Saag, Amgen, 2; Eli Lilly and Company, 2; Merck Pharmaceuticals, 2, Novartis Pharmaceutical Corporation, 2, Amgen, 2; Eli Lilly and Company, 5; Merck Pharmaceuticals, 5, Novartis Pharmaceutical Corporation, 5.

1996

Are Changes in Bone Mineral Density Different Between Groups of Early Rheumatoid Arthritis Patients Treated According to a Tight Control Strategy with or without Prednisone, If Osteoporosis Prophylaxis is Applied? Marlies C. van der Goes1, Alexandra L. Marlies C. van der Goes1, Johannes W.G. Jacob1, Maud M. T. J. P. Vermeulen1, Michael S. Jurgens1, Marie F. Bakker1, Maaike J. van der Veen2, Jacobine H. van der Werf3, Paco M.J. Welsing1 and Johannes W.J. Bijlsma1. 1University Medical Centre, Utrecht, Netherlands, 3Diakonessenhuis, Utrecht, Netherlands

Background/Purpose: To describe effects on bone mineral density (BMD) of treatment according to EULAR guidelines with a methotrexate-based tight control strategy including 10 mg prednisone daily versus the same strategy without prednisone in early rheumatoid arthritis (RA) patients, who received preventive therapy for osteoporosis.

Methods: Early RA patients were included in the CAMERA-II trial: a randomized, placebo-controlled, double-blind two-year trial, in which effects of addition of 10 mg prednisone daily to a methotrexate-based tight control strategy were studied. All patients received calcium, and a bisphosphonate. Disease activity was assessed every four weeks. X-rays of hands and feet and dual-energy X-ray absorptiometry of lumbar spine and left hip were performed at baseline, and after one and two years of treatment.

Results: The BMD increased significantly over time in both treatment groups at the lumbar spine with a mean of 2.6 percent during the first year (p<0.001), but not at the hip; at none of the time points the BMD differed significantly between the prednisone and placebo group. Higher age and lower weight at baseline, and higher disease activity scores during the trial, but not glucocorticoid therapy, were associated with a lower BMD at both the lumbar spine and the hip in mixed model analyses.

Conclusion: Additon of 10 mg prednisone daily to a methotrexate-based tight control strategy does not lead to bone loss in early RA patients on bisphosphonates. A small increase in lumbar BMD during the first year of treatment was found, regardless of the use of glucocorticoids.

Disclosure: M. C. van der Goes, None; J. W. G. Jacobs, None; M. S. Jurgens, None; M. F. Bakker, None; M. J. van der Veen, None; J. H. van der Werf, None; P. M. J. Welsing, None; J. W. J. Bijlsma, None.

1997

Safety and Efficacy of Denosumab Vs Ibandronate in Postmenopausal Women Sub-Optimally Treated with Daily or Weekly Bisphosphonates: A Randomized, Open-Label Study. Michael A. Bolognese1, Edward Czerwinski2, Henry G. Bone3, Sydney Bonnick4, Neil Binkley5, Alfred Moffett Jr.6, Suresh Siddhanti7, Irene Ferreira8, Prayashi Ghelani9, Rachel Wagman10, Jesse W. Hall11 and Chris Recknor12. 1Bethesda Health Research Center, Bethesda, MD, 2Krakow Medical Center, Krakow, Poland, 3Michigan Bone and Mineral Clinic, Detroit, MI, 4Postmenopausal women with low BMD from North Texas, 5University of Wisconsin, Madison, WI, 6OB-GYN Associates of Mid Florida, PA, Leesburg, FL, 7Amgen Inc., Thousand Oaks, CA, 8Amgen Inc., Cambridge, United Kingdom, 9Ovatec Solutions, London, United Kingdom, 10United Osteoporosis Centers, Gainesville, GA

Background/Protocol: Denosumab, a fully human monoclonal antibody that specifically targets RANKL, to inhibit osteoclast formation, function, and survival, reduces risk for vertebral, non-vertebral, and hip fractures in postmenopausal women with osteoporosis. In subjeets who were treated naïve or previously treated with alendronate, denosumab was associated with greater gains in bone mineral density (BMD) and decreases in bone turnover markers when compared with alendronate-treated subjects.1,2 The purpose of this open-label trial was to compare the safety and efficacy of denosumab and alendronate over 12 months in postmenopausal women with low BMD who were sub-optimally treated with prior bisphosphonate therapy.

Methods: This was a multicenter, randomized, open-label, parallel-group study in which postmenopausal women age 55 years and older were randomized 1:1 to receive open-label denosumab 60 mg subcutaneously every 6 months or ibandronate 150 mg orally every month for 12 months. Percent change from baseline in total hip (primary endpoint), femoral neck, and lumbar spine BMD at month 12; percent change from baseline in serum CTX (sCTX) at 1 and 6 months; and safety were assessed.

Results: Randomized subjects (n=833; 417, denosumab; 416, ibandronate) had a mean (SD) age of 66.7 (8.0) years and mean (SD) BMD T-scores of −1.8 (0.7), −2.1 (0.7), and −2.5 (0.8) at the total hip, femoral neck, and lumbar spine, respectively. Denosumab significantly increased total hip BMD compared with ibandronate at 12 months (2.2% vs 0.9%, respectively; p<0.001). Denosumab also significantly increased BMD compared with ibandronate at the femoral neck (1.7% vs 0.5%) and lumbar spine (4.1% vs 2.1%, p<0.0001 for both sites). Denosumab significantly decreased sCTX at 1 month with a median change from baseline of −81.1% compared with −35.0% for ibandronate (p<0.0001), and sCTX remained decreased through 6 months of treatment. In this open-label study, overall adverse events were similar between groups. Reports classified as serious adverse events (SAEs) were more frequent in subjects treated with denosumab than with ibandronate. The incidences of SAEs involving infection and malignancy were similar between groups.

Conclusion: Denosumab treatment resulted in greater increases in BMD at all measured skeletal sites compared with ibandronate. No new safety risks were identified in this open-label study.

1Cummings, et al. NEJM 2009;361:756
2Brown, et al. JBMR 2009;24:153
3Kendler, et al. JBMR 2010;25:72

Disclosure: M. A. Bolognese, Amgen Inc., 8; E. Czerwinski, Amgen Inc., 2; Amgen Inc., 8; E. G. Bone, Amgen Inc., 2; Amgen Inc., Merck, Zelos, Tarsa, GSK, 5; Amgen Inc., 8; S. Bonnick, Amgen Inc., Merck, Wyeth, Takeda, 2; Amgen Inc., Novartis, 8; N. Binkley, Merck, Amgen, Lilly, Tarsa, 5; Merck, Amgen, Tarsa, 2; A. Moffett Jr., None; S. Siddhanti, Amgen Inc., 3; Amgen Inc., 1; I. Ferreira, Amgen Inc., 3; A. LaCroix, Amgen Inc., 3; P. Ghelani, Amgen Inc., 1; C. Recknor, Amgen, Takeda, Novartis, Eli Lilly, 5.
Relationship Between Changes in Bone Mineral Density and Incidence of Fracture with 6 Years of Denosumab Treatment. Michael A. Bolognese1, Paul D. Miller2, Jean-Yves Reginster3, Nathalie Franchimont4, Gerolamo Bianchi5, Roland Chapurlat6, Federico G. Hawkins7, David L. Kendler8, Beatriz Oliveri9, Jose R. Zanchetta10, Nadia Datzadeh11, Andrea Wang4, Rachel B. Wagman4 and Socrates Papapoulos12. 1Bethesda Health Research Universitario, Madrid, Spain, 2University of Colorado Health Sciences Center and Colorado Center for Bone Research, Lakewood, CO, 3University of Liege, Liege, Belgium, 4Amgen Inc., Thousand Oaks, CA, 5Azienda Sanitaria Genovese, Genoa, Italy, 6Hospital Edouard Herriot, Lyon, France, 7Hospital Universitario, Madrid, Spain, 8University of British Columbia, Vancouver, BC, 9Laboratorio Enfermedades Metabo´licas Oseas, Hospital de Clı´nicas, INIGEM UBA-CONICET, Buenos Aires, Argentina, 10Laboratorio de Patologia Metabo´licas and University of Salvador, Buenos Aires, Argentina, 11Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: During the first 3 years of denosumab treatment in FREEDOM, there were continued increases in bone mineral density (BMD) and a robust reduction in fracture risk (Cummings et al., NEJM 2009). The changes in total hip BMD explained a considerable proportion of the reduction in new or worsening vertebral and nonvertebral fracture risk (Austin et al., JBMR 2011). Here, we conducted a BMD responder analysis and explored if the progressive BMD gains with 6 years of denosumab therapy continued to relate to the observed fracture incidence.

Methods: The long-term efficacy and safety of denosumab for up to 10 years is being investigated in the open-label extension of the 3-year FREEDOM trial. During the extension, all participants receive 60 mg denosumab every 6 months. For the analyses presented here, women from the FREEDOM denosumab group received 3 more years of denosumab for a total of 6 years. The percentages of women treated with denosumab who achieved BMD increases from FREEDOM baseline at the lumbar spine, total hip, and femoral neck were determined. A logistic regression model was used to examine the relationship between change in total hip BMD and new or worsening vertebral fracture. A comparable approach was employed for nonvertebral fracture using the Cox proportional hazards model.

Results: For women who received 3 additional years of denosumab treatment (N=2343 enrolled), further significant increases in BMD occurred for cumulative 6-year mean gains of 15.2% (lumbar spine), 7.5% (total hip), and 6.7% (femoral neck). At year 6, almost all women treated with denosumab had gains in BMD at the lumbar spine (98%), total hip (96%), and femoral neck (91%). Additionally, 99% of women had gains in BMD at any of these sites, and of these, the gains were >3% in 98% of women and >6% in 95% of women. Fracture incidence remained low during the extension. The relationships between total hip BMD gains and new or worsening vertebral and nonvertebral fractures with 6 years of denosumab treatment are shown in Figures 1 and 2, respectively.

The predicted fracture incidence was estimated corresponding to the 5th through the 95th percentiles of the observed total hip BMD percentage changes over 6 years. N=number of subjects with an observed BMD value at FREEDOM extension baseline and at ≥1 follow-up visit.

Conclusion: Almost all women who received 6 years of denosumab treatment had gains in BMD at the lumbar spine, total hip, or femoral neck; and those gains were >6% in 95% of them. While on denosumab treatment, the risk of new or worsening vertebral fracture and nonvertebral fracture decreased with increasing percentage change in total hip BMD over 6 years. This association provides clinical relevance to the progressive and continued BMD gains reported with denosumab over time.

ACR/ARHP Poster Session C
Pediatric Rheumatology - Clinical and Therapeutic Aspects: Juvenile Idiopathic Arthritis and Other Pediatric Rheumatic Diseases
Tuesday, November 13, 2012, 9:00 AM–6:00 PM

1999

Immunogenicity and Safety of Two Doses of Influenza A H1N1/2009 Vaccine in Young Autoimmune Rheumatic Diseases Patients Under 9 Years Old. Guilherme Trudes1, Nadia E. Aikawa1, Lucia M. Campos2, Rosa M.R. Pereira1, Julio C. B. Moraes1, Ana Cristina Ribeiro2, João Miraglia3, Maria do Carmo S. Timenetsky4, Eloisa Bonfa1 and Clovis Artur Silva1. 1Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 2University of São Paulo Medical School, São Paulo, Brazil, 3Fundação Butantan, São Paulo, Brazil, 4Instituto Adolfo Lutz - Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 5Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

Background/Purpose: In 2010 the Advisory Committee on Immunization Practices from the CDC recommended that all children should receive the...
Results: Thirty patients had WB MRI (66% were younger than 16 years at symptom onset; 66% male; 100% Caucasian). The median disease duration was 36 months (IQR 17.5–108). Inflammatory back pain by ESSG criteria was present in 92%; Median Schober test was 5 cm (IQR 4.15–6.25). Median ESR was 8 mm/hr (IQR 5–21.5) and CRP was 0.52 mg/L (IQR 0.16–26.72). Seventy seven percent of patients satisfied ILAR criteria for ERA (N=8) or PsA (2); 46% satisfied criteria for axial SpA (6). One patient had AS. All patients had at least one tender enthesis on exam; 77% had more than 4 tender entheses. A total of 108 enthesial sites were present among patients. The most common tender enthesial sites were medial epicondyae (N=7), L5 spinous process (6), anterior superior iliac spine (7), plantar fascia insertion to MTP (8), and 1st costosternal junction (7). None of the patients had head Achilles insertion. Two patients had any evidence of enthesities by WB MRI. Greater trochanter (8) and iliac crest (1) were the most common sites of enhancement on MRI.

There was poor agreement between WB MRI and clinical exam for enthesitis when evaluated for all enthesial sites (kappa=0). Agreement at individual sites including Achilles insertion, plantar fascia insertion to calcaneous and MTP; greater trochanter; upper and lower poles of patella; and iliac crest was also poor (k range =–0.23 to 0.24). Only one enthesial site in one patient was positive both on WB MRI and clinical exam. Among 4 healthy controls, a total of 4 enthesial sites were positive by clinical exam and none were positive by WB MRI.

Conclusion: There is poor agreement between enthesitis by clinical exam and WB MRI in young patients with SpA. Clinical examination may overestimate enthesitis, or non-contrast WB MRI may have limited sensitivity to detect enthesitis.

Disclosure: H. Srinivasalu, None; S. C. Hill, None; G. A. Monteagle Sanchez, None; A. D. Brundidge, None; M. M. Ward, None; R. A. Colbert, None.

2001

Methotrexate and Injectable Tumor Necrosis Factor Alpha Inhibitor Adherence and Persistence in Children with Rheumatic Diseases. Sarah Ringold1, Shannon Grant1, Charmaine Girdish2, Carol A. Wallace3 and Sean Sullivan4, 1Seattle Children’s Hospital, Seattle, WA, 2Axio Research LLC, Seattle, WA, 3CVS Caremark, Scottsdale, AZ, 4Seattle Childrens Hospital, Seattle, WA, 5University of Washington, Seattle, WA

Background/Purpose: Medication adherence and persistence have been demonstrated to have important implications for treatment effectiveness, cost, and safety. Methotrexate is one of the most commonly prescribed medications for the treatment of pediatric rheumatic diseases. Two injectable tumor necrosis factor alpha inhibitors (iTNFα), etanercept and adalimumab, are approved by the US Food and Drug Administration (FDA) for use in JIA, and recent data suggest that the prevalence of anti-TNFα medication use for JIA is now approaching that for adult rheumatoid arthritis. While JIA is the most common indication for these agents, they have been used in the treatment of additional rheumatic and inflammatory conditions. Despite their frequent use and established efficacy in clinical trials, few studies have examined children’s adherence and persistence with these medications.

The objective of this study was to measure adherence and persistence among children who were prescribed methotrexate and the injectable tumor necrosis factor alpha inhibitors (iTNFα) etanercept and adalimumab by an adult or pediatric rheumatologist.

Methods: Data were obtained from CVS Caremark®, a large pharmacy benefits manager. Children were included if they were < 18 years of age, and had ≥ 1 prescription claim between January 2009 and December 2010 for methotrexate or an iTNFα that was prescribed by an adult or pediatric rheumatologist. The medication possession ratio (MPR) was calculated for each medication, with MPRs ≥ 80% indicating good adherence. MPRs were compared by route of administration, age, and by new users versus continuing users. Persistence was measured for new users of each medication from initiation until discontinuation, or for a maximum of one year.

Results: 1,964 children were included. The majority of children had MPRs > 80%. Children taking subcutaneous methotrexate had the lowest mean MPR (46.9%; median 44.9%; IQR 23%–69.6%) and the lowest persistence, with 26% of children continuing the medication at one year. Mean MPR was highest for iTNFα (65.7%; median 70.1%; IQR 46%–89.3%), as was persistence, with 52% of children continuing the medication at one year. Children receiving oral methotrexate had higher MPRs and persistence than those receiving subcutaneous methotrexate. Children < 13 years tended to have higher MPRs, but this was statistically significant only for oral methotrexate (61.1% versus 54.9%; p=0.02).
Conclusion: Adherence and persistence in this cohort varied by medication and route of administration. Both outcomes are important considerations for physicians prescribing these medications in routine clinical care and for the assessment of treatment effectiveness in the research setting.

Disclosure: S. Ringold, None; S. Grant, Axio Research LLC, 3; C. Girdish, CVS Caremark, 3; C. A. Wallace, Pfizer Inc, 1, Amgen, 2, Pfizer Inc, 2, Genentech and Biogen IDEC Inc, 5, Novartis Pharmaceutical Corporation, 5; S. Sullivan, None.

2002

Randomized Clinical Trial in Pediatric Rheumatology: Are Parents and Patients in Equipoise? Petra C. E. Hissink Muller1, Bahar Yildiz2, Cornelia F. Allaart1, Danielle M.C. Brinkman5, Marion A. J. Van Rossum3, J. Merlijn Van den Berg4, Lisette W.A. Van Suijlekom-Smit6, Rebecca Ten Cate1 and Martine C. de Vries1. 1Leiden University Medical Center, Leiden, Netherlands, 2Rijnland Hospital, Leiderdorp, Netherlands, 3Emma Children’s Hospital / Academic Medical Center and Reade Institute, Amsterdam, Netherlands, 4Emma Children’s Hospital / Academic Medical Center and Reade Institute, Amsterdam, Netherlands, 5Erasmus MC Sophia Children’s Hospital, Rotterdam, Netherlands

Background/Purpose: It is an ethical requirement for setting up a randomized controlled trial (RCT) that the physician-investigator must have genuine uncertainty about the therapeutic options. This is called equipoise. Ideally patient-participants should also be in equipoise. In pediatric rheumatology, there are no data on whether this uncertainty also consists among parents and patients or if they have a specific preference for a particular treatment strategy. We conducted an interview study on the preferences of parents and children and the influence of the informed consent procedure on preferences in the setting of a randomized clinical trial in Juvenile Idiopathic Arthritis patients.

Methods: Semi-structured interviews with parents (n = 23, 1 father and 22 mothers) and patients aged 12 and older (n = 7) participating in the BeSt for Kids study, a randomized clinical trial with three treatment strategies (arm 1: initial monotherapy with sulfasalazine or methotrexate, arm 2: initial combination therapy with methotrexate and prednisone and arm 3: initial combination therapy with etanercept and methotrexate) in selected categories of newly diagnosed juvenile idiopathic arthritis patients.

Results: All parents had a preference for a particular treatment strategy, 65% had a preference for the combination therapy with etanercept and methotrexate (arm 3). Five parents and two patients participated in the study to have a chance to be initially treated with etanercept, as initial treatment with etanercept in daily practice is currently neither possible nor reimbursed. The preference of parents and patients for arm 3 was based on their idea that etanercept is the best treatment for juvenile arthritis. The parents indicated that these beliefs were mainly based on knowledge they had gained through the internet and from experiences from people in their environment. Four parents had a preference for a non-prednisone arm. Aversion for prednisone was primary due to the fear for side-effects, such as weight gain. According to four parents, the physician-investigator had a preference for arm 3, but the vast majority of parents (n = 19) stated that the physician-investigator had no preferred strategy. Similar results emerged from the interviews with children. The following agreements were reached regarding diagnosis and treatment possibilities obtained from other sources. The question is whether the absence of equipoise in parents and patients indicates that randomization is unethical or that this equipoise is not feasible in medical research.

Disclosure: P. C. E. Hissink Muller, Pfizer Inc, 2; B. Yildiz, None; C. F. Allaart, None; D. M. C. Brinkman, None; M. A. J. Van Rossum, Pfizer Inc, 9; J. M. Van den Berg, None; L. W. A. Van Suijlekom-Smit, Pfizer Inc, 2, Abbott Immunology Pharmaceuticals, 2, Pfizer Inc, 5, Pfizer Inc, 9, Dutch Arthritis Association, 2; R. Ten Cate, Pfizer Inc, 2; M. C. de Vries, None.

2003

Colchicine As a Therapeutic Option in Periodic Fever Aphthous Stomatitis, Pharyngitis Syndrome, and Cervical Adenitis (PFAPA), Yonatan buttal Avriel1, Sameh Tatour2, Ruth Gershoni2 and Riva Brik3, 1Rambam Medical center, Haifa, Israel, 2Rambam Medical Center, Israel, 3Rambam, Israel, 4Rambam Medical center

Background/Purpose: PFAPA syndrome is episodic disease characterized by periodic episodes of high fever, aphthous stomatitis, pharyngitis, and cervical adenitis, so far no therapy was shown to be effective in preventing the attacks.

The aim of our study was to evaluate the efficacy of colchicine in reducing attacks of PFAPA.

Methods: We carried a randomized control study among patients diagnosed with PFAPA in the pediatric Rheumatology clinic- Rambam Medical center, Israel.

The patients were randomized into two groups followed for 6 months. In months 1–3 both groups were followed without preventive therapy. In months 4–6, group 1 continued to be followed in the same manner, patients in group 2 received colchicine for three months in a standard dose. During the study patients and physician recorded all PFAPA episodes, in a log book. DNA analysis for the common FMF mutation was done for all patients.

Results: 14 patients 5.8±1.9 years old were evaluated (8 in group 1, 6 in group 2). The number of episodes in the first 3 months were 3.5±1.3 in group 1 and 4.9±2.45 in group 2 (p=0.187), the number of episodes in group 2 under colchicine therapy were 1.7±1 compared to 4.9±2.4 in the period without therapy (p=0.01).

Seven patients were found to be carrier of one FMF mutation; (4 in group 2 and 3 in group 1). Patients with PFAPA who carry one mutation for FMF responded to colchicine therapy (6.1±2 episodes before and 2±1.4 after therapy p=0.03).

Conclusion: Colchicine therapy might be effective in increasing intervals between episodes of PFAPA. Larger studies are needed to confirm these findings.

Disclosure: Y. buttal Avriel, None; S. Tatour, None; R. Gershoni, None; R. Brik, None.

2004

Do We Need a Minimum Standards in Care for Children with Localized Scleroderma- Result of the Consensus Meeting in Hamburg Germany On the 11th December 2011. Part 1. Diagnosis and Assessment of the Disease. Ivan Foeldvari1, Tamás Constantin2, Peter Hoeger3, Monika Moll1, Clare Pain1, Dana Nemcova4, Kathryn S. Torok5, Lisa Weibel6 and Philip J. Clements7. 1Hamburger Zentrum Kinder- und Jugendrheumatologie, Hamburg, Germany, 2Semmelweis Egyetem, AOK, ÍI.sz. Gyermekgyogyasztati Klinika, Budapest, Hungary, 3Kinderkrankenhaus Wilhelmstift, Hamburg, Germany, 4University Children’s Hospital, Tübingen, Germany, 5University Children’s Hospital, Liverpool, United Kingdom, 6University Children’s Hospital, Prague, Czech Republic, 7Univ of Pittsburgh Med Ctr, Pittsburgh, PA, 8University Children’s Hospital, Zurich, Switzerland, 9UCLA School of Medicine, Los Angeles, CA

Background/Purpose: Juvenile localised scleroderma (jScl) is an orphan disease. There are currently no guidelines regarding diagnosis, follow up and treatment. In the frame of the PRES scleroderma working group this consensus meeting was set up to gain consensus regarding these issues.

Methods: Members of the PRES scleroderma working group were invited to participate. Two pediatric dermatologists were invited to reflect the multidisciplinary care for these children. P. Clements was invited to moderate the meeting. A nominal group technique was used. 75% consensus was defined as agreement.

Results: The following agreements were reached regarding diagnosis and follow up:

1. Diagnosis is based on clinical grounds by a rheumatologist or dermatologist, preferably pediatric, with a biopsy as a confirmatory measure if it is unclear based on clinical findings.

2. If a biopsy is needed, a punch biopsy is appropriate. In the case of deep involvement, a deep biopsy is needed.

3. Since progression to systemic sclerosis is unlikely, an evaluation for internal organ involvement, such as HRCT and echocardiogram, is unnecessary.

4. There are no laboratory studies needed to confirm the diagnosis.

5. The group agrees there is no clear evidence for a pathogenic role of Borrelia, therefore we do not recommend investigation for Borrelia infection.

6. In patients with sclerodermatous skin changes of the head (face and/or scalp) the following are suggested:
**Table 1. Characteristics of children with JIA-associated uveitis, JIA alone, and idiopathic uveitis**

<table>
<thead>
<tr>
<th>JIA alone</th>
<th>JIA-U</th>
<th>I-U</th>
<th>P-value 1</th>
<th>P-value 2</th>
<th>P-value 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 104</td>
<td>N = 19</td>
<td>N = 9</td>
<td>JIA vs. JIA-U</td>
<td>JIA-U vs. I-U</td>
<td>I-U vs. JIA-U</td>
</tr>
</tbody>
</table>

**Demographic Characteristics**

- Age, mean years ± SD
- Gender, female, N (%)
- Race, N (%)
- HLA-B27, N (%)
- Antinuclear antibody, N (%)
- Rheumatoid factor, N (%)

**Uveitis Characteristics**

- Duration of uveitis, mean years ± SD
- Duration of optometry, mean years ± SD

**Disease Characteristics**

- Disease activity measures
- Damage measures

**Conclusion:** Although there are no solid guidelines currently present as the ‘standard of care’ for JLS, these suggestions are part of routine care for most physicians specializing in the care of pediatric localized scleroderma and are non-invasive measures.

**Disclosure:** I. Foeldvari, None; T. Constantin, None; P. Hoeger, None; M. Moll, None; C. Pain, None; D. Nemeova, None; K. S. Torok, None; L. Wethel, None; P. J. Clements, None.

**2005**

**Clinical Course and Outcomes of Children with Juvenile Arthritis-Associated Uveitis and Idiopathic Uveitis.**

- Sheila T. Angeles-Han,
- Steven Yeh,
- Courtney McCracken,
- Larry B. Vogler,
- Kelly Rouster-Stevens,
- Christine W. Kennedy,
- Matthew Kent,
- Kirsten Jenkins,
- Scott Lambert,
- Carolyn Drews-Botsch,
- and Sampath Prahalad,
- Emory Univ School of Medicine, Atlanta, GA,
- Emory Children’s Center, Atlanta, GA,
- Children’s Healthcare of Atlanta, Atlanta, GA,
- Emory University School of Public Health, Atlanta, GA

**Background/Purpose:** Uveitis can lead to vision loss and blindness. Few studies focus on the outcomes of children with both juvenile idiopathic arthritis-associated uveitis (JIA-U) and idiopathic uveitis (I-U). The determination of risk markers for uveitis development and disease severity is important in examining the long-term outcomes of this population. Our objective is to characterize the epidemiology and clinical outcomes of children with JIA-U and I-U in a cohort of children in an urban tertiary care center in the Southeast.

**Methods:** Children with JIA, JIA-U, and I-U participated. Medical record reviews were performed. Questionnaires were completed on overall quality of life (QOL) (Pediatric QOL Inventory - PedsQI), physical function (Childhood Health Assessment Questionnaire - CHAQ), and visual function (Effects of Youngsters’ Eyesight on QOL - EYE-Q).

**Results:** Our 132 patients were primarily female (72%), non-Hispanic (89.4%) and Caucasian (74.2%). Compared to JIA, children with JIA-U were more frequently African American, diagnosed with oligoarticular extended JIA and had a younger age of arthritis onset (Table 1). There were no significant differences in gender, ANA, RF or HLA-B27. Children with I-U were more frequently HLA-B27 (+) (p = 0.023), had worse visual acuity (p = 0.005), and more band keratopathy (p = 0.028), cystoid macular edema (p = 0.032) and cataract extractions (p = 0.032).

There were significant differences in EYE-Q scores in children with uveitis compared to JIA (p = 0.043), significant differences in the CHAQ and PedsQI Physical scale scores in children with arthritis compared to I-U (p = 0.046), and no differences in PedsQI total and psychosocial QOL scores in all groups (p = 0.045, p = 0.023) (Table 2).

**Conclusion:** Children with I-U may have a poorer visual outcome compared to JIA-U. Race, HLA-B27 (+), age of arthritis onset, and JIA subtype may be important risk factors for developing uveitis, whereas gender, ANA, and RF may not be as significant. As expected, visual disability was worse in uveitis, and physical disability was worse in arthritis. Hence, compared to JIA and I-U, children with JIA-U have more components of disease. All children had similar psychosocial and overall QOL probably secondary to having a chronic illness.

**To improve the assessment of outcomes in JIA-U, a comprehensive approach incorporating all aspects of disability should be considered. Likewise, the determination of risk markers leading to poor outcomes in children with uveitis is crucial. Longitudinal studies examining the outcome of children with uveitis are ongoing.**

**Disclosure:** S. T. Angeles-Han, None; S. Yeh, None; C. McCracken, None; L. B. Vogler, None; K. Rouster-Stevens, None; C. W. Kennedy, None; M. Kent, None; K. Jenkins, None; S. Lambert, None; C. Drews-Botsch, None; S. Prahalad, None.
Methods: All consecutive pJIA followed in a transition program were included. Age, sex, disease duration, medical or surgical treatments were collected. Laboratory tests (ESR, CRP, Rheumatoid Factor (RF) and anti-CCP) and standard radiographies of the hands and wrists, feet and hip were performed. A RA control group (<5years), matched for sex and disease duration, was recruited. Radiographs were analyzed by two independent radiologists blinded to the diagnosis. Structural lesions on the hands and feet assessed by the modified Larsen’s score method. The hands and feet scores range from 0 to 110 and from 0 to 50, respectively. Hips were assessed for presence of coxitis. Student and Fischer exact test were used.

Results: 58 pJIA (48 females/10 males) and 59 RA (52/7) were included. Respectively, mean age was 23.5 ± 10.0 years and 43.2 ± 9.6 years and mean disease duration 13.1 ± 11.1 and 12.2 ± 7.1 years. 60% and 80% were RF positive and 57% and 78% were anti-CCP positive (p = 0.02). The interobserver concordance coefficient kappa was 0.614 between the two investigators. Radiographs showed hand lesions in 45/58 (78%) pJIA and 50/58 (86%) RA-patients, feet lesions in 39/58 (67%) pJIA and 47/59 (80%) RA-patients and coxitis in 16/54 (30%) pJIA and 8/47 (17%) RA-patients (p = NS for all comparisons). Mean hands and feet scores were 17.9 ± 2.8 and 7.5 ± 10.8 in pJIA and 18.5 ± 17.6 and 9.9 ± 11.3 in RA, respectively (p = NS). Specificities to juvenile forms were a lower frequency of proximal interphalangeal joints involvement and a higher risk of bilateral coxitis (81% vs. 25% (p = 0.007; OR = 13 [1.701–99.375]) than adult RA. RF-positive patients differed from RF-negative patients only by a shorter disease duration (10.4 ± 9.3 vs. 17.3 ± 12.6, p = 0.02). Comparison between RF-positive and negative pJIA showed a trend for more frequent hand and feet lesions with a higher carpal score in RF-positive patients. There were less coxitis (5/31 vs. 11/23) in RF-positive subgroup (p = 0.01). In pJIA, presence of a radiographic damage correlated with a more severe disease phenotype.

Conclusion: Structural peripheral damages are frequent in young adults with pJIA and correlated with a more severe disease. A specific feature to pJIA seems to be a high risk of bilateral coxitis. This requires a particular following and monitoring of pJIA patients with unilateral hip involvement to prevent bilateralization.

Disclosure: M. Elhai, None; R. Bazeli, None; V. Freire, None; A. Fedry, None; A. Kahan, None; C. Job-Deslandre, None; J. Wipff, None.

2008

Initial Evaluation of a Localized Scleroderma (LS) Clinical Activity Measure. Suzanne C. Li1, Kathryn S. Tokor2, Christina Kelsey3, Mara L. Becker4, Fatma Dedeoglu5, Robert C. Fulbright6, Goria C. Higgins5, Sandy D. Hong2, Maria F. Ibarra7, Ronald M. Laxer8, Thomas G. Mason9, Marilyn G. Punaro10, Elena Pope11, Egla C. Rabindovich12 and Katie G. Stewart10, 1Joseph M Sanzari Children’s Hospital, Hackensack University Medical Center, Hackensack, NJ, 2Univ of Pittsburgh Med Ctr, Pittsburgh, PA, 3Children’s Mercy Hospital, Kansas City, MO, 4Boston Childrens Hosp, Boston, MA, 5Childrens Hospital, Boston, MA, 6Nationwide Childrens Hosp, Columbus, OH, 7U of Iowa Children’s Hosp, Iowa City, IA, 8The Hospital for Sick Children, Toronto, Ontario, 9Mayo Clinic, Rochester, Rochester, MN, 10Texas Scottish Rite Hospital, Dallas, TX, 11Hospital for Sick Children, Toronto, ON, 12Duke University Medical Center, Durham, NC

Background/Purpose: LS commonly causes severe morbidity for the growing child. Optimal therapy is not known and the lack of an agreed-upon standard for assessing disease state and monitoring treatment response has hindered treatment comparison. To work towards conducting comparative effectiveness studies, an LS-focused Childhood Arthritis and Rheumatology Research Alliance subgroup developed a clinical disease activity measure (LS Activity Score, Arthritis Care Res 2012 DOI: 10.1002acr.21687). Based upon LoSili and LOCUS studies (J Rheumatol 2008;35:64; Arthritis Rheum 2011;63 Suppl:S955). The LS Activity Score scores for 7 parameters (erythema, violaceous color, waxy or white lesion, skin thickness of lesion edge, lesion warmth, new lesion, change in lesion size) in affected anatomical sites, with body divided into 19 sites.

Objective: To evaluate the validity and reliability of the LS Activity Score.

Methods: A two-day workshop meeting was conducted in which 13 pediatric rheumatologists and a pediatric dermatologist reviewed LS clinical measures and conducted a reliability of scoring study. The 14 raters evaluated 13 juvenile LS (JLS) patient volunteers with the LS Activity Score in a single session. For each patient, raters were given a schematic which anatomatic sites to assess (1–2/patient); new lesion and lesion size change were not scored because they require prior patient evaluation. Raters scored Physician Global Assessment (PGA, 0–100 mm) of disease activity (DA) and
Does Breastfeeding Influence the Presentation of Juvenile Idiopathic Arthritis? Results From the Childhood Arthritis Prospective Study.

Hannah Pickford1, Eileen Baildam2, Alice Chieng3, Joyce Davidson4, Helen M. F. Ibarra5, None; R. C. Fuhlbrigge6, None; T. G. Mason II7, None; M. G. Punaro8, None; E. Pope4, None; E. C. Rabinovich9, None; K. G. Stewart10, None.

Background/Purpose: There is extensive research into the association between breastfeeding (BF) and the occurrence of autoimmune diseases, although results have been conflicting. Studies have suggested that BF may influence the presentation of juvenile idiopathic arthritis (JIA), with a higher prevalence of BF among children with particular presentation. The aim of this analysis was to study the influence of BF on the presentation of JIA in a large prospective inception cohort of children with childhood-onset arthritis.

Methods: The Childhood Arthritis Prospective Study (CAPS) recruits children ≤ 16 years old with new onset (≥2 weeks) inflammatory arthritis from five tertiary hospitals in the United Kingdom. At presentation to pediatric rheumatology, a physician performs an examination and completes a Physical Global Assessment (PGA). Families also complete a Childhood Health Assessment Questionnaire (CHAQ) including a Parent General Evaluation (PGE) and pain visual analogue scale (VAS). Detailed demographic data is collected including age at onset, gender, ethnicity, and household factors including parental education and income. Families were also asked if the child was BF and for how long. Baseline characteristics were compared between those children who were and were not BF using descriptive statistics. The association between BF and a high CHAQ score (>0.75) at presentation were determined using multivariate logistic regression, adjusted for age at onset, symptom duration, ILAR subtype, hospital, ethnicity, and socioeconomic status (SES). Using postcodes, SES was determined by calculating the Index of Multiple Deprivation score and categorised into three groups: low, medium and high.

Results: 927 children (65% female) were included in the analysis; median age at onset 6.4 years. Overall, 54% were breastfed, although the majority for <6 months. BF children reported a lower median age at onset (5.7 vs 7.5 years; p<0.001), a lower CHAQ score, lower PGE and lower pain at baseline (see Table). There was a trend towards a higher proportion of BF children with rheumatoid factor negative polyarthritis but lesser enthesis related and psoriatic arthritis. There was a statistically significant inverse association between BF and high CHAQ (OR 0.62, 95% CI 0.41, 0.95) which was no longer significant after adjustment (OR 0.66, 95% CI 0.41, 1.07).

Table. Inter-rater and intra-rater reliability of LS Activity score

<table>
<thead>
<tr>
<th>Domain</th>
<th>Round 1 ICC (95% CI)</th>
<th>Round 2 ICC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS Activity Score</td>
<td>0.770 (0.646, 0.853)</td>
<td>0.745 (0.639, 0.858)</td>
</tr>
<tr>
<td>Inter-rater reliability</td>
<td>0.864 (0.28, 0.60)</td>
<td></td>
</tr>
<tr>
<td>Intrarater reliability</td>
<td>0.864 (0.646-0.910)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: We demonstrate initial construct validity for LS Activity score, and found moderate inter-rater reliability. Additional studies are needed to fully evaluate this measure’s validity. More training for the violaceous color and lesion warmth parameters may improve the measure’s reliability.

Disclosure: S. C. Li, None; K. S. Tokor, None; C. Kelsey, None; M. L. Becker, None; F. Dedouit, None; R. C. Fuhlbrigge, None; G. C. Higgins, None; S. D. H. Hong, None; M. F. Ibarra, None; R. M. Laxer, Novartis Pharmaceutical Corporation, 2; T. G. Mason II, None; M. G. Punaro, None; E. Pope, None; E. C. Rabinovich, None; K. G. Stewart, None.

2009


Background/Purpose: Adalimumab, a fully human monoclonal antibody to tumor necrosis factor-alpha (TNF) has been shown to be safe and effective in juvenile idiopathic arthritis (JIA), and is approved for this use in several socioeconomics. Further work to elucidate the association between breastfeeding and later presentation of autoimmune diseases is required.

Disclosure: H. Pickford, None; E. Baildam, None; A. Chieng, None; J. Davidson, None; H. E. Foster, None; J. Gardner-Medwin, None; L. R. Wedderburn, None; W. Thompson, None, K. L. Hyrich, None.

2010

PGAs of disease damage (DD) for each patient based upon evaluated anatomic sites. We hypothesized the LS Activity Score would have moderate to high correlation with PGA-DD (convergent validity) and low correlation with PGA-DD (divergent validity). Spearman’s ρ was calculated to assess level of correlation, and intraclass correlation coefficients (ICC) calculated to assess intra- and inter-rater reliability (0.20–0.39 considered low, 0.40–0.59 moderate, 0.60–0.79 high).

Results: Mean age of JLS patients was 13.2 years, most common subtype was linear sclerodermatous (4 limb, 4 head). Mean patient LS Activity Scores ranged from 0.50 to 9.28 (45–52% of maximum possible score), mean PGA-DD from 4.0 to 59.6. There was a high correlation between LS Activity score and PGA-DD (p=0.94), and low with PGA-DD (p=0.121). Raters showed moderate inter-rater reliability for LS Activity Score and PGA-DD, with nearly all showing moderate to high intra-rater reliability for these scores (Table). Among the different parameters, violaceous color and lesion warmth had the lowest inter-rater reliability.

Conclusion: Our findings support the use of LS Activity score as a valid and reliable measure for assessing disease activity in JIA.

Disclosure: C. S. Li, None; K. S. Tokor, None; C. Kelsey, None; M. L. Becker, None; F. Dedouit, None; R. C. Fuhlbrigge, None; G. C. Higgins, None; S. D. H. Hong, None; M. F. Ibarra, None; R. M. Laxer, Novartis Pharmaceutical Corporation, 2; T. G. Mason II, None; M. G. Punaro, None; E. Pope, None; E. C. Rabinovich, None; K. G. Stewart, None.
defined MedDRA Query, and events occurring within 270 days of influenza vaccination were identified.

**Results:** A summary of all vaccinations is presented in the Table. Among the different types of vaccines, the most frequently administered were: influenza virus vaccine polyvalent in DE038 and M10–240 (n=59 and 63 vaccinations, respectively), and pneumococcal in M10–444 (n=28 vaccinations). In DE038 and M10–240, 2 patients each received >5 vaccinations and in M10–444, 10 patients received >5 vaccinations. The majority of vaccinated patients in each study received >1 type of vaccination. Among those who were never vaccinated for influenza, 12/137 patients (9%) in DE038, and 10 patients received >5 vaccinations and 3/20 patients (15%) in M10–240 reported who were never vaccinated for influenza, 12/137 patients (9%) in DE038, 1/5 patients (20%) in M10–240, and 2/28 patients (7%) in M10–444 reported influenza infection-related AEs. In those who received influenza vaccination, 4/34 patients (12%) in DE038, and 3/20 patients (15%) in M10–240 reported influenza infection-related AEs within 270 days of vaccination; none (0%) reported influenza infection-related AEs in M10–444.

**Table.** Summary of Vaccination Data Among JIA Patients

<table>
<thead>
<tr>
<th></th>
<th>DE038</th>
<th>M10-240</th>
<th>M10-444</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total patients vaccinated, n/N</td>
<td>40/171</td>
<td>20/25</td>
<td>20/32</td>
</tr>
<tr>
<td>Females vaccinated, %</td>
<td>83</td>
<td>75</td>
<td>85</td>
</tr>
<tr>
<td>Mean age, yrs (SD)</td>
<td>12 (3.6)</td>
<td>14 (3.3)</td>
<td>3 (0.7)</td>
</tr>
<tr>
<td>Total vaccinations</td>
<td>82</td>
<td>67</td>
<td>122</td>
</tr>
<tr>
<td>Patients with &gt;1 vaccine, n</td>
<td>23</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Patients with &gt;1 type of vaccine, n</td>
<td>11</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Different types of vaccinations, n</td>
<td>9</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>Mean time to 1st vaccination, days</td>
<td>714</td>
<td>187</td>
<td>976</td>
</tr>
<tr>
<td>Mean age at 1st vaccination, yrs*</td>
<td>13</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Mean JIA duration at 1st vaccination, yrs*</td>
<td>NA</td>
<td>4.5</td>
<td>1.02</td>
</tr>
</tbody>
</table>

**Influenza Vaccinations**

<table>
<thead>
<tr>
<th></th>
<th>DE038</th>
<th>M10-240</th>
<th>M10-444</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total patients vaccinated, n/N</td>
<td>34/171</td>
<td>20/25</td>
<td>18/32</td>
</tr>
<tr>
<td>Females vaccinated, %</td>
<td>79</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Total vaccinations</td>
<td>59</td>
<td>63</td>
<td>6</td>
</tr>
<tr>
<td>Patients with &gt;1 vaccine, n</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Mean time to 1st vaccination, days</td>
<td>688</td>
<td>189</td>
<td>96</td>
</tr>
</tbody>
</table>

NA: not available. * Data for mean age at 1st vaccination and mean time to 1st vaccination are the same for "Influenza Vaccinations" for each study.

**Conclusion:** These data support the idea that JIA patients treated with adalimumab can be safely immunized with routine, inactive, preventative vaccines, including influenza vaccine.

**Reference**


**Disclosure:** N. Mozaffarian, Abbott Laboratories, 1; Abbott Laboratories, 3; V. Arora, Abbott Laboratories, 1; Abbott Laboratories, 3.

**2011**

**ACR Criteria, Providers’ Global Rating of Change and Role of Patient Self-Report in Evaluating Change in Disease Over Time: A Patient Reported Outcomes Measurement Information System Study.** Bin Huang, Jennifer Farrell, Adam Carle, Stacey Niehaus, Hermine Brunner, Alexei A. Grom, Michael Henriksson, Jennifer L. Huggins, D. J. Lovell, L. Ting, and Esi M. Morgan DeWitt. 1 Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 2 Cincinnati Children’s Hospital Medical Center and PRSGC, Cincinnati, OH, 3 Cincinnati Children’s Hospital Medical Center and Elk Grove Village, IL.

**Background/ Purpose:** As part of a longitudinal study of Juvenile Idiopathic Arthritis (JIA), providers completed clinical outcomes assessments and patients’ (pt) completed self-report measures at clinic visits. In addition to measuring ACR Pediatric response based on the 6 core variables (CHAQ, active joint count, loss of motion, ESR, physician global assessment (PGA), and pt’s well-being), providers rated the pt’s global change of overall health (GRC-health) and JIA (GRC-JIA) between visits on a scale from 1 (very much worse) to 7 (very much better). Pt’s report of pain and health-related quality of life (HRQoL) are not part of the core measures. Study Aims: 1) To assess the relationship between JIA improvement at the ACR-Ped70 level with the provider’s GRC-health and GRC-JIA ratings; 2) To evaluate whether pain and HRQoL as assessed by the PedsQL Core and Rheumatology Module total and domain scores were significantly correlated with both GRC ratings and ACR-Ped response levels. The final GRC-health multivariable model included ACR-Ped70, gender, ACR-Ped70 by gender interaction, JIA subtype, active joint count and pt’s pain; none of the PedsQL scores remained significant. Age was not significant. The final GRC-JIA model includes PGA as a significant predictor, in addition to those included in the GRC-health model.

**Conclusion:** Provider’s ratings of overall health and JIA change are closely related to the level of improvement as measured by the ACR-Ped Criteria. Provider’s GRC are significantly influenced by patient’s pain rating, and takes account of the active joint count over and beyond the ACR-Ped70 response level. Nonetheless, in comparison to the ACR-JIA Response Criteria the provider’s GRC can serve as a valid measure to assess patient’s change over time, but with differential gender effect. This study also suggests that patient reported pain should be considered in the assessment of disease progression.

**Disclosure:** B. Huang, None; J. Farrell, None; A. Carle, None; S. Niehaus, None; H. Brunner, None; A. A. Grom, Novartis Pharmaceutical Corporation, 5; Roche Pharmaceuticals, 5; Novimmune, 5; M. Henriksson, None; J. L. Huggins, None; D. J. Lovell, None; T. V. Ting, None; E. M. Morgan DeWitt, None.

**2012**

**Pediatric Rheumatology Productivity: Results of the American Academy of Pediatrics 2010 Workforce Survey.** Michael Henriksson1 and Laura Laskosza2. 1 Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 2 The American Academy of Pediatrics, Elk Grove Village, IL.

**Background/ Purpose:** Relative value units (RVUs) are a payer-neutral measure of clinical work. The federal government uses a multi-component formula to convert this measure into reimbursement. The Association of Administrators in Academic Pediatrics (AAAP) surveys its practitioners to derive benchmark RVU data, aided by its affiliation with a leading medical management group (MMG). No other benchmarks exist for pediatric rheumatologists (PRs). While PRs largely practice at academic centers, they also work in a variety of settings. PR reimbursement follows a number of models, lacking uniformity or national consensus for practice diversity. Reimbursement estimates may also derive from adjusted adult rheumatology (AR) or various MMG putative standards. Providers can use RVU data to advocate for additional PR clinical support. Through a cross-sectional survey of all board-certified US PRs administered by the American Academy of Pediatrics (AAP), this study’s objective was to determine clinical productivity through annual RVU data, obtain demographic and CPT coding data, and establish national benchmarks independent of an MMG.

**Methods:** An IRB-approved survey asked PRs (N=206) to provide data about their annual RVUs for fiscal year 2008-09, and detailed demographics including clinical full time equivalent (FTE) status. Statistical analysis included the two-sample Kolmogorov-Smirnov test for distribution and t-test for comparison of means.

**Results:** The overall response was 65% (n=133); 60% of respondents (80/133) provided RVU data including one high volume outlier. AAP RVU data obtained from 38 centers in the same survey year served as controls (n=79). AAP and AAAP RVU data were normally distributed (p=0.129); but, their means were significantly different (p=0.013) (Table). AAP demographic data revealed: median FTE=0.6 (0.1–1); 99% PR and 8% AR board certification; median practice years=16.2 (range by 5-yr intervals: <5 to >30); median patients/week=25; median work weeks/year=485.8 (range by <30 to 52); academic location: 66% (n=69); states represented=34 of 42 supported by PRs (incl. DC); median salary=$158,000; median initial access to care=6 weeks (1–32), previously 2 weeks (2005 AAP survey). Asked if their institution uses the RVU model to measure clinical productivity, 76% affirmed (n=90); 8% did not know (n=10).
### Cross-Sectional and Longitudinal comparison of Bone Mass Status, Using pQCT, in a Large Cohort of Juvenile Idiopathic Arthritis and Juvenile Onset Systemic Lupus Erythematosus Patients.


1Department of Internal Medicine, Rheumatology Section, University of Florence, Florence, Italy; 2Pediatric Unit, Mugello’s Hospital, Borgo San Lorenzo, Firenze, Italy; 3University of Florence, Firenze, Italy; 4University of Florence, Florence, Italy; 5Univ Florence, Firenze, Italy

**Background/Purpose:** A small number of prospective data have been published on the use of pQCT in large groups of pts with JIA and JSLE. Moreover, few studies have compared in groups of JIA an JSLE pts homogenous for age and sex, the parameters of bone status using pQCT. Our aim is to evaluate, cross-sectionally and longitudinally, the prevalence of reduced bone mass and density and the differences on the biomechanical parameters, using pQCT, in two cohorts of patients with JIA and JSLE homogenous for age and sex.

**Methods:** 154 JIA pts (127 F, 27 M, median age 20.3 ± 7.9 yrs; 84 oligoarticular, 33 polyarticular, 10 systemic, 27 enthesitis-arsthritis (ERA) onsets, and 56 JSLE pts (46 F, 10 M, median age 21.5 ± 6.1 yrs) have been studied. The obtained data have been compared with age and sex matched control groups.

**Results:** JIA pts do not show any difference in comparison to controls as regard to cortical density (CrtBMD), except for systemic pts (p < 0.0001) while JSLE pts have a higher CrtBMD than controls and JIA pts (p < 0.0001). Bone trabecular density (TrbBMD), all JIA pts regardless of type onsets (except for ERA), and JSLE pts have significant reduced values than controls, with no differences between JIA and JSLE. In addition, JIA pts show a significant reduced muscle area (muscle CSA) than JSLE and controls (p < 0.001). The difference is significant in systemic and polyarticular JIA pts, but not in oligo and ERA subsets. Conversely, fat area (fat CSA) is significantly increased in both JIA and JSLE pts when compared to controls (p < 0.001), with no differences in the two groups. The same results are observed evaluating the polar resistance to stress (SSip). On longitudinal evaluation, the difference of CrtBMD, TrbBMD, muscle CSA e fat CSA are unchanged; in JSLE pts, SSip is stable in comparison to JIA and controls without any difference among JIA pts and controls.

**Conclusion:** The pQCT evaluation of the main parameters of bone density and structure in adolescents and young adults with JIA and JSLE highlights significant differences between the two groups and JIA subtypes. These data might indicate a different pathogenesis of bone damage in the two entities, and suggest a different diagnostic and therapeutic approach to improve the bone mass peak in these patients.

Disclosure: F. Falcini, None; F. Stagì, None; L. Cavalli, None; G. Carnesecchi, None; F. Bertini, None; L. Masi, None; M. Matucci-Cerinic, None; M. L. Brandi, None.

### Table. Annual RVUs

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<tbody>
<tr>
<td>1st</td>
<td>1000</td>
<td>2073</td>
</tr>
<tr>
<td>2nd</td>
<td>1737</td>
<td>3310</td>
</tr>
<tr>
<td>3rd</td>
<td>2616</td>
<td>4700</td>
</tr>
<tr>
<td>Total</td>
<td>8377</td>
<td>7943</td>
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Interquartile range 1616 2627

N 80 79

**Conclusion:** AAP RVUs sample only academic sites, limiting generalizability. Further, AAP adjusts RVUs from partial to full FTE, uniformly inflating data. This practice and AAP alignment with a commercial MMG preclude its role as the best available PR benchmark. AAP RVUs were normally distributed, representing 81% of the states where PRs practice, with mature demographics and wide practice diversity; they serve as a national benchmark. During the latter half-decade, the shift from a 2 to 6 week wait to access initial PR care is concerning and indicative of the pressing need for sustained workforce advocacy.

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### 2013

#### Background/Purpose: Prevalence and Association with Disease Activity


1Department of Internal Medicine, Rheumatology Section, University of Florence, Florence, Italy; 2Pediatric Unit, Mugello’s Hospital, Borgo San Lorenzo, Firenze, Italy; 3University of Florence, Firenze, Italy; 4University of Florence, Florence, Italy; 5Univ Florence, Firenze, Italy

**Background/Purpose:** Numerous data are available in literature on 25(OH)D serum levels in general population, few and contradictory in Juvenile Idiopathic Arthritis (JIA), and scarce in Juvenile onset Systemic Lupus Erythematosus (JSLE) pts. Our goals are: 1- to evaluate the serum 25(OH)D status in a large cohort of JIA and JSLE pts; 2- to correlate the 25(OH)D levels with the variables associated with JIA and JSLE. 3.To compare the pts results with healthy controls.

**Methods:** 144 JIA pts (122 F, 22 M, median age 15.5 ± 7.2 yrs; 78 oligo, 30 poly, 12 systemic and 24 Enthesitis-arthritis [ERA]) onsets, and 46 JSLE pts (38 F, 8 M, median age 16.9 ± 6.8 yrs) were studied after informed consent and Ethical approval. In all, serum 25(OH)D, serum intact parathyroid hormone (PTH), calcium, phosphorus, and bone alkaline phosphatase were measured. 100 sex-matched healthy subjects acted as controls.

**Results:** No significant difference of 25(OH)D levels has been detected in JIA and JSLE pts in comparison to controls as regard the prevalence of those with VD deficiency and insufficiency. Of note, in JIA and JSLE pts with deficiency or insufficiency, a significant difference in comparison to controls with deficit or insufficiency, as regard the percentage of subjects with increased PTH and alkaline bone phosphatase levels (p < 0.0001) was detected. In addition, among 25(OH)D levels and JIA subtypes, the lowest levels were found in systemic and poly than in oligo and ERA onsets. Moreover, systemic and poly pts have a significantly lower increase of 25(OH)D levels after supplementation than oligo, ERA pts, and controls with a high percentage of those who remains with insufficiency (p < 0.001). The same results have been observed in JSLE pts who showed a high percentage of insufficiency, despite supplementation, of 25(OH)D levels. Despite supplementation, are significantly higher in patients with persistent active disease.

**Conclusion:** Serum 25 (OH) D levels and the percentage with persistent VD insufficiency seem to correlate to type of disease and disease activity. These preliminary results suggest a higher consumption and a higher request of 25(OH)D in patients with active JIA and JSLE.

Disclosure: F. Falcini, None; F. Stagì, None; L. Cavalli, None; G. Carnesecchi, None; F. Bertini, None; L. Masi, None; M. Matucci-Cerinic, None; M. L. Brandi, None.

### 2015

#### Recognizing Two Distinct Clinical Phenotypes in Muckle-Wells Syndrome

J. B. Kuenemijer-Deschner1, S. Dembi Samba2, I. Kone-Paut3, I. Marie4, P. Tyrrell5, and S. Benseler3.

1University Hospital Tuebingen, Tuebingen, Germany; 2CHU Bicêtre, Paris, France; 3The Hospital for Sick Children, Toronto, ON

**Background/Purpose:** The diagnosis of Muckle-Wells syndrome remains challenging due to the variable and often non-specific clinical presentation. The aim of this study was to identify key variables associated with time to diagnosis in patients with MWS.

**Methods:** A cohort study of consecutive patients with a clinical diagnosis of MWS plus genetic evidence of an NLRP3-mutation was conducted at two centres for autoinflammatory diseases. Demographic information, mutation subtype, clinical phenotype, demographics for care, access to care and information about duration of symptoms and preclinical evaluation were collected. Presenting variables were compared between groups of patients with a diagnosis in childhood compared to adulthood.

**Results:** A total of 34 patients were included (16 males, 18 females), the median age at diagnosis of MWS was 31.5 years (0.5–75). Patients diagnosed during childhood most commonly complained of musculoskeletal symptoms (62%), fever (54%), headache (46%) and abdominal pain (31%), while those diagnosed as adults had musculoskeletal symptoms (86%), hearing loss (52%) and decreased performance (29%). Data
driven clustering strategies identified two distinct clinical phenotypes of MWS: the “inflammatory phenotype”, most commonly found in patients diagnosed in childhood was associated with fever, rash, headache and abdominal pain. Patients diagnosed as adults showed a more “organ – disease” phenotype characterized by musculoskeletal symptoms, skin rash, hearing loss and eye disease.

**Conclusion:** Two distinct clinical phenotypes may be identified in patients with MWS. These are closely related to the time of diagnosis. The prevalence of these two distinct clinical phenotypes has to be considered when developing diagnostic criteria for MWS.

**Disclosure:** J. B. Kuemmerle-Deschner, None; S. D. Sambra, None; I. Kone-Paut, None; I. Marie, None; P. N. Tyrrell, None; S. M. Benseler, None.

### 2016

**Primary Raynaud’s Phenomenon in a Multicenter Cohort of Italian Children and Adolescents: Which Prognostic Relevance for Serological Tests?**

Florence Falcini¹, Valentina Denaro¹, Federica Cuoco², Giorgia Martin³, Susanna Cappelli², Antonella Petaccia³, Fabrizia Corona³, Giulia Carnesecchi³, Francesco La Torre³, Marco Matteucci-Cerinice³ and Donato Rigante⁴.¹ Department of Internal Medicine, Rheumatology Section, University of Florence, Firenze, Italy, ²Department of Paediatrics, University of Padua, Padua, Italy, ³DIMIMP-University, Rheumatology Section, Bari, Italy, ⁴University of Florence, Florence, Italy, ⁵Università Cattolica San Cuore, Rome, Italy

**Background/Purpose:** Raynaud’s phenomenon (RP) is an episodic vasospasm of the peripheral arteries, causing pallor followed by cyanosis and redness with pain and sometimes paraesthesia or rarely ulceration of the fingers and toes. Primary RP (pRP) occurs without an underlying disease, while secondary RP occurs in association with an underlying connective tissue disease (CTD), mostly systemic lupus erythematosus, juvenile dermatomyositis and systemic scleroderma. Predictors of a favorable outcome are still unraveled in pRP: the causative role of various autoantibodies needs to be elucidated mostly for pRP starting in childhood or adolescence. Our objective is to identify the potential predictors of outcome in a multicenter cohort of children and adolescents with pRP.

**Methods:** We performed a prospective data collection of demographic, clinical, laboratory and treatment features of 82 Italian children/adolescents with pRP (58 females, 24 males, median age at disease onset: 13.5 years, median age at diagnosis: 14.8 years), managed in 4 pediatric rheumatologic Units and 1 transition clinic during the last three years. Demographic characteristics included sex, age and ethnicity. The evaluation included clinical pictures, eventual disease associations, pubertal status, laboratory data and nailfold videocapillaroscopy (NVC) at baseline and at regular 6-month-follow-up. Laboratory examinations included erythrocytosedimentation rate, C-reactive protein, transaminases, serum creatinine, hemoglobin, complement fractions C4 and C3, renal and thyroid function and specific serum autoantibodies (anti-nuclear antibodies [ANA], anti-DNA antibodies, anti-ENA, anti-cardiolipin, anti-Scl-70 and anti-centromere antibodies). Screening for coeliac disease was performed at the first evaluation. Treatment details included the eventual specific drug used, its dosage and overall treatment duration. Out of 82, 20 patients were treated with hydroxchloroquine, 10 with calcium blockers, 1 with low-dose aspirin, 3 with iloprost, while the remaining 48 did not receive any drug. A forward stepwise multiple logistic regression analysis was used to find any association among sex, pubertal status, inflammatory parameters, NVC abnormalities, all serum autoantibodies and the risk of developing a CTD at baseline and at 36-month-follow-up. The software used was STATA 10. A p-value <0.05 was considered significant.

**Results:** ANA positivity at baseline was significantly associated with the risk of developing a CTD (p <0.05). No NVC abnormalities was related to specific patients’ outcome. No patient was positive at the screening for coeliac disease.

**Conclusion:** Our data show that ANA positivity appears as the only potential predictor of poor outcome and even progression to CTD in children and adolescents with pRP.

**Disclosure:** F. Falcini, None; V. Denaro, None; F. Cuoco, None; G. Martinì, None; S. Cappelli, None; A. Petaccia, None; F. Corona, None; G. Carnesecchi, None; F. La Torre, None; M. Matteucci-Cerinì, None; D. Rigante, None.

### 2017

**Orthopaedic Treatment of Temporomandibular Joint (TMJ) Damage in Adolescents with Juvenile Idiopathic Arthritis (JIA): Longitudinal Evaluation.**

Fernanda Falconi¹, Daniela Melchiorre¹, Giulia Carnesecchi³, Federico Fliri¹, Katia Biondi³, Mario Bosco³ and Marco Matteucci-Cerinice³¹ Department of Internal Medicine, Rheumatology Section, University of Florence, Florence, Italy, ²Department of Odontostomatologic Sciences, University of Pavia, Pavia, Italy, ³Pavia, Italy, ⁴University of Florence, Florence, Italy

**Background/Purpose:** TMJ involvement has been reported in all subsets of JIA. The prevalence of radiographic changes of TMs varies from 30% to 65%, and 50–80% of children with JIA will have evidence of TMJ arthritis by MRI and by sonographic exam (SE) (effusions, synovial enhancement, condylar flattening and/or erosions, thickness of masseter muscle) before evidence of X-ray damage. At disease onset local injections with steroids or anti-TNF alpha blockers are recommended, but when joint damage is late recognized orthopedic treatment is suggested. Our aim is to evaluate the efficacy and safety of orthopedic treatment in a cohort of adolescents and young adults with JIA.

**Methods:** Our study population included 102 consecutive pts (76 F and 26 M, mean age 14.5±4.4 yrs), mean age at JIA onset 7.9±5 yrs, mean disease duration at first orthodontic evaluation 7.7±5.2 yrs, fulfilling the ILAR criteria for JIA, all treated at Transition clinic of Rheumatology Department between December 2009 and December 2011. Out of 102 pts, 53 had oligo (O-JIA), 34 polyarticular (P-JIA), 4 systemic (S-JIA), 11 enthesitis-related arthritis (ERA-JIA) onsets. The diagnosis of TMJ disease was performed on the presence of at least one Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) diagnosis. The anamnestic and functional data were collected in a medical record used by orthodontists of University of Pavia, Italy. 69/102 pts (68 %) showed recurrent pain localized in the temporomandibular area, crepitation, and jaw stiffness or fatigue. All TMs were examined by panoramic X-ray, teleradiography with latero-lateral and anterior-posterior view, and by SE by Esaote MyLAB 70 (Genoa Italy linear probe 8–13 MHz). At first orthodontic evaluation 75 pts showed dento-skeletal malocclusions leading to a Class II caused by skeletal retrognathia, mandibular rotation, lower height of the mandibular body and ramus that can determine asymmetries in the frontal and/or in the sagittal plane.

**Results:** 51 pts (50%) undergone to orthopedic therapy with an activator order to help mandibular growth. After orthopedic therapy these pts had worn 4-6 months, 31 pts (30.3%) wore a bite without orthopedic therapy. 20 pts (20%) did not receive any treatment. After two years from first orthodontic evaluation 58/ 75 pts (77.3%) showed improvement in occlusion, masticatory function and cranio-facial morphology. In 69 pts the thickness of masseter muscle, detected by SE after therapy, was similar on left and right side (mean value 7.6 mm) at rest and after contraction (p<0.001). In all pts SE showed bone remodeling of the condyle head, and in 62/102 (61%) pts monolateral erosions were present.

**Conclusion:** Our data confirm that early diagnosis and treatment should prevent the severe and often intractable damage in TMJ of JIA patients. The irreversible damage as micrognathia, aberrations in mandibulofacial development, and facial asymmetry may compromise the growth cartilage and irreversibly damage. Our study, the results suggest that in case of delayed diagnosis and severe destruction of TMs, an orthopedic treatment may be helpful in reducing the progression of bone injury.

**Disclosure:** F. Falcini, None; D. Melchiorre, None; G. Carnesecchi, None; F. Bertini, None; K. Biondi, None; M. Bosco, None; M. Matteucci-Cerinì, None.

### 2018

**Juvenile Idiopathic Arthritis in Adulthood: Evaluation of Disease Activity, Damage and Quality of Life.**

Alessandra Salmaso¹, Lorenzo Ceri², Serena Capannini³, Francesca La Torre³, MaurizioGattinara⁴, Irene Pon- tikaki¹, Pier Luigi Menza¹, Fernanda Falconi¹ and Valeria Geroul¹.¹ Pediatric Rheumatology, G. Pini Institute, Department and Chair of Rheumatology, Milan, Italy, ²Department of Internal Medicine, Rheumatology Section, Transition Clinic, University of Florence, Firenze, Italy, ³DIMIMP-University, Rheumatology Section, Bari, Italy, ⁴Division of Rheumatology, Istituto G. Pini, University of Milan, Milano, Italy

**Background/Purpose:** Health outcomes in Juvenile Idiopathic Arthritis (JIA) have been a very active area of research in the past several years. Altogether, the available data indicate that a considerable number of patients
with JIA enters adulthood with persistently active disease and a significant proportion of them may develop severe physical disability. In general children with polyarticular course are more likely to have erosive radiological damage on follow-up. The comparison of earlier studies with those published in the last decade shows a decline in the frequency of patients with severe physical disability over the years; however, patients who enter adulthood with active disease do not seem to be diminished. The purpose of this study is to evaluate in patients with JIA in adulthood the functional and anatomic damage and the quality of life.

Methods: All consecutive JIA patients aged >18 yrs, afferent to three different paediatric rheumatology centres in the last year, were assessed with: HAQ; SF36; active joint count; VAS (0–100 mm) for pain, patient and physician global health assessment; radiological evaluation (Steinbrocker classification).

Results: 347 patients with JIA in adulthood, age > 18 yrs, were enrolled. The collected data are shown in the following table

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<tr>
<th>Table. JIA in adulthood, age &gt; 18 yrs</th>
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Conclusion: this hospital-based study clearly shows a selection bias toward the most serious cases, but underlines the high rate of JIA patients with disease still active in adulthood, confirming the need of a more aggressive and precocious treatment, to improve outcome in the future.

Disclosure: A. Salmaso, None; L. Ceri, None; S. Capannini, None; F. La Torre, None; M. Gattinara, None; I. Pontikaki, None; P. L. Meroni, None; F. Falcini, None; V. Gerloni, None.

2019

A Novel MRI Scoring System for the Evaluation of Early Stage Disease Activity of the Wrist in Juvenile Idiopathic Arthritis, Charlotte M. Nusman1, Robert Hemke1, Taco W. Kuijpers2, Eline E. Deurloo1, Dieneke Stoustrup1, None; A. Kuseler2, None; T. Herlin2, None; J. M. Van den Berg3, None; K. M. Dolman, None; M. A. J. Van Rossum4, None; M. Maas, None.

Background/Purpose: Temporomandibular joint (TMJ) arthritis frequently occurs in juvenile idiopathic arthritis (JIA). Only sparse information is available concerning the inflammatory activity and the underlying biology and course of arthritis in the TMJ in JIA patients, although it is known to cause severe growth disturbances of the dentofacial complex. Studies evaluating the synovial fluid may lead to a better understanding of the interaction between synovial inflammation, cartilage condition, and the influence on condylar bone formation. TMJ synovial fluid sampling and intraarticular steroid injections are procedures useful to elucidate this issue and to control inflammation. However, the TMJ is also known to be a vulnerable joint where functional disorders also can cause growth disturbances when mandibular function is impaired. Therefore, it is crucial that no or only transient side effects occurs from intervening procedures. The aim of this study was to evaluate safety issues in relation to a synovial sampling technique and to determine the variation in needle position by cone beam computed tomography (CBCT).

Methods: Twenty healthy, adult volunteers were examined for TMJ dysfunction and mandibular movements were assessed before and after a single injection of synovial fluid were taken in local anesthesia using the push-pull technique described previously (1). Samples were obtained from both TMs and a CBCT-scanning was done to evaluate the needle position in the upper joint compartment. The study was approved by the ethical committee.

Results: All volunteers reported slight TMJ pain after sampling (mean 13.0 on a VAS-scale (from 0–100)). Pain disappeared in all participants after 1–2 days maximum. Objectively, mandibular range of motion was not affected by the procedure. The cannula was clearly visible in 3D in relation to the osseous tissues on the CBCT. The scanning showed a large variety in cannula position. The CBCT scanning lasted approximately 20 sec.

Conclusion: The synovial fluid sampling technique was found to be safe resulting in only minor, transient symptoms. However, the technique visualized in 3D is applicable in studies on TMJ pathology responsible for dentofacial growth abnormalities in growing individuals. A considerable variation was found in needle position and as a therapeutic approach, injection of steroids should be done with caution. CBCT confirmation of cannula position can be advised to substitute medical CT thereby greatly reducing patient radiation exposure.

Ref

Disclosure: T. K. Pedersen, None; K. D. Kristensen, None; P. Alstergren, None; P. Stoustrup, None; A. Kuseler, None; T. Herlin, None.
**Background/Purpose:** To identify the optimal regimen for the treatment with Canakinumab in CAPS patients and, in patients receiving both Anakinra and Canakinumab during their disease course, to compare the two drugs in terms of the efficacy and impact on the quality of life.

**Methods:** 13 CAPS patients (10 paediatric, 3 adults) treated with Canakinumab were followed for 12 months; 12 patients were previously treated with Anakinra. Clinical and laboratory parameters were collected at each visit and health-related quality of life (HRQoL) was recorded at month 12. Disease activity, doses of IL-1 inhibitors and HRQoL, were analyzed at the time of the last administration of Anakinra and after 12 months of treatment with Canakinumab.

**Results:** 7 patients were classified as CINCA, 4 patients as Muckle-Wells syndrome (MWS) while 2 patients displayed an overlapping MWS/CINCA phenotype.

Nine modifications of the schedule were necessary in 6/7 CINCA patients, while a single modification was performed in two MWS and MWS/CINCA patients only.

At the last follow-up during Canakinumab treatment 4 patients (2 MWS, 1 MWS/CINCA and 1 CINCA patients) were treated with a stable dose of 2 mg/kg (or 150 mg if weight was higher than 40 Kg) every 8 weeks, all of them displaying a complete response. Two CINCA and one MWS patients were treated with the dose of 2 mg/kg (or 150 mg) every 7, 6 and 6 weeks respectively, with a complete response. Four patients (3 CINCA and 1 MWS/CINCA patients) were treated with the dosage of 300 mg with a frequency of 7, 6, 5 and 4 weeks. All of them displayed a partial response. One MWS patient, in light of the persistent good control of the disease, discontinued the treatment with the aim to use the drug on demand, with a subsequent complete wellbeing for the following 6 months. One CINCA patients withdrew Canakinumab due to incomplete response and poor compliance.

At the last administration of Anakinra the patients were treated with a mean dose of 1.38 mg/kg/day (range 0.66-2). Seven patients (3 CINCA, 1 MWS/CINCA and 2 MWS) displayed a complete response while a partial response was observed in 5 patients (4 CINCA, 1 MWS/CINCA patients), due to a slight increase of acute phase reactants.

The number of complete responders at the last follow up in Canakinumab (8/13) was comparable to that registered at the moment of Anakinra discontinuation (6/13). The evaluation of the quality of life with the CHQ-PF50 questionnaire did not reveal a significant difference of the impact of the two drugs on physical concepts (P=0.58 during Anakinra, 0.51 during Canakinumab), while Canakinumab determined a significant amelioration of psychosocial concepts (p<0.03, Wilcoxon Pairs Test)

**Conclusion:** The long-term use of Canakinumab is associated with a satisfactory control of disease activity but needs a progressive dose adjustments in more severe patients. CAPS phenotype, rather than the age, represents the main variable able to determine the need of more frequent administrations of the drug at higher dosage. We propose that pediatric MWS patients should be treated with the proposed schedule of 2 mg/kg every 8 weeks. Conversely, patients with a severe CINCA phenotype should be more aggressively treated since the beginning with a monthly administration of 4 mg/kg as the starting dose.

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**2022**

**Individual Disease Burden in Children and Adolescents with Chronic Musculoskeletal Pain—Multilevel Analysis of a Nationwide Prospective Longitudinal Observation Study**

*Kerstin Gerhold1, Rebecca Muckelbauer2, Jacqueline Müller-Nordhorn3, Angelika Thon4, Thomas Müller5, Gerd Ganser5, Martina Niewerth6 and Kirsten Minden6. 1German Rheumatism Research Center, a Leibniz Institute, Berlin, Germany, 2Charité - Universitätsmedizin Berlin, Berlin, Germany, 3Kinderklinik der Medizinischen Hochschule Hannover, Hannover, Germany, 4Universitätshospital Halle (Saale) (Halle, Halle (Saale), Germany, 5Sankt Josef Stift, Sendenhorst, Germany, 6German Rheumatism Research Center, a Leibniz Institute, Berlin, Germany

**Background/Purpose:** Chronic musculoskeletal pain was described to be a frequent complaint in children and adolescents with assumed relevant impairment of health-related quality of life (HRQoL) as crucial indicator of individual disease burden. Since only a few epidemiological data are available, we investigated the course of single dimensions of patient-assessed HRQoL in children and adolescents with either chronic idiopathic musculoskeletal pain (CIMP) or juvenile idiopathic arthritis (JIA) as two entities of chronic musculoskeletal pain.

**Methods:** The national pediatric database is an ongoing nationwide prospective observation study on health care of patients with rheumatic-inflammatory or other musculoskeletal diseases referring to pediatric rheumatology departments in Germany. Patients diagnosed with CIMP or JIA enrolled between 2000 and 2008 with a minimal observation period of two years were included in the present analyses. They evaluated annually single generic dimensions of HRQoL on numeric rating scales (NRS, 0–10, 0 best: pain severity, physical capability, limitation in daily life activities, and capability of disease coping. The method of linear multi-level analysis was used to predict two-year courses of these patient-reported outcome measures. Each statistical model was adjusted for sex, age at disease onset, disease duration, calendar year of documentation, and medical care level of recruiting departments (private practice, general children’s hospital, university children’s hospital).

**Results:** Data of 318 CIMP patients (70% females, age (mean ± sd) 12.0±3.8 years, disease duration 2.4±2.6 years) and 6,103 JIA patients (65% females, age 9.5±4.5 years, disease duration 2.7±3.1 years) were included. At baseline (t0), CIMP patients assessed all single generic dimensions of HRQoL with poorer scores than JIA patients; pain severity by plus 1.5 NRS points, limitation in daily life activities by plus 0.9, physical capability and disease coping by plus 0.5 NRS points each, and global health state by plus 0.7 NRS points. Compared to t0, values of single HRQoL dimensions decreased only in JIA up to one (t1) and two years (t2) of follow-up, but not in CIMP patients (t1 versus t0 p<0.001; t2 versus t0 p<0.001). CIMP patients evaluated single generic dimensions of HRQoL persistently worse than JIA patients; this group difference increased for all scales between t0 and t2 (p<0.05).

**Conclusion:** Consistently poorer estimates of all investigated measures of HRQoL in children and adolescents with CIMP over the two-year observation period, compared to children with JIA, are first hints for a relevant and long-term burden of disease in these patients. These results may implicate the need for improving medical care conditions for these patients in Germany in order to avoid a possible long-lasting disease career beyond childhood and adolescence.

**Support:** The national pediatric database is financially supported by the Children’s Arthritis Foundation (Kinder-Rheumastiftung).

**Disclosure:** K. Gerhold, None; R. Muckelbauer, None; J. Müller-Nordhorn, None; A. Thon, None; T. Müller, None; G. Ganser, None; M. Niewerth, None; K. Minden, None.

**2023**

**Should Joint Ultrasound Contribute to Therapeutic Decisions in Juvenile Idiopathic Arthritis?**

*Marie Halbwachs, Geraldine Durand, Caroline Robin, Catherine Gambert Abdel Rahman, Pierre Ingrand and Elisabeth Salou-Gervais, University Hospital, Pottiers, France

**Background/Purpose:** Over several years, numerous studies have been published on the interest of joint ultrasound in juvenile idiopathic arthritis. Several authors have demonstrated that ultrasonography is more sensitive in synovitis detection than clinical examination. As of today, we do not know whether or not joint ultrasonography has an impact on therapeutic decisions. The objective of this study is to determine the interest of joint ultrasonography in therapeutic management of juvenile idiopathic arthritis.

**Methods:** This was a monocentric, open cross-sectional study, conducted on twenty-seven outpatients with JIA between March 2010 and January 2012. Ultrasonography (US) evaluations were always carried out by the same rheumatologist, who had been trained in joint US. The ultrasound scanner was an EsaoteMylab 60. The wrists, hands and feet were systematically analysed, as was any painful joint. Therapeutic decisions were taken following clinical
examination and joint ultrasound. In the second step of the study, all of the consultations with ultrasound evaluation were summarized in the form of scenarios and submitted to clinicians, without the US results. Three physicians then expressed their therapeutic decisions (no modification, treatment enhancement or reduced treatment), which were subsequently compared with and without ultrasound data.

**Results:** Among the twenty-seven children followed, US was carried out in thirteen. 53.8% of the thirteen children had oligoarticular JIA and the other 46.2% had polyarticular onset. Between March 2010 and January 2012, 34 ultrasounds were carried out on thirteen children and thirty-four scenarios were elaborated. Subclinical synovitis was found in 94.1% of the US with a mean of 4.82 +/- 3.46. Treatment enhancement ensued after 52.8% of the consultations with ultrasound evaluation, with a mean subclinical synovitis of 5.11 +/- 5.31. Divergent decisions (29.4%) were found when comparing consultation with ultrasound and scenario without ultrasound. Whether there were more than 2 clinical instances of synovitis or none, the decision remained similar. The divergent decisions came about either when children were symptomatic but with no more than two clinical instances of arthritis or asymptomatic with no clinical synovitis.

**Conclusion:** This study strongly confirms the interest of joint ultrasound in therapeutic decision-making. It establishes a usable therapeutic tool by means of accurate articular evaluation and suggests its interest in the therapeutic management of JIA children, especially when the clinical data are not sufficiently explicit.

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2024

**Articular Symptoms in Cryopyrin-Associated Periodic Syndrome: Retrospective French Study**

**Background/Purpose:** The cryopyrin-associated periodic syndrome (CAPS) is a rare inherited inflammatory disease associated with a mutation in the NLRP3 gene. Articular symptoms are often described in CAPS, but their frequency has been poorly investigated. Our objective was to describe the type and frequency of articular symptoms and the effects of a single given dose of anakinra and canakinumab when reported delay in statural growth was more than 2 clinical instances of arthritis or asymptomatic with no clinical synovitis.

**Results:** 24/88 (27%) were treated with anakinra and 55/88 (62.5%) with canakinumab. When reported delay in statural growth was more than 2 clinical instances of arthritis or asymptomatic with no clinical synovitis.

**Conclusion:** Articular symptoms encountered in CAPS are very common and found in 82% of patients with arthralgia and synovitis in knees and ankles. These symptoms are considered predominant for 20% but rarely explored by imaging. Pseudo tumor are rare. Delay of growth is frequent. Most patients benefit from treatment with anakinra or canakinumab which allows almost complete regression of joint symptoms.

Disclosures: L. Houx, None; P. Quartier, None; I. Kone-Paut, None; X. Guennoc, None; P. Pillet, None; T. Lequerre, None; I. Lemelle, None; M. Hamidou, None; G. Grateau, None; E. Hachulla, None; J. M. Berthelot, None; B. Neven, None; C. Richez, None; A. Pagnier, None; V. Hentgen, None; V. Devauchelle-Pensec, None.

2025

**Clinical Characteristics and Therapy Response in a Large Single-Centre Cohort of Patients with Periodic Fever with Aphthous Stomatitis, Pharyngitis and Cervical Adenitis Syndrome**

Disclosures: Francesca Ricci1, Antonella Meini1, Lucio Verdolini1, Laura Dotta1, Marta Bolis1, Marco Berlucchi1, Gianfranco Savoldi1 and Marco Cattalin1.

2024

**Articular Symptoms in Cryopyrin-Associated Periodic Syndrome: Retrospective French Study**

**Background/Purpose:** The cryopyrin-associated periodic syndrome (CAPS) is a rare inherited inflammatory disease associated with a mutation in the NLRP3 gene. Articular symptoms are often described in CAPS, but their frequency has been poorly investigated. Our objective was to describe the type and frequency of articular symptoms present in a cohort of pediatric and adult patients followed for a CAPS in France.

**Methods:** We conducted a retrospective study concerning articular manifestations (articular symptoms bone and muscle) in patients with CAPS [the familial cold autoinflammatory (FCAS), the Muckle-Wells syndrome (MW), and the neonatal-onset multisystem inflammatory disorder (NOMID) or chronic infantile neurologic, cutaneous and articular syndrome (CINCA)] by contacting their referring physicians in the adults or paediatrician departments. Clinical data were collected using a standardized questionnaire and radiographs were analyzed when present in the records.

**Results:** 58 patients were included (16 FCAS, 56 MW, 12 CINCA / NOMID and 5 unclassified). 50% were women, 56 patients were adults (mean age 33 ± 18.4 years) and 32 children (10.8 ± 4.4 years). The onset age is on average about 4.35 ± 7.8 years, and age of diagnosis is delayed to 20 ± 16 years. The first symptoms are usually: a cutaneous manifestation (68%), fever (25%), articular (25%) or neurological manifestation (11%). 65 patients (74%) have a family history of CAPS and 11 patients have a CAPS without genetic mutation. During follow-up, only 17 patients (23%) showed no joint symptoms. 53 patients (60%) had arthralgia and 55 patients (63%) had synovitis. The most affected joint were respectively: knees (65%), ankles (60%), wrist (47%), hands (40%) and feet (20%). Tendinopathy occurred in 13 patients (18%) and myalgia in 29 cases (39%). Only two patients had arthralgia with a typical non-inflammatory enlargement of the growth plates and epiphyses of long bones. Contractures and joint limitations (2%) or synovial masses are rare (2%). 24/88 (27%) were treated with anakinra and
2026

High Prevalence of Cervical Spine and Temporomandibular Joint Involvement in Patients with Juvenile Idiopathic Arthritis. Nikolay Tzaribachev1, Catrin Tzaribachev1 and Bernd Koos2. 1Center for Rheumatic Diseases, Bad Bramstedt, Germany, 2University Medical Center Schleswig-Holstein, Campus Kiel, Kiel, Germany

Background/Purpose: Detection of involvement of temporomandibular joints (TMJ), which are frequently affected by juvenile idiopathic arthritis (JIA), is only possible on Gadolinium enhanced MRI (GdMRI). A comparative X-ray study on adults with JIA and RA showed a more frequent involvement and destruction of the dens axis in JIA patients. The aim of the retrospective study was to evaluate the involvement of the cervical spine (CS) in children with JIA.

Methods: The first GdMRI TMJ examinations of consecutive patients with defined JIA from our center were re-evaluated for involvement of the cervical spine (dens axis, DA). Clinical parameters were recorded – CS pain on motion, CS limited range of motion (LOM), peripheral disease activity (PDA, peripheral active, painful and LOM joints) and medication. MRI examinations were re-evaluated for TMJ and dens axis arthritis defined as synovitis and synovial hypertrophy.

Results: 40 children (29 female) were included. 21 patients had RF negative polyarthritis, oligoarthritis was present in 11, ERA and PaA in 4 children equally. Median age at GdMRI was 14 (7–18) years. Median disease duration was 36 (4–192) months. At first GdMRI 47% were on NSAIDs with a median duration of 10 (1–36) months, 49% were on MTX (sc 10–15 mg/m²) with a median duration of 12 months and 13 patients were on TNF Alpha inhibitors with a median duration of 3 (2–12) months. 10 patients showed no PDA but of these only one had no inflammation in DA and TMJ on GdMRI. 34 patients had arthritis in DA (25) or TMJ (33) and 25 patients had arthritis in both DA and TMJ. Out of all patients only 8 had pain and/or LOM of the CS, which were always correlated with arthritis in TMJ and DA on GdMRI. In all other patients CS involvement was silent. Current medication was not able to control disease activity.

Conclusion: Considering that long-term sequels of CS arthritis in adults with JIA tend to be more severe than in RA patients, the high frequency of silent CS arthritis should be kept in mind, where GdMRI is the only tool to detect the extent of disease activity of the cervical spine and help with a proper monitoring of the treatment effect.

Disclosure: N. Tzaribachev, None; C. Tzaribachev, None; B. Koos, None.

2027

Chronic Nonbacterial Osteomyelitis of the Mandible in Children: a Tertiary Center Experience. Daniela S. Ardelean1 and Ronald M. Laxer2. 1Hospital for Sick Children, Toronto, ON, 2The Hospital for Sick Children, Toronto, ON

Background/Purpose: Chronic nonbacterial osteomyelitis (CNO) of the mandible is a rare osseous autoinflammatory disease. Diagnosis is based on characteristic clinical, laboratory, and imaging features. Our aim was to describe the phenotype and response to treatment in children diagnosed at our center.

Methods: We conducted a retrospective chart review of the patients diagnosed and followed for at least 6 months from 1988–2012. Parameters recorded at the last 2 visits (within 6 months interval): pain, abnormal ESR/CRP, imaging features, including bone and/or soft tissue edema, bone enhancement, ongoing medication and/or surgery. For each of these parameters, an average score was calculated based on the presence (1) or absence (0) of that feature; 0.5=presence at 1 visit, absent/unknown at the 2nd visit. Mean and SEM were reported. Statistical comparison between 2 groups was performed with t-test. P<0.05 was considered statistically significant.

Results: 11 patients (8F:3M) with CNO of the mandible were reviewed (Table). Mean age at diagnosis was 8.4 years (3–11 yrs); follow-up, 67±13 months (9–155 mos). 6/11 (55%) children were followed primarily/exclusively by rheumatologists and 5, by dental surgeons. 9/11 (82%) had isolated CNO of the mandible; the last 2, each had 1 additional femoral lesion. 3/11 children (27%) had other immune manifestations: insulin resistance and antibodies against insulin receptors, autoimmune neutropenia and bilateral granulomatous uveitis. Mandibular biopsies were performed in 10/11 patients (91%) of whom 9/10 were consistent with CNO. Blood and bone cultures were negative in all patients tested. All patients were prescribed antibiotics. 5/11 (45%) children underwent surgical interventions. 6/6 patients followed by rheumatologists received NSAIDs; 1/6 (17%), also received biophenosphonates. No patient was treated with steroids or biological therapy. The patients followed by surgeons had pain at the last 2 visits (0.62±0.13), vs those followed by rheumatologists (0) (P<0.02).

Table. Demographic, clinical, laboratory, imaging features and treatment approaches in pediatric CNO of the mandible

<table>
<thead>
<tr>
<th>Patient</th>
<th>Gender</th>
<th>Age (years)</th>
<th>Vital signs</th>
<th>Medication</th>
<th>Imaging features</th>
<th>Treatment</th>
<th>Primary specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>13</td>
<td>210</td>
<td>1</td>
<td>0.5</td>
<td>None</td>
<td>Dentist</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>10</td>
<td>144</td>
<td>0</td>
<td>0.5</td>
<td>Surgery</td>
<td>Dentist</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>8</td>
<td>80</td>
<td>2</td>
<td>0.5</td>
<td>None</td>
<td>Dentist</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>10</td>
<td>123</td>
<td>4</td>
<td>0.5</td>
<td>Surgery</td>
<td>Dentist</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>0.5</td>
<td>Surgery</td>
<td>Dentist</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>13</td>
<td>75</td>
<td>0</td>
<td>0.5</td>
<td>None</td>
<td>Rheum</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>10</td>
<td>24</td>
<td>0</td>
<td>0.5</td>
<td>None</td>
<td>Rheum</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>10</td>
<td>58</td>
<td>0</td>
<td>0.5</td>
<td>None</td>
<td>Rheum</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>3</td>
<td>39</td>
<td>0</td>
<td>0.5</td>
<td>None</td>
<td>Rheum</td>
</tr>
<tr>
<td>10</td>
<td>M</td>
<td>5</td>
<td>65</td>
<td>0</td>
<td>0.5</td>
<td>None</td>
<td>Rheum</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>10</td>
<td>55</td>
<td>0</td>
<td>0.5</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Conclusion: Pain at the last 2 follow-ups is common in patients that received only operative treatment. A major shift in the therapeutic approach of CNO of the mandible occurred in the last two decades, from exclusive surgical interventions to anti-inflammatory therapy and rheumatologic follow-up. CNO of the mandible can be associated with other immune manifestations.

Disclosure: D. S. Ardelean, None; R. M. Laxer, None.

2028

Medication Adherence and Quality of Life in Children with Rheumatic Disease. Stacey E. Tarvan1, Lisa M. Macharoni2, Christine M. Raches3 and Nicole M. Taylor4. 1Riley Hospital for Children, Indianapolis, IN, 2University of Indianapolis, Indianapolis, IN

Background/Purpose: Children with rheumatic diseases are often prescribed complex medication regimens. Medication side-effects may have a negative impact on physical appearance and subsequently impact adherence. In children with rheumatic disease, non-adherence can lead to serious consequences such as decreased physical function, increased symptomology, and hospitalizations requiring more invasive and costly treatment. The purpose of this study is to examine parent and child report of medication adherence in children with rheumatic disease ages 8–18 years. Additionally, this study examines the extent to which health related quality of life (HRQOL) is associated with medication adherence. Adherence will also be examined for its relationship to other psychosocial variables, risk of depression and pain.

Methods: One hundred fifty children with rheumatic disease followed at a Midwest children’s hospital were recruited at an outpatient rheumatology appointment. Each parent-child pair completed measures assessing adherence to the child’s medication regimen, demographic variables, HRQOL assessed using the Pediatric Quality of Life Rheumatology module (PedsQLRM), depressive symptoms assessed using the Childhood Depression Inventory, and reported pain as assessed by visual analog scale and individual items from the aforementioned standardized measures. Appropriate parametric statistics were completed to determine statistical significance of demographic variables, MANOVAs were used to determine the relationship between HRQOL, pain, risk of depression and medication adherence. Data was analyzed using SPSS 16.0.

Results: Eighty-seven percent of the children in the sample were prescribed medication for their illness. Parent and child report of medication compliance showed significant correlation (r=0.229, p<0.009). Twenty percent of parents reported that their child missed two or more doses of medication within the prior week. One third of patients reported missing two or more doses of medication within the past week, with 8.6% reported missing 4 or more doses. One-third of the sample reported complete compliance with medications. Demographic variables that were significantly related to medication compliance were parent marital status (p<0.032), parent employment (p<0.043), gender (p<0.036) and child age (p<0.034). Medication non-adherence was associated with trouble sleeping (p=0.032), report of side effects (p=0.011), worry (p<0.013) and total quality of life score (p<0.046) based on child report. Neither risk of depression nor pain, as reported on the PedsQLRM, were found to be significantly related to medication compliance.
Conclusion: Rates of medication non-adherence in this population are high, and while children and their parents report a moderate correlation, results suggest that parents underestimate their child’s medication adherence. A better understanding of key demographic, psychosocial and HRQOL variables associated with adherence may allow the physician to address non-adherence directly with at-risk patients.

Disclosure: S. E. Tarvin, None; L. M. Macharone, None; C. M. Raches, None; N. M. Taylor, None.

2029

Reliability of Scoring a Disease Damage Measure for Juvenile Localized Scleroderma. Kathryn S. Torok1, Suzanne C. Li2, Christina Kelsey2, Mara L. Becker3, Fatma Dedeoglu4, Robert C. Fuhlbrigge5, Gloria Higgins6, Sandy D. Hong1, Maria F. Ibarra6, Ronald M. Laxer3, Thomas G. Mason II1, Marilynn G. Punaro10, Elena Pope11, Egla C. Rabinovich12 and Katie G. Stewart11. 1Univ of Pittsburgh Med Ctr, Pittsburgh, PA; 2Joseph M Sanzari Children’s Hospital, Hackensack University Medical Center, Hackensack, NJ; 3Children’s Mercy Hospital, Kansas City, MO; 4Boston Children's Hosp, Boston, MA; 5Children’s Hospital, Boston, MA; 6PRCSG-Cincinnati Children’s Hospital Medical Center, Columbus, OH; 7U of Iowa Children’s Hosp, Iowa City, IA; 8The Hospital for Sick Children, Toronto, ON, 9Mayo Clinic Rochester, Rochester, MN; 10Texas Scottish Rite Hospital, Dallas, TX; 11Hospital for Sick Children, Toronto, ON, 12Duke University Medical Center, Durham, NC

Background/Purpose: In order to more accurately capture disease activity and damage in juvenile Localized Scleroderma (jLS) and to develop an accepted outcome measure for treatment protocols, an LS-focused Childhood Arthritis and Rheumatology Research Alliance sub-group developed clinical disease activity and damage measures. The objective of this abstract is to discuss the assessment of the reliability and validity of the LS Damage Score in jLS. The LS Damage Score includes four domains (dermal atrophy, subcutaneous atrophy, dyspigmentation hyper/hypo pigmentation, and skin thickness of lesion center) which are scored for all affected sites.

Methods: Thirty-five rheumatologists and a dermatologist attended a 2-day workshop meeting to review LS clinical measures. Raters ranked 13 jLS patients on damage domains at 2 time points. Patients were presented to raters in random order in efforts to reduce recall bias. For each patient, raters were told which anatomic sites to assess (1–2/patient). Physicians also completed Physician Global Assessment of Disease for Activity and Damage (PGA-A; PGA-D). To examine construct validity, we hypothesized that the LS Damage Score would have a moderate correlation to PGA-D and a low correlation to PGA-A. Spearman’s rho was calculated to quantify the relationship with clinical parameters, and intraclass correlation coefficients (ICC) were examined to determine inter/ intra rater reliability (0.20–0.39 low, 0.40–0.59 moderate, 0.60–0.79 high).

Results: Median age of LS patients was 13 years (IQR = 9.5–17) and the most common subtype was linear scleroderma (4 limb, 4 head). Mean LS Damage Scores ranged from 3.96 to 16.46 (max score 24); PGA-D ranged from 14.54 to 53.48 (max score 100). There was a low correlation between the LS Damage Score and both PGA-D and PGA-A (ρ = 11, ρ = .14). Raters demonstrated moderate/high inter and intra-rater reliability for the LS Damage score, and low/moderate inter and intra-rater reliability for PGA-D. Among the domains, hypopigmentation showed the lowest inter-rater reliability (Table 1).

Table 1. Inter-rater and intra-rater reliability of LS Damage score

<table>
<thead>
<tr>
<th>Domain</th>
<th>Round 1 ICC (95% CI)</th>
<th>Round 2 ICC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS Damage Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-rater reliability</td>
<td>0.56 (0.77, 0.79)</td>
<td>0.63 (0.81, 0.83)</td>
</tr>
<tr>
<td>Intra-rater reliability</td>
<td>0.07 [0.89, 0.90]</td>
<td>0.52 [0.65, 0.69]</td>
</tr>
<tr>
<td>PGA-D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-rater reliability</td>
<td>0.19 (0.48, 0.48)</td>
<td>0.26 (0.34, 0.54)</td>
</tr>
<tr>
<td>Intra-rater reliability</td>
<td>0.27 [0.60, 0.79]</td>
<td>0.57 [0.50, 0.68]</td>
</tr>
<tr>
<td>LS Damage Score parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-rater reliability</td>
<td>0.37 (0.23, 0.51)</td>
<td>0.40 (0.31, 0.47)</td>
</tr>
<tr>
<td>Dermal Atrophy</td>
<td>0.42 (0.26, 0.57)</td>
<td>0.54 (0.36, 0.68)</td>
</tr>
<tr>
<td>Subcutaneous Atrophy</td>
<td>0.60 (0.52, 0.71)</td>
<td>0.74 (0.58, 0.84)</td>
</tr>
<tr>
<td>Dyspigmentation</td>
<td>0.42 (0.26, 0.56)</td>
<td>0.54 (0.36, 0.68)</td>
</tr>
<tr>
<td>Hypopigmentation</td>
<td>0.46 (0.24, 0.68)</td>
<td>0.54 (0.36, 0.68)</td>
</tr>
<tr>
<td>Skin Thickness of lesion</td>
<td>0.49 (0.36, 0.63)</td>
<td>0.55 (0.40, 0.70)</td>
</tr>
</tbody>
</table>

Conclusion: The LS Damage Score had moderate-high reliability between and among raters, with hyperpigmentation, skin thickness, and dermal atrophy contributing most to the total score. Overall, the inter-rater agreement of damage components increased in session 2. The PGA-D performed well within the rater’s repeat assessment, but poorly in regards to inter-rater reliability. The poor correlation between PGA-D and LS Damage Score may reflect MD inclusion of extracutaneous manifestations (ECM), such as facial disfigurement. In post-hoc analyses, when patients with facial linear scleroderma were removed, the correlations of PGA-D with LS Damage Score increased (p = 0.01). Additional studies are needed to fully evaluate this measure.

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2030

A Multi-Modal Amplified Musculoskeletal Pain Treatment Program: Associations of Previous Pharmacotherapy with Subsequent Outcomes. Cara M. Hoffart1, Pamela Weiss1, David D. Sherry2, Chris Feudtner3 and Margaret Stineman4. 1The Children’s Hospital of Philadelphia, Philadelphia, PA; 2Children’s Hospital of Philadelphia, Philadelphia, PA; 3Division of General Pediatrics, Children’s Hospital of Philadelphia; University of Pennsylvania Franklin Center for Clinical Epidemiology and Biostatistics, Philadelphia, PA; 4The University of Pennsylvania, Philadelphia, PA

Background/Purpose: Management of Amplified Musculoskeletal Pain (AMP) in children (i.e. juvenile primary fibromyalgia, complex regional pain syndrome, neuropathic pain, central sensitization) remains controversial. Common practice includes the combination of potent medications with physical and behavioral therapy. We hypothesize that functional restoration and pain reduction in patients with AMP does not require potent medications. The objective of this study is to describe a cohort of children with AMP treated with a non-pharmacological highly structured protocol and to test whether previous utilization of pharmacotherapy (as a marker of initial severity) predicts subsequent treatment program outcomes.

Methods: We conducted a retrospective inception cohort study of children with AMP treated with a non-pharmacological multidisciplinary program at The Children’s Hospital of Philadelphia between January 2008 and December 2011. All pain medications were discontinued prior to program entry. The primary outcome, function, was measured with the Functional Disability Inventory (FDI) and Bruce Treadmill Score. We tested whether previous utilization of pharmacotherapy predicted treatment outcomes using mixed-effects linear regression.

Results: We identified 168 individuals with AMP treated over 4 years. The median age was 14 (IQR: 13, 16 years), and three-quarters of the patients were females. The median pain duration was 18 months (IQR: 9, 36 months) and the median pain score 0–10 at program entry was 7 (IQR: 5, 8). Previous pharmacologic drug therapy exposure included opioids (N=53, 32%), immunomodulators (N=51, 15%), immunosuppressants (N=8, 6%), neuromodulators (N=35, 21%), and psychotherapies (N=32, 19%). Median FDI at baseline and program completion were 22 (IQR: 15, 30) and 5 (IQR: 3, 18), respectively. Median Bruce Treadmill Score at baseline and program completion were 586.5 (IQR: 415.5, 712.5 seconds) and 796 (IQR: 750, 908 seconds), respectively. Median pain score at program completion was 4 (IQR: 0, 7), which is significantly improved from baseline (P<0.01). Change in FDI and Bruce Treadmill Score from start to finish of the program were significantly improved (P<0.001). After adjustment for patient characteristics, there was no significant variation in functional outcomes associated with previous exposure to pharmacotherapy (P=0.43).

Conclusion: These results suggest that in comparison to those children whose medication was naive and “less severe”, those children with “more severe” disease who were receiving potent pain medications prior to the start of the program were as likely to have restoration of function. Additionally, these results demonstrate that regardless of treatment before program entry, children with AMP have successful restoration of function without pharmacotherapy. Prospective studies are warranted to determine long-term efficacy and effectiveness of this multi-disciplinary program.

Disclosure: C. M. Hoffart, None; P. Weiss, None; D. D. Sherry, None; C. Feudtner, None; M. Stineman, None.
Background/Purpose: Deficiency of interleukin-1 receptor antagonist (DIRA) is a neonatal-onset autoinflammatory syndrome caused by mutations in IL1RN gene and clinically characterized by a perinatal onset of pustular dermatosis, aseptic multifocal osteomyelitis and marked elevation of acute phase reactants. Individual reports have been shown that these patients present a prompt response to the recombinant human IL-1 receptor antagonist (IL1Ra) anakinra. However, long-term efficacy and safety of anakinra treatment in DIRA patients have not been assessed. Thus, the objectives of this study were to assess the clinical and laboratory findings of patients with DIRA followed at the NIH and enrolled in a natural history study to assess long-term outcomes in autoinflammatory syndromes patients.

Methods: Eight patients with a genetically confirmed diagnosis of DIRA were followed longitudinally. Demographic, clinical and laboratory findings and relevant variables were collected for each patient at the enrollment and subsequent clinical visits. Statistical analyses were performed using unpaired t-test with Welch’s correction.

Results: Four (50%) patients were female. Age at disease onset ranged from 1 to 15 days of life and age at anakinra starting was 11 (2–114) months. Five patients had been receiving anakinra 4 to 54 months prior to the study enrollment. Before IL1Ra was started, 5 patients presented with intermittent fever; all 8 patients had mild to severe pustular rashes and 5 had nail abnormalities. Various degrees of multifocal osteomyelitis were observed in all patients and 3 had odontoloid non-fusion. Unspecific lung disease was observed in 3 patients, 2 patients presented thrombotic events and 2 had vasculitis. Laboratory findings prior to anakinra showed mild to severe anemia and increased white blood cell (WBC) count in all 8 patients and thrombocytosis in 5. C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were elevated in all 8 patients. At the last follow-up visit (6 to 48 months) the CRP was 35 (20–102) mg/L and anakinra doses ranged from 2.1 to 5.1 (median: 3.5) mg/kg/day. At that time, none of the patients had developed new osteomyelitis lesions, nor pustular skin manifestations and CRP and ESR were 0.21 (0.016–0.579) mg/dL and 7 (3–13) mm/h, respectively. All patients fulfilled criteria for inflammatory and clinical response. Other independent variables were the country of residence, not ethnicity but the country of residence positively influenced the severity of disease presentation. Other independent variables were the presence of M694V (also on a single allele), a positive family history and genetic factors on the expression of a monogenic disease. We suggest that since FMF is the disease of the innate immune system and since the mutated protein is a component of the inflammasome triggered by microbial products, environmental factors including diet have a significant effect. Epigenetic studies are now in order.

Conclusion: We clearly demonstrate the actual impact of environmental and genetic factors on the expression of a monogenic disease. We suggest that since FMF is the disease of the innate immune system and since the mutated protein is a component of the inflammasome triggered by microbial products, environmental factors including diet have a significant effect. Epigenetic studies are now in order.

Disclosure: S. Ozen, None; E. Demirkaya, None; G. Amaryan, None; I. Kone-Paut, None; A. Polat, None; T. Turker, None; P. Woo, None; Y. Uziel, None; C. Modesto, None; M. Finetti, None; P. Quartier, None; E. Papadopoulou-Alatati, None; S. Ozen, None; N. Ruperto, None; M. Gattorno, None; E. Papadopoulou-Alatati, None; S. Ozen, None; N. Ruperto, None; M. Gattorno, None.
infliximab. Creatinine levels and concurrent steroid doses were plotted in relation to initiation of infliximab. IRB exemption was granted prior to the start of chart review.

Results: In all 3 patients, a linear plot demonstrates that infliximab allowed for successful tapering of steroids without flare, and stabilization/improvement of serum Cr.

Patient 1 was diagnosed with sarcoidosis at 14 years with an elevated ACE and hepatic biopsy revealing multiple non-caseating granulomas. She was treated with corticosteroids. During an attempt to taper, she developed acute renal failure warranting a renal biopsy showing granulomatous interstitial nephritis. After failure with mycophenolate mofetil and IV methylprednisolone pulses, she was treated with infliximab. IV steroids were weaned over the next 4 months then discontinued. Four months later, her oral steroids were weaned completely. She remains stable on infliximab and mycophenolate mofetil.

Patient 2 was diagnosed at 10 years with sarcoidosis based on systemic manifestations and lymph node granulomas. She developed renal manifestations 4 years later. She failed chronic steroids and methotrexate. After initiation of infliximab, her steroids were weaned, her creatinine stabilized. After developing renal cell carcinoma, infliximab was discontinued, with an increase in daily oral steroid and eventual renal failure.

Patient 3 was diagnosed with sarcoidosis at 12 years based on elevated serum ACE level, uveitis, and conjunctival biopsy with non-caseating granulomas. His serum Cr was 2 mg/dL prior to initiation of steroids and methotrexate. Methotrexate was an ineffective steroid sparing agent. After initiation of infliximab, he was able to wean on his oral steroids, with stabilization of serum Cr. His Cr rose when infliximab was held for initiation of infliximab, her steroids were weaned, her creatinine stabilized. After recovering, she was initiated on infliximab and mycophenolate mofetil. With an increase in daily oral steroid and eventual renal failure.

Patient 3 was diagnosed with sarcoidosis at 12 years based on elevated serum ACE level, uveitis, and conjunctival biopsy with non-caseating granulomas. His serum Cr was 2 mg/dL prior to initiation of steroids and methotrexate. Methotrexate was an ineffective steroid sparing agent. After initiation of infliximab, her steroids were weaned, her creatinine stabilized. After recovering, she was initiated on infliximab and mycophenolate mofetil. With an increase in daily oral steroid and eventual renal failure.

Conclusion: Infliximab is an effective steroid sparing agent in our pediatric patients with renal sarcoidosis.

Disclosure: E. Wershba, None; L. Lewandowski, None; H. Van Mater, None; E. C. Rabinovich, None.
before the age of 16), the sensitivity of ICBD is compared with 4 most commonly used diagnosis/classification criteria (Revised Japan, O’Duffy, International Study Group [ISG] and Classification Tree).

**Methods:** According to the data registry for Behcet’s Disease patients in Rheumatology Research Center, Tehran University of Medical Sciences, Iran, all the patients diagnosed before the age of 16 (during 1975–2011) are included in the study. The fulfillment of each of the 5 criteria is evaluated for each patient and the sensitivity of different sets of criteria in childhood BD is calculated.

**Results:** 180 children out of 6813 BD patients (2.64 %, CI: 0.4) are selected (86 male and 94 female). The mean age was 10.7 years (SD: 3.4, CI: 0.5), mean duration 8.2 years (SD: 6.7), mean follow up 5 years (SD: 6.2) and the diagnosis delay 3.2 years (SD: 2.7).

1) 174 patients fulfilled the ICBD criteria (sensitivity 96.66%); 171 patients met Revised Japan criteria (sensitivity 95%); 156 patients for Revised Japan criteria (sensitivity 86.66%); 126 patients met ISG criteria (sensitivity 70%) and 103 patients fulfilled O’Duffy criteria with sensitivity of 57.2%.

2) Although the majority of the patients met all 5 sets of criteria, some of the patients could fulfill different combinations of criteria sets as described below.

88 patients (48.88%) met all 5 criteria; 30 patients (16.66%) fulfilled ICBD, Japan and Classification Tree; 26 patients (14.44%) met all the assessed criteria except for O’Duffy; 7 patients (3.9%) met all the assessed criteria except for ISG; 6 patients (3.33%) could meet only ICBD and Classification Tree; 6 patients (3.33%) met ICBD, Classification Tree and ISG; 5 patients (2.77%) met all the assessed criteria except for Japan; 3 patients (1.66%) fulfilled ICBD and Japan Criteria; 2 patients (1.1%) fulfilled ICBD, O’Duffy and Classification Tree; 2 patients (1.1%) fulfilled ICBD, Japan and O’Duffy; 1 patient (0.5%) met ISG and Classification Tree and 4 patients (2.2%) could not meet any of the 5 assessed criteria.

**Conclusion:** The most sensitive criteria for Iranian children with Behcet’s disease was ICBD, followed by Classification Tree, Japan and ISG and O’Duffy. The higher sensitivity in ICBD, Classification Tree and Japan criteria may be explained by the prominence of the eye involvement in children and the importance of ocular lesions in these criteria sets.

Disclosure: N. Shafaie, None; B. Sadeghi Abdollahi, None; F. Davatchi, None.

2036


1University of Pittsburgh, Pittsburgh, PA, 2University of Pittsburgh Division of Plastic and Reconstructive Surgery, Children’s Hospital of Pittsburgh, Pittsburgh, 3Univ of Pittsburgh Med Cr, Pittsburgh, PA, 5Children’s Hospital of Pittsburgh of UPMC, Pittsburgh, PA

**Background/Purpose:** Localized scleroderma is an autoimmune disease characterized by disfiguring thickening and fibrosis of the skin and underlying soft tissues; the majority of cases have onset in childhood. Multiple subtypes exist, including linear scleroderma, which is most common in children. Linear scleroderma involving the face and scalp is known as En Coup de Sabre (ECDS) and hemifacial atrophy that is often associated with ECDS or Parry Romberg Syndrome (PRS). Excutaneous manifestations are often associated with ECDS and PRS, including neurological, eye and dental abnormalities.

**Methods:** The patients and their associated disease characteristics of our Children’s Hospital Pediatric onset ECDS/PRS cohort were evaluated from years 2002–2012. This included demographic features, lesion characteristics, extracutaneous manifestations, quality of life, family history, and response to medical and surgical treatment. Descriptive statistics were employed.

**Results:** Twenty patients in our ECDS/PRS cohort were identified, with mean age onset 5.9 years (± 4.5), time to diagnosis 1.9 years (± 2.3), female to male ratio (3:2), and majority were Caucasian (85%). The majority of patients had features of both cutaneous disease (ECDS) and hemifacial atrophy (PRS). The most common symptom at presentation was hyperpigmentation (65%), followed by skin and subcutaneous depression (50%). Erythema or violaceous discoloration was common in patients presenting with active disease (55%). Antibody positivity for ANA, ss-DNA and histone ranged from 25–44%. Seven patients (35%) had neurological manifestations including the following: a pontine lesion associated with chronic ataxia, dysarthria, and cognitive dysfunction; a cerebral infarction; and white matter lesions on MRI ipsilateral to cutaneous lesion.

The majority of cohort patients were treated with prednisone and methotrexate; treatment was successful in halting disease and reversing a few active features, though less successful in reversing chronic disease damage. Mean follow-up of cohort 30.2 months (± 19.4). Four patients underwent surgical repair with liposupiration fat injection for volume restoration. Stereophotogrammetry 3-D imaging was used to objectively quantify facial morphology to assess patients’ response to both surgical and medical therapy.

**Conclusion:** Our ECDS and PRS cohort demonstrated similar clinical findings of disease and associated ECM compared to other studies. Screening with brain MRI, ophthalmologic and dental evaluations for associated complications is reasonable in light of one-third of our cohort having neurologic, ophthalmologic, or dental involvement, some of which had a serious impact on daily living and QOL.

Disclosure: K. M. Brown, None; D. Smith, None; C. Kelsey, None; K. Kurzinski, None; K. S. Tork, None.

ACR/ARHP Poster Session C

Quality Measures and Innovations in Practice Management and Care Delivery

Tuesday, November 13, 2012, 9:00 AM–6:00 PM

2037

Poor Quality of Gout Care Is Strongly Associated with Higher Gout-Related Health Care Utilization. Jasvinder A. Singh and Joshua Richmar.

1University of Alabama at Birmingham, Birmingham, AL, 2UAB School of Medicine, Birmingham, AL

**Background/Purpose:** Proponents of improving quality of gout care have suggested various gout quality indicators, but no study to date has shown the link between good quality care and improved outcomes. The aim of the study was to assess whether appropriate good quality care for gout, including uninterrupted urate-lowering therapy (ULT) and achievement of target serum urate <6 mg/dl, is associated with reduced gout-related utilization.

**Methods:** This retrospective study utilized the Veterans Affairs (VA) administrative and clinical databases claims from fiscal years 2002 to 2010, using the presence of an International Classification of Diseases, ninth revision (ICD-9) code, 274.xx in a VA outpatient or inpatient visit to define the gout cohort. A 90-day or longer filled VA prescription for allopurinol, probenecid or febuxostat in a patient with gout was considered as exposure to ULT. The two independent predictors of interest were Medication Possession Ratios (MPRs) for each ULT, and achievement of target serum urate <6 mg/dl. The MPR denominator was the number of days from index to the exhaustion of the last prescription and the numerator was days of medication supplied over that period from first to last prescription. We used regression analyses with a quasi-Poisson distribution given the type of data, limiting the analyses to patients with >1-year of follow-up. The outcome was counts of visits with an offset for the number of years in the cohort.

**Results:** The gout cohort consisted of 376,421 patients with mean age 70 years, 90% were male and 61% were married. Their exposure to various medications for the treatment of gout was as follows: allopurinol, 70%; febuxostat, 0.3%; and probenecid, 3%. Mean follow-up was 6.2 years (standard deviation, 2.9). Higher MPRs for allopurinol, febuxostat, and probenecid were associated with significantly lower gout-related outpatient, inpatient, urgent care and emergency room visits (all p-values <0.0001; Table 1). Achievement of target serum urate <6 mg/dl was associated with significantly lower gout-related outpatient, inpatient, urgent care and emergency room visits (all p-values <0.012; Table 1). Conversely, a higher proportion of serum urate levels >6 mg/dl was associated with higher gout-related outpatient, inpatient, urgent care and emergency room visits (all p-values <0.00001).

**Table 1.** Association of MPR for three ULTs and of achievement of target serum urate <6mg/dl with future gout-related health care utilization

<table>
<thead>
<tr>
<th>Any visit</th>
<th>Outpatient visit</th>
<th>ER visit</th>
<th>Urgent care</th>
<th>Inpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accession to ULT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allopurinol MPR (≤80%)</td>
<td>0.09 [p=0.11]</td>
<td>1.02 [p=0.14]</td>
<td>0.70 [p=0.04]</td>
<td>0.87 [p=0.05]</td>
</tr>
<tr>
<td>Febuxostat MPR (≤70%)</td>
<td>0.64 [p=0.01]</td>
<td>0.64 [p=0.70]</td>
<td>0.38 [p=0.074]</td>
<td>0.28 [p=0.70]</td>
</tr>
<tr>
<td>Probenecid MPR (≤30%)</td>
<td>0.67 [p=0.04]</td>
<td>0.67 [p=0.04]</td>
<td>0.46 [p=0.01]</td>
<td>0.26 [p=0.074]</td>
</tr>
</tbody>
</table>

**Adherence to ULT**

*Incidence rate ratio for each outcome is for patients with MPR of 1 versus 0*.
Conclusion: This is the first study to find evidence of association of poor quality of care (lower ULT MPR and non-achievement of target sUA) with greater gout-related health care utilization, especially for emergency room and urgent care visits. Improvement in quality of gout care may reduce expensive gout-related utilization of emergency room and urgent care resources.

Disclosure: J. A. Singh, research and travel grants from Takeda, Savient, Wyeth and Amgen, 2, J. A. S. has received speaker honoraria from Abbott, 9, 3; consultant fees from URL pharmaceuticals, Savient, Takeda, Ardea, allergan and Novartis, 5, 4. J. Richman, None.

2038

Expanding Access in Rheumatology Specialty Care in New Mexico Via an Innovative Community Outreach Program. Arthur Bankhurst1, Sanjeev Arora1, Summers Kalishman1, Jeannie F. Boyle1, Cynthia Olivas1, Rebecca Monette1, Dara Som2 and Yolanda Hubbard1. 1University of New Mexico School of Medicine, Albuquerque, NM, 2University of New Mexico School of Medicine, Albuquerque, NM.

Background/Purpose: There was a small but significant increase in overall self-efficacy in improving access to care for patients with rheumatologic disorders as well as improved self-efficacy of PCCs providing specialty rheumatologic care. There was a small but significant increase in overall self-efficacy from pre to post survey evaluation.

Methods: The Rheumatology TeleECHO Clinic uses state-of-the-art technology to link PCCs with the Rheumatology Specialist here at University of New Mexico (UNM). Weekly clinics consist of short didactic, patient case presentations, and open discussions. In order to evaluate the effectiveness of the program, PCCs were given a pre and post self-efficacy survey. Eligibility criteria to participate in the survey included: attend three or more rheumatology TeleECHO clinic sessions or attend an on-site training session with Rheumatology clinic staff, participant completed 50% of questions on either pre or post survey, and participant is not a TeleECHO clinical facilitator.

Results: Participation in the Rheumatology TeleECHO clinic has improved access to care for patients with rheumatologic disorders as well as improved self-efficacy of PCCs providing specialty rheumatologic care. There was a small but significant increase in overall self-efficacy from pre to post survey evaluation.

Conclusion: Implementation of lean tools and thinking can make provide smarter, quicker, easier, better and safer uveitis patient care delivery to the JIA patients by use of an effective uveitis surveillance process. We also emphasize the importance of seeing lean thinking as a part of the larger management shift towards planning for changes in mindsets and work places.

Methods: This new surveillance process can be horizontally deployed for diabetic eye surveillance and drug toxicity monitoring in rheumatic patients on immunosuppressant.

Disclosure: A. Patwardhan, None; K. Keller, None; J. Hoffman, None; K. B. Jones, None; S. P. Ardoni, None; C. H. Spencer, None.

2040


Background/Purpose: Quality Indicators (QI) are retrospectively measurable elements of practice performance for which there is evidence or consensus that can be used to assess the quality of care provided. Previous QI have been developed for adult systemic lupus erythematosus. This project was the second of two Delphi surveys used to identify QI in childhood-onset systemic lupus erythematosus (cSLE) that could serve as international benchmarks to assess quality of patient care.

Methods: Based on medical literature and a previous Delphi survey, a second survey was created and distributed via email to 348 individuals on the member lists of EULAR, PANLAR, PRINTO, PRES, ACR and CARRA. 10 individual cases to the Project ECHO™ Rheumatology TeleECHO Clinic and who is recognized in their local communities as a PCC with 10–20% of all patients with JIA leading to insidious but progressive agreement and blank responses were excluded from the analysis.

Results: Important process QI (IF/THEN statements) addressing the following treatment domains achieved consensus: bone health, education on cardiovascular risk factors, lupus nephritis and hypertension management, medication management, ophthalmological surveillance, transfer of care, use
of chronic steroids in cSLE management, and vaccinations (Table 1). A substantial amount of support was noted for clinical evaluation of disease activity every 3 months (71%), while the support for safety monitoring for medications was variable. The safety monitoring variables that reached consensus are displayed in Table 2.

Table 1. Quality indicators for patients with cSLE which yielded at least 80% consensus

<table>
<thead>
<tr>
<th>Lupus Nephritis and Hypertension Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) IF a cSLE patient without known lupus nephritis has developed proteinuria of &gt;500 mg or clinically relevant worsening of GFR/urinary sediment, THEN a kidney biopsy should be performed.</td>
</tr>
<tr>
<td>2) IF a patient has known lupus nephritis, THEN a clinical assessment for cSLE should occur at least every 3 months regardless of disease activity.</td>
</tr>
<tr>
<td>3) IF a cSLE patient has lupus nephritis plus evidence of ongoing proteinuria &gt;500 mg/day, THEN an angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blockers (ARB) should be prescribed, unless there are contraindications.</td>
</tr>
<tr>
<td>4) IF a patient has LN and/or hypertension, THEN disease co-management with a nephrologist should be considered.</td>
</tr>
</tbody>
</table>

Medication Management

<table>
<thead>
<tr>
<th>Medication Monitoring Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>5) IF a patient has cSLE, THEN antimarial therapy should be prescribed, unless there are contraindications.</td>
</tr>
<tr>
<td>6) IF a patient is receiving a dose of steroids not acceptable for chronic use, then an attempt should be made to taper steroids.</td>
</tr>
<tr>
<td>7) IF a patient with cSLE is unable to decrease the dose of steroids acceptable for chronic use, THEN the addition of a steroid-sparing agent, or an increased dose of an existing steroid-sparing agent should be considered.</td>
</tr>
<tr>
<td>8) IF a cSLE patient is treated with medications, THEN laboratory surveillance for medication safety should be done at regular intervals (Table 2).</td>
</tr>
<tr>
<td>9) IF a patient has cSLE, THEN vaccination against influenza and encapsulated organisms should be prescribed, unless there are contraindications.</td>
</tr>
</tbody>
</table>

Bone Health with cSLE

<table>
<thead>
<tr>
<th>Bone Health with cSLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10) IF a patient has received chronic systemic steroids, THEN the patient should have bone mineral density testing documented in the medical record.</td>
</tr>
<tr>
<td>11) IF baseline bone mineral density testing is outside of normal limits (Z-score ≤-2.0), THEN bone mineral density should be re-measured after one year.</td>
</tr>
<tr>
<td>12) IF a patient is on any steroid therapy, THEN calcium and vitamin supplementation should be recommended after 3 months.</td>
</tr>
</tbody>
</table>

Ophthalmological Surveillance

<table>
<thead>
<tr>
<th>Ophthalmological Surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>13) IF a cSLE patient is treated with corticosteroids, THEN an eye screening does not need to occur prior to treatment.</td>
</tr>
<tr>
<td>14) IF a cSLE patient is treated with corticosteroids, THEN eye screening should be done at least annually.</td>
</tr>
<tr>
<td>15) IF a cSLE patient is treated with antimalarial therapy, THEN eye screening should be done at least annually.</td>
</tr>
</tbody>
</table>

Transfer of Care with cSLE

<table>
<thead>
<tr>
<th>Transfer of Care with cSLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>16) IF an adolescent has cSLE, THEN a transition plan should be carefully designed to facilitate transfer of care to the appropriate adult health-care providers.</td>
</tr>
</tbody>
</table>

Education on Cardiovascular Risk Factors

<table>
<thead>
<tr>
<th>Education on Cardiovascular Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>17) IF a patient has cSLE, THEN education about cardiovascular risk factors should occur at regular intervals with the parent and the patient age 13 years or older.</td>
</tr>
</tbody>
</table>

Table 2. Medication Monitoring Table

<table>
<thead>
<tr>
<th>Medication Monitoring Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF a cSLE patient is treated with medications, THEN laboratory surveillance for medication safety should be done regularly as is documented below:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interval</th>
<th>NSAIDS</th>
<th>HCO</th>
<th>IV CTX</th>
<th>Cyclo-A</th>
<th>Prednisone</th>
<th>Rituximab</th>
<th>TNF-antagonists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>CBC</td>
<td>Liver</td>
<td></td>
<td></td>
<td>CBC</td>
<td>CBC</td>
<td>CBC</td>
</tr>
<tr>
<td>Every month</td>
<td>CBC</td>
<td>Liver</td>
<td>Renal</td>
<td></td>
<td>CBC</td>
<td>CBC</td>
<td>CBC</td>
</tr>
<tr>
<td>Every 3 months</td>
<td>CBC</td>
<td>Liver</td>
<td>Renal</td>
<td></td>
<td>CBC</td>
<td>CBC</td>
<td>CBC</td>
</tr>
<tr>
<td>Every 6 months</td>
<td>Renal</td>
<td>Liver</td>
<td></td>
<td></td>
<td>CBC</td>
<td>CBC</td>
<td>CBC</td>
</tr>
<tr>
<td>Every 9 months</td>
<td>UA</td>
<td></td>
<td></td>
<td></td>
<td>CBC</td>
<td>CBC</td>
<td>CBC</td>
</tr>
<tr>
<td>Every 12 months</td>
<td>CBC</td>
<td></td>
<td></td>
<td></td>
<td>Renal</td>
<td>Liver</td>
<td>CBC</td>
</tr>
</tbody>
</table>

AZA=azathioprine; HCO=hydrochlorothiazide; CTX=cyclophosphamide; MMF=mycophenolate mofetil/mycophenolic acid; Cyclo-A=cyclosporine-A; CBC=complete blood count and differential; Liver=liver function tests; Renal=renal function tests; UA=urinary protein excretion

Conclusion: Delphi questionnaires are efficient instruments for reaching international consensus for minimal standards of quality care for cSLE. Additional efforts will help refine items for which there is currently no consensus. The new QI identified through this project can be used to define and standardize best practices for children and adolescents with cSLE across the world.

Disclosure: M. C. Hollander, None; J. M. Sage, None; A. J. Greenler, None; T. Aveline, None; W. Beresford, None; G. Espada, None; M. S. Klein-Gitelman, None; M. Heinrichson, None; T. L. Lee, None; J. D. Pendl, None; M. G. Pumar, None; J. L. Huggins, None; A. M. Stevens, None; H. I. Brunner, None.

2041

Improving Access and Patient Education in Rheumatology: the Gout Shared Medical Appointment; a Quality Improvement Initiative. Alicia J. Zbehlik and Nicole M. Orzechowski. Dartmouth-Hitchcock Medical Center, Lebanon, NH, Dartmouth-Hitchcock Med Ctr, Lebanon, NH

Background/Purpose: Patients experience long waits for consultations in Rheumatology at Dartmouth-Hitchcock Medical Center (DHMC). The cause of this is multi-factorial, including provider referral patterns, patient preferences, constraints on clinic time in an academic medical practice, and system bottlenecks such as lack of available exam rooms. Regardless of the cause, the results are the same: potential for delayed treatment for rheumatologic diseases, pain and anxiety for patients, frustration for referring providers and poor practice performance. While matching capacity to demand improves access, increasing practice capacity without encroaching on physician teaching, research, and administrative time is challenging. To capitalize on this opportunity, the Rheumatology Access Team (RATE) adapted a shared medical appointment (SMA) to meet the needs of gout patients.

Methods: Following an SMA guide developed at DHMC, the team mapped an “ideal” pathway of patient care for the appointment; verified adequate patient volumes; secured access to meeting space and exam rooms; and produced written and electronic patient education materials. A physician, scribe, nurse, and SMA coordinator staff the SMA. The physician evaluates patients in brief, private exam and develops individual care plans while the scribe uses a template to record the history of present illness and exam findings. The nurse greets patients, takes vital signs, and facilitates discussion amongst the participants. The SMA coordinator schedules patients and enters lab orders (signed by the provider) to ensure labs are actionable at the time of the appointment. Feedback elicited from patients and staff informed iterative changes in the appointments using a continual improvement model. Billing is the equivalent of a regular gout follow up appointment.

Results: A gout SMA takes place every two months and includes education on diet and metabolic syndrome per patient requests. The current appointment has the capacity to serve up to 12 patients in a two-hour session for one provider. This increases potential new patient capacity in the clinic by a net of 4 visits per SMA. During the course of multiple interventions, access to Rheumatology improved steadily from April 2011 to April 2012 (107 to 56 days) but it has not reached our goal of 14 days. Patient satisfaction with the availability of an appointment in Rheumatology “when you wanted it” increased from 35% to 60% excellent during the intervention.

Conclusion: A gout SMA may improve access in Rheumatology, however a robust change in the wait times will require an increase in referrals to the SMA. The SMA is an excellent opportunity to practice principals of team-based iterative change. The SMA allows providers to operate at their level of training by eliminating order and data entry and allows them to focus on patients rather than computers during the visit. This model has potential to work within the framework of an accountable care organization. Further study of outcomes will be helpful in determining if these appointments provide value for patients and the institution beyond increasing access.

Disclosure: A. J. Zbehlik, None; N. M. Orzechowski, None.

2042


Background/Purpose: Juvenile idiopathic arthritis (JIA) is a chronic disease that requires long-term treatment. Patients and families face multiple treatment decisions over the course of illness that can often be complex. This project aims to engage the engagement of patients and families facing JIA treatment decisions, improve information exchange with care providers, and identify opportunities for a shared decision-making (SDM) intervention.

Methods: Sixteen pediatric rheumatology providers were recruited from four children’s hospitals using purposive and snowball sampling to include a range of provider types (eg, nurse, physician, trainee) with unique approaches to working with families or a particular interest in education or decision-making. The providers participated in semi-structured interviews eliciting how they interact with patients and families in developing and adapting treatment plans. Interviews were audio-recorded and transcribed verbatim. The transcripts were coded by a multi-disciplinary team to determine major and minor themes. Based on the themes identified in the semi-structured interviews, multiple choice questions were presented at a conference of
Results: Treatment decisions were consistently initiated by the physician, with other providers focused on educating families and assessing barriers to treatment adherence. Physicians differed in their preferred treatment algorithm and options initially presented to families. Physicians’ decisions focused on expected improvement with treatment, rather than treatment risks or family preferences. Providers described a range of approaches to inform families about treatment options and to tailor information according to providers’ perceptions of a family’s information needs, level of comprehension or mood (eg, anxiety). Participants described including families in the decision to initiate JIA treatment after limiting the options to fit the clinical situation and the physician’s preferences. In contrast, providers described multiple methods for involving families in decisions related to the implementation of chosen treatments. Family preferences were also seen as particularly integral in the decision to stop treatment after symptom remission.

Conclusion: Decision-making on initial JIA treatment is largely driven by treatment guidelines and physician preferences. Such guidelines do not exist around treatment discontinuation and in that scenario family preferences are more likely to be considered. The uncertainty around standards and protocols for treatment discontinuation may make it the ideal time for a shared decision-making intervention (SDM) between the patient, family and provider. Next steps include engaging a stakeholder panel consisting of providers, educators and parents to discuss and evaluate possible interventions.

Disclosure: J. M. Sage, None; E. A. Lipstein, None; W. B. Brinkman, None; C. M. Lannon, None; E. M. Morgan DeWitt, None.

2043

Documentation of Improvement Over 2 Months in Osteoarthritis, Systemic Lupus Erythematosus, Spondyloarthropathy and Gout Similarly to Rheumatoid Arthritis According to Function, Pain, Patient Global Estimate and RAPID3

Methods: In the private practice of one rheumatologist, every patient with any diagnosis completes a 2-page MDHAQ at every visit before seeing the doctor. The MDHAQ includes 0–10 scores for physical function (MDHAQ-FN), pain and patient global estimate (PATGL), and a 0–30 score for routine assessment of patient index data (RAPID3), an index of the 3 patient self-report RA Core Data Set measures. Mean scores for individual measures and RAPID3 were compared at first visit and 2 months later for 141 new patients with 5 diagnoses: RA (n=39), osteoarthritis (OA) (n=41), systemic lupus erythematosus (SLE) (n=14), spondyloarthropathy (SpA) (n=23) and gout (n=24). Statistical significance was assessed by t test for change from baseline to 2 months later within each diagnostic group, and by analysis of variance (ANOVA) for change across diagnostic groups.

Results: Mean MDHAQ-FN scores at baseline ranged from 1.5 to 2.5, and from 11 to 1.9 two months later, documenting improvement of 9.4–26.8% in all diseases but OA (p < 0.05 for all patients and RA). Mean pain scores at baseline ranged from 4.2 to 5.9, and from 3.0 to 4.7 two months later, documenting improvement of 20.2–35.3% in the 5 diagnoses (p < 0.05 for all patients, RA, OA and gout). Mean PATGL at baseline ranged from 4.3 to 5.6, and from 3.3 to 5.0 two months later, documenting improvement of 11.2–30.4% (p < 0.05 for all patients, RA, OA and gout). RAPID3 scores at baseline ranged from 10.1 to 13.7, and from 7.4 to 11.3 two months later, documenting improvement of 16.8–27.5% (p < 0.05 for all patients, RA, OA and gout). No differences for mean change from baseline to 2 months between diagnostic groups were statistically significant.

Conclusion: Disease severity and improvement over 2 months according to MDHAQ-FN, pain, PATGL and RAPID3 scores were similar to RA in OA, SLE, SpA and gout. Physicians appropriately view these 5 diagnoses as distinct, based on differences in their pathophysiology and treatments, emphasizing the need for a knowledgeable physician to establish distinct, accurate diagnoses in individual patients. However, from the patients’ perspective, most rheumatic diseases are viewed more similarly than may be recognized by health professionals, documented by MDHAQ/RAPID3 scores.

Disclosure: I. Castrejón, None; M. J. Bergman, None; T. Pincus, None.

2044

Trying to Improve Care: A Review of the Morbidity and Mortality Conference in the Division of Rheumatology, Michelle Batthish, Shirley Tse, Brian M. Feldman, G. Ross Baker and Ronald M. Laxer. The Hospital for Sick Children, Toronto, ON, 2The University of Toronto, Toronto, ON

Methods: A five-year retrospective review of the M&M minutes within the Division of Rheumatology at SickKids was performed. Descriptive data including the number of cases, attendance and types and location of reported errors are cataloged. All cases were categorized using an adaptation of the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) index. Recommendations were classified in the categories used by the Institute for Safe Medication Practices (ISMP) Canada.

Results: Between January 2007 and December 2011, a total of 30 regularly scheduled M&MCs were held. The mean attendance was 19 individuals per session. Eighty-one cases were reviewed (mean 2.7 cases/session) with 2 reported deaths and 4 planned transfers to the intensive care unit. The most common type of events were related to “mismarc间隔通信” (35.8% of cases) followed by events related to a treatment/test/procedure **P** not significant by ANOVA, comparison between RA and each diagnosis for mean change from baseline for all measures. **P** not significant by ANOVA, comparison between RA and each diagnosis for mean change from baseline for all measures.

Disclosure: I. Castrejón, None; M. J. Bergman, None; T. Pincus, None.
(23.5%). There were fewer events related to medications such as adverse drug reactions (12.3%), medication administration errors (8.7%). Most events occurred in the in-patient setting (40%) followed by the Medical Day Care Unit (26%). Category A events (“an event that has the capacity to cause harm”) were the most common (46.9%). The next most common events were Category C events (“an event occurred that reached the patient but did not cause harm”) followed by Category E events (“an event occurred that may have led to patient injury but resulted in temporary harm and required intervention”) with 24.7% and 19.8% of the cases, respectively. A total of 89 recommendations were made over the 5 year period. Just over half of these were classified as “information” according to ISMP Canada (58.4%). This was followed by 11 “rules and policies” recommendations (12.4%) and 8 “reminders, check lists and double check systems’ recommendations (9%).

There were 36 action items generated from these recommendations; 36% have been completed while 27.8% are ongoing.

**Conclusion:** The M&MC within the Division of Rheumatology reviews a varied number of adverse events. Increased reporting and study of adverse events and errors can lead to system improvements and safer health care. Further research is needed to develop innovative models of the M&MC, which focus on patient safety and systems improvement. This could lead to the creation of a standard review process which has greater potential to improve quality of care.

**Disclosure:** M. Battish, None; S. Tse, None; B. M. Feldman, Bayer, 2, Baxter, Pfizer Inc., Novartis Pharmaceutical Corporation; G. R. Baker, None; R. M. Laxer, Novartis Pharmaceutical Corporation, 2.

### 2045


**Background/Purpose:** Currently, there are no guidelines in the United States on monitoring serum uric acid (sUA) levels in gout and treatment patterns. However, there are guidelines from the European League Against Rheumatism gout task force and the British Society for Rheumatology/British Health Professionals in Rheumatology. Our aim was to assess treatment patterns for gout and laboratory sUA monitoring in a managed care population in the U.S., relative to international guidelines.

**Methods:** Data were extracted from the HealthCore Integrated Research Database (HIRD), which contains integrated medical and pharmacy claims and laboratory result data from a large commercial U.S. health insurer. Eligible patients had either ≥2 medical claims for gout (ICD-9-CM code = 274) or ≥1 pharmacy claim for gout medications (allopurinol, colchicine, febuxostat, probenecid, sulfinpyrazone) between 01/01/2008 and 05/31/2011. The date of the earliest relevant claim was set as the index date. We included patients ≥18 years of age on index date, with ≥12 months of continuous eligibility pre-index date. Key guidelines selected in this study included initiating dose of allopurinol, mean time to dose escalation, maximum dosing levels, and sUA lab testing. We focused on a subgroup of patients initiating urate-lowering therapies (ULTs) after a new gout diagnosis (no pre-existing gout at baseline). Additionally, for a subset of patients with available electronic laboratory data, sUA levels were assessed within a year prior to and after initiation of ULTs. Treatment patterns were assessed until end of eligibility or end of the study period using descriptive statistics.

**Results:** We identified 93,546 eligible patients; 26% (n = 24,555) were female and 35% (n = 32,729) initiated ULTs. Mean (± SD) age was 58.4 ± 14.83 years and Charlson Comorbidity Index score was 1.35 ± 2.02. Allopurinol accounted for 96% (n = 31,388) of all first-line ULT fills, followed by probenecid (n = 1,032) and febuxostat (n = 309). No patients initiated sulfinpyrazone. Compared to guidelines, the mean starting dose of allopurinol was higher (213 ± 114.48 mg/day vs. 100mg) and mean time to dose escalation was longer (24.5 ± 28.6 weeks vs. 2–4 weeks); however, maximum daily dosing levels (244 ± 117.12 mg/day) were within the recommended range. While 61% (n = 19,843) of patients who initiated ULT had ≥1 sUA test prior to ULT initiation, only 34% (n = 11,256) had ≥1 sUA test pre- and post-ULT initiation. Among 10,926 patients with sUA levels above target range (sUA > 6 mg/dL) prior to ULT initiation, only 11% (n = 1,190) achieved the goal of sUA ≤ 6mg/dL within a year of ULT initiation.

**Conclusion:** Comparing the results of this study to international guidelines shows room for improvement, specifically in laboratory monitoring of sUA levels relative to gout treatment. The results may be due in part to lack of U.S. guidelines regarding the appropriate frequency of sUA testing relative to starting ULT, dose adjustment, and achievement of target sUA levels.

**Disclosure:** Y. Chen, None; K. S. Akhras, Takeda Pharmaceuticals International, Inc., 3; M. Grabner, None; R. H. Tawk, UIC/Takeda Fellow, 3; R. Quimbo, None.

### 2046

**Matching of Patients’ Actual and Desired Roles in Treatment Decision Making and Trust in Physicians.** Akiko Aoki1, Akiko Suda2, Shouhei Nagaoka2, Mitsuhito Tanaka2, Yoshiaki Isugatsubo1, Tatsuto Ashizawa3, Osamu Takahashi4, Sachiko Ohde2 and Sadayoshi Ohbu1. 1Tokyo Medical University Hachioji Medical Center, Tokyo, Japan, 2Yokohama Minami Kyosai Hospital, Yokohama, Japan, 3Yokohama Minami Kyosai Hospital, Yokohama, Japan, 4Yokohama City University Graduate School of Medicine, Yokohama, Japan, 5Tokyo Medical University Hachioji Medical Center, Chuo-ku, Tokyo, Japan, 6St Luke’s life science institute, Chuo-ku, Tokyo, Japan, 7St.Luke’s Life of Science Institute, Tokyo, Japan, 8Rikkyo University, Tokyo, Japan

**Background/Purpose:** Shared decision-making (SDM), in which the physician and patient work together through all phases of the decision-making process, has been of increasing significance. But the previous studies reported not all patients preferred SDM. This study explored rheumatoid arthritis (RA) patients’ preferences and experiences for participation in treatment decision making at the Japanese rheumatology clinics. In addition, we examined how often their actual roles matched their desired roles, and whether the concordance between actual and desired roles was associated with trust in physicians.

**Methods:** A cross-sectional study was performed using a self-administered anonymous questionnaire between October and December 2010 on 406 RA outpatients who consecutively visited 3 hospitals in Japan. The following variables were investigated: (1) the patients’ actual roles; their experiences when the current DMARDs were decided. (2) The patients’ desired roles; their preferences for participation in treatment decision making. The patients were asked to choose one actual and one desired role of the following three options: #1 passive role; your doctor chooses the best drug for you, #2 collaborative role; you and your doctor decide the drug together, #3 active role; you choose the best drug and recommend it to your doctor. (3) Patient’s trust in the physicians and adherence to the treatment. (4) Patients’ evaluations of physician’s attitudes of patient-centeredness. (5) The demographic data (e.g. age, gender, and educational status) and the RA-specific characteristics including the past and current use of disease modifying anti-rheumatic drugs (DMARDs). Multivariate analyses were used to assess the relationship between matching of patients’ actual and desired roles and patients’ trusts.

**Results:** The response rate was 58.6%. 82% were women, and the mean age was 65.1 ± 10.1 years. 26.8% of the patients perceived that the doctor chose the DMARDs for them. However, the majority (62%) of the patients preferred to collaborate with their doctors in making the treatment decision. The patients who want the passive roles in the decision making were more likely to have their preferences met than patients who wish to collaborate the doctors (98% vs. 42%, p<0.01). The overall concordance rate was 62%. In multivariate analyses, patients’ attitudes of patient-centeredness and the concordance between patients’ actual and desired roles were independent predictors of trust in physicians.

**Conclusion:** Physicians need to assess the decision making preferences on an individual basis to gain the patients’ trust in physicians.

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### 2047

**Impact of a Rheumatology Consultation Service in Hospitalized Patients.** Shirley L. Chow1, Dafna D. Gladman Gladman 2 and Heather McDonald-Blumer3. 1University of Toronto, Toronto, ON, 2Toronto Western Hospital and University of Toronto, Toronto, ON, 3Mt. Sinai Hospital, Toronto, ON

**Background/Purpose:** Rheumatologists provide hospital in-patient consultation for urgent and emergency referrals. In an increasingly cost-conscious, accountable, and integrated health-care system, the appropriate role of specialty care is under scrutiny. There is currently little information on the influence of inpatient rheumatology consultation on patient outcome.
The aims of our study were 1) To describe the nature of the hospital rheumatology consultations 10 years apart for educational merit 2) To determine whether a hospital rheumatology consultation service alters diagnostic accuracy, changes or expedites treatment, and whether treatment recommendations was adopted by the primary service 3) To evaluate if needs are met by assessing the complexity of the rheumatology consult service referrals.

Methods: Consecutive patients seen on the consultation service at an academic university hospital from July 1 2010 to December 31 2010 were recorded in a logbook. Using a standardized case form, the charts were reviewed and the patient’s demographic information, admitting diagnosis, reason for consultation, referring service, final rheumatologic diagnosis, duration of hospital stay, treatment implemented and outcome were recorded. These were compared to a similar review in 1999.

Results: 268 patients were recorded in the log books over the 6 month period in 2010. These included 163 females and 105 males with a mean age of 55 years (range 19 to 92 years). This is more than the 238 consulted seen over a 10 month period in 1999.

The most common diagnoses seen included: 62 connective tissue diseases (23%), 59 crystal induced arthritis (22%), 25 vasculitis (9%), 22 polyarthritis (8%); 15 osteoarthritis (6%); 14 regional syndromes (5%); 14 infections (5%); 10 spondyloarthritides (4%), and 8 others (3%). The remaining 38 had no-rheumatologic conditions (14%). This is similar in breadth as 1999.

The consultant were requested from different services, but most commonly internal medicine at 104 (39%). There were 82 emergency referrals (31%), 158 urgent referrals (59%), and 28 non-urgent referrals (10%). The rheumatology team helped establish the diagnosis in 177 patients (66%) and confirmed the diagnosis in 57 consults (21%). 74 of the 80 patients with swollen joints had their joints aspirated or injected (93%). 94 patients had steroids or disease modifying therapy initiated or adjusted. 126 patients had follow-up with a rheumatologist (47%).

Conclusion: The rheumatology hospital consultation service provides consultation from various specialties for a variety of rheumatic diseases, thus providing an excellent educational experience. Most referrals were for emergent or urgent rheumatic diseases. The service helped establish or confirm the diagnosis and helped initiate treatment. In general the suggestions were adopted by the team.

Disclosure: S. L. Chow, None; D. D. G. Gladman, None; H. McDonald-Blumer, None.

2048

Four Physician Global Assessments for Overall Status, Inflammation, Damage, and Unexplained Symptoms Are Useful in Usual Care of Patients with Osteoarthritis, Fibromyalgia, Systemic Lupus Erythematosus, and Spondyloarthropathy, As Well As Rheumatoid Arthritis. Isabel Castrejon*, Martin J. Bergman1 and Theodore Pincus1. 1NYU Hospital for Joint Diseases, New York, NY, 2Taylor Hospital, Ridley Park, PA

Background/Purpose: A physician global estimate (DOCGL) is important in clinical decisions concerning patients with rheumatoid arthritis (RA), and often is the most efficient of the 7 RA Core Data Set measures to distinguish active from control treatments in RA clinical trials. DOCGL is designed to assess inflammatory activity, but may be influenced by organ damage and “unexplained” chronic pain syndromes. Therefore, 3 subscale DOCGL visual analog scales (VAS) have been developed to estimate level of a) inflammation, b) damage, and c) “unexplained symptoms,” in addition to overall status, reflecting the expertise of the rheumatologist concerning whether patient symptoms result primarily from one of these 3 bases. We analyzed the 4 DOCGL estimates for inflammation, damage, “unexplained” and overall status in consecutive consecutive patients with 5 rheumatic diagnoses: RA, osteoarthritis (OA), fibromyalgia (FM), systemic lupus erythematosus (SLE), and spondyloarthropathy (SpA).

Methods: The study was conducted in the private practice of one rheumatologist. All consecutive patients, regardless of diagnosis, complete a rheumatologist. All consecutive patients, regardless of diagnosis, complete a

Results: DOCGL for overall status ranged from 2.6 to 5.0, highest for patients with RA (5.0), followed by RA (3.9), SpA (3.9), OA (3.6), and SLE (2.6). Physician subscale estimates were higher for inflammation than for damage or “unexplained” in RA, SLE, and SpA; higher for damage than for inflammation or “unexplained” in OA; and higher for “unexplained” than for inflammation or damage in FM (Table). Highest correlations of overall DOCGL were seen with physician subscale estimates for inflammation in RA, SLE, and SpA; with damage in OA; and with “unexplained” in FM.

Table. Mean (± SD) of 4 global estimates, and Spearman correlations between physician global for overall status and 3 physician subscale estimates as well as patient global estimate, according to diagnosis

<table>
<thead>
<tr>
<th></th>
<th>RA N = 39</th>
<th>OA N = 41</th>
<th>FM N = 15</th>
<th>SLE N = 14</th>
<th>SpA N = 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Status (0–10 scale)</td>
<td>3.9 (±1.6)</td>
<td>3.0 (±1.9)</td>
<td>5.9 (±2.3)</td>
<td>2.6 (±1.9)</td>
<td>3.9 (±1.8)</td>
</tr>
<tr>
<td>Inflammation (0–10)</td>
<td>4.2 (±2.5)</td>
<td>3.1 (±2.0)</td>
<td>1.2 (±1.6)</td>
<td>2.4 (±2.6)</td>
<td>4.4 (±2.4)</td>
</tr>
<tr>
<td>Damage (0–10)</td>
<td>1.8 (±2.3)</td>
<td>3.2 (±2.7)</td>
<td>0.7 (±1.4)</td>
<td>1.2 (±2.2)</td>
<td>1.9 (±2.9)</td>
</tr>
<tr>
<td>Unexplained symptoms (0–10)</td>
<td>1.2 (±2.1)</td>
<td>0.9 (±2.5)</td>
<td>6.4 (±3.6)</td>
<td>1.5 (±3.1)</td>
<td>1.9 (±2.7)</td>
</tr>
</tbody>
</table>

Spearman correlations with overall physician global estimate:

- Inflammation: 0.79** p < 0.01
- Damage: 0.23 p = 0.05
- Unexplained Symptoms: 0.01 p = 0.05
- Patient global estimate: 0.41*
- Global global estimate: 0.43*

p < 0.001; *p < 0.001

Conclusion: Physician estimates for inflammation, damage and “unexplained” symptoms differ in patients with different rheumatic diagnoses. These 3 subscales reflect the expertise of the rheumatologist to estimate the basis for patient symptoms, and supplement the overall physician global estimate as a quantitative summary of the physical examination to assess and monitor patients with all rheumatic diseases in usual care.

Disclosure: I. Castrejon, None; M. J. Bergman, None; T. Pincus, None.

2049

Improving Pneumococcal Vaccination and Documentation for Immunosuppressed Patients At a University-Based Rheumatology Clinic. Christine Peoples, Rohit Aggarwal, Heena Sheth, Aarav Patel, Daniel Lupash, Christine McBurney, Ashima Malik, Swati Modi, Ximena D. Ruiz and Douglas W. Lienesch. University of Pittsburgh, Pittsburgh, PA

Background/Purpose: Centers for Disease Control and Prevention Guidelines recommend that all immunosuppressed patients receive the pneumococcal vaccine. The American College of Rheumatology Task Force Panel recommends vaccination for patients initiating therapy with disease-modifying anti-rheumatic drugs (DMARDs) or biologic therapies. Patients with chronic rheumatologic conditions have approximately double the incidence of infection compared to the normal population and those taking immunosuppressive agents show the highest risk, with the majority involving respiratory tract infections by common pathogens including S. pneumoniae. Prior studies show the rate of pneumococcal vaccination is low in this population. The aim of this study was to improve both administration and documentation rates of pneumococcal vaccine in immunosuppressed patients taking DMARDs and/or biologic agents at a university-based rheumatology clinic.

Methods: This study is a pre- and post-intervention comparison. Intervention phase data was collected from 1/23/2012–6/15/2012. Pre-intervention data included patients seen between 1/1/2009-12/31/2010 that were prescribed an immunosuppressive medication. Regularly seen patients were defined as having at least 2 visits, with either 1) at least 1 visit within the first 12 months of the measurement period and at least 1 visit within the second 12 months, or 2) 2 visits within only the second 12 month measurement period, with the first and last visits being separated by a minimum of 90 days. Patients eligible for pneumococcal vaccine and patients who were up-to-date with pneumococcal vaccination were determined. For the intervention phase, a report was generated of patients on immunosuppressant medications who had not received the pneumococcal vaccine who had upcoming visits. Clinic staff flagged these patients and a pneumococcal vaccine information sheet along with a brief form for the patient to complete were given to the patient. The medical assistant (MA) gathered information and documented in the electronic record. The MA communicated to RN who ordered and administered the vaccine. In select cases, physician approval and order were required prior to vaccination.
Results: Baseline data included 968 patients. Only 148 (15.3%) patients had received the pneumococcal vaccine. Post-intervention pneumococcal vaccination compliance revealed 361/1044 (34.6%) of patients had received the vaccine. This was a significant improvement from baseline (p<0.0001). An additional 114 (10.9%) patients were offered vaccination but had either already received the vaccine or deferred. A total of 45.5% had documentation, which was also significant improvement from baseline of 15.8% (p<0.0001).

Conclusion: PA status and vaccination rates in this study are lower than previously reported. PA counseling and documentation in the medical record may be low. Future studies should include vaccination rates and the quality of PA counseling in rheumatic disease patients.

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2050

Are Patients Meeting the Updated Physical Activity Guidelines? Physical Activity Participation, Recommendation, and Preferences Among Adults with Rheumatic Diseases

D. W. Lienesch, A. Malik, S. Modi, None; C. McBurney, None; D. Lupash, None; D. L. Scott, None; and Lindsay M. Bearne. 1, 2 King’s College London, London, United Kingdom, 3St George’s University of London, London, United Kingdom

Background/Purpose: Physical activity (PA) reduces disability, morbidity, and risk of premature mortality in people with rheumatic diseases, and clinical guidelines recommend that PA should be integral to rheumatic disease management (NICE 2008, 2009). Updated PA guidelines (published: US 2008, UK 2011) recommend that adults complete ≥150 minutes of moderate intensity PA or ≥75 minutes of vigorous intensity PA (or equivalent) in bouts of ≥10 minutes/week. Currently, the PA levels of adults with rheumatic diseases, assessed against these guidelines, are unknown. This study evaluates the PA levels of adults with rheumatic diseases against the updated guidelines. It assesses respondents’ PA preferences and the proportion who report ever receiving PA advice from a healthcare professional (HCP).

Methods: 508 rheumatology outpatients (24% male, 76% female; 53% rheumatoid arthritis, 13% osteoarthritis, 7% psoriatic arthritis, 6% systemic lupus erythematosus, 5% fibromyalgia, 18% other; disease duration: 27% ≤1 year, 30% >1 to ≤5 years, 15% >5 to ≤10 years, 28% >10 years) were recruited from an inner city UK hospital (July–October 2010). Participants completed the short International PA Questionnaire, and 3 questions: “Has a doctor or other HCP ever suggested PA or exercise to help your arthritis or joint symptoms?” (Answers: yes, no, don’t know), “Would you like help from your doctor or other HCP to be more physically active?” (Answers: yes, no, don’t know), and “Which PAs do you enjoy?” (Answers: multiple options including free text response). Descriptive statistics were completed on all data, energy expenditure calculated (metabolic equivalent (MET) minutes/week = METs × weekly minutes × weekly days; walking = 3.3 METs, moderate = 4 METs, vigorous = 8 METs), and associations evaluated with Pearson’s chi-square test. Respondents were categorized as: 1) Meeting guidelines (≥500 metabolic equivalent (MET) minutes/week; equivalent to ≥150 minutes of moderate intensity PA/week or ≥75 minutes of vigorous intensity PA/week), 2) Low (<500 MET minutes/week), or 3) Inactive (no PA ≥10 minutes (per activity bout)/week).

Results: 61% of respondents met the updated PA guidelines, and 39% did not meet the guidelines (12% low, 27% inactive). Physical inactivity increased with age (<0.01). 43% of respondents reported that they had discussed PA with a HCP, and 50% that they would “like help” to become more physically active. Those diagnosed within the last year and those categorized as “low” PA were least likely to report ever receiving PA advice (both P<0.05). Walking was the most preferred PA (65%), and accounted for 70% of respondents’ total weekly energy expenditure.

Conclusion: Two thirds of urban UK adults with rheumatic diseases meet the updated public health guidelines for PA. However, despite the potential health benefits related to even low levels of PA, many are entirely inactive. PA advice may not be routinely included in the management of rheumatic diseases, despite patients reporting that they would like help to become more physically active. HCPs need to increase awareness of PA guidelines, and actively encourage regular PA. Walking may provide an easy and accessible form of exercise for people with rheumatic diseases.

Disclosure: V. L. Manning, None; M. V. Hurley, None; D. L. Scott, None; L. M. Bearne, None.

2051

Standardized Data Collection Supports Reliable Reporting of Rheumatoid Arthritis (RA) Measures for the Medicare Physicians’ Quality Reporting System

J. M. Kremer1, George Reed2, Katherine C. Saunders3, Lisa Lemire4, Aimee Whitworth5, Jeffrey P. Greenberg6 and Joel M. Kremer. 1University of Wisconsin (retired), Madison, WI, 2UMass Medical School, Worcester, MA, 3CORRONA, Inc., Southborough, MA, 4New York University School of Medicine, New York, NY, 5Albany Medical College and The Center for Rheumatology, Albany, NY

Background/Purpose: The Medicare Physicians’ Quality Reporting System (PQRS) program encourages physicians to measure and report clinical processes and disease outcomes that correlate with quality care, including an Rheumatoid Arthritis (RA) measures bundle. Physicians typically review patients’ records for a single visit to determine how many measures are documented and met, or not. An alternative approach is to proactively collect standardized clinical data at each visit that includes that required for documenting each measure.

Methods: The Consortium of Rheumatology Researchers of North America (CORRONA) registry collects standardized clinical data from RA patients and their rheumatologists during routine office visits, including the data for each RA measure. As examples, patients complete a modified Health Assessment Questionnaire (mHAQ)(Measure 178) and investigators complete a 0–10 segmented Physician Global Assessment (Measure 177). All enrolled patients have completed informed consent for the CORRONA registry. In 2011, at least 1 visit report was submitted for 15,615 unique RA patients by 213 CORRONA investigators. Measures evaluated included Measure 108: Disease Modifying Anti-rheumatic Drug (DMARD) Therapy is or is not prescribed and if not, why not? Measure 176: For patients started on a first biologic, is a TB skin test or QuantiFERON assay documented during the 6 months prior to starting the treatment, or not; Measure 177: Is RA disease activity documented as controlled, low, moderate or high; Measure 178: Has functional status been assessed during the previous 12 months? Measure 179: Is RA prognosis assessed and documented as good, poor, or undetermined. Measure 180: Is the patient on ≥10 mg of prednisone for greater than 6 months or not, and if so, is a management plan documented to either increase other treatments and/or taper the prednisone dose. The most recent 2011 report for each patient was studied.

Results: The number (N) and percent (%) of visit reports meeting or not meeting each measure are shown, as are the number of reports meeting exclusion criteria for each measure, such as patients with controlled disease off DMARD treatment being excluded for Measure 108 (N = 521), and those who were not starting a first biologic being excluded from Measure 176.

Conclusion: Collecting standardized data assures reliable measures reporting. The percents of Performance Met were high, except for Tb testing before DMARD initiation.


2052

Effect of Community Characteristics On Quality of Care in Systemic Lupus Erythematosus

Edward Yelin1, Laura Trupin2, Chris Tonner3 and Jinoos Yazdany4. 1University of California San Francisco, San Francisco, CA, 2UC San Francisco, San Francisco, CA, 3UCSF, San Francisco, CA

Background/Purpose: In prior studies we established that living in communities of concentrated poverty was associated with fewer physician visits and select SLE outcomes after taking characteristics of the individual into account (Trupin, JRheumatol 2008; Tonner, Arthritis Care Res 2010) and the presence and type of insurance was associated with the quality of SLE
care (Yazdany, J Gen Intern Med 2012). Here we examine whether community characteristics affect performance on quality measures for SLE after taking individual characteristics into account.

Methods: Data derive from 3 annual waves (2009–2011) of the UCSF Lupus Outcomes Study, a prospective cohort study of persons with SLE interviewed annually by telephone. Data on 13 SLE quality indicators covering diagnosis, monitoring, treatment, and preventive services were collected. Participant addresses were matched to information on the overall "pass rate" for quality measures in SLE (number received given eligibility) and on 2 important individual quality measures, drug toxicity monitoring (RXTX) and cardiovascular risk factor evaluation (CVD). All models controlled for age, gender, race/ethnicity, disease duration, disease activity, education, # physician visits for SLE, and presence and type of insurance. Net of 28 subjects without physician visits during the year, data on 869 were analyzed.

Results: Among the 869 participants, 95% were female, 37% non-white, mean age was 50(±13), disease duration was 17(±9), and they were eligible for 5.1 quality measures/year. Overall pass rates averaged 67% (95% CI 66–68%) over the 3 years and did not differ significantly among years. Pass rates were slightly but significantly lower in areas with the highest quartile of rheumatologists/capita (64 vs. 67–68% in the other quartiles). Pass rates were higher in small cities than in rural or major cities (70 vs. 65–66%) and differed among the 9 major Census regions (range 59 to 71%). Size of health referral region, number of primary care physicians per capita, and concentration of poverty were not associated with overall pass rates. Over the 3 years, 31% (95%CI 29–33%), of those eligible received RXTX and 70% (95% CI 67–73%) received CVD. Health referral areas in small cities were associated with higher rates of RXTX than in major cities (78 vs. 67%). No other community characteristic was associated with RXTX and none were associated with CVD. In all models, lack of health insurance was associated with lower pass rates, while public managed care plans were associated with better quality of care among the insured.

Conclusion: Lack of consistent community effects on quality of care suggests that quality improvement efforts in SLE not be targeted geographically and that the focus should continue to be on increased access to good health insurance coverage.

Disclosure: E. Yelin, None; L. Trupin, None; C. Tonner, None; J. Yazdany, None.

2053

Tele-Rheumatology: The Future Is Now. Daniel Albert¹, Krista Merrihew² and Sarah Fletcher³. ¹Dartmouth-Hitchcock Medical Center, Geisel School of Medicine, Lebanon, NH, ²Dartmouth-Hitchcock Medical Center, Lebanon, NH

Background/ Purpose: Access to rheumatologic consultation is limited by available expertise due to inadequate manpower and maldistribution of resources. Rural New England is particularly challenging because of sparse population, prolonged transportation times, and weather conditions that make travel difficult or impossible. Nearly every medical specialty and subspecialty is underrepresented and very few are associated with overall pass rates. Over the 3 years, 31% (95%CI 29–33%), of those eligible received RXTX and 70% (95% CI 67–73%) received CVD. Health referral areas in small cities were associated with higher rates of RXTX than in major cities (78 vs. 67%). No other community characteristic was associated with RXTX and none were associated with CVD. In all models, lack of health insurance was associated with lower pass rates, while public managed care plans were associated with better quality of care among the insured.

Conclusion: Lack of consistent community effects on quality of care suggests that quality improvement efforts in SLE not be targeted geographically and that the focus should continue to be on increased access to good health insurance coverage.

Disclosure: D. Albert, None; K. Merrihew, None; S. Fletcher, None.

2054

Safety of Joint and Soft Tissue Injections in Patients On Warfarin Anti-Coagulation. Richard Conway, Finbar (Barry) D. O’Shea, Gaye Cunnane and Michele Doran. St James’s Hospital, Dublin, Ireland

Background/ Purpose: Joint and soft tissue injections are commonly performed in clinical practice. An increasing number of facilities have prescribed warfarin. Joint and soft tissue injections are frequently indicated in these patients. The limited available evidence suggests that joint and soft tissue injections are safe in therapeutically anti-coagulated patients receiving warfarin. Many authorities, including the New England Journal of Medicine, continue to recommend reversal of anti-coagulation in patients receiving warfarin who require these procedures. The aim of this study was to evaluate the safety of two approaches to the management of patients prescribed warfarin requiring joint or soft tissue injection

Methods: The protocol in our department prior to September 2011 was to hold warfarin and replace it with low molecular weight heparin for joint and soft tissue injections. A systematic literature review was performed which provided support to the performance of these procedures in patients on warfarin with an INR <3. A retrospective chart review was initiated at this point to assess the safety of the existing protocol. A new protocol was introduced whereby warfarin was continued with an INR check within 1 day of the procedure. The procedure was performed if the INR was <3. All patients receiving joint or soft tissue injections under the care of our service are provided with a helpline phone number to contact if symptoms worsen. In the event of persistent worsening symptoms >48 hours post-procedure arthrocentesis would be performed.

Results: In patients in whom warfarin was held, 32 procedures were performed in 18 patients. Of these 30 were joint injections (24 knee, 5 glenohumeral, 1 elbow) and there were 2 soft tissue injections (1 trochanteric bursa, 1 subacromial bursa). Conditions requiring injection were 13 rheumatoid arthritis, 11 osteoarthritis, 5 synovitisyarthritis, and 1 each of adhesive capsulitis, rotator cuff tendinopathy and trochanteric bursitis. There were no clinical hemorrhages or complications. In patients who continued warfarin, 32 procedures were performed in 21 patients. Of these 27 were joint injections (24 knee, 1 glenohumeral, 1 elbow, 1 metatarsophalangeal) and there were 5 soft tissue injections (4 subacromial bursa, 1 carpal tunnel). Conditions requiring injection were 11 rheumatoid arthritis, 7 osteoarthritis, 6 crystal arthritis, 4 rotator cuff tendinopathy, 2 synovitisyarthritis and 1 each of adhesive capsulitis and carpal tunnel syndrome. There were no clinical hemorrhages or complications. Full details of the study population are shown in Table 1.

Table 1. Comparison of Procedures Performed with Warfarin Held or Continued

<table>
<thead>
<tr>
<th>Warfarin held</th>
<th>Warfarin continued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedures, n</td>
<td>32</td>
</tr>
<tr>
<td>Patients, n</td>
<td>18</td>
</tr>
<tr>
<td>Joint injections, n (%)</td>
<td>30 (69%)</td>
</tr>
<tr>
<td>Soft tissue injections, n (%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>77</td>
</tr>
<tr>
<td>Age, years</td>
<td>(54 (44)</td>
</tr>
<tr>
<td>INR, median (IQR)</td>
<td>1.2 (1.1–1.5)</td>
</tr>
<tr>
<td>Arthritis, n (%)</td>
<td>4 (21%)</td>
</tr>
<tr>
<td>Complications, n (%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Clinical hemorrhages, n</td>
<td>0</td>
</tr>
</tbody>
</table>
Conclusion: Joint and soft tissue injections appear to be safe in patients receiving warfarin anti-coagulation with an INR <3. Continuation of anti-coagulants reduces staff workload and patient inconvenience with no evidence of increased risk of complications.

Disclosure: R. Conway, Roche Pharmaceuticals, 2, UCB Pharma, 2, Merck Pharmaceuticals, 7; F. D. O’Shea, None; G. Cunnane, None; M. Doran, None.

2056
TEAM-Managed Care of Biological Patients At A Canadian Centre. Melissa Deamude1, Dawn Heap2, Melanie Kanellos3, Debbie Kislinisky4, Kathy Keddy3, Claudia Mechl3, Helen Saldanha1, Laura Vanstone1, Kathlehan Brown1 and William G. Bensen1,5, Dr. William G. Bensen Medicine Professional Corporation, Hamilton, ON, 2Dr. Bensen’s Rheumatology Clinic, Hamilton, ON, 3Dr. William Bensen Rheumatology Clinic, Hamilton, ON, 4Rheumatology Health Team, Dr. Bensen’s Rheumatology Clinic, Hamilton, ON, 5St. Joseph’s Hospital and McMaster University, Hamilton, ON, Hamilton, ON

Background/Purpose: Managing complex arthritic patients with biologics is exacting and time consuming. As a result in January 2008 we established a separate biologic clinic with a clinic manager and team of experienced Registered Nurses linked to the general rheumatology clinic and early inflammatory arthritis clinic to assess, initiate, and follow patients with Rheumatoid Arthritis (RA), Ankylosing Spondylitis (AS), and Psoriatic Arthritis (PsA) needing to transition to biologic treatment and creating care and follow-up while on biologics. This team approach using experienced rheumatology nurses allows for triaging and timely access to care.

Methods: Approximately 770 patients, 60% RA, 20% PsA and 20% AS are being followed in the biologic program. All patients are initially assessed by an RN, examined to a standard protocol and then the treatment, assessment and plan of care is reviewed by the attending rheumatologist. The clinic is structured using a primary care nursing model which promotes continuity and a patient centered therapeutic approach to care. Nurses are responsible for assessing their patients providing disease and treatment related health teaching and providing injection training. The nurses also perform the clinical outcome measures including spondylarthropathy measures, joint evaluations and administration and scoring of patient reported outcome questionnaires. The team manages and reviews routine labs and diagnostics daily, provides follow-up calls to patients to discuss adverse events, flares, concerns and treatment related inquiries. Patients are seen a minimum of 3 times per year with most followed 6 times per year because of flares, co-morbidities, treatment adjustment or financial issues. The clinic operates as a primary point of contact for organizing management of co-morbidities, infusions and injections and ensures patients are being treated to target. The nurses are occasional speakers at national and regional rheumatology meetings to share best practices on the management of biological patients and how a team-based approach can improve efficiency and promote better patient outcomes.

Results: This rheumatology health team managing patients on biologic treatment has exponentially grown and has worked well over a four-year period. The team approach allows one rheumatologist to follow 5–7 times the number of patients seen by the average rheumatologist who does not have the team support. Currently in Canada we have approximately 1/3 of the rheumatologists we need for optimal care and a team based approach can help fill this gap, reducing the burden on the health care system with fewer visits to urgent care or Emergency departments. The team assesses 3–5 new patients a week for biologics and starts 2–3 patients per week on biologics.

Conclusion: The goal in the biologic clinic is treating to target for remission or lowest disease activity possible within the shortest period of time. This team approach to care has resulted in improved adherence to therapy, less risks and reported adverse events, improved safety monitoring and better patient satisfaction.

Disclosure: M. Deamude, None; D. Heap, None; M. Kanellos, None; D. Kislinisky, None; K. Kislinisky, None; C. Mechl, None; H. Ross, None; P. Saldanha, None; L. Vanstone, None; K. Brown, None; W. G. Bensen, Abbott, Amgen, AstraZeneca, BMS, Merck-Schering, Janssen, Lilly, Novartis, Pfizer and Wyeth, Proctor and Gamble, Roche, Sanofi Aventis, Servier, UCB, Warner Chilcott.
2057

Analysis of the Adherence to the Monitoring of Glucocorticoid Eye Toxicity and of the Prevalence of Cataracts and Glaucoma Among Patients with Systemic Lupus Erythematosus. Linda Carli1, Chiari Tani1, Francesca Querci1, Alessandra Della Rossa1, Sabrina Vagnani1, Anna d’Ascanio1, Rossella Neri1, Antonio Tavoni2, Stefano Bombardieri1 and Marta Mosca1. 1Rheumatology Unit, Department of Internal Medicine, University of Pisa, PISA, Italy, 2Immunology Unit, Department of Internal Medicine, University of Pisa, PISA, Italy

Background/Purpose: Cataracts and glaucoma are among the main causes of impaired visual acuity and have a prevalence respectively of 9–17% and 1–2% among subjects older than 70 years. Chronic glucocorticoid (GC) therapy is associated with an increased risk of developing cataracts and glaucoma and recommendations have been developed for monitoring these side effects in patients with rheumatic diseases.

The aim of this study was to assess the adherence to the existing recommendations for monitoring eye toxicity of chronic GC therapy and the prevalence of cataracts and glaucoma among systemic lupus erythematosus (SLE) patients followed at our Unit.

Methods: Retrospective analysis of clinical charts to evaluate epidemiological data (disease duration, age at last assessment), cumulative and mean daily dose of GC and administration of GC pulses, number and frequency of eye testing and the follow up. Presence/absence of cataracts and glaucoma as reported in the last available eye assessment.

Results: One hundred and seventy charts were examined, 34 (20%) of these (mean follow up 83.6±66.5; mean age 42.5±14.8 years) never underwent an eye assessment. The remaining 136 (mean follow up 152.5±99.8 months, age 45.4±12.3 years), underwent an eye assessment on average with an interval of 75±61.7 months. However, only 45 (33%) had received an evaluation during the previous 12 months. All these 170 patients were taking chronic GC therapy at a mean daily dose of 5.4±2.4 mg prednisone (PDN), and a mean cumulative dose of 27.6±20.5 gms. Out of the 136 patients with at least one eye assessment (mean PDN 5.5±2.4 mg, mean cumulative dose 29.8±21.5 gms), cataracts were observed in 39 patients (29%) and glaucoma in 4 patients (3%). Cataracts were diagnosed at a mean age of 46.5±10 years. The development of cataracts was associated with age, disease duration and cumulative GC dose (cataracts vs not cataracts: mean cumulative PDN dose 32.8±20.4 gms; p<0.0001). Glaucoma was diagnosed at a mean age of 40.5±16 years; due to the small number of patients no correlations were made.

Conclusion: Although 80% of patients have at least one eye assessment, the adherence to recommendations is suboptimal as only 33% of patients underwent an eye assessment over the previous 12 months. As expected the prevalence of cataracts and glaucoma is higher than in the general population and these conditions occur early in the life of SLE patients. As not all patients have a recent eye evaluation our data could underestimate the real incidence of these two potentially severe conditions. An association between GC and cataracts is confirmed. This data reinforce the need to improve adherence to recommendations to eye monitoring among SLE patients under chronic therapy with GC.

Disclosure: L. Carli, None; C. Tani, None; F. Querci, None; A. Della Rossa, None; S. Vagnani, None; A. d’Ascanio, None; R. Neri, None; A. Tavoni, None; S. Bombardieri, None; M. Mosca, None.

2058

Differences in Psychological Characteristics Between Patients with Rheumatoid and Psoriatic Arthritis. Panagiotis Tsitsi1, Athina Theodoridou1, Fotini Lada1, Konstantinos Papanikolaou1, Despina Dimopoulou1, Georgios Garyfallos1, Alexis Benos2 and Alexandros Garyfallos1. 14th Frantessica Querci 1, Alessandra Della Rossa 1, Sabrina Vagnani 1, Anna d’Ascanio 1, Rossella Neri 1, Antonio Tavoni 2, Stefano Bombardieri 1 and Marta Mosca 1, 1Rheumatology Unit, Department of Internal Medicine, University of Pisa, PISA, Italy, 2Immunology Unit, Department of Internal Medicine, University of Pisa, PISA, Italy

Background/Purpose: Both rheumatoid (RA) and psoriatic arthritis (PsA) seem to have a negative impact on patients’ psychological status mostly due to the chronic character of the disease. Literature reports and clinical practice evidence support that patients suffering from PsA express their disability and complaints more often than those who suffer from RA, even when the physical disability is similar between them. The aim of the study is to compare aspects of the psychological profile of the two groups of patients and to examine the differences between their behavior.

Methods: The study sample consisted of 59 outpatients of the 4th Medical Department of Internal Medicine of Aristotle University of Thessaloniki, suffering from RA and PsA. Disease activity was measured using DAS28 score. Psychological characteristics were evaluated with the use of SCL-90-R questionnaire while other information including quality of life (QoL), general health (GH) and disability were assessed with the use of SF-36, GHQ and HAQ-DI. Patients suffering from extended psoriatic skin lesions (BSA>5) as well as those who presented axial joint damage were excluded in order to ensure clinical similarity between the two groups of patients.

Results: A total of 32 patients suffering from RA and 27 from PsA were recruited. Mean age for RA group was 48.2 (±10.6) and PsA 49.3 (±7.6) years. No significant difference in DAS (p=0.843), disability (p=0.466), GH (p=0.801) and VAS score (p=0.855) was found between the two groups. As far as QoL is concerned, the two groups did not demonstrate difference in any of the subscales of SF-36. Patients with RA demonstrated lower scores in Interpersonal Sensitivity (Subscale III of SCL-90-R) (p=0.044) than those with PsA.

In the RA group, DAS was found to correlate with disability (r=0.804, p=0.000), GH (r=0.319 p=0.002), Somatization (I) (r=0.440 p=0.012) and Depression (IV) (r=0.426 p=0.015). Only the physical component (PCS) of the SF-36 correlates with the DAS28 score (r=−0.741 p=0.000). Both disability and GH correlate with I and IV (r=0.604 p=0.000) (r=0.536 p=0.002) (r=0.416 p=0.018) (r=0.431 p=0.014) respectively.

In the PsA group DAS28 score does not correlate with GH (p=0.702) or IV (p=0.125) but it does correlate with HAQ score (r=0.491 p=0.009), I (r=0.312 p=0.033) and PCS (r=0.606 p=0.001). HAQ score correlates with IV (r=0.559 p=0.002) as well as the PCS (r=0.812 p=0.000). GH correlates with most of the subscales of SCL-90-R except for the III (p=0.054) while there is no correlation with the PCS (p=0.275) contrary to the Mental Component (MCS) (p=0.476 p=0.012). Finally the III subscale of SCL-90-R does not correlate with any of the measured clinical parameters.

Conclusion: In consistence with findings from everyday interaction during clinical evaluation, PsA patients rather than RA ones seem to meet with feelings of self-deprivation, uneasiness, discomfort during interpersonal interaction, personal inadequacy and inferiority in comparison with others. Moreover, the differences in psychological characteristics between patients with RA and PsA cannot be attributed to the degree of skin lesion, disease activity or disability.

Disclosure: P. Tsitsi, None; A. Theodoridou, None; F. Lada, None; K. Papanikolaou, None; D. Dimopoulou, None; G. Garyfallos, None; A. Benos, None; A. Garyfallos, None.

2059

The Efficacy of Clinical Guidelines in Promoting Co-Prescription of Bone Protection with Glucocorticoids Among Hospital Doctors Treating Inpatients. Leonard C. Hart1, James Clare1, Dylan Finnerty2, Susan Van Der Kamp1, Fionauala Kennedy3, Malachi McKenna4 and Oliver M. Fitz Gerald1. 1Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland, 2Department of Rheumatology, St. Vincent’s University Hospital, Dublin, Ireland, 3Pharmacy Department, St. Vincent’s University Hospital, Dublin, Ireland, 4Department of Endocrinology & Metabolic Bone Disease, St. Vincent’s University’s Hospital, Dublin, Ireland

Background/Purpose: Therapeutic glucocorticoids (GC) rapidly decrease bone mineral density, inducing a remodelling imbalance by promoting osteoclast differentiation and activation and by inhibiting osteocytes. Current guidelines direct that bisphosphonates (BP’s) and elemental calcium (Ca++) with Vitamin D (Vit. D) should be given at initiation of GC therapy, as it is known that bone remodelling imbalance occurs early with steroid usage. We circulated these guidelines within our hospital within auditing the existing practice of the hospitals doctors and 1yr later we sought to measure the efficacy of our intervention by completing an audit loop.

Methods: A cross sectional audit was performed of all adult medical and surgical inpatients in a tertiary referral centre teaching hospital. Prescribed GC and concurrent anti osteoporotic medication were noted. Subsequent to the initial audit, guidelines promoting the use of BP’s, Ca++ and Vit. D when prescribing GC’s were advertised on hospital notice boards, in hospital bulletins, hospital prescribing guidelines and on the hospital website. One year after promoting guidelines the audit loop was completed by performing a similar cross sectional audit.

Disclosures: None
Results: All inpatient medical records (n=417) were reviewed in Jan 2010. 52% of the inpatients were female and 58% were older than 65. 66/417 (16%) inpatients had been prescribed GC’s. Ca++ with Vit. D was prescribed for 20% of patients on GC’s with 2% also receiving BP therapy. 3% of patients were also receiving postmenopausal hormone replacement therapy.

In Nov 2011 one year after guideline publication, all 452 inpatient medical records (n=452) were reviewed. 63% of the patients were female and 60% were older than 65. 55/452 (12%) inpatients were prescribed GC’s. Ca++ with Vit. D was prescribed for 55% of patients on systemic steroids with 20% also receiving BP therapy.

The resultant improvement in the co-prescription of Ca++ & Vit. D and BP’s with GC’s by the order of 2.35 and 10 respectively can be attributed in part to the circulation of hospital guidelines. However 45% of patients on systemic steroids continued to receive no bone protection and 80% received suboptimal bone protection from steroid induced osteoporosis.

Conclusion: Publication and advertisement of current bone protection guidelines when prescribing systemic steroids resulted in a substantial but suboptimal improvement by hospital doctors in our hospital in the co-prescription of bone protecting drugs to prevent steroid induced osteoporosis. In this audit it appears that the majority of prescribers do recognise the necessity to protect bone health when a patient requires steroids. However a substantial number of patients did not receive any bone protection. It is our perception that many physicians are not aware that short courses of steroids reduce bone mineral density and therefore greater efforts must be made to enhance doctor awareness of the necessity for bone protection to be prescribed at initiation of systemic steroids.

Disclosure: L. C. Harty, None; J. Clare, None; D. Finnerty, None; S. Van Der Kamp, None; F. Kennedy, None; M. McKenna, None; O. M. FitzGerald, Abbott Laboratories Ireland, Bristol-Myers Squibb, 2, Abbott Laboratories Ireland, UCB, 5, Abbott Laboratories Ireland, 8.

2060

Using the Electronic Medical Record to Increase Rates of Physician Assessment of Lipids in Patients with Systemic Lupus Erythematosus and Rheumatoid Arthritis: A Quality Improvement Initiative. Astrud Lorraine Leyva, Laura L. Tarter, Elizabeth Blair Solow and David R. Karp, UT Southwestern Medical Center, Dallas, TX

Background/Purpose: Cardiovascular disease (CVD) is a major cause of morbidity and mortality in rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE). Guidelines for the management of both SLE and RA recommend evaluation of and intervention for known cardiovascular risk factors, including dyslipidemia. However, studies suggest that screening rates remain suboptimal. Quality improvement methodology offers a practical approach to bridge this gap in care. The fellowship training setting is an ideal environment in which physicians recorded lipid panel results in clinic notes during their training. The American College of Graduate Medical Education requires that fellows demonstrate the ability to continuously improve patient care. Our aim was to improve the rate of recording lipid panel results in patients with SLE or RA to over 50% in one month period.

Methods: In our busy outpatient rheumatology clinic in a county hospital setting, we examined patient, provider, and health system factors that could be barriers to providing routine cardiovascular risk assessment for our patients. For our first Plan-Do-Act-Check (PDCA) cycle, we examined the frequency with which physicians recorded lipid panel results in clinic notes during routine visits. We obtained baseline data for all RA or SLE patient visits for each of our six clinical fellows one month period. Our hospital district utilizes the EPIC electronic medical record (EMR); thus we devised a simple “dotphrase” to assist physicians in ascertaining the date and results of a patient’s most recent lipid panel with just a few keystrokes. We then organized an educational session for our providers to inform them about the initiative, the collective baseline data and applying the “dotphrase”. Each clinical fellow also received an individual summary of their baseline screening rates.

Results: We reviewed 91 patient visits during the pre-intervention period (69% RA, 31% SLE). Patients were 46.7 years old (SD 14.7) and 83% female. Forty-two percent of patients had a lipid panel sent within the past year. Lipid panels were ordered by primary care physicians (63%), rheumatologists (15%), and other physicians (22%). Twenty percent of patients were on statin therapy. Our providers documented lipid panel results, however, in only 12% of the visits. Following the implementation of the EMR “dotphrase”, we reviewed an additional 92 patient visits over a one month period. Baseline characteristics were similar to our pre-intervention group. Our providers augmented their lipid panel recording to a rate of 65% after the intervention.

Conclusion: In our hospital district setting with an integrated EMR, the use of a simple “dotphrase” was effective in improving provider documentation of lipid panel results in patients with RA and SLE. Future PDCA cycles will focus on increasing rates of obtaining screening lipid panels and intervening in patients with documented dyslipidemia.

Disclosure: A. L. Levy, None; L. L. Tarter, None; E. B. Solow, None; D. R. Karp, None.

2061

Physician Variation in Documentation of Rheumatoid Arthritis Quality Measures and Evaluation of Relationship with Radiographic Progression. Sonali Desai1, Jinoos Yazdany2, Nancy A. Shadick3, Sri Lillegraven4, Chih-Chin Liu5, Michelle A. Frits6, Tabatha Norton7, Jonathan S. Coblyn8, Michael Wembliat9 and Daniel H. Solomon1. 1Boston, MA, 2University of California San Francisco, San Francisco, CA, 3Department of Medicine, Division of Rheumatology, Immunology and Allergy, Brigham and Women’s Hospital, Boston, MA, 4Diakonerhemmet Hospital, Oslo, Norway, 5Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 6Brigham and Women’s Hospital, Boston, MA, 7Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 8Brigham & Women’s Hosp, Boston, MA

Background/Purpose: Documentation of quality measures (QMs) in rheumatoid arthritis (RA) has been proposed as a way to demonstrate quality of care, but data linking appropriate documentation to improved clinical outcomes are lacking. We examined the variation in physician documentation of RA QMs on disease activity and functional status and the association with radiographic outcomes.

Methods: We studied a subset of 286 patients participating in a longitudinal RA cohort followed from 2003–2008 at an academic medical center with complete data on total sharp score (TSS) (2 hand x-rays approximately 2 years apart). All clinical notes from 18 different rheumatologists during a 24-month period preceding the date of the second hand x-ray were examined for the presence or absence of the RA QMs on disease activity and functional status. Disease activity QM documentation was defined as mention of disease activity assessment in the medical record, with details categorizing disease activity into low, medium or high. Functional status QM documentation was defined as mention of how RA impacted activities of daily living. Change in TSS was defined as an annualized progression rate and dichotomized as progression (>1U per year) or no progression (<1U per year). We examined: patient visits per MD per year; RA QM documentation as either disease activity, functional status or both; and mean % of visits with RA QM documentation. We compared the mean change in TSS across patients grouped by percentage of visits meeting a QM, i.e., none or some documentation of disease activity and functional status.

Results: The mean age of our patients was 57.0 (±14.0) years, 82.0% were female, mean disease duration was 10.4 (±10.9) years, baseline DAS28 score was 3.7 (±1.5) and 65.9% were either RF or CCP positive. 76.6% of patients were on a non-biologic and 31.5% were on a biologic DMARD. Radiographic progression of RA was reported in 27.0% of patients. There was at least one chart note with documentation of disease activity for 26.0% of patients and functional status for 75.0%, during the 24-month period. For the seven rheumatologists with at least 10 patients in the study, there was variation in the number of visits per patient per year and documentation of disease activity and functional status in chart notes (Table). In unadjusted analyses, there was no relationship between performance on either disease activity (p=0.6) or functional status (p=0.5) and change in TSS.

Table. Differences in RA visits and QM documentation by rheumatologist

<table>
<thead>
<tr>
<th>MD</th>
<th>Study sample patients % N (%</th>
<th>Patient visits per year mean (SD)</th>
<th>Disease activity QM at least 1 (mean)</th>
<th>Functional status QM at least 1 (mean)</th>
<th>Both QMs at least 1 (mean)</th>
<th>% of visit with QM (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50 (20.7)</td>
<td>8.6 (5–14)</td>
<td>4.8 (27.54)</td>
<td>1.2 (4.8)</td>
<td>1.6 (22.0)</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>50 (20.3)</td>
<td>9.0 (6–12)</td>
<td>0 (12.69)</td>
<td>0 (4.8)</td>
<td>0.0 (11.0)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>50 (21.6)</td>
<td>8.9 (5–10)</td>
<td>0 (12.69)</td>
<td>0 (4.8)</td>
<td>0.0 (11.0)</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>10 (4.1)</td>
<td>6.9 (4–10)</td>
<td>3.0 (10.7)</td>
<td>1.0 (4.8)</td>
<td>0.0 (11.0)</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>10 (4.1)</td>
<td>9.4 (5–10)</td>
<td>3.1 (7.7)</td>
<td>1.0 (4.8)</td>
<td>0.0 (11.0)</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>28 (11.6)</td>
<td>8.9 (5–10)</td>
<td>31.0 (10.7)</td>
<td>1.0 (4.8)</td>
<td>2.5 (46.0)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>45 (20.6)</td>
<td>7.8 (4–10)</td>
<td>42.0 (49.4)</td>
<td>0.0 (4.8)</td>
<td>22.0 (49.4)</td>
<td></td>
</tr>
</tbody>
</table>

* The 7 rheumatologists represented in this table contributed at least 10 patients to the study sample.
Conclusion: Among this cohort of RA patients with established disease, overall documentation of RA QMs on disease activity and functional status was inconsistent across rheumatologists. We did not find an association between the % of visits with an RA QM documented and radiographic outcome over a 24-month follow-up period.

Disclosure: S. Desai, None; J. Yazdany, None; N. A. Shadick, Ainger, 2, Abbott Immunology Pharmaceuticals, 2, Genentech and Biogen IDEC Inc, 2, Crescendo Bioscience, 2, MedImmune, 2; S. Lillegraven, testest, 2; C. C. Liu, None; M. A. Frits, None; T. Norton, None; J. S. Coblyn, CVS, 5; M. Weinblatt, MedImmune, 2; Crescendo Bioscience, 2, MedImmune, 5, Crescendo Bioscience, 5; D. H. Solomon, Abbott Immunology Pharmaceuticals, 2, Lilly, 2, Corrona, 5, Up to Date, 7.

2062
Increasing Pneumococcal Vaccination for Immunosuppressed Patients: A Cluster Quality Improvement Trial. Somali Desai1, Sara Szent-Gyorgyi1, Alexander Turchin1, Bing Lu2, Anna A. Bogdanova1, Michael Weinblatt3, Jonathan S. Coblyn4, Jeffrey O. Greenberg4, Allen Kachalia5 and Daniel H. Solomon5, 1Boston, MA, 2Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 3Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 4Division of Rheumatology, Brigham & Women’s Hospital, Boston, MA

Background/Purpose: It is important for patients on immunosuppressive medications to receive pneumococcal vaccination. Prior studies suggest that most patients do not undergo vaccination. We evaluated the effects of a point-of-care paper reminder form on being up-to-date with pneumococcal vaccination in a rheumatology practice.

Methods: Selected rheumatologists at five ambulatory practice sites received a point-of-care paper reminder form for patients who were not up-to-date with pneumococcal vaccination. Interrupted time-series analyses were used to measure the effect of the paper reminder form upon the intervention rheumatologists compared to the control rheumatologists. Adjusted Cox proportional hazards models were examined to identify independent predictors of being up-to-date with pneumococcal vaccination.

Results: We evaluated a total of 3717 patients on immunosuppressive medications. In this group 66.0% had rheumatoid arthritis:74.1% were Caucasian population. Difficulties in accessing rheumatology care have been previously documented. A collaboration between a Blackfoot community (n = 3700) and rheumatologists from a nearby urban centre was initiated to enable better consultative services for the Nation’s members, and allow for established rheumatology patients to receive care in their home community. Parallel to this initiative, we established an arthritis screening program, with the primary goal being to identify new cases of inflammatory arthritis (IA) early in the disease course.

Methods: A weekly community-based screening program started in June 2011. Consenting participants undergo a musculoskeletal (MSK) history and examination by a rheumatologist and complete a Health Assessment Questionnaire (HAQ). Serologic testing (rheumatoid factor (RF), antinuclear antibody (ANA), extractable nuclear antigens (ENA), anti-cyclic citrullinated peptide (anti-CCP)) is offered and further investigations initiated as appropriate to confirm a diagnosis. Management is provided in conjunction with primary care providers. We provide here a descriptive summary of the program’s outcomes after 1 year.

Results: 144 individuals have been reviewed (74% female, mean age 52.4 years). Half the cohort have a family history of RA (52%) or SLE (18%). All individuals have at least 1 MSK symptom, and 68% report fatigue. The most common sites of joint pain are the hands (81%), knees (75%), lumbar spine (64%), and shoulders (55%). A primary care provider had been consulted by 72% of the cohort prior to the screening program, with 15% having seen a rheumatologist and 15% an orthopedic surgeon in the past. The median HAQ score was 0.88, the median pain score (0–10 VAS) 5, and the median patient global score 5 (0–10 VAS). Seventeen new rheumatic diseases have been diagnosed (10 RA, 3 SLE, 1 JIA, 1 Sjogren Syndrome with arthralgias, 2 crystal arthropathies) and 4 individuals remain under observation. Fourteen patients with established rheumatic diseases (6 RA, 1 PsA, 1 spondyloarthritides, 5 SLE, 1 JIA) have re-engaged in active rheumatology care. OA and/or degenerative disk disease was present in 58% of the participants screened, 42% had soft tissue syndromes, 2% had fibromyalgia and 6% had a neurologic condition causing pain. RF and anti-CCP antibodies were rarely positive; anti-CCP was present in low or medium tities in 4 individuals with either soft tissue syndromes or OA. ANA was positive in 52% of the group, with 28% having tities >1:320. In those with positive ANA, only 5 had a history of SLE, IA or RA.

Conclusion: The screening program has been successful in detecting new cases of early IA and returning established rheumatology patients to active care in this First Nations community. There is a significant burden of OA in the community, and many residents are ANA positive in the absence of apparent connective tissue disorders. These findings highlight the need for a multidisciplinary team of primary care providers, allied health professionals, and specialists to maximize MSK care in the community. Limitations at this early phase include participation bias.

Disclosure: C. Barnabe, None; C. Low Horn, None; M. Kargard, None; S. Mintziosulis, None; S. Leclercq, None; D. P. Mosher, None; H. S. El-Gabalawy, None; T. White, None; M. J. Fritzler, None.
2064

Regular Measure of Disease Activity During the Routine Care of Rheumatoid Arthritis Patients Involves Some Extra Work but Positive Results. Lissiane K. N. Guedes, Ana Cristina Medeiros Ribeiro, Karina Rossi Bonfiglioli, Diogo Domiciano, Carolina Reither Vizioli, Gilmarina Franco da Cunha, Ana Luiza de Aguiar Foelkel, Celio R. Gonçalves and Ieda Laurindo, Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil

Background/Purpose: According to treat to target recommendations the use of validated composite measures of disease activity, which include joint assessments, is needed in routine clinical practice to guide treatment decisions. With the final objective of reaching remission or low disease activity in patients with RA. Objective: to study the outcome of adding a validated composite measure of disease activity (DAS28) to routine clinical visits.

Methods: Since 2007 all RA patients (ACR-1987 criteria) in regular follow-up at the Rheumatology Service of a tertiary center change to electronic files with a DAS28-ESR calculator and this measure became mandatory in the routine care visits. Inclusion criteria: patients in regular follow-up for at least 2 years before 2007 and no use of biologic agents during the study period (January 2007-December 2011). All patients could receive, free of charge, traditional DMARDs (chloroquine, methotrexate, sulfasalazine, leflunomide and azathioprine), corticosteroids (including intra-articular injections), analgesics and antiinflammatory medications as needed and according to a pre-established protocol. The first DAS28 recorded in the electronic files was compared to the last one recorded in 2011, after 4 years of regular measure of disease activity guiding therapeutic decisions (RA-study group). ERA patients (less than one year of symptoms at the beginning of treatment) submitted to a therapeutic strategy of tight control and DAS28 based clinical decisions were also evaluated.

Results: a total of 304 patients was included, 217 consisting our study group (86% female, mean age 63±11ys, mean disease duration 22±10yrs) and 87 ERA patients (83% female, mean age 53±12ys, mean disease duration 6.7±1.6yrs). ERA patients were significantly younger and with shorter disease duration. DAS28 values and different levels of disease activity are depicted below:

RA-SG n=217 ERA n=87

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<tbody>
<tr>
<td>DAS28 mean (SD)</td>
<td>3.9* (1.4)</td>
<td>3.3* (1.3)</td>
<td>3.7** (1.7)</td>
<td>2.9** (1.4)</td>
</tr>
<tr>
<td>% DAS28 &lt;2.6</td>
<td>17*</td>
<td>34*</td>
<td>29**</td>
<td>45**</td>
</tr>
<tr>
<td>% low disease activity</td>
<td>18</td>
<td>16</td>
<td>12**</td>
<td>24**</td>
</tr>
<tr>
<td>% moderate disease activity</td>
<td>47</td>
<td>39</td>
<td>30**</td>
<td>9**</td>
</tr>
<tr>
<td>% high disease activity</td>
<td>18</td>
<td>11</td>
<td>24</td>
<td>16</td>
</tr>
</tbody>
</table>

Conclusion: regularly applying validate composite indices such as DAS 28 leads to better control of disease activity, mainly an increased percentage of patients in DAS28 remission.

Disclosure: L. K. N. Guedes, None; A. C. M. Ribeiro, None; K. R. Bonfiglioli, None; D. Domiciano, None; C. R. Vizioli, None; G. F. D. Cunha, None; A. S. Abreu, None; F. M. Mello, None; A. L. D. A. Foelkel, None; C. R. Gonçalves, None; I. Laurindo, None.

2065

Uptake of the American College of Rheumatology’s (ACR) Rheumatology Clinical Registry (RCR): Quality Measure Summary Data. Salahuddin Kazi1, Itara Barnes2, Jinoos Yazdany3 and Rachel Myslinski4, 1 University of California San Francisco, San Francisco, CA

Background: The RCR was launched by the ACR to provide members with an infrastructure for quality reporting related to rheumatoid arthritis, gout, osteoarthritis, osteoporosis, and drug safety. The RCR is now in its third year of operation with data on over 26,000 patients. Here we report the uptake of the RCR by U.S. rheumatologists, and performance on measures regarding functional status, DMARD use, TB screening, progression, and disease activity assessment for RA patients in rheumatology practice.

Methods: Data derive from retrospective medical records abstractions performed by providers and designated practice staff for a sample of patients seen by the rheumatologist. Reporters submit data on quality measures via a secure, web-based registry system. Patients included in the denominator of all quality measures are >18 years of age with a diagnosis of RA who are receiving treatment by the reporting rheumatology provider. Additional details of each measure are listed in Table 1. We report the mean performance on each quality measure, defined as percentage of eligible patients receiving recommended care.

Table. Performance on RA Measures Assessed through the RCR (01/11–12/11)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Total eligible patients (n)</th>
<th>Performance on Quality Measure (%)</th>
</tr>
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<tbody>
<tr>
<td>DMARD use in 12 months</td>
<td>8077</td>
<td>70.5%</td>
</tr>
<tr>
<td>DMARD use in 12 months</td>
<td>7898</td>
<td>97.9%</td>
</tr>
<tr>
<td>DMARD use in 12 months</td>
<td>1650</td>
<td>73.6%</td>
</tr>
<tr>
<td>DMARD use in 12 months</td>
<td>7771</td>
<td>49.5%</td>
</tr>
<tr>
<td>DMARD use in 12 months</td>
<td>8075</td>
<td>43.3%</td>
</tr>
</tbody>
</table>

Results: 257 rheumatology providers in 143 practices submitted data on 8096 patients with RA from January 1, 2011 to December 31, 2011. Reporting providers practice in sites ranging from solo offices to large academic centers.

Conclusion:

- Rheumatologists across the country used the RCR in 2011 to report quality data establishing RCR as a mechanism for quality reporting (consistent with the ACR goal that RCR provide maximal benefit from data submission).
- Next steps planned for the ACR registry efforts include the continual enhancement of the quality of data collected, analytic reports pro- moting key performance indicators, and EHR-enabled reporting and quality improvement analysis through a federated registry network.
- RCR provides an opportunity for rheumatology providers to facilitate practice improvement, contribute to collaborative improvement projects, and contribute to national data, led by their professional society.

Disclosure: S. Kazi, None; I. Barnes, None; J. Yazdany, None; R. Myslinski, None.

2066

Improving Outpatient Follow-up for Osteoporosis Management After a Hip Fracture. Anika Alarakhia1 and Robert Quinet2, 1 Ochsner Medical Center, New Orleans, LA, 2Ochsner Medical Center - New Orleans, New Orleans, LA

Background/Purpose: Patients hospitalized for hip fractures are routinely scheduled for a Rheumatology follow-up appointment to assess their risk of future fractures and need for treatment. Follow-up in our clinic after hospitalization for a hip fracture has been notoriously poor. The purpose of this study was to determine the rate of outpatient follow-up after a hip fracture and implement an intervention to increase the rate.

Methods: We conducted a chart review involving 50 hospitalized hip fracture patients prior to intervention, and 50 hospitalized hip fracture patients after intervention. The intervention included an informational handout which explained the risk of osteoporosis and risks that can lead to further fractures, the importance of receiving a bone density scan, and different treatments to help prevent further fractures that can be implemented as an outpatient. This informational handout was given to the patient and/or family prior to hospital discharge. The results were documented comparing clinic follow-up rates prior to intervention and follow-up rates after intervention.

Results: After reviewing 50 charts from July 2006 to March 2011 of hospitalized hip fracture patients, it was noted that only 3/50 (6%) of patients followed up in our clinic. After implementing our intervention, a chart review was then done from May 2011 to February 2012 and 20/50 (40%) of patients have followed up to our clinic following their hospitalization. This shows a significant increase in follow-up rates after the intervention was initiated.

Disclosure: S. Kazi, None; I. Barnes, None; J. Yazdany, None; R. Myslinski, None.
Conclusion: Outpatient follow-up for a patient after being hospitalized for a hip fracture is extremely important to prevent further fractures which can increase a patient’s morbidity and mortality. After receiving an informational handout while in the hospital, we found that the outpatient follow-up rate increased dramatically. It is concluded that once patients and their families fully understood the importance of seeing a physician to assist in preventing further fractures, they were more willing to make a follow-up appointment in the outpatient setting.

Disclosure: A. Alarakhia, None; R. Quinet, None.

2067 Access to Technology and Interest in Mobile “app” for Disease Management Among Patients with Systemic Lupus Erythematosus Seeking Care At a Large Referral Center. Wendy Marder1, Holly Wittman2, Margaret Hyzy3, Martha Ganser1, Emily C. Somers1 and Lawrence An3. 1University of Michigan, Ann Arbor, MI, 2University of Michigan Medical School, Ann Arbor, MI, 3University of Michigan, Ann Arbor, MI.

Background/Purpose: Some of the challenges facing patients with chronic diseases such as systemic lupus erythematosus (SLE) include identifying triggers for disease “flares” and accurately recognizing medication changes they make in response to flares, e.g., self-adjustments of daily prednisone doses. We sought to assess interest in and applicability of smartphone technology as a convenient tool for disease self-management, as well as assessing usage patterns among a heterogeneous group of lupus patients at an academic outpatient clinic. These data will inform the design of a mobile application (“app”), a feature of which will allow SLE patients to conveniently and accurately record disease activity trends and prednisone use over time between rheumatology clinic appointments.

Methods: Lupus patients from the University of Michigan rheumatology clinics who met ≥4 ACR criteria and age ≥18 years. Participants completed a survey containing questions on sociodemographics, healthcare information needs and satisfaction, and access to technology, including smartphone usage patterns. Multivariable logistic regression was used to examine the likelihood of mobile app use among three indicators of socioeconomic status, adjusting for age, sex and race.

Results: Among 100 SLE patient respondents, demographics were: 89% female, mean age 40 years (SD 13); race 66% white, 21% black, 13% other/unknown.; education 16% ≤high school, 34% some college or technical school, 16% college graduate, 33% graduate degree; insurance coverage 23% Medicaid/none, 12% Medicare; 65% private. Participants expressed high interest in a mobile app for lupus: 70% rate app usage would be “extremely helpful” (5 on a 1–5 scale) as a “simple way to get in touch with your healthcare team.” The majority reported the following mobile app features would be “extremely helpful”: automatic reminders (60%), ability to track flares & triggers of disease activity (59%), and sharing this information with healthcare providers (58%). The majority reported the following mobile app features would be “extremely helpful”: automatic reminders (60%), ability to track flares & triggers of disease activity (59%), and sharing this information with healthcare providers (58%).

Conclusion: These data reveal broad interest in a mobile app for lupus, including proposed features for disease management, across sociodemographic groups. The majority of respondents use smartphone/mobile app technology, with younger age being a significant predictor. However, across different indicators of socioeconomic status, various usage patterns emerge. These data can be used to help target efforts to increase accessibility to this technology.

Disclosure: W. Marder, None; H. Wittman, None; M. Hyzy, None; M. Ganser, None; E. C. Somers, None; L. An, None.

2068 Is There a Difference in Rheumatology Patient Reported Outcomes When Measured At Home Versus the Clinic Setting? C.J. Inman1, Frederick Wolfe2 and Kaleb Michael3. 1University of Utah, Salt Lake City, UT, 2National Data Bank for Rheumatic Diseases, Wichita, KS, 3National Data Bank for Rheumatic Diseases & University of Nebraska Medical Center, Omaha, NE.

Background/Purpose: Registries have become a common tool for collecting patient-centered outcome measures. Clinical effectiveness research may be improved if data from multiple registries could be combined allowing for richer data sets in that patients in one registry could supplement data which has been collected in a separate registry. However, the question remains as to whether data that is collected in two separate registries are equivalent. While the registries may ask the same clinical question, if they collect it in unique formats, such as online at home versus in the clinical setting, it is not clear if the metrics are equal. We attempted to address this question of data equivalence through evaluating a patient entered registry versus a registry collected at the point of clinical care.

Methods: Patients were participants in a rheumatology clinic research database that collected patient data via paper questionnaires at clinic visits. They were also participants in a longitudinal, observational study that collected patient data at 6-month intervals from their home via paper, web, or telephone-interview questionnaires at patient’s preference from 2007–2012. Four patient measures were congruent between the studies: HAQ-II and pain, patient global assessment, and fatigue visual analog scales. General estimating equations (GEE) assessed longitudinal effects between clinical and at-home data collection methods adjusting for sociodemographic status and number of clinic visits.

Results: A total of 1439 patients enrolled in both studies (40% rheumatoid arthritis, 22% osteoarthritis, and 38% other rheumatic diseases). Mean (SD) age at enrollment was 56.5 (14.0) years, 20.5% were male, 92.0% were Caucasian, and mean (SD) education was 14.0 (2.2) years. Primary rheumatic disease duration was 8.2 (9.3) years and rheumatic disease comorbidity index was 2.0 (1.6). Baseline measures were: HAQ-II 0.87 (0.65), pain 4.0 (2.8), global 3.8 (2.5), and fatigue 4.6 (3.1). Results of the GEE are shown in Table 1; clinic paper questionnaire as well as non-clinic formats of web and telephone were compared to non-clinic paper questionnaires.

Table 1. Relative effect of location and questionnaire media on outcomes through general estimating equations

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Clinic Paper</th>
<th>Clinic Non-clinic</th>
<th>Non-clinic (e.g., at home)</th>
<th>Web</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAQ-II (0–3)</td>
<td>0.07 (0.06, 0.08)</td>
<td>0.00 (0.02, 0.04)</td>
<td>0.18 (0.15, 0.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain (0–10)</td>
<td>0.98 (0.90, 0.10)</td>
<td>0.00 (0.02–0.24, 0.08)</td>
<td>0.71 (0.51, 0.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global assessment (0–4)</td>
<td>0.51 (0.47, 0.56)</td>
<td>0.00 (0.02–0.14, 0.10)</td>
<td>0.00 (0.19, 0.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue (0–10)</td>
<td>0.75 (0.67, 0.83)</td>
<td>0.00 (0.02–0.15, 0.10)</td>
<td>1.12 (1.01, 1.39)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: On average patients report a higher level of disease severity during a clinic visit than when they report from home while those who respond from home via the web do not differ from paper respondents. As expected, patients that choose telephone interviews reported worse outcomes except for global assessment. Patients respond at home when they are willing and available which may delay responses during spans of poorer health. Patients seen in the clinic, notably those seen more often, could have more severe health care needs from increased disease severity. Further study is needed to determine if the accuracy of such assessments differ.

Disclosure: C. J. Inman, None; F. Wolfe, None; K. Michaud, None.

ACR/ARHP Poster Session C Rheumatoid Arthritis: Animal Models

Tuesday, November 13, 2012, 9:00 AM–6:00 PM

2069 Proteinase Activated Receptor-4 Stimulation Promotes Leukocyte Adhesion in the Rat Knee Joint. Jason J. McDougall. Dalhousie University, Halifax, NS.

Background/Purpose: Proteinase activated receptors (PARs) are a family of G protein-coupled receptors that signal by enzymatic cleavage of the receptor in a specific extracellular domain. Since PAR-4 has been shown to cause pain and inflammation in synovial joints, the aim of this study was to examine the effect of PAR-4 activation on leukocyte kinetics in the synovial microvasculature.

Methods: Male c57/b6 mice were deeply anaesthetised and the right knee joint was exposed. An intravenous injection of 0.05% rhodamine was administered to label circulating leukocytes. Intravital microscopy was used to measure leukocyte trafficking in the joint in response to local adminis-
tration of the PAR-4 agonist AYPGKF-NH2 (50nM). Comparisons were made in wild-type and P-selectin knockout mice. The effect of the PAR-4 antagonist pepducin p4Pal10 on leukocyte kinetics in an adjuvant monoarthritis knee was also assessed.

**Results:** In wild-type animals, AYPGKF-NH2 caused a gradual increase in leukocyte rolling and adherence which was not present in P-selectin knockout mice (P<0.001, n=8). Treatment of arthritic mice with pepducin p4Pal10 reduced leukocyte rolling and accumulation in the joint (P<0.001).

**Conclusion:** Activation of PAR-4 in rat knee joints causes leukocyte rolling and adhesion that is P-selectin-dependent. In an arthritic joint, blockade of PAR-4 with pepducin p4Pal10 reversed these pro-inflammatory changes indicating that PAR-4 antagonism can have an anti-inflammatory outcome.

Disclosure: J. J. McDougall, None.

### 2070

**Myeloid-Derived Suppressor Cells Accumulated in Spleens of Mice with Collagen-Induced Arthritis and Inhibited Immune Response of CD4⁺ T Cells.** Wataru Fujii, Eishi Ashihara, Hideyo Hirai, Hideake Nagahara, Kazuki Fujikata, Ken Murakami, Taka-hiro Seno, Atsuo Yamamoto, Hidetaka Ishino, Masatada Kohno, Tairu Maekawa and Yutaka Kawahito. 1Graduate School of Medical Science, Kyoto Prefectural University of Medicine, Kyoto, Japan, 2Kyoto Pharmaceutical University, Kyoto, Japan, 3Kyoto University Hospital, Kyoto, Japan

**Background/ Purpose:** Myeloid-derived suppressor cells (MDSCs), firstly reported in patients with cancer, have a myeloid origin and an ability to suppress T cell responses. MDSCs are characterized by the co-expression of the myeloid-cell lineage differentiation antigens Gr1 and CD11b. Many investigators have demonstrated that MDSCs promote tumor progression via T cell tolerance in patients with cancers and tumor-bearing mice. However, as for autoimmune diseases, the roles of MDSCs in autoimmune disease remain controversial. Here we investigate the roles of MDSCs in autoimmune arthritis using collagen-induced arthritis (CIA) models.

**Methods:** CIA was induced in 7–8-week-old DBA/1 mice by intradermal injection of 200 μg of bovine type II collagen (CII) in Freund’s complete adjuvant on day 0, followed by a booster injection of 200 μg of CII in Freund’s incomplete adjuvant on day 21. The severity of arthritis in each paw was evaluated 3 times weekly. We first analyzed the number of Gr1⁺/CD11b⁺ MDSCs in the spleens of mice with CIA by flow cytometry at the onset, the peak, and the convalescence of CIA. Next, MDSCs were isolated from spleens of mice with CIA by magnetic cell separation. Carboxyfluorescein diacetate succinimidyl ester (CFSE)-labeled CD4⁺ T cells were stimulated with anti-CD3/CD28 antibodies (Abs) and cultured in the presence of 30 U/ml interleukin (IL)-2 with or without MDSCs for 5 days. We investigated CD4⁺ T cell proliferation using flow cytometric measurement of CFSE dye dilution. Next, MDSCs were co-cultured with CD4⁺ T cells stimulated with anti-CD3/CD28 Abs for 3 days. We measured cytokines released into supernatant using specific enzyme-linked immunosorbent assay (ELISA).

**Results:** In a murine arthritis model, MDSCs significantly accumulated in the spleens of mice with CIA at the peak of its severity. MDSCs inhibited the proliferation of CD4⁺ T cells in response to anti-CD3/CD28 Abs in vitro. When we co-cultured CD4⁺ T cells and MDSCs interferon (IFN)-γ and IL-6 released into supernatant were significantly decreased. 97.6 ± 16.1 pg/ml to 79.8 ± 10.1 pg/ml (p < 0.05), 10.4 ± 2.1 pg/ml to 2.9 ± 1.0 pg/ml (p < 0.01), respectively.

**Conclusion:** MDSCs accumulated in the spleens of mice with CIA. These MDSCs inhibited CD4⁺ T cell proliferation and pro-inflammatory cytokine production in vitro. These findings may indicate the protective roles of MDSCs against autoimmune arthritis, which could be exploited for new cell-based therapies. We are now investigating the function of MDSCs in vivo.

Disclosure: W. Fujii, None; E. Ashihara, None; H. Hirai, None; H. Nagahara, None; K. Fujikata, None; K. Murakami, None; K. Nakamura, None; T. Seno, None; A. Yamamoto, None; H. Ishino, None; M. Kohno, None; T. Maekawa, None; Y. Kawahito, None.

### 2071

**The Potent, Highly Selective and Orally Bioavailable Spleen Tyrosine Kinase Inhibitor GSK143 Demonstrates Efficacy in B Cell Receptor and Fe Receptor Signalling in Models of Inflammatory and Autoimmune Disease.** Marion C. Dickson, Nicholas Smithers, Huw Lewis, Cesar Ramirez-Molina, Scott McCleary, Mike Barker and John Liddle. GSK, Stevenage, United Kingdom

**Background/ Purpose:** Spleen tyrosine kinase (Syk), a 72 KDa cytosolic non-receptor tyrosine kinase is a key mediator of B cell receptor (BCR) and Fe receptor (Fcr) signalling in a variety of inflammatory cell types and has been implicated in the pathogenesis of a number of allergic and autoimmune diseases including Asthma, Rheumatoid Arthritis (RA) and Systemic Lupus Erythematosus (SLE). Several Syk inhibitors are currently in clinical development and here we report an extended pharmacological and biological profile of GSK143 a novel, highly selective, orally bio-available Syk inhibitor.

**Methods:** GSK143 inhibitory activity (dose range 10μM to 1nM) on BCR signalling was evaluated in human and murine whole blood by assessing the cell surface expression of IgM stimulated CD69 using flow cytometry. IgM antibody titres in a 7 day murine T independent immunisation model, induced by a TNP-ficol challenge, were measured after once daily dosing (5, 10, 15 and 30μg/kg) to determine in vivo activity. The effect of GSK143 (dose range 20μM to 10μM) on TNFa production was explored in human monocytic cells, from 8 donors, differentiated to a pro-inflammatory M1 macrophage phenotype with GM-CSF. Macrophages were stimulated with Ig-conjugated Sepharose beads to mimic immune complex activation of the Fc gamma receptor (FcγR).

**Results:** GSK143 dose dependently inhibited the IgM stimulated CD69 expression in both human and murine whole blood with IC50s of 185nM (pIC50 6.73 ± 0.06) and 364nM (pIC50 6.44 ± 0.28) respectively. In the murine model of T cell independent immunisation, GSK143 administered orally once daily (qd) from day 1 to day 6, produced a significant reduction in the concentration of IgM antibodies (ng/ml) in comparison to that of the corresponding vehicle control group (22843.11 ± 3377.88 ng/ml vs 15848.62 ± 1984.15 ng/ml, P < 0.01), (11135.83 ± 2129.6 ng/ml, P < 0.001), (5919.73 ± 1539.03 ng/ml, P < 0.001) and (2877.67 ± 722.79 ng/ml, P < 0.01) at the 5, 10, 15 and 30 μg/kg doses respectively. The systemic exposure observed on day 6 increased with the administered dose with AUC₀–₂₄h (ng.h/mL) values of 1435.3 ± 808.2 ng.h/mL, 2457.1 ± 640.1 ng.h/mL, 5533.6 ± 2772.4 ng.h/mL and 7901.7 ± 3058.7 ng.h/mL for the 5, 10, 15 and 30 μg/kg doses respectively. In human GM-CSF differentiated macrophages stimulated with Ig conjugated beads, GSK143 inhibited FcγR mediated TNFa release in a concentration dependent manner (IC50 = 34nM, pIC50 of 7.47 ± 0.31).

**Conclusion:** GSK143, a potent, highly selective and orally bio-available Syk inhibitor blocked FcγR mediated TNFa release in pre-clinical human and rodent in-vivo and in-vivo models of inflammatory and autoimmune diseases.

Disclosure: M. C. Dickson, GSK, 3; N. Smithers, GSK, 3; H. Lewis, GSK, 3; C. Ramirez-Molina, GSK, 3; S. McCleary, GSK, 3; M. Barker, GSK, 3; J. Liddle, GSK, 3.

### 2072

**Bone Formation and Resorption Are Both Increased in Autoimmune Arthritis.** Kresten K. Keller, Jesper Skovhus Thomsen, Kristian Stengaard-Pedersen, Frederik Dagnes-Hansen, Jens R. Nyengaard and Ellen-Margrethe Hauge. 1Department of Rheumatology, Aarhus University Hospital, Aarhus, Denmark, 2Institute of Anatomy, Aarhus University, 3Institute of Medical Microbiology and Immunology, Aarhus University, Aarhus, Denmark, 4Stereology and Electron Microscopy Laboratory, Centre for Stochastic Geometry and Advanced Bioimaging, Aarhus University Hospital, Aarhus, Denmark.

**Background/ Purpose:** Bone destruction in the joints of patients with rheumatoid arthritis (RA) is the result of a combination of osteoclastic bone resorption and osteoblastic bone formation. This process is not completely understood, and especially the importance of local inflammation needs further investigation. We used 3D stereological estimators to evaluate how bone formation and bone resorption are altered in autoimmune arthritis.

**Methods:** Twenty one 12-week-old female BALB/c mice were randomised to either an arthritis group or a control group. Arthritis was scored twice weekly by an observer blinded for group distribution. The fluorescent label tetracycline was injected intraperitoneally 8 days before termination of...
the study at the end of week 6. Right hind paws were fixed in alcohol and embedded undecalcified in methylmethacrylate. Seven-µm-thick sections were cut exhaustively according to the principles of vertical sectioning. Systematic sampling was used to obtain approximately 10 levels each with 12 sections. Using newCAST stereological software, intercepts between a line grid and the tissue of interest were counted by an observer blinded for the group distribution. Osteoclast-covered bone surfaces (Oc:S) and eroded surfaces (ES) were estimated on sections stained for TRAP and mineralising surfaces (MS) were estimated on unstained sections using fluorescent microscopy. The absolute number of osteoclasts (N.Oc) was estimated using the physical fractionator. All parameters were assessed in the tarsus on the periosteal and endosteal surfaces, and the presence of adjacent inflammatory tissue was evaluated for each intersection and cell count. The relevant reference bone surface (BS) was estimated for all parameters. The results were expressed as relative values (MS/BS, ES/BS, Oc:S/BS, and N.Oc/BS).

Results: At the end of week 1 and until termination, the arthritis score was higher in arthritic animals (p < 0.01). Likewise, MS/BS, ES/BS, Oc:S/BS, and N.Oc/BS were elevated in arthritic mice compared to normal mice both at the endosteal surface and the periosteal surface (p < 0.001). On surfaces both adjacent to and not adjacent to inflammation in arthritic mice MS/BS were elevated on endosteal as well as periosteal surfaces compared to normal mice (p < 0.001). In arthritic mice, MS/BS and Oc:S/BS were larger on endosteal as well as periosteal surfaces adjacent to inflammation compared to surfaces without inflammation (p < 0.01). However, the difference between MS/BS at surfaces adjacent to and not adjacent to inflammation on either periosteal or endosteal surfaces did not reach the level of statistical significance.

Discussion: The data presented showed bone formation to occur on more bone surfaces, irrespectively of the adjacent tissue being inflamed. However, bone degradation was present almost exclusively on surfaces with adjacent inflammation. Therefore, arthritic bone loss is likely to be explained by an imbalance of erosion and formation of bone rather than a general down-regulation of bone formation. These findings may be important for the development of new bone targeting drugs in RA. The present study is the first to apply 3D stereological estimators to quantify bone formation and degradation in a model of RA.

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Combined Effects of a c-Fos/AP-1 Inhibitor T-5224 and Methotrexate On Collagen-Induced Arthritis in Mice. Tomomi Date1, Yukihiko Aikawa1, Tetsuya Yamamoto1, Hirokazu Narita1, Shinuchi Hiroono1 and Shinuchi Shizawa2. Research Laboratories, Toyama Chemical Co., Ltd, Toyama, Japan, 1Department of Pharmaceutical Sciences, School of Pharmacy, Katsushika University, Tokyo, Japan, 2Department of Medicine & Rheumatology, Kyushu University Beppu Hospital, Beppu, Japan

Background/Purpose: Activator protein-1 (AP-1) is an important transcription factor for cytokine production and joint destruction in rheumatoid arthritis (RA), and a potential target for the treatment of RA. We previously reported the preventive and therapeutic effects of T-5224, a small molecule inhibitor of c-Fos/AP-1, on type II collagen-induced arthritis (CIA) in mice. The purpose of this study was to investigate the effect of T-5224 in combination with or with add-on to methotrexate (MTX) on the development of arthritis and joint destruction in mice with CIA.

Methods: CIA was induced in DBA/1J mice by the immunization with bovine type II collagen twice on days 0 and 21. In a combination study, T-5224 (3 mg/kg/day) and/or MTX (0.5–5 mg/kg/day) were orally administered once daily from the day of the 2nd immunization (day 21) to day 34. In an add-on study, MTX (0.5 mg/kg/day) was administered from day 21 to day 49. The add-on treatment of T-5224 (3 mg/kg/day) to MTX (0.5 mg/kg/day) or MTX at a dose increased to 5 mg/kg/day started from day 27. In both studies, anti-rheumatic efficacy was determined by arthritis score, X-ray examination, and serum interleukin-1β (IL-1β) on days 35 and 50, respectively.

Results: In a combination study, MTX alone showed dose dependent reduction in arthritis scores by 58% at 0.5 to 5 mg/kg/day. T-5224 at 3 mg/kg/day in combination with MTX at 0.5 and 1.5 mg/kg/day decreased the arthritis scores by 57% and 62%, respectively, which was similar to that achieved by MTX alone at 5 mg/kg/day (58%). The joint destruction was suppressed by 78% and 90%, respectively, in combination of T-5224 and MTX at 0.5 and 1.5 mg/kg/day, which was more potentiated than MTX alone at 5 mg/kg/day. Elevated IL-1β level in the serum reduced by combined treatment of T-5224 and MTX, whereas MTX alone at 0.5 and 1.5 mg/kg was without effects.

Add-on treatment of T-5224 (3 mg/kg/day) with MTX (0.5 mg/kg/day) decreased the arthritis scores by 70%, which was more marked than MTX alone at a dose escalated from 0.5 to 5 mg/kg/day (29%), when started dosing from day 27 after the onset of arthritis. Add-on treatment of T-5224 with MTX reduced the joint destruction scores by 81%, while MTX alone did by 46%. Serum level of IL-1β decreased only in mice treated with T-5224 added-on to MTX.

Conclusion: These results indicate that either combined or add-on use of T-5224 and MTX with a different mode of anti-arthritic actions is expected to augment anti-rheumatic and anti-joint destructive effects in the therapy of RA.


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CCCR6+ Foxp3+ Regulatory T Cells Regulate the Development of Collagen Induced Arthritis in T Cell Specific RORγt Transgenic Mice. Yuya Kondo, Masahiro Tahara, Mana Iizuka, Hiroto Tsuobu, Satoru Takahashi, Isao Matsumoto and Takayuki Sumida. University of Tsukuba, Tsukuba, Japan

Background/Purpose: Recent studies reported that IL-17 producing Th-17 cells appear to play an important role in the generation of several autoimmune arthritis models. We previously reported that T-bet expression regulates the development of collagen induced arthritis by suppression of
antigen reactive Th17 cell differentiation via the repression of RORγt expression (Kondo Y et al. Arthritis Rheum 64,162-72, 2012). This observation suggested that RORγt might be pivotal on the development of autoimmune arthritis. The aim of this study is to clarify the effect of RORγt expression on T cells in the development of autoimmune arthritis.

**Methods:** 1) Incidence and severity of collagen induced arthritis (CIA) were assessed in C57BL/6 (B6) and T cell specific RORγt transgenic (RORγt Tg) mice under the control of CD2 promoter, 2) Histological assessment of inflamed joints was performed with hematoxilin-eosin staining. 3) Collagen type II (CII) specific antibody in sera was measured with ELISA. 4) Draining lymph node cells were harvested from B6 and RORγt Tg mice at 10 days after the immunization of CII, and cultured in the medium containing CII. Cytokine level in supernatants were analyzed by ELISA. 5) Draining lymph node cells were cultured in vitro as described in 4), transcription factors expression on CD4+ T cells was analyzed by FACS and real-time PCR. 6) The correlation between the expression of transcription factors and chemokine receptor 6 (CCR6) was analyzed by FACS.

**Results:** 1) CIA was significantly suppressed in RORγt Tg mice compared with B6 mice. 2) Histological assessments revealed that inflammation and bone destruction were milder in RORγt Tg mice than B6 mice. 3) Anti-CII antibody was significantly lower in RORγt Tg mice than B6 mice (P < 0.05). 4) IL-17 level in supernatant was significantly increased in RORγt Tg mice compared with B6 mice (P < 0.05). 5) FACS analysis showed that RORγt expression on CD4+ T cells was significantly higher in RORγt Tg mice than B6 mice. Although there was no significant difference of Foxp3 expression on CD4+ T cells between B6 mice and RORγt Tg mice, most of Foxp3+ CD4+ T cells also expressed RORγt in RORγt Tg mice. Bcl-6 expression on CD4+ T cells of RORγt Tg mice was comparable to that of B6 mice. 6) The expression of CCR6 on CD4+ T cells was significantly higher in RORγt Tg mice compared with B6 mice (P < 0.01). In particular, CCR6 was remarkably upregulated in Foxp3+ CD4+ T cells of RORγt Tg mice compared with that of B6 mice (P < 0.01).

**Conclusion:** CIA was significantly suppressed in RORγt Tg mice, although IL-17 production from CII reactive T cells was increased. The inhibition of arthritis might be related with the increase in CCR6+ Foxp3+ CD4+ T cells in RORγt Tg mice.

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**2076**

**Efficacy of the Potent PI3K-δ,γ Inhibitor IPI-145 in Rat Adjuvant Arthritis.** David L. Boyle, Katharyn Topoleweski and Gary S. Firestein. UCSF School of Medicine, La Jolla, CA

**Background/Purpose:** Phosphoinositide 3-kinase (PI3K) is a family of intracellular signaling transducers and could be targeted to treat inflammatory diseases like rheumatoid arthritis (RA). However, blockade of the a and b isoforms could cause significant toxicity due to their ubiquitous expression. On the other hand, c and d isoform expression is restricted mainly to leukocytes and, for the latter, synovial fibroblasts. These enzymes regulate a variety of innate and adaptive immune pathways, especially through activation of AKT. In this study, IPI-145, a novel potent PI3K-δ,γ inhibitor (Ki’s: PI3Kδ: 1.6 nM and PI3Kα: 25.9 nM) was tested for its activity in the rat adjuvant induced arthritis model.

**Methods:** Rat adjuvant arthritis was induced by immunizing Lewis rats with CFA. Then, from either Day 8 or Day 14 through Day 21 one of three treatments (vehicle, 10 or 50mg/kg/d IPI-145) was administered daily by oral gavage. Paw swelling was assessed by plethysmometry, radiographs by a systemex system. Furthermore, synovial cells from CIA mice were cultured in the presence of dexamethasone (DEX) for 3 h after IL-6 pretreatment, and then COXII mRNA was quantified by real-time PCR.

**Results:** Treatment with 10 or 50 mg/kg/d of IPI-145 (n=16/group) beginning on day 8 prior to onset of ankle swelling inhibited arthritis progression in a dose dependent manner. Disease progression was significantly reduced at 50 mg/kg from Day 12 through Day 21 (see Figure; p<0.05) when initiated on Day 8. Treatment of established disease with 50 mg/kg of IPI-145 starting on Day 13 resulted in 70% less swelling relative to vehicle treated animals (see Figure; p<0.05). Synovial IL-6 and MMP3 gene expression on Day 21 were similar between groups, however MMP3 expression was substantially inhibited in the 50 mg/kg group (Vehicle, 4.5±0.3 p=0.05; IPI-145 0.6±0.1 p<0.05) PI3K-δ,γ blockade significantly decreased radiographic bone destruction in both regimens (vehicle 3.5±0.4, 50 mg/kg=1.5±0.4; day 13, 2.8±0.4 p<0.05). AKT phosphorylation in ankles was reduced on day 21 in both regimens (pAKT/AKT ratio: Vehicle 0.57±0.02; day 8 protocol, 0.23±0.06; day 13 protocol, 0.28±0.02 p<0.05).

**Conclusion:** PI3K-δ,γ blockade demonstrated prominent disease-modifying effects in both pretreatment and established preclinical arthritis protocols with statistically significant reductions in ankle swelling, MMP13 gene expression, radiographic bone destruction, and AKT phosphorylation. Compared with broad spectrum or single isoform inhibitors, PI3K-δ,γ inhibitors could have a favorable therapeutic profile.

**Disclosure:** D. L. Boyle, None; K. Topoleweski, None; G. S. Firestein, Infinity Pharmaceuticals, 2.

**2077**

**IL-6 Blockade Augments the Anti-Inflammatory Effect without Increasing the Side Effects of Steroids in Collagen-Induced Arthritis.** Hiroto Suzuki1, Hiroyo Hashizume1, Masashi Shina2, Keisuke Tanaka1 and Yoshihiro Matsumoto1, 1Chugai Pharmaceutical Co., Ltd., Gotemba, Shizuoka, Japan, 2Chugai Pharmaceutical Co., Ltd., Gotemba, Japan

**Background/Purpose:** Steroids are the main therapy for chronic inflammatory diseases. They are very effective, but induce many side effects, such as osteoporosis, making it important that the dose steroids be reduced. However, some patients with chronic inflammatory disease may have difficulty tapering off steroids. It is thought that IL-6 might be involved in the steroid effects because elevated levels of IL-6 are found in these patients. Here, we elucidated the role of IL-6 in several effects of steroids using a collagen-induced arthritis (CIA) mouse model to examine the possibility of combination therapy.

**Methods:** To prepare a CIA model, DBA/1J mice were immunized intradermally with bovine type II collagen, and 21 days later (Day 21) once again given a booster injection. Mice were treated with the steroid prednisolone (PSL) intraperitoneally from Day 21 at doses of 1, 3, and 6 mg/kg five times a week or were administered with 8 mg of rat anti-mouse IL-6R monoclonal antibody (MR16-1) intraperitoneally once on Day 21. Another group was given a combination of the two from Day 21. Clinical symptoms of arthritis were evaluated by observation and expressed as an arthritis score on a scale of 0-4 for each limb. To assess the side effects of PSL, BMD was measured with DXA, and neutrophils and lymphocytes were quantified in blood using a symex system. Furthermore, synovial cells from CIA mice were cultured in the presence of dexamethasone (DEX) for 3 h after IL-6 pretreatment, and then COXII mRNA was quantified by real-time PCR.

**Results:** PSL dose-dependently reduced the arthritis score in the CIA model on the peak (Day 33) of arthritis. At the same time, neutrophil count was increased and lymphocyte count was decreased in a dose-dependent manner. MR16-1 in combination with low doses of PSL (1, 3 mg/kg) improved clinical symptoms significantly more than the same dose of PSL alone on Day 33 even though administration of MR16-1 alone resulted in no improvement. Interestingly, neutrophil and lymphocyte counts did not change and BMD was not reduced. To explore how MR16-1 could improve the anti-inflammatory effect of PSL, we next examined the influence of IL-6 on DEX activity in vitro. COXII expression was clearly suppressed by DEX, but IL-6 pretreatment attenuated the inhibitory effect of DEX.
Conclusion: We demonstrated that IL-6 blockade augmented the anti-inflammatory effect of PSL without changing BMD or neutrophil and lymphocyte counts in CIA mice. IL-6 blockade might make steroid tapering possible.

Disclosure: M. Suzuki, None; H. Yoshida, None; M. Hashizume, None; M. Shina, None; K. Tanaka, None; Y. Matsumoto, None.

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Low-Density Lipoprotein Receptor Deficiency Ameliorates the Development of Immunflammatory Arthritis. Shawn Rose and Harris R. Perlman. Northwestern University, Chicago, IL.

Background/Purpose: Patients with rheumatoid arthritis (RA) carry a higher risk of cardiovascular disease compared to the general population. The low-density lipoprotein receptor (LDLR) and Apolipoprotein E (ApoE) have been shown to modulate atherosclerosis and play a crucial role in the pathogenesis of RA-like disease. We hypothesized that IL-20, a pro-inflammatory cytokine expressed in RA, might stimulate IL-6 and TNF-α production, promoting inflammation, pain, and swelling of joints. However, it is not fully understood whether inhibition of IL-6 and TNF-α would reduce disease activity.

Methods: Two separate experiments in the mouse CIA model were conducted to test the effect of an anti-IL-20 antibody in the collagen-induced arthritis (CIA) model. Patients with CIA were treated with an anti-IL-20 antibody (NNC0109-0012) or PBS at day 10 and continued for 6 weeks. Disease activity scores, whereas administration of a TNFα inhibitor decreased disease activity. Histopathological evaluation revealed no effects of anti-IL-20 treatment on the collagen-induced arthritis (CIA) model. In contrast, atheroma development and on the formation of atherosclerotic lesions in arthritic mice. Here, we investigated the interaction between proinflammatory cytokines and the effector phase of RA-like disease in mice lacking ApoE. We demonstrated that IL-6 and TNF-α play a crucial role in bone loss of femurs caused by inflammatory arthritis in mice. However, in the lumbar spine, IL-6 is involved in bone loss but TNF-α is not. This suggests that blockade of IL-6 would have a beneficial effect on systemic osteoporosis in RA patients.

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IL-20 Is Not Involved in Mouse Collagen Induced Arthritis. Christina Andersson1, Kyle Sekikawa2, Hermann Pelzer3, Petter Thygesen4, Patricia Smith4, Kim Kruse5, Shameek Biswas6, Brian Fox6, Anders Milner7, Peter Kvist1, Josephine Hebsgaard1, Jesper Pass1, and John Romer1, Novo Nordisk, 1, Biopharmaceutical Research Unit, Novo Nordisk A/S, Måløv, Denmark, 2, Biopharmaceutical Research Unit, Novo Nordisk A/S, Seattle, WA.

Background/Profile: Interleukin-20 (IL-20) is a pro-inflammatory cytokine involved in the pathogenesis of rheumatoid arthritis (RA). Clinical phase 2a testing has shown that treatment with an anti-IL-20 monoclonal antibody (NNC0109-0012) reduces disease activity in patients with RA. In order to further explore the role of IL-20 in arthritis pathogenesis we have investigated the effects of a neutralizing anti-IL-20 antibody in the collagen-induced arthritis (CIA) model.

Methods: Two separate experiments in the mouse CIA model were conducted to test the effect of an anti-IL-20 antibody (5B7, human IgG4), which cross reacts with mouse IL-20. Two doses of 5B7 (1 and 10 mg/kg, 3× weekly for 6 weeks) were tested in a prophylactic setting with dosing from day 0 after immunization. Three doses of 5B7 (1, 10, and 40 mg/kg, 3× weekly for 3 weeks) were tested in a late prophylactic setting with dosing from day 21. Serum samples were collected for exposure analysis and to test for anti-drug antibodies and anti-collagen type II (CII) antibody levels. Paws were collected for histopathological evaluation. Overall mRNA expression profiles were assessed with RNA sequencing in paws from non-treated CIA mice with different degrees of disease.

Results: Prophylactic administration of anti-IL-20 5B7 starting from either day 0 or day 21 after immunization did not affect the clinical disease activity scores, whereas administration of a TNFα inhibitor decreased disease activity. Histopathological evaluation revealed no effects of anti-IL-20 treatment on the collagen-induced arthritis (CIA) model. In contrast, atheroma development and on the formation of atherosclerotic lesions in arthritic mice. Here, we investigated the interaction between proinflammatory cytokines and the effector phase of RA-like disease in mice lacking ApoE. We demonstrated that IL-6 and TNF-α play a crucial role in bone loss of femurs caused by inflammatory arthritis in mice. However, in the lumbar spine, IL-6 is involved in bone loss but TNF-α is not. This suggests that blockade of IL-6 would have a beneficial effect on systemic osteoporosis in RA patients.

Disclosure: C. Andersson, Novo Nordisk, 1, Novo Nordisk, 3; K. Sekikawa, Novo Nordisk, 1, Novo Nordisk, 3; H. Pelzer, Novo Nordisk, 1, Novo Nordisk, 3; P. Thygesen, Novo Nordisk, 1, Novo Nordisk, 3; P. Smith, Novo Nordisk, 1, Novo Nordisk, 3; K. Kruse, Novo Nordisk, 1, Novo Nordisk, 3; S. Biswas, Novo Nordisk, 1, Novo Nordisk, 3; B. Fox, Novo Nordisk, 1, Novo Nordisk, 3; A. Milner, Novo Nordisk, 1, Novo Nordisk, 3; J. Pass, Novo Nordisk, 1, Novo Nordisk, 3; J. Hebsgaard, Novo Nordisk, 1, Novo Nordisk, 1, Novo Nordisk, 3; J. Pass, Novo Nordisk, 1, Novo Nordisk, 3; J. Romer, Novo Nordisk, 1, Novo Nordisk, 3.
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Avß3 Integrin Inhibition with Cilengitide Both Prevents and Treats Collagen Induced Arthritis. Despoina Sykoutri1, Nisha Geetha1, Silvia Hayer1, Peter Mandl1, Josef S. Smolen1, Gerald Prager1 and Kurt Redlich1. 1Medical University of Vienna, Vienna, Austria, 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by synovial inflammation and osteoclast (OC) mediated bone erosions. Alpha_vBeta3 (avß3) integrin is highly expressed in osteoclasts and its inhibition disturbs their function. Avß3 blocking antibodies can reduce bone resorption and mice lacking ß3 are osteopetrotic. However, the role of avß3 in the development of collagen induced arthritis (CIA), a well established model for human RA, has not been examined extensively. We aimed to study the role of the avß3 inhibitor cilengitide, a synthetic Arginine-Glycine-Aspartic acid phosphate positive (TRAP+) mononuclear OC precursor cells (pre-OCs) and TRAP+ multinucleated mature OCs in the presence of macrophage-colony stimulating factor (M-CSF) and receptor activator of nuclear factor kappaB ligand (RANKL).

RESULTS: Cilengitide, was added in increasing concentrations (2nM to 20µM) to the cultured MC3T3-E1 cells, performed these osteoclastogenesis assays on plates coated with RGD containing matrix molecules such as osteopontin, fibronectin and fibrinogen but also on Poly-D-lysine coatings to assess for avß3 independent adhesion.

For in vitro analysis mouse bone marrow-derived cells (BMCs) were differentiated into tartrate resistant acid phosphatase positive (TRAP+) cells. In vivo experiments were performed with C57Bl6 mice with CIA induced arthritis. C57Bl6 were treated with cilengitide (1.5mg/kg) starting 1 day prior to CIA induction until day 53. In the CIA treatment study cilengitide (n=7) cilengitide or placebo (n=7) were evaluated by investigating the clinical course of arthritis assessed by paw thickness and grip strength.

RESULTS: In vitro increasing concentrations of cilengitide (IC50: 250nM) dose-dependently reduced pre-OC numbers on all plate coatings, indicating an inhibiting effect at the early stage of pre-OC proliferation. OCs were significantly reduced between 20nM and 200nM, followed by complete blockade of OC formation above 2µM. At 200nM an intriguing morphological difference was observed with reduction in OC size, suggesting that cilengitide may disrupt spreading and the fusion capacity at the early pre-OC stage. In in vivo preventive experiment, cilengitide significantly reduced incidence (92.8% vs. 40%) and severity of CIA as evidenced by the reduction of the clinical disease activity scores of paw swelling and grip strength. In the in vivo treatment experiment, both low dose and high dose cilengitide effectively inhibited the progression of established arthritis.

Conclusions: Osteoclastogenesis requires intact avß3 integrin function. Systemic avß3 integrin inhibition with cilengitide potently prevents and treats experimental CIA arthritis. Therefore, cilengitide may be a novel therapeutic target in RA.

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Peripheral and Local Effects of Anti-C5aR Treatment in the Collagen Induced Arthritis Model. Christina Andersson1, Carola Wenander, Penulle Usher, Josephine Hebsgaard and Lars Hornum, Biopharmaceutical Research Unit, Novo Nordisk A/S, Måløv, Denmark

Background/Purpose: The activated C5a-factor of complement plays a major role in inflammation and immune response. Blocking C5aR with specific antibodies or small molecules has been shown to reduce inflammation in vivo. However, the effect of C5aR antagonists on T cell inflammation has not been studied. Here, we investigated the effect of a specific small molecule inhibitor of cell cycle independent Cdk-9 inhibition on the collagen induced arthritis model.

Methods: DBA/1 mice were treated with 100ug bovine collagen type II at day 0 and day 21. During experiment mice were treated orally with high specific cdk-9 inhibitors (compound 1 and compound 2), either 10mg/kg daily or 10mg/kg and 30mg/kg twice a week, respectively. Clinical scoring was performed every second day during experiment and was followed by histological evaluation at end of experiment. Protein expression of Mcl-1 and survivin in spleens was determined by western immunoblotting. Flow cytometric analysis of regulatory T cells in spleens from arthritic mice following daily treatment as well as 7day treatment of healthy NMRI mice was performed.

Results: Peripheral blood monoclonal cells were incubated with compound 1 and 2 and induced apoptosis, as well as protein and RNA expression of Mcl-1 was investigated. Caspase-3 activity, LDH activity and Mcl-1 protein expression was assessed in human monocyte derived macrophages following incubation with compound 1.

Conclusion: This study demonstrates that C5aR blockade has a rapid effect on joint inflammation by down-regulation of pro-inflammatory mediators. This effect may be due to a direct effect on infiltrating myeloid cells, as C5a induces cytokine and chemokine release by macrophages and other cells. The effect on the circulating neutrophil number and activation stage indicate also a peripheral effect on target cells, suggesting that leukocyte activation and recruitment may also be targeted by C5aR blockade. The effects on peripheral cells may be used as biomarkers in human clinical trials. In conclusion, mechanistic data from the CIA model suggest that C5aR blockade is a potential novel treatment for arthritis that may elicit rapid clinical effects on both infiltrating and peripheral leukocytes.

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New Treatment Approach of Rheumatoid Arthritis Based On Inhibition of Cyclic Dependent Kinase-9. Anneline Hellvard1, Lutz Zeitlinmann1, Ulrich Heiser2, André Niestroj3, Hans-Ulrich Demuth3, Jan Potempa4 and Piotr Mydel1. 1Broegelmann Research Laboratory, The Gade Institute, University of Bergen, Bergen, Norway, 2Ingenium Pharmaceuticals GmbH, Martinsried, Germany, 3Probiobag AG, Halle/Saale, Germany, 4Jagiellonian University, Krakow, Poland

Background/Purpose: The problem of moderate and severe rheumatoid arthritis (RA) has remained challenging due to the complexity of the disease and the difficulty in designing treatments that achieve sustained remission. Cyclic Dependent Kinase-9 (cdk-9) is a transcription regulator of the cell cycle and has been shown to play a role in inflammation and the progression of RA.

Methods: To evaluate the potential of cdk-9 as a therapeutic target in RA, we designed a novel small molecule inhibitor that specifically targets cdk-9. This inhibitor was tested in vivo in a mouse model of RA to assess its efficacy in reducing joint inflammation.

Results: The cdk-9 inhibitor was shown to significantly reduce joint swelling and inflammation in the mouse model of RA. Furthermore, the inhibitor was able to reduce the expression of pro-inflammatory cytokines and chemokines, as well as the activation of immune cells. These findings suggest that cdk-9 inhibition may represent a promising new target for the treatment of RA.

Conclusion: The results of this study suggest that cdk-9 inhibition may be a promising new target for the treatment of RA. Further studies are needed to confirm these findings and to explore the potential of cdk-9 inhibitors as a novel class of RA therapeutics.

Disclosure: The authors report no conflicts of interest.

Tuesday, November 13
Results: Mice treated with compound compound 1 or compound 2 showed striking delay in onset as well as significant reduction in severity of arthritis. This effect was shown, not only in daily treatment but also in bi-weekly regime. Western blot of spleens showed decreased level of McI-1 in a dose dependent manner, whereas survivin levels were significantly increased. Flow cytometric analysis of splenocytes in arthritic- and healthy mice treated with inhibitors showed an increase in frequency of regulatory T cells.

Cdk-9 inhibition in peripheral blood mononuclear cells resulted in loss of McI-1 expression both on protein and RNA level with a subsequent increase in apoptosis. Down-regulation of McI-1 was also observed in monocyte derived macrophages with an activation of caspase-3.

Conclusion: This study provides clear results that inhibition of cdk-9 is working in an immunomodulatory manner, independent of high survivin expression and may in the future serve as an alternative treatment, not only of cancer, but also of autoimmune- and inflammatory diseases.

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ASPO15K: A Novel JAK Inhibitor Demonstrated Potent Efficacy in Adjuvant-Induced Arthritis Model in Rats. Shunji Yamazaki, Masanichichi Inami, Misato Ito, Yasutomo Fujii, Kaori Hanaoka, Kaoru Yamagami, Kenji Okuma, Yoshiaki Morita, Shohi Shirakami, Takayuki Inoue,Susumu Miyata and Yasuyuki Higashi. Astellas Pharma Inc., Tsukuba, Japan

Background/Purpose: The Janus kinase (JAK) family of enzymes plays a key role in cytokine signaling, which is involved in the pathogenic events of immune-mediated disorders such as rheumatoid arthritis (RA). The objectives of this study were to identify in vitro and in vivo pharmacological profiles of a novel synthesized compound, ASPO15K, and to evaluate its therapeutic potential in the treatment of RA patients using an experimental animal model.

Methods: In vitro enzyme inhibition assays were conducted against JAKs and tyrosine kinase 2 (TYK2) enzymes. Cell-based assays were also conducted to assess the selectivity of ASPO15K for signaling via JAK1/JAK3 over JAK2/JAK2. JAK1/3 activation was evaluated by interleukin (IL)-2-stimulated T cell proliferation; JAK2/2 action was evaluated by erythropoietin (EPO)-stimulated erythroleukemia cell proliferation. In order to evaluate the potential efficacy of ASPO15K to reduce clinical signs and symptoms of RA as well as disease progression, the reduction of paw swelling and ankle bone destruction in adjuvant-induced arthritic (AIA) rats were assessed after both prophylactic and therapeutic dosing regimens of ASPO15K. Dunnett’s and Steel’s multiple comparison tests were used to compare ASPO15K-treated groups with the control group of the paw volume and ankle bone destruction score, respectively.

Results: ASPO15K inhibited JAK1, JAK2, JAK3 and TYK2 enzyme activities with IC50 values of 3.9, 5.0, 0.71 and 4.8 nM, respectively. ASPO15K inhibited the IL-2-induced proliferation of human T cells with an IC50 value of 18 nM. Moreover, ASPO15K was 14-fold more potent against JAK1/3 than JAK2/2 on the basis of EPO-induced proliferation of human leukemia cells. This selectivity suggests that ASPO15K has the potential to demonstrate JAK1/3-mediated immunomodulatory effects without the occurrence of JAK2-mediated hematopoietic effects. In rat AIA model, the hind paw volume gradually increased starting 10 days after adjuvant injection and ankle bone destruction was established by day 25, the end of the experiment. After once-daily oral administration of ASPO15K 1 to 30 mg/kg in prophylactic dosing regimen, the increase in paw volume was significantly (p<0.05) decreased in a dose-dependent manner and was completely suppressed at the highest dose compared to control. Similar findings of dose-dependent reduction in ankle bone destruction score were observed. In therapeutic dosing regimens initiated after paw swelling was established, paw swelling and ankle bone destruction scores were also suppressed in a dose-dependent manner.

Conclusion: Data from the current study demonstrates that ASPO15K potently inhibits human JAK enzymes with moderate selectivity against JAK1/3 over JAK2/2, which may translate to less hematological side effects observed in the clinic such as anemia. In rat AIA model, ASPO15K demonstrated a dose-dependent reduction in paw swelling and suppression of ankle bone destruction scores after both prophylactic and therapeutic dosing regimens. The data suggests that ASPO15K has the potential to reduce clinical signs and symptoms as well as prevent disease progression in RA patients warranting further clinical investigation.


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T Cell-Mediated Murine Antigen-Induced Arthritis Is Resistant to Transgenic Disruption of Glucocorticoid Signaling in Osteoblasts and Osteoclasts in Vivo. Cornelia M. Spies1, Edgar Wiebe1, Jinwen W. Tu2, Aijing Li1, Timo Gaber1, Dörte Huscher1, Markus J. Seibel2, Hong Zhou3 and Frank Buttgeriet1. 1Charité University Medicine, Berlin, Germany, 2ANZAC Research Institute, The University of Sydney, Concord, Australia

Background/Purpose: The role of endogenous glucocorticoids (GC) in, and their contribution to the susceptibility and severity of rheumatoid arthritis remains inconclusive. We previously demonstrated that disruption of GC signaling in osteoblasts results in attenuation of arthritis in the antibody-mediated mouse model of K/BxN serum-induced arthritis (Buttgereit et al., Arthritis Rheum 2009). The aim of this study was to test whether GC-dependent osteoblast effects have a similar impact on the T cell-mediated model of antigen-induced arthritis (AIA).

Methods: GC signaling in osteoblasts was disrupted by transgenic overexpression of 11β-hydroxysteroid dehydrogenase type 2 (11β-HSD2) under the control of a type I collagen promoter. Arthritis was induced by intra-articular injection of mBSA into one knee joint of pre-immunised 11-week old male transgenic mice (tg) and their wild-type (WT) littermates. Controls received PBS. Knee joint swelling was assessed continuously for 14 days until the mice were sacrificed. The mice were examined by histology, histomorphometry, and micro-CT. In a part of the animals, arthritis was prolonged through three weekly repeated intravenous injections of mBSA until day 28. Statistical analysis was performed by repeated measures analysis.

Results: Acute and significant arthritis developed in both 11β-HSD2-tg and WT mice with maximum knee joint swelling on day 1 and abatement thereafter, with no significant difference in knee joint swelling between tg (n = 14) and WT mice (n = 17). Histological indices of inflammation, cartilage damage and bone erosion of WT and tg mice, respectively, accordingly showed no differences. Bone turnover and bone volume measured at the contralateral knee remained unchanged. In the prolonged AIA model with repeated intravenous antigen boosts, a significant arthritis with flares on days 7, 14 and 21 was achieved, but also without significant differences between tg mice (n = 7) and their WT littermates (n = 8) and corroborating histological findings.

Conclusion: In contrast to K/BxN serum-induced arthritis, murine antigen-induced arthritis is resistant to disruption of GC signaling in osteoblasts. This suggests that osteoblasts do not modulate the T cell-mediated inflammatory response but the antibody-mediated inflammatory response (complement, Fc receptors, neutrophils, monocytes/macrophages) via a GC-dependent pathway.

Disclosure: C. M. Spies, None; E. Wiebe, None; J. W. Tu, None; A. Li, None; T. Gaber, None; D. Huscher, None; M. J. Seibel, None; H. Zhou, None; F. Buttgeriet, None.

2086

PI3-Kinase Controls Inflammatory Bone Destruction by Regulating the Osteoclastogenic Potential of Myeloid Cells. Stephan Bluemel1, Gernot Schabbauser2, Antonia Puchner1, Emine Sahin2, Victoria Saferding1, Birgit Niederreiter1, Josef S. Smolen3 and Kurt Redlitch1. 1Medical University of Vienna, Vienna, Austria, 2Medical University Vienna, Vienna, Austria, 3Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: Local bone destruction in rheumatoid arthritis, psoriatic arthritis or ankylosing spondylitis is a serious health burden and the major cause of disability and severely reduced quality of life in these diseases. This damage to the bony structures is exclusively mediated by a special cell type, the osteoclast (OC). Therefore, it is important to understand factors and pathways regulating the generation of OCs under inflammatory conditions. As PTEN is a lipid phosphatase and one of the main antagonists of the PI3-kinase, we analyzed the impact of the PI3-Kinase/PTEN axis on OC formation and bone biology in an animal model of inflammatory bone loss.

Methods: We induced osteoclastogenesis in wt and PTEN deficient bone marrow cells and measured the generation of OCs, their resorptive capacity and induction of OC differentiation markers in vitro. Moreover, we analyzed mice with a monocye/macrophage-specific deletion of PTEN (myeloid specific PTEN^−/−) by bone histomorphometry and crossed these mice into hTNFtg animals.

Results: We show that myeloid specific PTEN^−/− mice have increased osteoclastogenesis in vitro and in vivo when compared to wild-type animals. However, under non-inflammatory conditions, enhanced osteoclastogenesis did not result in systemic bone loss in vivo. However, when we crossed myeloid specific PTEN^−/− mice, we found significantly decreased grip strength scores in myeloid specific PTEN^−/−/hTNFtg mice compared to wt hTNFtg mice. Joint swelling scores, however, were not different between both groups. In line, myeloid specific PTEN^−/−/hTNFtg mice displayed enhanced local bone destruction as well as OC formation in the inflamed joints, whereas the extent of synovial inflammation was not different between the groups. Analysis of the synovial membranes of wt and myeloid specific PTEN^−/− animals revealed similar relative compositions of the cellular infiltrate including macrophages, which serve as OC precursors. This suggests that increased capacity for osteoclastogenic differentiation rather than enhanced recruitment of precursor cells is responsible for the enhanced local generation of OCs.

Conclusion: Taken together, these data demonstrate that sustained PI3-Kinase activity in myeloid cells specifically elevated the osteoclastogenic potential of these cells, leading to enhanced inflammatory local bone destruction. Therefore, targeting the PI3-Kinase pathway therapeutically may be especially useful for the prevention of structural joint damage.

Disclosure: S. Blumel, None; G. Schaabauer, None; A. Puchner, None; E. Sahin, None; V. Saferding, None; B. Niederreiter, None; J. S. Smolen, None; K. Redlich, None.

2087

Regulatory Effect of the Combination of Methotrexate and 1,25-Dihydroxyvitamin D3 on the Balance of Treg and Th17 in Collagen-Induced Arthritis. Jing Luo, the Second Hospital of Shanxi Medical University, Taiyuan, China

Background/Purpose: 1,25-dihydroxyvitamin D3 (1,25-(OH)2D3) is the physiologically active metabolite of vitamin D, and it may modulate inflammatory response, cell maturation and cell differentiation. More recently, animal and human studies have suggested that vitamin D is a potential modifier of autoimmune diseases such as rheumatoid arthritis (RA), but the mechanism is not yet clear. In this study, we aimed to determine the effect of methotrexate (MTX) and 1,25-(OH)2D3, used alone or in combination, in the balance of CD4(+)/CD25(+) Tregs and CD4(+)/CD25(-) Th17, in a rat model of collagen-induced arthritis (CIA).

Methods: Arthritis was induced in 50 female Sprague-Dawley rats. After the clinical onset of CIA, rats were assigned to treatment with MTX (1 mg/kg/week), 1,25-(OH)2D3 (5 mg/kg twice weekly), both treatments at the clinical onset of CIA, rats were assigned to treatment with MTX (1 mg/kg/week), 1,25-(OH)2D3 (5 mg/kg twice weekly), both treatments at the clinical onset of CIA.

Results: From day 0 to 4, the ratio of Tregs in the MTX group was significantly increased compared to the control group. MTX and 1,25-(OH)2D3 significantly decreased the ratio of Th17 cells in the treated group.

Conclusion: A combination of MTX and 1,25-(OH)2D3 had beneficial effects on CIA by regulating the balance of CD4(+)/CD25(+) Tregs and Th17. These two different mechanisms of action provide support for the use of a combination of these two drugs to improve the prevention of structural joint damage in RA.

Disclosure: J. Luo, None.

2088

Annexin A1 Receptor Agonist Suppresses Development of Inflammatory Arthritis. Yuan Hang Yang1, Yuan Jia2, Wenping Kao3, Wuqi Song1, Zhan-guo Li1,2 and Eric F. Morand1,11Monash University, Melbourne, Australia, 2Peking University People’s Hospital, Beijing, China, 3Harbin Medical University, Harbin, China

Background/Purpose: Annexin A1 (AnxA1) is recognized as an endogenous anti-inflammatory molecule. AnxA1 receptor, formyl-peptide receptor 2 (FPFR2), has been identified in human and mice. The contribution of FPFR2 to rheumatoid arthritis (RA) is not well understood. We investigated the contribution of AnxA1 and FPFR2 to the regulation of inflammatory arthritis.

Methods: Arthritis was induced by injection of K/B×N serum (35μl/mouse, ip) in wild-type or AnxA1^−/− mice at day 0 and 2. Wild-type mice were treated with Compound 43, an agonist of FPFR1/2, at 6–30μg/g on days 0–4. RA synovial fi like fibroblasts (FLS) were treated with FPFR2 ligand or antagonist compounds, and AnxA1 was silenced using siRNA.

Results: Deficiency of AnxA1 significantly increased arthritis clinical and histopathological severity. Treatment of wild-type mice with Compound 43 dose-dependently and significantly suppressed clinical scores (Fig 1A), paw thickness (Fig 1B) and histopathological score. AnxA1 silencing increased RAFLS proliferation, ERK and NFKB activation. RAFLS expressed FPFR2, and an FPFR ligand inhibited proliferation while, blocking FPFR2 significantly increased proliferation, ERK and NF-κB activation, and IL-6 release.

Conclusion: Compound 43 was potently therapeutic in K/B×N arthritis and FPFR2 regulates RAFLS activation. These data suggest that FPFR2 ligands may have important beneficial actions on RA.

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2089

High Local Cathepsin Activity in a Murine Rheumatoid Arthritis Model, but Not in an Osteoarthritis Model. Explains the Difference in Cartilage Viability Neoeitope Formation. Eline A. Vermeij, Marije I. Koenders, Onno J. Arntz, Miranda B. Bennink, Arjen B. Blom, Peter L.E.M. van Lent, Wim B. van den Berg and Fons A.J. van de Loo, Rheumatology Research and Advanced Therapeutics, Department of Rheumatology, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

Background/Purpose: Rheumatoid arthritis (RA) is an autoimmune disease characterized by joint inflammation and connective tissue destruction. On the other hand, osteoarthritis (OA) is regarded as a joint disease with cartilage destruction, but the role of inflammation in OA is still debatable. During joint inflammation and destruction, a variety of proteases are upregulated, including different cathepsins and matrix-metalloproteinases (MMPs). MMPs are a large group of enzymes known to degrade the extracellular matrix during both RA and OA, causing cartilage proteoglycan depletion and breakdown of the collagen network, leading to erosion. Cathepsins are lysosomal proteases which are abundantly found in the synovial fluid and the lining tissue of arthritic joints. In this study we investigated cathepsin and
MMP activity in the process of cartilage destruction, in both a RA and an OA model.

Methods: Collagen-induced arthritis (CIA) was induced in DBA/1J mice, mimicking a RA model. Destabilization of the medial meniscus (DMM) was induced in C57BL/6J mice causing instability of the joint and subsequently osteoarthritic features. For the CIA model at day 30 and for the DMM model at day 56, fluorescent imaging was performed using Sense 680 probes (PerkinElmer, Massachusetts, USA) and enzyme activity was detected using the IVIS Lumina (Caliper Life Sciences). The ProSense 680 probe becomes activated upon enzymatic cleavage by cathepsins, whereas the MMPSense 680 can be activated by different MMPs. After imaging, mice were sacrificed and knee and ankle joints were dissected and processed for histology. Sections were also immunostained for VDIPEN, a neoepitope of aggrecan cleaved by MMPs.

Results: The ProSense as well as the MMPSense showed a 3 times higher fluorescent signal intensity during CIA, indicating both cathepsin and MMP activity in this model. Interestingly, on the other hand, only MMP activity (1.5 times higher), but no cathepsin activity, could be measured in the DMM model. On histological level, although different in severity, the CIA model and the DMM model both showed features of cartilage damage. In the CIA model, more VDIPEN staining was seen with increasing severity of the disease; on the other hand, in the DMM model no VDIPEN staining was seen above baseline levels.

Conclusion: In the CIA model, inflammation and destruction are correlated, while the DMM model showed MMP activity without inflammation. Mort et al. (1998) showed that cathepsin-B can also cleave aggrecan, and can thereby form the VDIPEN neoepitope. Because no cathepsin activity could be measured in the DMM model, this can explain the absence of the VDIPEN neoepitope. This argues for a role of cathepsins in cartilage destruction but their role in CIA remains to be determined. Combining the imaging of local enzyme activity using activatable fluorescent probes together with cartilage neoepitope immunolocalization may unravel the processes involved in joint destruction.

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2090

Orchestrating the Orchestrators: Blockade of Flt3L Signaling-Dependent Dendritic Cells Protects Against Collagen Induced Arthritis.

Maria I. Martins Ramos1, Karpus O.N. Karpus1, Pleun Broekstra2, Saida Aarras2, Paul P. Tak1 and Maria C. Lebre1, 1Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands, 2Academic Medical Center, University of Amsterdam and GlaxoSmithKline, Amsterdam, Netherlands

Background/Purpose: Autoimmune diseases often result from inappropriate or unregulated activation of autoreactive T cells. The induction and maintenance of self-tolerance to tissue antigens is essential for preventing autoimmunity. A key requirement for tolerance is the presentation of antigens in a correct context. Dendritic cells (DCs) are the central antigen-presenting cells (APCs) for the initiation of T cell responses. In this context, stimulation of the Flt3 via Flt3L is known to drive expansion and differentiation of DCs. Traditional approaches to treatment of autoimmune diseases through immunosuppression have focused on direct inhibition of T cells. Stimulation of Flt3 in T cells also produce significantly less IL-17 (p=0.016) and TNF-α (p=0.010), and CD8+ T cells less IFN-γ (p=0.029) compared to WT. We also observed less infiltration of inflammatory cells and less peptidoglycan loss.

Conclusion: Mice lacking Flt3L are protected from CIA. We observed that Flt3L deletion influences the magnitude (cell numbers) and quality (CD25 expression and cytokine expression) of T cell responses. Stimulation of lymphocytes by different types of DC, DC at different stages of maturity and producing and responding to different growth factors might contribute for the changes in T cell numbers and/or effector functions in Flt3−/− mice. Targeting this signaling pathway might be considered as a good therapeutic strategy in RA.

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2091

The Effect of Pretreatment with Capsaicin On Measurement of Arthritis Pain by Dynamic Weight Bearing and Evoked Pain Responses in an Acute Murine Arthritis Model. Hollis E. Krug1, Christopher W. Dorman2, Sandra Frizelle2 and Maren L. Mahowald3, 1VA Health Care System, Minneapolis, MN, 2Minneapolis VA Health Care System, Minneapolis, MN, 3University of Minnesota Medical School and Minneapolis VA Health Care System, Minneapolis, MN

Background/Purpose: Murine models are important to study arthritis pain and new analgesics, however measuring pain in mice is challenging. The Dynamic Weight Bearing (DWB) device measures individual limb forces during spontaneous activity and time spent bearing weight on each limb. Evoked pain behaviors in mice are sensitive to change due to arthritis pain and analgesia. We hypothesized that mice with acute arthritis would have measurable changes in DWB due to joint pain and that this could be prevented by pre-treating with intra-articular (IA) capsicain.

Objectives: We measured DWB and Evoked Pain Scores (EPS) in acute arthritis to determine if DWB correlates with EPS and whether it is a reliable measure of spontaneous pain behavior in animals with arthritis. To test the reliability of DWB in differentiating arthritic from nonarthritic animals, some mice were pretreated with capsicain to prevent development of arthritis.

Methods: C57Bl6 mice were used for all experiments. Acute inflammatory arthritis was produced by IA injection of 10μl 2.5% carrageenan into the left knee 2–4 hours prior to pain behavior testing. Analgesic controls were injected with 2.5% carrageenan diluted in morphine (MOR) solution (morphine dose of 0.15mg/kg). Some mice were injected IA with capsicain (0.305 nmol) 7 days before induction of arthritis. DWB was measured with a Dynamic Weight Bearing apparatus (Bioseb, Vitrolles, France). Evoked pain behavior was measured by tailing fights + vocalizations/l min with repeated firm palpation of the knee.

Results: Arthritis pain was clearly and reproducibly indicated by increased Evoked Pain Scores (EPS) in arthritic mice. DWB was significantly reduced by acute arthritis in the affected limb measured by both % weight bearing and time on the affected limb. IA MOR improved EPS but did not improve DWB significantly. Pretreatment with capsicain abolished the increased EPS from carrageenan arthritis and normalized DWB by all measures. IA capsicain injection alone had no effect on DWB or EPS by day 7.

Conclusion: Pain can be quantitated in murine arthritis models using measures of DWB and EPS. EPS increased and DWB of the affected limb decreased significantly with acute inflammatory arthritis. Animals pretreated with capsicain did not develop pain as measured by EPS or DWB. IA MOR was not effective in normalizing DWB in this small experiment, but was effective in reducing EPS in arthritic mice. DWB appears to have significant utility for measuring arthritis pain in animal models. It is sensitive to change, has good reproducibility between mice and is highly correlated with other measure of arthritis pain in mice.

Disclosure: H. E. Krug, None; C. W. Dorman, None; S. Frizelle, None; M. L. Mahowald, None.
2092

No Significant Effect of Hepatitis B Virus Infection On Disease Activity, Synovitis or Joint Destruction in Rheumatoid Arthritis. Chan Juan Zou, Yan Hua Li, Ying Qian Mo, Lang Jing Zhu, Dong Hui Zheng, Jian Da Ma, Xiu Ouyang and Lie Dai. Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University, Guangzhou, China

Background/Purpose: The prevalence of chronic hepatitis B virus (HBV) infection is high in China. 4% patients with HBV infection can present with polyarthritides and positive rheumatic factor similar to RA, which implied similar pathogenic mechanism. We aimed to investigate the association between HBV infection and serological, radiological or histological disease status in RA.

Methods: 223 continuous hospitalized Chinese patients with RA were enrolled retrospectively. Clinical and laboratory data including HBV detection, and hand X ray were collected. Among 133 active RA patients, synovium was obtained by closed-needle biopsy from inflamed knee joint. Serial tissue sections were stained immunohistochemically for HBV surface antigen (HBsAg), CD79a, CD20, CD38, CD68, CD3, and CD34. Densities of positive-staining cells and synovitis score were determined.

Results: According to HBV infection status, 25/223 had chronic HBV infection (including 4 chronic hepatitis B and 21 HBV carriers), 72/223 had past HBV infection and 126/223 had no HBV infection. The prevalence of HBsAg positivity and chronic hepatitis B in RA was 11.2% and 1.7%, not significantly different with age-matched general Chinese population (8.7% from 2006 Chinese national epidemiological survey and 1.0% from 2005 local survey, respectively, 0.05). Clinical parameters, DAS28 or Sharp scores showed no significant difference among chronic HBV infection, past HBV infection and no HBV infection groups in 206 active RA or 140 active RA patients without any corticosteroid or DMARDs treatment (all 0.05). Synovial immunohistochemical staining showed negative HBsAg in 10 HBV carriers and 10 past HBV infection patients. Except for higher sublining CD3+ cell density in past HBV infection group, Kremp’s synovitis score, mean densities of sublining positive-staining cells (CD20, CD38, CD79a and CD68) and CD34+ microvesicle counts showed no significant difference among RA patients with HBV carrier, past HBV infection or no HBV infection (all 0.05).

Conclusion: The prevalence of HBV infection in RA patients was consistent with general Chinese population. Chronic HBV infection have no significant effect on disease activity, synovitis or joint destruction in RA, implying that chronic HBV infection may play neither promotive nor protective role in RA.

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2093

Rates of Opportunistic Infections Among Rheumatoid Arthritis Patients Receiving Biologic Therapy. John Baddley, Shuo Yang, Kye Briindzen, Scott DuVal, Kevin L. Winthrop, Mary J. Burton, Nivedita M. Patkar, Elizabeth S. Delzell, Monika M. Safford, Javaid A. Singh, Iris E. Navarro, Grant W. Cannon, Ted R. Mikuls, Lang Chen, Kimberly Alexander, Pavel Nalpakov, Aaron Kamasa and Jeffrey R. Curtis. University of Alabama at Birmingham, Birmingham, AL, VA Salt Lake City Hospital Care System and University of Utah School of Medicine, Salt Lake City, UT, Oregon Health & Science University, Portland, OR, VA Hospital, Jackson, University of Alabama-Birmingham, Birmingham, AL, George E. Wahlen VA Medical Center, Salt Lake City, UT, University of Nebraska Medical Center, Omaha, NE, Genentech, Inc., San Francisco, CA, Anolinx, Bountiful, UT

Background/Purpose: The incidence of opportunistic infections (OIs) in patients on biologics is low, but may approach several cases per 100 person-years (PY). Data on risk of OIs associated with newer biologics and in those switching biologics among rheumatoid arthritis (RA) patients are limited.

Methods: Using data from 1998–2011 from the U.S. Veteran’s Health Administration we identified a cohort of rheumatologist-diagnosed RA patients (n=36,433). Patients eligible for this analysis started anti-TNF therapy (adalimumab, infliximab, etanercept) after previous anti-TNF exposure, or rituximab (RTX) or abatacept (ABA). To minimize confounding from channeling of patients to certain biologics, those patients with a history of hematologic malignancy in the past year were excluded. Potential OIs were identified using ICD-9 codes and/or available laboratory results (cultures, serology). With the exception of zoster, where ICD-9 code alone identified OIs, all other OIs were confirmed by chart review using standardized case definitions. Patients were censored at first OI event. Baseline co-morbidities were defined in the 1-year period prior to treatment initiation. Exposure was “treated” on the basis of days supply or usual dosing calculations. Exposure was extended 60 days after the end of the day’s supply; RTX exposure was assumed to be 12 months after infusion. Frequencies of OIs were calculated and crude OI incidence rates were estimated using a Poisson distribution.

Results: A total of 2917 unique RA patients contributed 3774 treatment episodes (ABA 338; RTX 511, TNFs 2925). Two-thirds of TNF use was adalimumab. Mean age of the cohort was 60.8 ± 10.7 years, 87% were male, hypertension (55.5%), diabetes (25.6%) and COPD (14.2%) were common. Overall, 84 OIs (2.9%) in 2917 patients were identified, yielding an overall rate of 1.5 (95% CI 1.2, 1.9) OIs per 100 PY (Table). The most common OIs were zoster, rate 1.17 (0.9, 1.5) per 100 PY and tuberculosis, rate 0.05 (0.02, 1.6) per 100 PY. Crude rates of OIs per 100 PY among TNFs, ABA and RTX users were 1.5 (1.2, 1.9); 1.1 (0.4, 2.6), and 1.8 (1.0, 3.2), respectively. Among TNFs, rates per 100 PY were infliximab 0.8 (0.3, 2.1), adalimumab 1.6 (1.2, 2.2) and etanercept 1.6 (1.0, 2.5). For the 19 confirmed OIs other than zoster, 7 (37%) were identified by screening lab data and were not identified by ICD-9 codes.

Table. Frequency of Physician-Confirmed Opportunistic Infections by OI by Biologic Exposure

<table>
<thead>
<tr>
<th>Opportunistic Infection</th>
<th>Abatacept</th>
<th>Adalimumab</th>
<th>Etanercept</th>
<th>Infliximab</th>
<th>Rituximab</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoster</td>
<td>5</td>
<td>16</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pneumocystis</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Leprosy</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Coccidioidesmosis</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hepatitis</td>
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<td>1</td>
<td>0</td>
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<tr>
<td>Non-tuberculosis mycobacteria</td>
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<td>1</td>
<td>1</td>
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<tr>
<td>Salmonellosis</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Nocardiosis</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total OIs</td>
<td>4</td>
<td>44</td>
<td>19</td>
<td>4</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>100 PY CI per 100 persons (1-2.0)</td>
<td>1.6 (1.2, 2.2)</td>
<td>1.6 (1.0, 2.5)</td>
<td>0.8 (0.3, 2.3)</td>
<td>1.8 (1.0, 3.2)</td>
<td>1.5 (1.2, 1.9)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: In US veterans with RA, overall crude OI rates were low and similar among biologics. The most common OI was zoster. The availability of serologic and culture data for OI screening yielded a meaningfully higher proportion of OI cases compared to administrative data alone.

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Reactivation of Hepatitis B Virus in Autoimmune Disease Patients Receiving Immunosuppressive Agents. Daisuke Kobayashi, Satoshi Ito, Megumi Unno, Ichiro Narita and Akira Murasawa. Niigata Rheumatic Center, Niigata, Japan, Niigata University Graduate School of Medical and Dental Sciences, Niigata, Japan

Background/Purpose: Reactivation of resolved hepatitis B in patients undergoing immunosuppressive therapy is now considered to be a complication of major clinical importance. Because this is still an emerging concept, the majority of our patients with autoimmune disease have been tested only for hepatitis B surface antigen (HBsAg), and not for hepatitis B surface antibody (anti-HBs) or hepatitis B core antibody (anti-HBc) in our country.
We evaluated the prevalence of previous infection of hepatitis B virus (HBV) in patients with autoimmune disease and the incidence of its reactivation.

**Methods:** We enrolled 318 patients (63 males, 255 females) with autoimmune disease, who were receiving, or were scheduled to receive, immunosuppressants at our hospital. The immunosuppressants included methotrexate (MTX), tacrolimus (TAC), mizoribine (MZK), prednisolone (PSL) at over 30 mg/day, azathioprine (AZ), cyclosporine (CyA), cyclophosphamide (CP), bucillamine, indinavir (IND), rituximab (RTX), ibudabuc (IBA), adabatcept (ABA). Patients underwent HBV serological examination including HBsAg, anti-HBs, and anti-HBe. When HBsAg, anti-HBs and/or anti-HBe were positive, HBV-DNA was measured once a month using a real-time polymerase chain reaction assay. Clinical data were examined by reviewing the medical records.

**Results:** Among the 318 patients, 4 were HBsAg positive and the rest were HBsAg negative; 61 patients were anti-HBs positive and 70 were anti-HBe positive. Eighty patients (rheumatoid arthritis (RA) 72, systemic lupus erythematous (SLE) 4, adult-onset Still’s disease 1, polymyositis 1, polymyalgia rheumatica 1, juvenile rheumatoid arthritis 1) showed HBsAg negative and anti-HBs and/or anti-HBe positive serology, indicating previous HBV infection. Among these patients, 72 had already been treated with immunosuppressive agents as monotherapy or in combination (MTX 42, TAC 25, MZR 11, high-dose PSL 5, AZ 3, CyA 1, CPA 1, ETN 9, IFX 7, TJC 4, ADA 1, ABX 1) for 43.9 ± 44.4 months (range 4–248 months, median 32 months) before evaluation of anti-HBs and anti-HBe without developing acute hepatitis. Another 8 patients were scheduled to begin immunosuppressive therapy. Among patients with past HBV infection, 5 were positive for viral replication (>2.1 log copies/mL). The first of these patients had SLE, and the other four had RA. Among them, a patient was treated with high-dose PSL and CPA. She was HBsAg negative at the start of immunosuppressant therapy, but 3 months later HBV-PCR increased to 7.9 log copies/mL, and HBsAg became weakly positive with elevation of the transaminase level. The second patient was treated with 3 mg/day TAC, 150 mg/day MZ and 5 mg/day PSL, and the third with 3 mg/day TAC and 5 mg/day PSL. Two patients who were treated only with sulfasalazine and bucillamine, showed reactivation of HBV in the absence of immunosuppressant.

**Conclusion:** Reactivation of HBV sometimes occurs without MTX or biological agents. Patients in whom hepatitis B infection has serologically been resolved, need to be monitored carefully even when receiving immunosuppressants other than MTX, or biological agents.

**Disclosure:** D. Kobayashi, None; S. Ito, None; M. Unno, None; I. Narita, None; A. Murasawa, None.

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**2095**

**Identifying Arthralgia Patients At Risk for Rheumatoid Arthritis in the Rotterdam Early Arthritis Cohort:** M. van der Veer,1 D. van Zepen,2 A.E.A.M. Weel,1 P.J. Barendregt,1 A.H. Gerards,4 J. M. W. Hazes3 and J. J. Luime, None.

**Background/Purpose:** Patients with rheumatoid arthritis (RA) frequently have a high disease burden and erosions at first presentation because of the insidious nature of the disease. Previous studies showed that early recognition and initiation of therapy lower the risk for developing erosive disease and leads to a better quality of life. Our aim is to identify predictive features in patients at risk for rheumatoid arthritis when inflammatory joint complaints are present but before synovitis is observed.

**Methods:** We used data from the Rotterdam Early Arthritis Cohort (REACH). Patients with two or more joints with pain or loss of movement with two or more of the following criteria: morning stiffness for more than 1 hour; unable to clenches a fist in the morning; pain when shaking someone’s hand; pins and needles in the fingers; difficulties wearing rings or shoes; a family history of RA; unexplained fatigue for less than 1 year were eligible.

**Results:** 458 patients fulfilled the REACH criteria without synovitis at baseline. After 12 months 40 patients developed arthritis (8.7%), 34 out of those 40 developed arthritis within the first six months (85%). Rheumatoid arthritis was diagnosed 16 times in the arthritis group (40%). A predictor for developing arthritis was positive ACPA (OR 10.5, 95% CI 4.5–24.5). In the 28 ACPA positive patients at baseline, 12 patients developed arthritis (43%), after 12 months 16 patients were still free from arthritis. Increasing ESR was the second predictive feature (OR 1.06 per point ESR, 95% CI 1.03–1.09). RF was a less strong predictor (OR 2.86, 95% CI 1.08–7.52). No difference was observed for age, gender, tender joint count, symmetry of joint complaints, distribution of joints in a rheumatoid arthritis pattern, smoking, education level, VAS and CRP.

**Conclusion:** In patients with inflammatory joint complaints, raised ESR and positive ACPA both predicted the development of arthritis within 12 months. Therefore, we advise to monitor patients with inflammatory joint complaints with positive ACPA or/and raised ESR carefully.

**Disclosure:** M. van der Veer, None; D. van Zepen, None; A. E. A. M. Weel, None; P. J. Barendregt, None; A. H. Gerards, None; J. M. W. Hazes, None; J. J. Luime, None.

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**2096**

**A Prediction Rule for the Progression to Rheumatoid Arthritis Applied in a Mexican Mestizo Cohort with Undifferentiated Arthritis.** Ana Arana Guajardo, Lorena Perez Barbosa, David Vega Morales, Janett Riega Torres, Roberto Negrete Lopez, Jacqueline Rodriguez Amado, Jorge Esquivel Valero, Cassandra Skinner Taylor, Diana Flores Alvarado, Dionicio Galarza Delgado, Miguel Villarreal Alarcon and Mario Garza Elizondo, University Hospital, UANL, Monterrey, Mexico.

**Background/Purpose:** A high proportion of patients who present with recent-onset arthritis have undifferentiated arthritis (UA), as these patients do not fulfill the classification criteria for a specific diagnosis. Several cohort studies in UA have used predictive score models to screen patients at risk to develop rheumatoid arthritis (RA). Our objective is to validate the Leiden Prediction Rule (LPR) in an inception cohort of patients with UA.

**Methods:** We included patients with UA diagnosed from 2008 to 2011, mostly from a community based epidemiological study (COPCORD), who met the following characteristics: >18 years old, at least 1 swollen joint, with a symptom duration of >1 week to 1 year. We excluded patients with pregnancy or with well-defined inflammatory disease. During one year the patients were followed every 2 months. We applied the LPR at the first visit, which includes sex, age, morning stiffness, disease distribution, painful and swollen joints, C-reactive protein (CRP), rheumatoid factor assay (RF) anti-cyclic citrullinated peptide (anti-CCP) antibodies; in each visit they were evaluated for clinical signs of inflammation including the metacarpophalangeal (MCP)/metatarsophalangeal (MTP) squeeze test (ST). Subsequently we reclassified patients a year after their diagnosis of UA. The diagnosis of RA was made according to 1987 ACR classification criteria. Statistical Analysis. The results were expressed as means and standard deviations. The groups were compared with Mann Whitney U test. Chi-Square test was applied for categorical variables. The association between MCP/MTP ST and LPR was established by relative risk (RR) with a confidence interval (CI) of 95%.

**Results:** We included 47 patients with UA, with a mean age of 51.6 years ± 9.5 SD, 98% were females. One year after diagnosis, the patients were reclassified as follows: RA 20(43%), and non-RA which included: persistent UA 12(25%), other inflammatory arthritis 9(19%) and spontaneous remission 6(13%). There were no statistical differences between the groups on the number of swollen or painful joints (p = 0.576 and p = 0.564, respectively) or titers of CRP, RF and anti-CCP antibodies (p = 0.754, p = 0.29, respectively). In patients who progressed to RA, LPR was ≥ 8 points in only 15% (3 patients), while 85% (17 patients) had <8 points in LPR. When we compared the score obtained from LPR between groups, we did not find any significant difference (p = 0.940). We found an association between the MCP/MTP squeeze test (ST) and patients who progressed to RA, RR 1.74; 95% CI [0.92 – 3.28] on MCP ST and RR 2.99; 95% CI [1.12 – 7.61] on MTP ST.

**Conclusion:** A proportion of 43% of our patients with UA had progression to RA after 1 year of follow-up; 100% patients who scored >8 points in the LPR progressed to RA. These proportions are similar to the data published previously from other UA cohorts. Notably, an important difference is the 56% of patients who progressed to RA with a score <6 points on LPR compared to the Leiden cohort were it was less than 10%. We did find that the presence of pain during the MCP/MTP squeeze test is associated with the progression of RA.

**Disclosure:** A. Arana Guajardo, None; L. Pérez Barbosa, None; D. Vega Morales, None; J. Riega Torres, None; R. Negrete Lopez, None; J. Rodriguez Amado, None; J. Esquivel Valero, None; C. Skinner Taylor, None; D. Flores Alvarado, None; D. Galarza Delgado, None; M. Villarreal Alarcon, None; M. Garza Elizondo, None.
Adiponectin is Associated with Pro-Inflammatory Cytokines in Autoanti-
tibody Positive First-Degree Relatives (FDRs) of Patients with Rheuma-
toid Arthritis. Jan M. Hughes-Austin1, Kevin D. Deane2, Lelizie A. Derber3, Gary O. Zerbe4, Dana M. Dabelea5, Jeremy Sokolove6, William H. Robin-
son7, V. Michael Holers2 and Jill M. Norris6. 1Colorado School of Public Health / University of Colorado Anschutz Medical Campus, Aurora, CO, 2University of Colorado School of Medicine, Aurora, CO, 3University of Colorado Anschutz Medical Campus, Aurora, CO, 4VA Palo Alto Health Care System and Stanford University, Palo Alto, CA, 5Stanford University, Palo Alto, CA, 6Colorado School of Public Health, Aurora, CO

Background/Purpose: While adiponectin is generally considered an anti-inflammatory adipokine, it has also been shown to participate in active RA in inflammatory, matrix-destructive and fibrotic processes leading to joint destruction. Because adiponectin’s role as a pro- or anti-inflammatory adipokine has been controversial in situations of autoimmunity and chronic inflammation, we sought to determine the relationship of adiponectin to rheumatoid arthritis (RA)-related autoantibodies and markers of inflammation in a population without RA, but at increased risk for future development of the disease.

Methods: We selected all visits of 113 FDRs who were positive for rheumatoid factor (RF), RF isotypes IgM, IgG, IgA, or anti-cyclic citrullinated peptide (anti-CCP) at least once, and 100 FDRs who were never autoantibody positive. In blood obtained from these 391 visits, we measured cytokines/chemokines, high-sensitivity C-reactive protein (hsCRP), and adiponectin. As a comprehensive measure of inflammation, we calculated a Cytokine Score by summing all cytokine/chemokine levels, weighted by their regression coefficients for RA-autoantibody association. We first compared the effect of adiponectin on two autoantibody phenotypes: positivity for RF, and positivity for the high-risk autoantibody profile (HRP) (positive for anti-CCP2 and/or ≥ 2 RF isotypes) that we have shown in previous work to be highly specific (>96%) for future RA; and then tested the interaction between autoantibodies and adiponectin on markers of inflammation using mixed models to account for multiple samples per FDR. All analyses were adjusted for age, sex, ethnicity, body mass index, pack-years of smoking, a delay in sample processing, and current use of statins.

Results: Adiponectin was not associated with either RF (p = 0.44) or HRP (p = 0.60) positivity. Adiponectin was inversely associated with hsCRP (β = 0.31 ± 0.10; p = 0.002) and IL-6 (β = 0.21 ± 0.10; p = 0.044). The relative variance in TNF-α, GM-CSF, and IL-8 Cytokine Score differed by HRP status, where a 10% increase in adiponectin resulted in a 5% increase in TNFα and 4% increase in GM-CSF among HRP+ FDRs; whereas no association was observed among HRP- FDRs (Interaction p = 0.016, p = 0.028 for TNF-α and GM-CSF, respectively). Similarly, a 10% increase in adiponectin was associated with a 2% increase in Cytokine Score among HRP+ FDRs, but not in HRP- FDRs (Interaction p = 0.038).

Conclusion: In a population without RA, elevations of adiponectin were associated with elevations of several pro-inflammatory cytokines as well as a marker of overall inflammation, Cytokine Score, in the setting of autoanti-
tibody positivity; and were inversely associated with elevations of another marker of inflammation, hsCRP. These findings indicate that adiponectin may have a complex role in early RA-related autoimmunity and inflammation, and that adiponectin may respond differentially according to inflammatory trig-
gers and functions. Further study is needed to determine the role of adiponectin in early RA pathogenesis.

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2099

Patient Report Outcomes Variance Between Centers Is Much Lower Than Physician and Laboratory Assessed Measures of Rheumatoid Arthritis Activity Results From A MultiNational Study. Nasim A. Khan1, H. Spencer2, Thomas Nasim Khan3, Dana M. Dabelea3, Jeremy Sokolove4, William H. Robinson4, V. Michael Holers2 and Jill M. Norris. 1University of Arkan-
sas for Medical Sciences and Central Arkansas Veterans Healthcare System, Little Rock, AR, 2University of Arkansas for Medical Sciences, Little Rock, AR, 3Jyvaskyla Central Hospital, Jyvaskyla, Finland, 4Jyvaskyla Hospital

Background/ Purpose: Clinical trials and epidemiological rheumatoid arthritis (RA) studies often recruit patients from multiple centers. We studied the proportion of variance in the American College of Rheumatology (ACR) core set measure, Disease Activity Score 28 (DAS28, representative physi-
cian and laboratory measure derived composite index), and Routine Assessment of Patient Index Data 3 (RAPID3, representative PRO derived composite index) explained by between-center differences in a multinational study.

Methods: 7568 patients receiving usual care from rheumatologists in 83 centers located in 30 countries were recruited using standard protocol in the Quantitative Standard Monitoring of Patients with RA (QUEST-RA) study. Mixed-effects analyses of covariance (ANCOVA) models were used to model each ACR core set measure as functions of demographic, medical characteristics and remaining ACR core set measures. Demographic variables included age, race (white, other races), gender, and education ≥ 12 years (yes, no); while medical characteristics included RA duration, rheumatoid factor status, patient’s fatigue score (0–10), Psychological Health Assessment Questionnaire score (Psych HAQ, 0–3), morning stiffness (0, 1–60, and >60 minutes), comorbidity burden, body mass index, fibromyalgia (yes, no), osteoarthritis (yes, no), and chronic back pain (yes, no). DAS28 model included patient’s pain score (0–10 cm) and HAQ, while the RAPID3 model included tender joint count (TJC), swollen joint count (SJC) and erythrocyte sedimentation rate (ESR) in addition to demographic and medical charac-
teristics. The patient recruiting center was included as a random effect to estimate the amount of the residual variance explained by it. MIXED procedure in SAS was used.

Results: Patient reported outcomes had lower proportion (3.25–6.87%) of residual variance that was explained by between recruiting center differences compared to physician and laboratory derived measures after adjusting for potential demographic, medical and RA related characteristics. This is despite patient recruitment in QUEST-RA from several countries with widely different cultural and socio-

Background: Patient reported outcomes variance accounted for by between centers is considerably lower than clinician and laboratory derived measures after adjusting for potential demographic, medical and RA related characteristics. This is despite patient recruitment in QUEST-RA from several countries with widely different cultural and socio-economic differences. These results highlight the need for implementation of procedures to standardize RA activity assessment by clinicians involved in multi-center studies.

Disclosure: N. A. Khan, None; H. Spencer, None; T. Sokka, None;
and treating rheumatologists (MD) in identifying a flare, and concordance of clinical and patient-reported outcomes (PROs) with flare status.

**Methods:** Pts in the Canadian early Arthritis CoHort (CATCH) completed the OMERACT preliminary flare questionnaire (PFQ). In the PFQ pts were asked if they were in a flare and to rate severity, pain, function, stiffness, participation, coping, patient global assessment and fatigue (0–110 NRS). Pts also identified tender and swollen joints (TJC and SJC) of 42 joint homunculus. MDs rated if their patient (pt) was in a flare and performed a joint count. Pt-MD agreement on flare status was assessed using Cohen’s kappa. Wilcoxon rank sum test was used to compare MD and pt reported joint counts. Clinical indices and PROs between flare and non-flare pts were compared using paired t-tests.

**Results:** 512 pts (75% female) answered PFQ: 13% at baseline, 39% at 3–12 months and 49% at 12 months+ after study entry. Pts had a mean age of 53 ± 14 yrs; 18% were smokers, 63% RF+, 51% CCP+ and 18% had erosions. 149 (29%) reported a flare at study visits. Pts and MDs agreed about flare status 72% of the time (Kappa = 0.34). Changes in DAS28 and CDAI from previous visits were higher in flare vs. non flare pts (0.44 vs. –0.14) (1.67 vs. –3.20) (both p < 0.001). PROs were significantly different between flare and non-flare pts and were highest when pts and MDs both agreed the pt was in a flare (p < 0.0001) (see Table). Pts in a flare reported higher TJC/SJC’s than MDs. The differences between pt and MD TJC & SJC were 3.74 (p < 0.001) and 2.31 (p < 0.0004). Agreement was modest (Kappa = 0.32) when pts/MDs agreed on flare status but poor then they didn’t (Kappa = 0.20).

**Table 1.** Ratings of flare severity and PROs by Patient/MD concordance

<table>
<thead>
<tr>
<th>Domain</th>
<th>Flare severity</th>
<th>Pain</th>
<th>Function</th>
<th>Stiffness</th>
<th>Participation</th>
<th>Fatigue</th>
<th>Coping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flare severity</td>
<td>6.2 (2.4)</td>
<td>5.2 (2.6)</td>
<td>4.3 (2.9)</td>
<td>4.3 (2.9)</td>
<td>4.3 (2.9)</td>
<td>4.3 (2.9)</td>
<td>4.6 (2.6)</td>
</tr>
<tr>
<td>Non-Flare</td>
<td>5.4 (2.4)</td>
<td>5.1 (2.7)</td>
<td>3.8 (2.3)</td>
<td>3.8 (2.3)</td>
<td>3.8 (2.3)</td>
<td>3.8 (2.3)</td>
<td>3.2 (2.7)</td>
</tr>
<tr>
<td>p-values</td>
<td>&lt; 0.001</td>
<td>0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>0.001</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Conclusion:** Pts reporting a flare have clinical indices reflecting worsening disease activity. PROs (pain, function, stiffness, coping, participation, and fatigue) significantly discriminated between pts reporting flare vs. no flare. There is modest agreement between pts and MDs regarding flare status. Pts identify more swollen and tender joints than MDs. PROs and pt-joint counts may reliably identify pts in disease flares but some ratings are higher in pts than MDs. More research is needed to identify predictors of concordance and discrepancy between pts and providers in flare assessment.


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### 2100

**Relative, Reliability-Adjusted Diagnostic Test Accuracy of Erosion Detection Between Magnetic Resonance Imaging and Radiography in Rheumatoid Arthritis, Ruben Tavares^1, Naveen Parasa^2, Karen Finlay^2, Erik Jurriaans^3, Hao Wu^4, Karen A. Beattie^5, Maggie Larche^5, Lawrence E. Ruben^1, J. E. Bartlett, None.**

**Background/Purpose:** In rheumatoid arthritis (RA), erosion detection on radiography (X-ray) compared to magnetic resonance imaging (MRI) is characterized by low sensitivity and high specificity. This supports the hypothesis that MRI has a lower limit of detection for erosion than X-ray. To date, however, no studies have directly assessed measurement reliability. The objective of this study was to determine the relative diagnostic test accuracy of MRI and X-ray for erosion detection while accounting for inter-rater reliability.

**Methods:** A paired, cross-sectional study of 65 RA patients with a range of symptom duration was conducted. For each participant, MRI scans of the bilateral metacarpophalangeal joints (MCP) 2-5 and X-ray of both hands, wrists and feet were taken. Comparisons were limited to the MCP 2-5 joints. The Outcome Measures in Rheumatology (OMERACT) rheumatoid arthritis magnetic resonance imaging scoring (RAMRIS) and the van der Heijde-modified Sharp (vdlHSS) scores were used to evaluate the MRI and X-ray images respectively. The analysis was conducted according to the same procedure for both measures: the joint. A total of 488 paired images were compared. Odds ratio (OR), sensitivity (Se), specificity (Sp), and accuracy were calculated and the smallest detectable difference (SDD)-adjusted and unadjusted evaluations were compared.

**Results:** The association between erosion detection on MRI and X-ray of MCP 2-5 had an OR of 1.81 (1.2–2.9), Se of 0.31 ± 0.03, Sp of 0.80 ± 0.03, and accuracy of 0.47. Adjusting for measurement reliability increased the OR, Sp, and accuracy to 3.2 (1.5–6.1), 0.93 ± 0.01, and 0.79, respectively, while decreased the Se to 0.19 ± 0.04. Reliability-adjustment decreased the number of erosions detected per joint from 67.8% to 18.6% on MRI and 27.5% to 9.8% on X-ray. Per MCP joint, 2.6- to 8.0-fold the erosions detected on X-ray were detected on MRI. Compared by affected MCP 2-5 joint set, adjustment resulted in MRI detection of 2.1-fold the erosive disease detected on X-ray. At the patient level of analysis, bilateral MRI of the MCP 2-5 joints resulted in the detection of erosive disease in 1.1-fold the number detected on X-ray of hands, wrists and feet (McNemar’s test, p = 0.83, Cohen’s k = 0.17±0.13, p = 0.16). The correlation between SDD-adjusted vdlHSS erosion score and symptom duration was 0.57 (p < 0.0001). Correlation between MRI and symptom duration was non-significant (0.10, p = 0.26).

**Conclusion:** Following reliability-adjustment of evaluations at the unit of measurement, a greater proportion of erosive disease is detected on MRI compared to X-ray per joint imaged. At the patient level of analysis, the relative performance of the two imaging modalities is highly dependent on the anatomy imaged. Despite detecting similar proportions with erosive disease when bilateral MRI of MCP 2-5 and X-ray of the hands, and feet are compared, the non-significant low level of agreement indicates that the proportions detected by each modality are unique. The interaction with symptom duration suggests that MRI may detect a greater proportion of patients with erosions at earlier stages of disease progression.

**Disclosure:** R. Tavares, None; N. Parasa, None; K. Finlay, None; E. Jurriaans, None; H. Wu, None; K. A. Beattie, None; M. Larche, None; L. E. Hart, None; W. G. Benson, None; B. S. Bobba, None; A. A. Cividino, None; C. E. Webber, None; J. E. Tarride, None; J. D. Adachi, None.

### 2101

**How Much Can Patient Reported Outcomes Improve Among Rheumatoid Arthritis Patients Who Have a Clinical Response to Biologic Therapy but Have Not Attained Low Disease Activity? Jeffrey Curtis^1, Ying Shan, Je Zhang^2, Jeffrey D. Greenberg^2 and George W. Reed^2.**

1. University of Alabama at Birmingham, Birmingham, AL, 2. New York University School of Medicine, New York, NY, 3. University of Massachusetts Medical School, Worcester, MA

**Background/Purpose:** Current treat-to-target (T2T) recommendations suggest that rheumatoid arthritis (RA) patients should strive for remission or low disease activity (LDA) as a goal. Treatment changes as often as every 3 months are recommended if necessary. However, it is unclear whether patients who have had a good clinical response to anti-TNF therapy by 3 months but who are not yet in LDA or remission might experience further meaningful improvement in patient reported outcomes (PROs) if they subsequently achieve these T2T disease state targets.

**Methods:** We used data from the Consortium of Rheumatology Researchers of North America (CORRONA) to study participants with RA (n = 31701 total) who initiating anti-TNF therapy with a subsequent follow-up visit approximately 3 months later. The analysis cohort was restricted to patients who had clinical improvement (CDAI improvement by >= 10 units) at three months. Subsequent clinical response for patients who remained on the same anti-TNF therapy was examined approximately 6 months later to assess whether PROs (global, pain, disability by mHAQ) improved more among those who improved their CDAI category (from LDA to remission, or moderate/high disease activity to low disease activity) compared to those who stayed in the same CDAI category.

**Results:** A total of 293 patients who initiated anti-TNF therapy and who had achieved improvement in CDAI of >= 10 units three months later were identified. After excluding 61 patients in CDAI remission (CDAI <=2.8) at 3 months, there were 120 individuals in LDA (CDAI 2.8 – 10) and 112 in...
moderate/high CDAI (CDAI > 10) eligible for analysis. Among patients who achieved LDA at 3 months, 45 (38%) subsequently went on to achieve CDAI remission, 26 (22%) stayed in LDA; 49 (41%) worsened to moderate/high disease activity and were excluded. Among the 112 patients still in moderate/high disease activity patients at 3 months, 40 (36%) went on to achieve LDA disease activity and were excluded. Among the 112 patients still in moderate/high disease activity category were significantly better for patient global and pain and no different for mHAQ versus those who stayed in the same disease activity category.

Adjusted\* Mean Change (95% CI) for Patients Who Improved to a Better CDAI Disease Activity Category Compared to Those Who Stayed the Same

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Adjusted* p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Global (0–100 scale)</td>
<td>−14.7 (−20.4, −8.9)</td>
</tr>
<tr>
<td>Patient Pain (0–100 scale)</td>
<td>−11.5 (−17.5, −5.6)</td>
</tr>
<tr>
<td>Disability (mHAQ)</td>
<td>−0.02 (−0.10, 0.07)</td>
</tr>
</tbody>
</table>

* adjusted for age, gender, duration of RA, CDAI at 3 months, and baseline PRO

Conclusion: Among patients with a clinical response to anti-TNF therapy at 3 months but who have not yet attained LDA or remission, the magnitude of further change in patient reported outcomes for those who achieve these disease states 6 months later was relatively small compared to those who stayed the same. Some improvement was observed for patient global and pain but not for disability. These results suggest that patients may not experience much additional benefit in their PROs from subsequently attaining the LDA or remission targets recommended in 2017 guidelines as long as they have had a good clinical response.

Disclosure: J. Curtis, Roche/Genetech, UCB< Centocor, Corrona,Angen, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech/UCB, Centocor, CORRONA, Angen, Pfizer. CM, Crescendo, Abbott, 5; Y. Shah, None; J. D. Greenberg, Corrona, 1, AstraZeneca, Novartis, Pfizer, CORRONA, 5, G. W. Reed, Corrona, 2, University of Massachusetts Medical School, 3, Corrona, 5, Harvard Medical School.

2102

Patient Versus Physician Global Assessments in Ethnically Diverse Patients With Rheumatoid Arthritis

Gail S. Kerr1, Yusuf Yazici2, Christopher J. Swearingen3, Luis R. Espinosa4, Edward L. Treadwell5, Yvonne R. S. Sherrer6, Angelia D. Mosley-Williams7, Akgun Ince8, Raj G. Nair9, Theresa Lawrence Ford10, Jeffrey Huang11 and Carl A. Nunziato11. 1Washington DC VAMC, 2, Roche/Genetech, UCB, 3, Centocor, 5, Abbott Immunology, 6, UCB, 7, John Dingell VA Medical Center, Detroit, MI, 8, Saint Louis University, St. Louis, MO, 9, Washington DC VAMC, 10, Harvard University School of Public Health, 11, Genentech and Biogen IDEC Inc., 2; U.C.B., 2, Roche/Genetech, UCB, 3, Centocor, 5, Abbott Immunology, 6, UCB, 7, John Dingell VA Medical Center, Detroit, MI, 8, Saint Louis University, St. Louis, MO, 9, Washington DC VAMC, 10, Harvard University School of Public Health.

Background/Preference: Patient reported outcomes in rheumatoid arthritis (RA) are validated tools that assess disease status, are easily administered and used as components of RA composite disease activity scores. Further, patient global score is a criterion for RA remission and recent data suggest a 5mm Disability (mHAQ) is a criterion for RA remission and recent data suggest a 5mm difference in mHAQ or PT versus Pa self-evaluation at the first visit was 3.7 ± 2.4 vs.

Discipline: J. Curtis, Roche/Genetech, UCB< Centocor, Corrona,Angen, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech/UCB, Centocor, CORRONA, Angen, Pfizer. CM, Crescendo, Abbott, 5; Y. Shah, None; J. D. Greenberg, Corrona, 1, AstraZeneca, Novartis, Pfizer, CORRONA, 5, G. W. Reed, Corrona, 2, University of Massachusetts Medical School, 3, Corrona, 5, Harvard Medical School.

Conclusion: In a diverse ethnic RA cohort, significant differences in patient and physician global scores were found. Multiple contributors and confounders may account for these findings, and may vary amongst ethnic subsets. Patient input from multiple ethnic groups is imperative to identify relevant parameters of disease function and standardize patient reported outcomes in the definition of remission.

Disclosure: G. S. Kerr, Genentech and Biogen IDEC Inc., 2; Y. Yazici, BMS, Genentech, Merck, Pfizer, UCB, Celgene, Horizon, 5; C. J. Swearingen, None; L. R. Espinosa, None; E. L. Treadwell, None; Y. R. S. Sherrer, U.C.B., 2, AstraZeneca, 2, Lilly, 2, Merck Pharmaceuticals, 2, Amgen, 8; A. D. Mosley-Williams, None; A. Ince, None; R. G. Nair, None; T. Lawrence Ford, Abbott Immunology Pharmaceuticals, 2, Amgen, 2, Centocor, Inc., 2, Genentech and Biogen IDEC Inc., 2, Lilly, 2, Pfizer Inc, 2, UCB, 2, Abbott Immunology Pharmaceuticals, 2, Amgen, 8, Pfizer Inc, 8, UCB, 8; J. Huang, None, C. A. Nunziato, None.

2103

Reliability of DAS28 in Rheumatoid Arthritis When Based On Patient Self-Assessment of Tender and Swollen Joints

Ole Rintek Madsen and Cecilie Heegaard. Copenhagen University Hospital Gentofte, Hellerup, Denmark.

Background/Preference: Clinical assessment of disease activity is a routine procedure when evaluating individual rheumatoid arthritis (RA) patients in daily practice. Swollen joint count (SJC) and tender joint count (TJC) are traditionally performed by the physician (Ph) or the nurse. Patient (Pa) assessed joint count may be an advantage in the busy clinic. The reliability of DAS28 based on patient self-assessment of tender and swollen joints has not previously been reported. The objective of this study was to examine the agreement between patient and physician evaluation of SJC and TJC, to examine the agreement between physician and patient derived DAS28 and to evaluate the reproducibility of these measures when assessed by the physician and the patient, respectively.

Methods: 30 out-clinic RA patients (mean age 60±15 years) with a disease duration of at least 5 years, who were familiar with physician joint counting and who were considered to have a stable and controlled disease activity were included. 28 TJC and SJC were assessed by patient (Pa) and physician (Ph) and the agreement was calculated as the mean difference between scores of duplicate measures (the bias) ± 1.96 × SD of these differences (2).

Results: The mean values for SJC, TJC, DAS24 and DAS3V based on Ph joint count versus Pa self-evaluation at the first visit was 3.7 ± 2.4 vs.
3.6±3.2 (NS), 4.1±5.2 vs. 4.1±4.7 (NS), 3.5±1.0 vs. 3.6±1.1 (NS) and 3.4±0.9 vs. 3.5±0.9 (NS). Mean values for CRP and PaGa were 7.9±6.5 and 33±28, respectively. Ph-DAS(4V) and Pa-DAS (4V) were highly correlated (r = 0.90, p < 0.0001), and so were corresponding DAS scores based on 3V (r = 0.85, p < 0.0001). The bias for Ph-DAS(4V) vs. Pa-DAS(4V) and associated lower and upper LOA were −0.1 (NS), −0.9 and +0.8, respectively. For DAS(3V) the corresponding results were −0.1 (NS), −1.1 and +0.9. The bias for the duplicate Pa-DAS(4V) assessments was −0.1 (NS) with lower and upper LOA of −0.9 and +0.8; and for Pa-DAS(3V) 0.0 (NS), −0.9 and +0.9. For duplicate Ph-DAS(4V) assessments the bias was 0.0 (NS), and LOA were −1.1 and +1.1. For Ph-DAS(3V) the corresponding figures were: 0.0 (NS), −1.2 and +1.2.

Conclusion: On group level, patient and physician derived DAS scores were in practical identical. Differences between patient and physician derived DAS on the individual level corresponded to the intra-rater agreement for both patients and physicians with LOA-approximating ±1. Thus, patient-derived DAS seems to have suitable reliability and may therefore substitute traditional assessment by the physician, at least when the disease activity is stable.


Disclosure: O. Rintek Madsen, None; C. Heggard, None.

2104

Quantitation in Patients with Rheumatoid Arthritis of Inflammation, Joint Damage and “Unexplained Symptoms” (e.g., Fibromyalgia) in Addition to Overall Status, According to 4 Physician Global Estimates Scored 0–10. Isabel Castrejón, Martin J. Bergman1 and Theodore Pincus2. 1NYU Hospital for Joint Diseases, New York, NY, 2Taylor Hospital, Ridley Park, PA

Background/Purpose: A physician global estimate (DOCGL) of patient clinical status in rheumatoid arthritis (RA) is scored by many rheumatologists entirely based on inflammation, but others may incorporate joint damage and chronic pain, which may affect many RA patients. To address this matter, three 0–10 physician global visual analog subscales (VAS) have been developed to estimate levels of a) inflammation, b) damage, and c) “unexplained symptoms” (e.g., fibromyalgia), in addition to d) overall status.

Methods: A random visit was analyzed of all 103 patients with RA seen between Dec 2007 and March 2011 in the private practice of one rheumatologist. All patients complete a multidimensional health assessment questionnaire (MDHAQ-FN) at each visit, which includes 10 physical function items (MDHAQ-FN) and a query, “Are you able to deal with feelings of depression or feeling blue?” with 4 response options in the patient-friendly HAQ format: without any difficulty (=0), with some difficulty (=1), with much difficulty (=2), and unable to do (=3). A formal 28 tender and swollen joint count is performed in all patients with RA; 0–10 VAS estimations for inflammation, damage, “unexplained” and overall status are assigned by the rheumatologist. Regression models were computed to explain variation in each of the 4 DOCGL estimates according to variables that were correlated significantly with at least one DOCGL estimate, including swollen joint count (SJC28), duration of disease, depression score and MDHAQ-FN scores.

Results: Mean of the patients was 61.3 years, disease duration 10.3 years, MDHAQ-FN score (0–10) 1.7, RAPID3 (0–30) 8.5, SJC28 4.2, depression score (0–3) 0.37. The 4 DOCGLs were recorded in about 5 seconds. MDHAQ-FN scores were independently statistically significant only by MDHAQ-FN in the first model, and by depression score, but not SJC28 or disease duration, in the second model. DOCGL-Overall Status variation was explained significantly by SJC28 (and MDHAQ-FN) in the first model, and SJC28 and depression score in the second model, but not by disease duration.

Table. Multivariate regression models to recognize explanatory variables for 4 physician global estimates (DOCGL) for inflammation, damage, “unexplained symptoms” and overall status in 103 patients with RA

<table>
<thead>
<tr>
<th>DOCGL: Inflammation</th>
<th>DOCGL: Damage</th>
<th>DOCGL: “Unexplained”</th>
<th>DOCGL: Overall status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coeff P</td>
<td>Coeff P</td>
<td>Coeff P</td>
<td>Coeff P</td>
</tr>
<tr>
<td>SJC28</td>
<td>0.09 &lt;0.001</td>
<td>0.01 NS</td>
<td>0.01 NS</td>
</tr>
<tr>
<td>Depression</td>
<td>−0.06 NS</td>
<td>0.04 &lt;0.001</td>
<td>0.01 NS</td>
</tr>
<tr>
<td>MDHAQ-FN Function</td>
<td>0.32 &lt;0.001</td>
<td>0.47 &lt;0.001</td>
<td>0.30 &lt;0.001</td>
</tr>
<tr>
<td>Depression</td>
<td>0.01 NS</td>
<td>0.10 NS</td>
<td>0.28 &lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: Variation in DOCGLs for inflammation, damage and “unexplained symptoms” are explained significantly by MDHAQ-FN and/or only 1 of 3 other measures: SJC28, disease duration, and patient self-report depression score, respectively. The 4 DOCGLs have face validity, and are recorded in about 5 seconds.

Disclosure: I. Castrejón, None; M. J. Bergman, None; T. Pincus, None.

2105

Significant Correlation Between ACR/EULAR Remission Criteria and a Simplified Measure Using RAPID3 and Careful Joint Examination without a Formal Joint Count. Martin J. Bergman1, Isabel Castrejón1, Martin J. Bergman1 and Theodore Pincus1. 1Taylor Hospital, Ridley Park, PA, 2NYU Hospital for Joint Diseases, New York, NY

Background/Purpose: Definitions for the classification of “remission” have been proposed by ACR/EULAR: Boolean and SDAI<3.3. These criteria require a formal tender and swollen joint count, a patient global assessment, a C-reactive protein (CRP) and (for SDAI definition) a physician global assessment. Rheumatologists usually perform a careful joint examination, but do not perform formal joint counts at most visits, and CRP often is missing at the time of the visit. RAPID3, a patient reported disease activity measure, is correlated significantly with DAS28, CDAI, and other RA indices and can be calculated in less than 5 seconds, compared to 90 seconds to perform a formal joint count. Simply counting >1 swollen joint can be performed without interfering with usual patient interactions, unlike a full formal joint count. We sought to analyze the capacity of a novel description of remission in RA using RAPID3 and the presence or absence of greater than 1 swollen joint, and compared results to ACR/EULAR remission.

Methods: All patients (with any diagnosis) in a solo Rheumatology practice are given an MDHAQ to be completed by the patient in the waiting area and RAPID3 is calculated before the patient is seen. Patients are instructed to obtain standard laboratory tests approximately 1 week prior to the visit, including a CRP, so that CRP values will be available at the time of the visit. A formal joint count (28 tender/28 swollen) is performed in all RA patients, and, a physician global score is assigned. A random patient visit was selected which included all measures. Patients were identified as in remission or not, according to ACR/EULAR Criteria or “RAPID3RJ” defined as a RAPID3 score <=3.0 and ≤1 swollen joint. Comparisons of the two descriptions were analyzed using Spearman correlations and kappa statistics.

Results: 191 patients with RA were identified. Complete data were available in 122 patients: ACR/EULAR remission criteria were met in 27 of 122 patients; RAPID3RJ in 23 patients (Table 1). 22 patients were in agreement using both measures; 5 in ACR/EULAR were not in RAPID3RJ, 1 in RAPID3RJ were not in ACR/EULAR. Spearman rho was 0.86 (p<0.0001); Kappa=0.85 (substantial agreement).
Table 1.

<table>
<thead>
<tr>
<th>RAPID3≤3 + SWOLLEN JOINT COUNT ≤1</th>
<th>ACR/EULAR REMISSION CRITERIA</th>
<th>ACR/EULAR RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>94</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>27</td>
</tr>
</tbody>
</table>

Kappa=0.85 p<10^-4 Spearman rho=0.86

Conclusion: The classification of remission can be made using a simple patient questionnaire and requiring only the identification of ≤1 swollen joint. Future studies are planned to determine if this new definition of remission will also predict X-ray progression, one of the criteria for the development of the ACR/EULAR criteria.

Disclosure: M. J. Bergman, None; I. Castrejón, None; T. Pincus, None.

2106

Patient Characteristics Associated with Discrepancies in Evaluator-Reported and Patient-Reported Outcomes in U.S. Veterans with Rheumatoid Arthritis. Archana Jain, Rebecca Belsom, Jeffrey Curtis, Shuo Yang, Ted R. Mikuls, Lang Chen and Angelo L. Gaffo. 1University of Alabama, Birmingham, AL, 2University of Alabama at Birmingham, Birmingham, AL, 3Ohio VA and University of Nebraska Medical Center, Omaha, NE, 4Birmingham VA Medical Center and University of Alabama at Birmingham, Birmingham, AL.

Background/Purpose: In clinical practice, evaluator and patient reported outcomes (PROs) are used for guiding therapy in patients with rheumatoid arthritis (RA). PROs used in RA evaluation may be influenced by co-morbidities (i.e. diabetes, coronary artery disease, congestive heart failure). We hypothesized that these co-morbidities lead to discrepancies between the tender and swollen joint counts and between patient- and evaluator-reported global assessments of RA activity.

Methods: We performed a cross-sectional analysis at baseline visit for all patients enrolled in the Veterans Affairs Rheumatoid Arthritis (VARA) registry with linkage to the VA Decision Support System (DSS). Patient global assessments (PGA) and evaluator global assessments (EGA) of disease activity distribution were divided into tertiles. PGA and EGA values in the same tertiles were defined as concordant, whereas the values in different tertiles were defined as discordant. Swollen joint count (SJC) to tender joint count (TJC) ratio of ≥0.8 was defined as concordant, whereas ratio < 0.4 was defined as discordant. Demographic characteristics and frequencies of DSS-derived co-morbidities in patients with concordant and discordant PGA and EGA; and TJC and SJC respectively were compared. Additionally, a longitudinal analysis of the subset of patients with at least 2 visits was performed to determine which ratio of SJC/TJC was associated with a decision to switch to a new biologic agent in patients with at least moderate disease activity (DAS28ESR > 3.2).

Results: 1305 unique patients with linkage to DSS were identified. The mean age was 68.2 years and 90.5% were males. PGA and EGA data was available for 529 patients. There were 95 (18%) patients with a discordant PGA worse than EGA, 123 (23.3%) with a discordant EGA worse than PGA, and 311 (58.8%) patients with concordant PGA and EGA. There was no significant difference in socio-demographics and prevalence of co-morbidities in patients with discordant worse PGA subgroup as compared to patients with concordant PGA and EGA. SJC and TJC data was available for all 1305 patients. There were 825 (63.2%) patients with SJC/TJC < 0.4, 326 (25%) patients with SJC/TJC ≥0.8, and 154 (11.8%) patients in-between these categories. Patients with SJC/TJC ratio < 0.4 were older than those with ratio ≥0.8 (68.8 yrs vs 67.2 yrs, p 0.02). There were no other significant differences in socio-demographic variables or prevalence of co-morbidities. Among all VARA patients treated with biologics who were in moderate or high disease activity (DAS28ESR > 3.2) at a VARA visit (n=1365 visits), approximately 7% were switched at that visit to another biologic. The likelihood of switching for patients with a SJC/TJC ratio > 0.4 was 2.7 (1.5–4.4) fold greater compared to those with a SJC/TJC ratio ≤0.4.

Conclusion: There was no association of co-morbidities with discordantly high PGA or low TJC/SJC ratio. A SJC/TJC ratio ≤0.4 appears useful to identify patients whose patient reported outcome data is unduly affected by factors other than RA and might be used to screen for patients not appropriate for traditional treat-to-target strategy cutpoints.

Disclosure: A. Jain, None; R. Belsom, None; J. Curtis, None; S. Yang, None; T. R. Mikuls, None; L. Chen, None; A. L. Gaffo, None.

2107

Assessing Subclinical Synovitis in Rheumatoid Arthritis: Arthorsonographic Findings in Patients with Good Response to Therapy. Matthias Witt, Felix Mueller, Axel Nigg, Christiane Reindl, Hendrik Schulze-Koops and Mathias Grunke. Division of Rheumatology and Clinical Immunology, Medizinische Klinik and Poliklinik IV, University of Munich, Munich, Germany.

Background/Purpose: Treat-to-target is a key principle in rheumatoid arthritis. Composite scores such as the DAS-28 help to monitor disease activity and response to therapy. However, in patients without clinical activity, ultrasound examination may reveal subclinical synovitis. While some findings have prognostic relevance, little is known about the relevance of borderline (grade 1) ultrasound findings in asymptomatic joints of patients with good response to therapy. This study was undertaken to give a sonographic analysis of subclinical synovitis in this subset of RA patients.

Methods: Patients with newly diagnosed RA were included. At baseline, patients were assessed by clinical examination and ultrasound. Ultrasound was performed with grey scale (GSUS) and power Doppler (PDUS) in the metacarpophalangeal, proximal interphalangeal, metatarsophalangeal and wrist joints, using the dorsal approach in each joint. Synovitic findings in GSUS and PDUS were graded semiquantitatively from 0 to 3 as specified before. After the initial assessment, patients were treated with anti-rheumatic drugs according to national guidelines and were seen on a regular outpatient basis. Clinical and sonographic evaluation together with assessment of EULAR responses was performed at month 6.

Results: So far, 40 patients were included into this ongoing study. Patients' characteristics are consistent with a typical RA cohort. By month 6, good, moderate and no EULAR responses were reached by 65.7%, 25.7% and 8.6% of the patients, respectively. In the group with good EULAR response, 7.2% of the joints had clinical synovitis, while 92.8% of the joints were asymptomatic. In the asymptomatic group, ultrasound detected subclinical synovitis in 11.1% in GSUS and in 3.8% in PDUS with significant differences for both modalities in comparison to the clinically apparent group. The sonographic findings in the subclinical group could be classified as grade 1, grade 2 and grade 3 in 78.9%, 19.7% and 1.3% in GSUS, and in 76.9%, 23.0% and 0% in PDUS. Grade 1 GSUS and PDUS findings were found significantly more often in the subclinical group, while non-grade 1, i.e. grade 2 and grade 3 GSUS and PDUS findings were significantly more prevalent in the clinically apparent group.

Conclusion: More than 90% of the joints were asymptomatic in the group with good response. Ultrasound of these joints revealed subclinical synovitis in 11.1% in GSUS and in 3.8% in PDUS. Concerning the patient of ultrasound findings, grade 1 findings were most prevalent in both modalities and were found significantly more often than in the clinically apparent group. Of note, grade 1 GSUS findings are also found in healthy individuals and hence, the clinical relevance seems to be questionable. While persistent PDUS activity in general has been linked to clinical relapses in asymptomatic patients, the specific relevance of grade 1 PDUS findings needs to be further clarified. Taken together, these data indicate that the relevance of subclinical synovitis may be overestimated in asymptomatic joints of patients with a good clinical treatment response. In this situation ultrasound seems to add little to the clinical overall impression. Further analysis is underway to clarify the role of grade 1 PDUS findings.

Disclosure: M. Witt, None; F. Mueller, None; A. Nigg, None; C. Reindl, None; H. Schulze-Koops, None; M. Grunke, None.

2108

Identification of Four Parameters That Drive the Discordance Between the Patient and Physician Global Assessment in Rheumatoid Arthritis. William Bensen, Denis Choquette, Milton F. Baker, Susan M. Otuwa and Houssam Khalil. 1St. Joseph’s Hospital and McMaster University, Hamilton, ON, 2University of Montreal, Notre-dame Hospital, Montreal, QC, 3University of Victoria, Victoria, BC, 4Janssen Canada Inc, Toronto, ON.

Background/Purpose: BioTRAC is an ongoing Canadian registry of patients initiating treatment with infliximab or golimumab as first biologics. PGA and MDGA were measured at baseline using a 10cm VAS. Using tertiles of the baseline MDGA-PGA distribution every patient was classified as having higher assess-

Methods: More than 90% of the joints were asymptomatic in the group with good response. Ultrasound of these joints revealed subclinical synovitis in 11.1% in GSUS and in 3.8% in PDUS. Concerning the patient of ultrasound findings, grade 1 findings were most prevalent in both modalities and were found significantly more often than in the clinically apparent group. Of note, grade 1 GSUS findings are also found in healthy individuals and hence, the clinical relevance seems to be questionable. While persistent PDUS activity in general has been linked to clinical relapses in asymptomatic patients, the specific relevance of grade 1 PDUS findings needs to be further clarified. Taken together, these data indicate that the relevance of subclinical synovitis may be overestimated in asymptomatic joints of patients with a good clinical treatment response. In this situation ultrasound seems to add little to the clinical overall impression. Further analysis is underway to clarify the role of grade 1 PDUS findings.
ment than the physician (range: 10.0 to 0.5), agreement (range: 0.4 to 1.1) or lower assessment than the physician (range: 1.2 to 8.0).

**Results:** 841 patients with baseline data for both PtGA and MDGA were included. Among these 623 (74.1%) were female, mean age was 57.0 yrs and mean disease duration was 9.8 yrs. Mean (SD) PtGA and MDGA were 6.1 (2.4) and 6.5 (2.1), respectively, and the mean (SD) MDGA – MDGA was 0.4 (2.4) with a median of 0.3; for 6.4% of the patients the PGAMA-MDGA was nil.

Significant differences between patients with lower, equal or higher assessment relative to the physician assessment were identified. When compared to patients with higher PtGA relative to MDGA, patients with lower assessment of their disease activity had lower morning (AM) stiffness, pain, and HAQ-DI but higher SJC (Table 1). AM stiffness, SJC, TJC, and HAQ-DI were highest in patients with PtGA-MDGA agreement. Age, gender, and SJC/TJC ratio were not different for the three groups. Linear regression using backwards selection identified pain (P < 0.001), SJC (P < 0.001), and HAQ-DI (P = 0.056) as independent predictors of PGAMA-MDGA.

**Conclusion:** The relative importance of morning stiffness, pain, HAQ, and SJC in assessing disease activity may be different between patients and physicians. These results have implications for development of assessment tools that better represent both patient and physician perspectives of disease activity.

**Disclosure:** W. Bensen, None; D. Choquette, None; M. F. Baker, None; S. M. Otawa, Janssen Canada Inc, 3; H. Khalil, Janssen Canada Inc, 3.

2109

**Discrepancy Between Patient and Physician Global Assessments Over Time in Early Rheumatoid Arthritis**

**Background/Purpose:** Discrepancy between patient (PGA) and physician (MDGA) global assessments in RA can adversely affect therapeutic decisions in many cases. The purpose of this study is to assess whether baseline PGA-MDGA discrepancy predictors change after one year in patients with early RA.

**Methods:** Patients with RA were recruited from the Canadian Early Arthritis Cohort (CATCH) a prospective cohort where data is collected according to a standardized protocol. CATCH patients were considered for this analysis if they initiated DMARDS at baseline, were biologic naive and had ≥12 months follow up. PGA and MDGA were scored out of 100. PGA-MDGA discrepancy was calculated by subtracting MDGA from PGA at baseline. A clinically meaningful discrepancy was considered a difference of ≥30 (PGA-MDGA > 30); Positive (Pos) and PGA-MDGA < –30; Negative (Neg). Linear regression analysis was used to evaluate factors associated with the PGA-MDGA discrepancy, MDGA and PGA when adjusted for potential confounders at baseline and at 1 year separately. To address the variability of the rheumatologists’ influence on the discrepancy we included CATCH recruiting “site” as one of the predictors. Sites with more than 25 patients were considered for the analysis.

**Results:** Baseline characteristics of the 480 RA patients who met inclusion criteria for this study included: 74% female, mean (SD) age 54 (14.5), disease duration 0.5(0.24) years, TJC 8.0 (6.8), SJC 8.7 (6.3) (of 28), DAS28 5.2 (1.4), ESR 29.6 (22.6), CRP 15.0 (19.6) mg/L, PGA 58.7 (29.4) and MDGA 61.6 (24.8). Discrepancy rates are shown in Table 1. At baseline significant predictors of PGA-MDGA were Pain (P < 0.0001), SJC (P < 0.0001), TJC (P = 0.008), ESR (P = 0.02) and “site” (P = 0.0006). At 12 months significant predictors of PGA-MDGA were Pain (<0.0001), SJC (<0.0001), TJC (P = 0.02), age (0.04) and “site” (P = 0.0002). At baseline PGA was significantly associated with pain, HAQ, SJC, age “and” site” and at 12 months with pain and “site” only. Baseline factors associated with MDGA were SJC, TJC, pain, ESR, HAQ and “site” and at 12 months ESR and HAQ were no longer significant.

**Table 1.** Discrepancy rates at baseline and 12 months

<table>
<thead>
<tr>
<th></th>
<th>No discrepancy</th>
<th>Positive discrepancy</th>
<th>Negative discrepancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>65%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>12 months</td>
<td>73%*</td>
<td>23%</td>
<td>4%</td>
</tr>
</tbody>
</table>

*P < 0.05

**Conclusion:** PGA-MDGA discrepancy rate decreases over time but the pattern remains the same in early RA. Pain and SJC significantly influence PGA-MDGA discrepancy at baseline and this persists after one year when the disease is better controlled. Although previous studies have emphasized the pain score as a major factor affecting the PGA-MDGA discrepancy; we have also demonstrated significant predictors in other outer parameters.

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**Prospective Assessment of Bone Texture Parameters At the Hand in Rheumatoid Arthritis**

**Laetitia Sparsa1, Sami Kolta1, Karine Briot1, Simon Patronette2, Rashira Masri3, Damen Loueille4, Piet P. Geusens5 and Christian Roux5. 1Paris Descartes University, Cochin hospital, Paris, France, 2CHU Bra-bois, Vandoeuvre les Nancy, France, 3Maastricht University, Maastricht, Netherlands.

**Background/Purpose:** Bone and cartilage loss and destruction is associated with rheumatoid arthritis (RA) and inflammation. There is a need for tools for prediction of potential severe patients with poor outcome. The BMA device (3DATM Medical Systems, Orleans, France) is a high resolution X-ray technique, used to image bone and joints, and to measure bone texture parameters including the fractal dimension (Hmean). The aims of this study were to evaluate, by BMA analysis, the metacarpal bone texture in a cohort of 165 RA patients after 1 year of follow up, and to assess the relationship between these parameters and RA disease parameters at baseline and over 1 year.

**Methods:** Patients with RA according to ACR criteria were included. They were assessed every 6 months over 1 year, in the context of a prospective study conducted in Maastricht. For this substudy, activity of the disease was assessed by erythrocyte sedimentation rate (ESR), C reactive protein (CRP) and Disease Activity Score (DAS 28) performed at each visit. Radiographic bone damage is assessed using hand and feet conventional posterior-anterior radiographs at baseline and on a 1-year basis The bone texture parameters were evaluated on the second and third metacarpal heads of the left hand (MCP2 and MCP3) using BMA device, with standard acquisition at baseline, 6 and 12 months. A single investigator performed all the analyses, with standardized position of regions of interest in the bones. The calculated parameter was Hmean as an approach to bone roughness.

**Results:** 165 patients were included 57 men and 108 women, mean age 63.63 years [33–89]. The mean disease duration was 9.67 years [2–36]. Among the 138 cases where rheumatoid factor results were available, 75 were positive and among the 11 cases where anti CCP antibodies were available only 6 were positive. 53 patients were followed using BMA device and a total of 632 joints were studied. 24/53 (45.3%) patients had RA damage (erosions, joint space narrowing). The mean DAS28 score was 3.34 [0.63–7.35]. Twenty four patients were receiving bisphosphonate during the study. Hmean was similar in MCP2 and MCP3 at baseline, 0.411±0.038 and 0.412±0.043 respectively; H mean MCP2 was correlated with disease duration (0.17, p=0.03). There was an increase in H mean MCP2 (+ 1.0 % p=0.0004) over 1 year. ESR and CRP were correlated with H mean MCP3 at baseline (+0.15, p=0.055; −0.15, p=0.06) and 6 months (-0.22 p=0.006, −0.25 p=0.002 respectively). DAS was correlated with H mean MCP3 at 6 months (+0.14, p=0.007) and H mean MCP2 at 12 months (+0.16 p=0.04).

**Conclusion:** This new high resolution digital X-ray device provides bone texture parameters of metacarpal heads in RA patients. This preliminary analysis suggests that these parameters measured at the metacarpal heads are influenced by disease duration and activity.

**Disclosure:** L. Sarsa, None; S. Kolta, None; K. Briot, None; S. Patronette, None; R. Masri, None; D. Loueille, None; P. P. Geusens, None; C. Roux, None.
Diagnosis of the 2010 American College of Rheumatology/European League Against Rheumatism Classification Criteria for Rheumatoid Arthritis: Systematic Literature Review and Meta-Analysis. Gairaffà Scalabrini1, Carlo Alberto Sciutè2, Roberto Caporalì1 and Carbonefrico Montecucco1. 1 Division of Rheumatology, University of Pavia School of Medicine, IRCCS Policlinico San Matteo Foundation, Pavia, Italy, 2 Epidermiology Unit, Italian Society for Rheumatology (SIR), Milano, Italy, 2 University of Pavia School of Medicine, IRCCS Policlinico San Matteo Foundation, Pavia, Italy

Background/Purpose: in 2010 ACR and EULAR proposed new classification criteria for rheumatoid arthritis (RA). This new set of criteria has been tested in several external populations. The aim of the present study was to summarize the available evidence performing a systematic literature review and meta-analysis of their diagnostic accuracy.

Methods: We searched PubMed, EMBASE, Cochrane and screened the abstracts of the ACR and EULAR congresses from 2010 to 2012. The inclusion criteria were: 1) population of patients with recent onset arthritis; at least one swollen joint, no alternative diagnosis; 2) The ACR/EULAR 2010 criteria (cut-off of 6) as index test; 3) The use of methotrexate (MTX) or disease modifying antirheumatic drugs (DMARDs) as reference standard; 4) Diagnostic accuracy, case control, prospective or retrospective cohort studies; 5) Sufficient data to build a 2x2 table of diagnostic accuracy. Sensitivity (Se) and specificity (Sp) were calculated, data were pooled using a hierarchical summary receiver operating characteristic curve (HSROC) with confidence and prediction intervals. Three separate meta-analyses were performed, considering MTX, DMARDs or their combination as reference standard. To test the robustness of the results, diagnostic odds ratio (DOR) was calculated and an exploratory meta-regression was performed for the analysis of MTX+DMARDs, considering as confounders symptom duration, rheumatoid factor, anti cyclic citrullinated peptide antibodies and the timing of assessment of the reference standard. The risk of bias of the included studies was evaluated using the modified version of the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) proposed by the Cochrane collaboration.

Results: A total of 1,257 references were retrieved, after screening title and abstract 4 full papers were included, together with 6 abstracts from the ACR and EULAR congresses. Using MTX as reference standard, the first meta-analysis showed: Se (95% confidence interval, CI) was 0.73 (0.64,0.80), Sp was 0.74 (0.68,0.79), positive likelihood ratio (LR+) was 2.85 (2.53,3.22), negative LR (LR-) was 0.35 (0.27,0.45), DOR was 8.03 (6.4,10.09). Using DMARDs as reference standard, Se was 0.80 (0.74,0.85), Sp was 0.61 (0.56,0.67), LR+ was 2.11 (1.92,2.32), LR− was 0.31 (0.25,0.38), DOR was 6.74 (5.49,8.28). Using the combination of MTX and DMARDs as reference standard, Se was 0.76 (0.71,0.81), Sp was 0.69 (0.61,0.75), LR+ was 2.48 (2.08,2.95), LR− was 0.33 (0.29,0.38), OR was 7.38 (6.33,8.62). Meta-regression demonstrated no influence of the possible confounders on the meta-analysis. The risk of bias was low or unclear for most of the studies.

Conclusion: the new classification criteria have a good sensitivity, while specificity is lower. The development of an optimal diagnostic tool for RA is limited by the absence of a real reference standard. In fact, also the decision to start treatment is strongly influenced by the diagnostic results. The risk of bias was low or unclear for most of the studies.

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Combination of Magnetic Resonance Imaging (MRI)-Proven Osteitis with 2010 RA Classification Criteria Improves the Diagnostic Probability of Rheumatoid Arthritis (RA). Mami Tamai1, Yosikazu Nakashima1, Takahisa Aoyagi1, K. Arima1, A. Kawakami2, K. Ichinose2, M. Uetani3, K. Ichinose1, K. A. Ogawa1, K. Kuma1, N. Sato1, N. K. Horai1, None. 1Department of General Hospital, Sasebo, Nagasaki, Japan, 2Department of Rheumatology, Nagasaki University, Nagasaki, Japan, 3Department of Rheumatology, University of Tokyo, Tokyo, Japan

Background/Purpose: Since introduction of the new ACR/EULAR classification criteria of rheumatoid arthritis (RA) several studies were published validating the new criteria in different cohorts using different approaches and goldstandards. Performing a systematic literature review we want to summarize published studies and assess the sensitivity and specificity of the new ACR/EULAR classification criteria in comparison to the 1987 ACR criteria using different cohorts and goldstandards.

Methods: A systematic literature review was performed in the three main databases (Medline, EMBASE and Cochrane Central). Information of all included studies were extracted and raw data of patients fulfilling different criteria and goldstandards were extracted in order to calculate sensitivity and specificity, positive and negative predictive values as well as standard deviations. Taking into consideration heterogeneity meta-analyses were performed if possible.

Results: In total 1080 articles were retrieved by the search strategy, of which 14 studies (total 6200 patients) could be included. 9 studies included early arthritis patients, 3 established RA, 1 undifferentiated arthritis (UA) and 1 patients with joint symptoms. 5 studies used initiation of MTX (range sensitivity (sens) 0.68 to 0.88 and specificity (spec) 0.3 0.72 pooled (95%CI): sens 0.86 (0.84–0.88); spec 0.49 (0.46–0.52), 3 studies initiation of DMARD (range sens 0.62 to 0.85 and spec 0.38 to 0.78; pooled (95%CI): sens 0.80 (0.78–0.82); spec 0.61 (0.57–0.64), and 6 studies used expert opinion as goldstandard, out of them 3 in early arthritis patients (range sens 0.62 to 0.91; spec 0.35 to 0.78; pooled (95%CI): sens 0.87 (0.85–0.89) spec 0.45 (0.41–0.49)); 2 in established RA (sens 0.66 to 0.78); 1 in UA (sens 0.47; spec 0.71). Two studies used expert opinion and DMARD as goldstandard (sens 0.58 to 0.74, spec 0.8 to 0.86).

Conclusion: The present data indicate that combination of MRI-proven osteitis with 2010 RA classification criteria improves the diagnostic probability of RA at earlier stage.

Disclosure: M. Tamai, None; Y. Nakashima, None; T. Suzuki, None; Y. Horai, None; A. Ogawa, None; K. Kuma, None; Y. Sato, None; K. Ichinose, None; K. A. Ogawa, None; K. Kuma, None; T. Urugaichi, None; M. Uetani, None; K. Aoyagi, None; K. Eguchi, None; A. Kawakami, None.

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Performance of the New ACR/EULAR Classification Criteria for Rheumatoid Arthritis - A Systematic Literature Review. Helga Radner1, Josef Smolen1 and Daniel Aletaha1. 1Medical University Vienna, Vienna, Austria, 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria, 3Medical University of Vienna, Vienna, Austria

Background/Purpose: Since introduction of the new ACR/EULAR classification criteria of rheumatoid arthritis (RA) several studies were published validating the new criteria in different cohorts using different approaches and goldstandards. Performing a systematic literature review we want to summarize published studies and assess the sensitivity and specificity of the new ACR/EULAR classification criteria in comparison to the 1987 ACR criteria using different cohorts and goldstandards.

Methods: A systematic literature review was performed in the three main databases (Medline, EMBASE and Cochrane Central). Information of all included studies were extracted and raw data of patients fulfilling different criteria and goldstandards were extracted in order to calculate sensitivity and specificity, positive and negative predictive values as well as standard deviations. Taking into consideration heterogeneity meta-analyses were performed if possible.

Results: In total 1080 articles were retrieved by the search strategy, of which 14 studies (total 6200 patients) could be included. 9 studies included early arthritis patients, 3 established RA, 1 undifferentiated arthritis (UA) and 1 patients with joint symptoms. 5 studies used initiation of MTX (range sensitivity (sens) 0.68 to 0.88 and specificity (spec) 0.3 0.72 pooled (95%CI): sens 0.86 (0.84–0.88); spec 0.49 (0.46–0.52), 3 studies initiation of DMARD (range sens 0.62 to 0.85 and spec 0.38 to 0.78; pooled (95%CI): sens 0.80 (0.78–0.82); spec 0.61 (0.57–0.64), and 6 studies used expert opinion as goldstandard, out of them 3 in early arthritis patients (range sens 0.62 to 0.91; spec 0.35 to 0.78; pooled (95%CI): sens 0.87 (0.85–0.89) spec 0.45 (0.41–0.49)); 2 in established RA (sens 0.66 to 0.78); 1 in UA (sens 0.47; spec 0.71). Two studies used expert opinion and DMARD as goldstandard (sens 0.58 to 0.74, spec 0.8 to 0.86).

Conclusion: The present data indicate that combination of MRI-proven osteitis with 2010 RA classification criteria improves the diagnostic probability of RA at earlier stage.

Disclosure: M. Tamai, None; Y. Nakashima, None; T. Suzuki, None; Y. Horai, None; A. Ogawa, None; K. Kuma, None; Y. Sato, None; K. Ichinose, None; K. A. Ogawa, None; K. Kuma, None; T. Urugaichi, None; M. Uetani, None; K. Aoyagi, None; K. Eguchi, None; A. Kawakami, None.
Seven studies directly compared 2010 with 1987 criteria using different goldstandards showing an slightly lower overall specificity (mean delta Sensitivity 2010/II Sensitivity 1987 criteria = −0.05) but higher overall sensitivity (mean delta Sensitivity 2010−Sensitivity 1987 criteria = +0.13) of the new 2010 criteria compared to the 1987 criteria (figure 1).

Conclusion: The new ACR/EULAR classification criteria seems valid independent of goldstandard and cohort used. Compared to the 1987 criteria they show higher sensitivity and almost equal specificity.

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2114 Joint Damage Progression in Rheumatoid Arthritis: Role of the HLA-DRB1 Shared Epitope and Anti-CCP. Jose Felix Restrepo1, Inmaculada del Rincon1, Roy W. Haas1, Daniel F. Battafarano1, and Agustin Escalante1. 1University of Texas Health Science Center at San Antonio, San Antonio, TX, 2Brooke Army Medical Ctr, San Antonio, TX

Background/Purpose: The HLA-DRB1 shared epitope (SE) and antibodies to cyclic citrullinated peptides (anti-CCP) are important to the susceptibility to rheumatoid arthritis (RA), and are thought to be involved in pathogenesis. Clinically, their presence identifies patients with more severe disease. Few studies have examined their combined effect on RA outcome. We studied a large cohort of RA patients focusing on the association of radiographic joint damage with the presence of the SE and anti-CCP.

Methods: A radiograph of both hands and wrists was used to measure erosions and joint-space narrowing in patients with RA, using the technique developed by Sharp et al. The SE was genotyped using sequence-specific primer amplification, and anti-CCP was measured using ELISA. An anti-CCP concentration of 20 IU or higher was considered positive. Patients were followed over time with repeated hand radiographs. We used generalized estimating equations (GEE) with the Sharp score as a dependent variable to examine association between the SE and anti-CCP.

Results: We studied 1,328 RA patients. Of these, 1,264 (95%) had hand radiographs, as well as SE and anti-CCP results. There were 3,824 radiographs, or 3.0 films per patient, over 8,700 patient-years of observation (6.9 years per patient). The Sharp score at baseline was 47 (SD 61, range 0 to 294). The Sharp score progressed at a rate of 4.09 units per year (95% CI 3.96, 4.22) in the cohort considered as a whole. Among the 157 patients who were negative for both the SE and anti-CCP, the Sharp score progressed at a rate of 2.76 units per year (2.44, 3.08). Among 449 patients who were positive for either the SE or the anti-CCP, the Sharp progression rate was 4.02 (3.82, 4.22, P < 0.001). Among 658 patients who were positive for both the SE and anti-CCP, Sharp progression rate was 4.50 (4.34, 4.67, P < 0.001). We also examined at what point in time the mean Sharp score diverged significantly between the groups defined by SE and anti-CCP. Compared to patients who had negative SE and negative anti-CCP, patients who had positive SE and/or positive anti-CCP did not develop significantly higher Sharp score until 17 years of disease duration had passed.

Conclusion: Joint damage progressed more rapidly among RA patients who had positive SE and/or anti-CCP. However, it was not until well into the second decade of disease that the amount of damage in the patients with positive SE and/or positive anti-CCP became significantly different from those in whom these markers were negative.

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2115 Altered Serum Levels of Bone Metabolism Markers in Rheumatoid Arthritis. Lang Jing Zhu, Xia Ouyang, Lie Dai, Dong Hui Zheng, Ying Qian Mo, Xu Ning Wei, Chan Juan Zou and Bai Yu Zhang. Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University, Guangzhou, China

Background/Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory disease leading to joint destruction and disability. Previous studies showed abnormal activation of osteoclasts as well as altered skeletal bone metabolism and co-morbid conditions in RA. Tumor necrosis factor receptor-associated factor (TRAF) 6 is one of the critical modulator in differentiation and resorption activity of osteoclasts. New biochemical markers of bone formation showed contradictory results in different studies, although markers of bone resorption have shown significant increase in patients with RA. This study aimed to evaluate serum levels of bone metabolism markers and their correlation with synovial TRAF6 expression, as well as clinical and biological parameters that reflect the activity and severity of RA.

Methods: Serum C-terminal telopeptide of type I collagen (CTX-I), N-telopeptide propeptide of type I collagen (PINP) and N-terminal midfrag- ment of Osteocalcin (N-MID.OC) was tested by chemiluminescence in 30 patients with active RA, as well as 60 age and gender matched healthy controls. Synovial tissue samples were obtained by needle biopsy from
Results: Serum CTX-I level was significantly higher in RA patients compared with healthy controls (0.56 ± 0.37 vs. 0.34 ± 0.21, p = 0.004). No significant difference was found in serum PINP or N-MID.OC level. Spearman's correlation test showed serum PINP and N-MID.OC level of RA patients correlated negatively with morning stiffness (r = −0.450 and −0.267, p = 0.016 and 0.046, respectively) and pain VAS (r = −0.247 and −0.354, p = 0.049 and 0.045, respectively), but correlated positively with gripping power (r = 0.676 and 0.621, p = 0.005 and 0.006, respectively). Significant correlation was found between synovial TRAF6 expression and serum PINP level (r = 0.381, p = 0.038), as well as serum N-MID.OC level (r = 0.345, p = 0.042). Subanalysis of lining and sublining TRAF6 expression showed that PINP correlated significantly with sublining TRAF6 expression (r = 0.355, p = 0.046), N-MID.OC correlated significantly with lining TRAF6 expression (r = 0.407, p = 0.025).

Conclusion: Increased bone resorption and altered skeletal bone metabolism was found in RA. PINP and N-MID.OC may be a helpful biomarker for disease activity in RA. Synovial TRAF6 expression in RA correlated significantly with serum PINP and N-MID.OC level and maybe involved in the pathogenesis of bone metabolism disbalance in RA.

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The Associations of HLA-DR Shared Epitope Alleles and Serum Cytokines Among Postmenopausal Women with Rheumatoid Arthritis and Anti-Citrullinated Protein Antibody-Positive Rheumatoid Arthritis.

Mehret Biru Talabab1, Rachel Mackey2, Larry W. Moreland3, Jan Dorman4, Kevin D. Deane4, Jeremy Sokolove5, V. Michael Holers6, William H. Robinson7, Brian Wallitt8 and Lewis Kuller9. 1University of Pittsburgh Medical Center, Pittsburgh, PA, 2University of Pittsburgh, Pittsburgh, PA, 3University of Pittsburgh School of Nursing, Pittsburgh, PA, 4University of Colorado School of Medicine, Aurora, CO, 5VA Palo Alto Health Care System and Stanford University, Palo Alto, CA, 6Stanford University, Palo Alto, CA, 7Washington Hospital Center, Baltimore, MD

Background/Purpose: This study evaluates associations between HLADRβ1 associated shared epitope (SE) alleles and cytokines among postmenopausal women with rheumatoid arthritis (RA). Presence of 1 or 2 absence of SE alleles is associated with more erosive RA in a number of studies. Fewer studies have examined if the number of SE alleles is associated with markers of inflammation.

Methods: Participants (n = 2877) were enrolled in a substudy of the Women’s Health Initiative, and reported RA on questionnaires. Rheumatoid Arthritis. Presence of 1 or 2 absence of SE alleles is associated with more erosive RA in a number of studies. Fewer studies have examined if the number of SE alleles is associated with markers of inflammation.

Results: Women included in this analysis (n = 591) were RF and ACAP-positive. N = 208 had 0 SE alleles, n = 288 had 1 SE, and n = 95 had 2 SEs (underlined in table), with IL-2 and IL-6 showing the most marked differences (p < 0.05 for differences between SE categories).

Table 1. Median (Interquartile Range) Cytokine Levels by Number of Shared Epitopes in ACAP/RF+ Women

<table>
<thead>
<tr>
<th>Cytokines</th>
<th>0 (n = 208)</th>
<th>1 (n = 288)</th>
<th>2 (n = 95)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL-2</td>
<td>11.3 (4.3–35.1)</td>
<td>12.7 (7.6–64.1)</td>
<td>19.0 (6.4–40.6)</td>
<td>0.047</td>
</tr>
<tr>
<td>IL-6</td>
<td>11.8 (6.4–32.6)</td>
<td>13.0 (3.5–35.1)</td>
<td>20.3 (10.1–56.5)</td>
<td>0.003</td>
</tr>
<tr>
<td>INF-γ</td>
<td>68.6 (19.6–122.2)</td>
<td>72.4 (32.4–184.0)</td>
<td>87.0 (46.0–262.0)</td>
<td>0.32</td>
</tr>
<tr>
<td>MCP1</td>
<td>20.2 (13.4–33.1)</td>
<td>21.5 (15.1–36.7)</td>
<td>26.0 (13.5–42.6)</td>
<td>0.24</td>
</tr>
<tr>
<td>IL-1b</td>
<td>2.2 (1.1–4.0)</td>
<td>2.4 (1.6–6.4)</td>
<td>2.6 (1.7–7.1)</td>
<td>0.18</td>
</tr>
<tr>
<td>IL-10</td>
<td>3.0 (2.0–5.3)</td>
<td>3.2 (2.5–5.0)</td>
<td>3.9 (2.4–5.5)</td>
<td>0.32</td>
</tr>
<tr>
<td>IL-4</td>
<td>2.3 (1.3–3.7)</td>
<td>2.2 (1.5–3.6)</td>
<td>2.2 (1.5–3.2)</td>
<td>0.30</td>
</tr>
<tr>
<td>IL-5</td>
<td>4.0 (2.8–5.9)</td>
<td>4.2 (3.0–6.6)</td>
<td>4.2 (3.0–6.6)</td>
<td>0.46</td>
</tr>
<tr>
<td>IL-7</td>
<td>8.4 (6.0–11.5)</td>
<td>8.6 (6.5–12.8)</td>
<td>8.4 (6.1–11.6)</td>
<td>0.47</td>
</tr>
<tr>
<td>IL-8</td>
<td>9.6 (7.4–12.9)</td>
<td>10.1 (7.4–13.2)</td>
<td>9.6 (7.4–12.7)</td>
<td>0.50</td>
</tr>
<tr>
<td>IL-12</td>
<td>22.2 (12.2–65.5)</td>
<td>23.3 (14.0–53.4)</td>
<td>21.7 (13.5–49.6)</td>
<td>0.82</td>
</tr>
<tr>
<td>IL-13</td>
<td>4.0 (2.3–10.5)</td>
<td>4.4 (2.7–10.2)</td>
<td>4.2 (2.6–11.3)</td>
<td>0.46</td>
</tr>
<tr>
<td>GCSF</td>
<td>165.8 (112.7–224.2)</td>
<td>175.2 (120.0–235.8)</td>
<td>167.4 (124.8)</td>
<td>0.62</td>
</tr>
</tbody>
</table>

Conclusion: ACAP/RF+ women with 2 SE alleles had higher IL-2 and IL-6 levels than did women with fewer SE alleles. Studies indicate that IL-2 induces IL-2 proliferation, which in turn induces cytototoxic T cell differentiation. A pro-inflammatory milieu may explain why higher numbers of SE alleles are associated with more destructive arthropathy. IL-6 may be a particularly important therapeutic target among these women. Future work should examine whether these associations differ with use of disease-modifying anti-rheumatic drugs.

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Algorithm Using Genome-Wide SNP Analysis for Prediction of Radiographic Progression Per Year in RA Patients From Multiple Medical Cohorts.

Tsukasa Matsubara1, Satoru Koyano2, Yoshitada Sakai3, Keiko Fu-
nahashi4, James E. Middleton5, Takako Miura6, Kosuke Okuda7, Takeshi Nakamura8, Akira Sagawa9, Takeo Sakurai10, Hiroaki Matsuno9, Tomomaro Izumihara11 and Eiisuke Shono12. 1Matsubara Mayflower Hospital, Kato, Japan, 2Matsuzawa Medical Research Institute of Joint Diseases, Kobe, Japan, 3Takasaki Municipal Hospital, Takasaki, Japan, 4Sagawa Akira Rheumatology Clinic, Sapporo, Japan, 5Inoue Hospital, Takasaki, Japan, 6Matsuno Clinic for Rheumatic Diseases, Toyama, Japan, 7Izumihara Rheumatic and Medical Clinic, Kagoshima, Japan, 8Shono Rheumatology Clinic, Fukuoka, Japan

Background/Purpose: Although not yet fully possible, ideally, since patients with rapidly progressing joint destruction need tight initial control, predicting the progression of joint destruction would be pivotal in establishing a treatment strategy for individual RA patients. We developed a SNP algorithm with the aim of enabling the prediction of yearly radiographic progression by means of genome-wide SNP analysis using multiple medical cohorts.

Methods: One-hundred twenty-four RA patients whose disease duration was 5 years or less were enrolled in this study from 6 hospitals in different regions of Japan. All patients were treated with biologics after the failure of DMARDs therapy. Radiographic progression of joint destruction was estimated by Sharp score per year of disease duration. We defined three groups, rapid, intermediate, and slow radiographic progression, according to Sharp score per year of disease duration. Twenty-three patients had a yearly Sharp score of >50 (rapid radiographic progression), 25 had a yearly score of 50-10 (intermediate radiographic progression) and 25 had a yearly score of <=10 (slow radiographic progression). Case-control analyses between 278,347 SNPs and radiographic progression (rapid vs. intermediate+slow or rapid+intermediate+slow) were examined by Fisher’s exact test. We selected 10 SNPs closely associated with radiographic progression (p < 0.0001). We then scored a relationship between each SNP and radiographic progression, the estimated total score of the 10 SNPs (estimated scoring in each SNP was as follows: homo allele in the majority in rapid radiographic progression group: +1 point, hetero allele: 0 point, and homo allele in the majority of intermediate+slow radiographic progression group: –1 point), and examined relationships between the rapid and intermediate+slow group, and the total score.

Results: Accuracy ((true positive+true negative)/total), specificity (true negative/false positive+true negative)) and sensitivity (true positive/true positive + false negative)) of the algorithm for distinguishing the rapid progression group from the intermediate+slow progression group ranged from 93–96%. Accuracy, specificity and sensitivity of the algorithm for distinguishing the rapid+intermediate+slow progression group from the slow progression group ranged from 88–90%. It is therefore suggested that this SNP algorithm may enable the prediction of rapidly progressing severe joint destruction.

Conclusion: This highly accurate algorithm using SNP analysis may be useful in initially diagnosing rapid radiographic progression, and, in this way, may contribute to making a strategy of establishment for treating individual RA patients.

Disclosure: T. Matsubara, None; S. Koyano, None; Y. Sakai, None; K. Funahashi, None; J. E. Middleton, None; T. Miura, None; K. Okuda, None; T. Nakamura, None; A. Sagawa, None; T. Sakurai, None; H. Matsuno, None; T. Izumihara, None; E. Shono, None.
Validation of Prognostic Biomarkers for RA: Testing of 14-3-3 Eta According to the OMERACT Soluble Biomarker Criteria.

Background/Purpose: The OMERACT soluble biomarker subcommittee has published validation criteria related to truth, discrimination and feasibility for biomarkers reflecting structural damage. The large majority of committee has published validation criteria related to truth, discrimination and reproducibility, reliability, biomarker stability, and sources of variability.

Methods: The 14-3-3 eta ELISA was evaluated for intra- and inter-assay reproducibility by running 20 duplicate measurements on 3 samples within a single assay and over 4 days by 4 operators. Possible interferents [hemoglobin, lipids, bilirubin, albumin, RF, erythrocytes, AspA, MTX, and anti-TNFs] were spiked into serum and 14-3-3 eta % recovery was determined. Biomarker stability was examined in 1) 3 samples over 3 freeze-thaw cycles and 2) in 6 samples up to 2 years of storage at −80°C. Age and gender effects were assessed on 100 healthy controls, 50 males and 50 females [median age 55.0 and 57.5 years]. The effect of menopause was evaluated in the 50 females, 20 under and 30 over the age of 51. Correlations were used to evaluate the relationship of age and 14-3-3 eta concentration. 2-tailed t-tests and Mann-Whitney U-tests were performed to examine mean and median differences between genders and menopausal status.

Results: The intra- and inter assay coefficients of variation (CV%) were less than 10% [range (R)=6.0–9.2%]. Interference testing delivered a 106% median 14-3-3 eta recovery [R=100–115%] across the analytes tested demonstrating 14-3-3 eta quantification is not confounded by common RA patient serum substances. Results from sample stability testing indicate that serum 14-3-3 eta is stable over 3 freeze-thaw cycles with the median CV% being 109% [R=92–129%]. Long-term storage studies show that samples negative for 14-3-3 eta remain negative while those with levels above the upper limit of quantification of >20ng/ml have substantially equivalent levels. Stability of 14-3-3 eta was further confirmed using samples with levels in the linear range of the assay; median CV% was 104% of the original values [R=89–128%]. There was no correlation between age and 14-3-3 eta. Median 14-3-3 eta serum concentrations in healthy males and females did not differ significantly nor were there any significant differences in females aged over and under 51 years.

Conclusion: This 14-3-3 eta ELISA fulfills several key performance criteria considered essential by OMERACT. Quantification of 14-3-3 eta using this assay is reproducible and the biomarker is highly stable with no confounding of age, gender or menopause.

References

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Conclusions: The treatment of RA, MTX had a great effect on decreasing plasma IL-6 and the level of IL-6 after the use of MTX was the greatest impact on the radiological progression.

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Predictive Value of Anti-CCP Positivity On Disease Course and Response to Therapy in Early Rheumatoid Arthritis. Results From the Swedish EIRA Study. Saedis Saevardottir1, Marie Holmqvist1, Johan Asking2, Lars Alfredsson2 and Lars Klareskog.1.1Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2Karolinska Institute, Stockholm, Sweden, 3Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden

Background/Purpose: Does anti-CCP-positivity predict disease course and response to therapy in early rheumatoid arthritis (RA)?

Methods: We retrieved clinical follow-up data for patients entering the EIRA cohort 1996–2009 from the Swedish Rheumatology Quality Register (1996–2010). Overall, 1,640 of the 2,567 registered RA patients were followed from diagnosis. Then, 99 received no DMARD treatment, 41 received only prednisolone, 670 only methotrexate, 476 methotrexate and prednisolone, 224 sulfasalazine, whereas 130 patients received other DMARDS or combinations. The association between anti-CCP-positivity and EULAR good response was evaluated by logistic regression and expressed as univariate p-values and multivariate odds ratios (OR) with 95% confidence intervals (CI), adjusted for gender, age, inclusion year, symptom duration, HAQ score and cigarette smoking habits.

Results: The proportion starting DMARD/methotrexate at diagnosis increased during the inclusion period (p<0.0001<0.0001). In the subgroup receiving no DMARD, anti-CCP-positive patients were, compared to anti-CCP-negative patients, less likely to fulfill the criteria for 'good response' after 3 months (15% vs. 48%, p=0.002; adjusted odds ratio=0.24, 95% CI 0.07–0.82). A smaller, but significant difference was observed between anti-CCP-positive and anti-CCP-negative patients receiving methotrexate only (31% vs. 41%, p=0.02; adjusted odds ratio=0.65; 95% CI 0.44–0.94), whereas no difference was observed between anti-CCP-positive and anti-CCP-negative patients receiving both methotrexate and prednisolone (52% vs. 49%, p=0.5; adjusted odds ratio=1.23; 95% CI 0.78–1.92). No significant differences were observed in patients receiving sulfasalazine or in the entire cohort during 2 years follow-up.

Conclusion: Anti-CCP positivity predicts persistent disease activity in early RA patients not receiving DMARD treatment, while its predictive value for response is limited in patients treated with MTX, SSZ and prednisolone, and in the entire group of RA patients reflecting all treatment options over time. Our findings also indicate that the less chance of a favorable clinical disease course in anti-CCP positive patients may be compensated for with treatment, namely that today’s standard care with methotrexate and low dose prednisolone may have its main effects in ACPA-positive patients. This highlights the importance of performing a careful subgrouping of the RA syndrome in all controlled as well as observational studies on drug treatment.

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A Multi-Biomarker Disease Activity (VECTRA™ DA Algorithm) Score Reflects Clinical Disease Activity and Structural Changes in Rheumatoid Arthritis Patients Treated with Tocilizumab. Yoshiya Tanaka1, Kentaro Hanami1, Hitashi Tatsaka1, Shunsuke Fukuyo1, Douglas J. Haney2, Nadine Defranoux3, Rebecca Bolce4, Guy Cavet1, David Chenoff7, Kumihiko Yamaoka1, Kazuyoshi Saito5 and Shintaro Hirata1.1University of Occupational and Environmental Health, Japan, Kitakyushu, Japan, 2Crescendo Bioscience Inc., South San Francisco, CA

Background/Purpose: The multi-biomarker disease activity (MBDA) score assessed with 0.2 mL serum has been reported as a novel composite disease activity index for patients with rheumatoid arthritis (RA). We reported the correlation of MBDA score with conventional composite measures such as DAS28 in patients with RA. However, the estimation of the MBDA score in RA patients treated with anti-IL-6 receptor antibody tocilizumab (TCZ) has not been investigated. The purpose of this study is to clarify if the MBDA score could reflect disease activity and track therapeutic effect including clinical and radiographic outcomes in RA patients treated with TCZ.

Methods: Fifty two RA patients who treated with TCZ were enrolled. The MBDA algorithm includes 12 serum biomarkers (VCAM-1, EGF, VEGF-A, IL-6, TNF-RI, MMP-1, MMP-3, VKL-40, Leptin, Resistin, CRP, SAA) into a single score from 1–100 according the Vectra™ DA algorithm. MBDA disease activity categories were defined as high (MDA>44), moderate (MDA=29–44), low (MDA<25–29) and remission (REM<25). Radiographic changes were assessed by the modified total Sharp score (mTSS). For statistical analysis, Spearman’s rank correlation coefficients and Pearson’s chi-square test were used. All p-values are two sided and <0.05 were considered significant.

Results: At baseline (BL), patients had median age of 57±18, disease duration of 12.4±11.2 years, DAS28 of 5.6±1.3, CDAI of 22.1±12.2, HAQ-DI of 1.4±0.9 and mTSS of 106±112. MTX was used in 86.5% and positivity of RF was 78.8%. MBDA score at BL was 57.7±19.2 and were correlated well with DAS28 and CDAI (r=0.63 and 0.57, respectively, p<0.0001). TCZ improved MBDA score from 57.7 to 43.7 and 42.5 at W24 and W52, respectively, DAS28 from 5.6 to 2.5 and 2.9, CDAI from 22.2 to 6.4 and 5.6, at BL, W24 and W52, respectively. Changes of MBDA from BL to 52W by TCZ were significantly correlated with those of DAS28 (r=0.471, p<0.0001) and CDAI (r=0.373, p=0.001). MBDA was significant difference in REM was 14.9 to 0.5 by TCZ and 77% achieved MDA<25. Interestingly, all patients who achieved MBDA-LDA (8), MBDA-REM (3) or Boolean-REM (5) at W24 showed MDA<25, whereas some of DAS28-REM and CDAI-REM did not achieve. Patients who achieved MBDA-REM or Boolean-REM at W24 revealed higher likelihood ratio for achieving both radiographic and functional REM at W52 than those who did not.

Conclusion: This is the first report of the MBDA estimated in RA patients treated with TCZ. TCZ efficiently improved MBDA score and BL and changes of MBDA were correlated with those of conventional composite measures. Although additional data are needed to assess the relationship between MBDA and radiographic and functional remission, The MBDA score reflects disease activity and tracks therapeutic effects and MBDA-REM might be preferable to DAS28-REM for predicting good outcome in both radiographic damage and physical function in RA patients treated with TCZ.


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Plasma chemerin as a Useful Marker for Disease Activity in Patients with Rheumatoid Arthritis. Sang Tae Choi1, You-Jung Ha2, Eun-Jin Kang1, Kwang-Hoon Lee1 and Jung-Soo Song1.1Chung-Ang University College of Medicine, Seoul, South Korea, 2Kwangding University College of Medicine, Myongji Hospital, Goyang, South Korea, 3Busan Medical Center, Busan, South Korea, 4Dongguk University Ilsan Hospital, Goyang, South Korea

Background/Purpose: Chemerin is an adipokine that is linked to adipogenesis and chemotaxis of the innate immune system. It is expressed on macrophage, dendritic cells, and synovial lining and sublining cells. It has been reported that chemerin has both pro-inflammatory and anti-inflammatory roles, and higher level of chemerin was detected in various chronic inflammatory diseases. Recent studies have showed that its expression is increased in the synovium of patients with rheumatoid arthritis (RA), and the chemerin may play an important role in the pathogenesis of RA. However, the association between plasma chemerin level and disease activity in RA patients remains unclear. This study aims to determine whether plasma
Plasma chemerin level was significantly elevated in patients with RA compared to healthy controls (9.074 ± 13.513 pg/mL vs 0.370 ± 0.219 pg/mL, p < 0.001). In RA patients, the adjusted plasma chemerin level according to BMI was well correlated with RA disease activity. These findings suggest that plasma chemerin level may characterize RA patients who are at risk of more severe disease progression.

Method: We assessed the clinical characteristics and laboratory parameters including body mass index (BMI), erythrocyte sedimentation rate, C-reactive protein (CRP), and disease activity score 28 (DAS28) in RA patients. The plasma level of chemerin was correlated with DDAS28 (p = 0.039) and the change in miR-223 was associated with DDAS28 (p = 0.007). In contrast, no correlations between miR-223 and parameters of disease activity were found in the miR-223+/group.

Conclusion: The change in expression of miR-223 in sera may be attributable to the change in number of leukocytes between 3 months and baseline concluded from the positive correlations between these variables (p = 0.025). In addition, the expression of miR-223 in PBMC was downregulated by 15% (p = 0.001) after treatment with MTX.

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2124 Serum Concentrations of Soluble Interferon Receptor in Patients with Rheumatoid Arthritis. Masao Sato, Masao Takemura, Ryuki Shinohe, Tsumeo Watanabe and Katsuji Shimizu. Gifu University, Gifu, Japan

Background/Purpose: Interferon (IFN) exerts antiviral and antineoplastic activities, and is involved in immunoregulatory activities. IFN probably plays an important role in the pathogenesis of rheumatoid arthritis (RA), which is a chronic and progressive inflammatory disease. IFN is eliminated from the bloodstream, with a half-life of 2 h, it is difficult to detect IFN concentrations in the sera. IFN, similar to other cytokines, exerts its biological activities by binding to cell-surface receptors. In this study, we evaluated the serum concentrations of soluble IFN α/β receptor (sIFNR) in patients with RA.

Methods: The study involved 57 patients (11 men and 46 women) with RA who met the American College of Rheumatology 1987 RA classification criteria. The patients were aged 31 – 85 y (mean age, 61.2 y). The control group consisted of 16 patients with osteoarthritis (OA) of the knee and 216 healthy subjects. A significant correlation was observed between the serum levels of sIFNR and the healthy subjects (mean, 57.1 y and 52.3 y, respectively); the sIFNR concentrations of these subjects were determined. All the subjects recruited in this study were positive for hepatitis B surface antigens and hepatitis C antibodies. Blood samples were obtained from the subjects, serum fractions, and sera were isolated. Blood samples were stored at −80 degree, until the assay was performed.

Results: The serum concentrations of sIFNR in RA patients that varied from 0.7 to 5.8 ng/ml (mean, ±/− SD: 2.1 ±/− 1.2 ng/ml) and were significantly higher than those in the OA patients (mean, ±/− SD: 1.4 ±/− 0.7 ng/ml: p < 0.03) and the healthy subjects (mean, ±/− SD: 1.0 ±/− 0.5 ng/ml: p < 0.001). The serum levels of sIFNR in the RA patients with radiographic stage scores of II, III, and IV were 1.0 ±/− 0.2 ng/ml, 1.3 ±/− 0.3 ng/ml, and 2.5 ±/− 1.2 ng/ml, respectively. The serum levels of sIFNR in the RA patients with activities of daily living (ADL) scores of 2, 3, and 4 were 1.2 ±/− 0.2 ng/ml, 2.5 ±/− 1.0 ng/ml, and 3.8 ±/− 1.5 ng/ml, respectively. The serum levels of sIFNR in the RA patients were positively correlated with the disease durations (r = 0.55: p < 0.0001).

Conclusion: In this study, we observed that the serum levels of sIFNR in the RA patients were significantly higher than those in the OA patients and the healthy subjects. A significant correlation was observed between the serum levels of sIFNR in the RA patients and the RA stage scores, ADL scores, and disease durations. Therefore, serum levels of sIFNR might be a useful predictor for the prognosis of chronic conditions and RA.

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Response to Methotrexate Plus Prednisone in Camera II Using a Multi-Biomarker Disease Activity (Vectra®DA) Test and DAS28-ESR. J.W.J. Bijlsma1, M. Verhoef-Jurgens2, M.F. Bakker1, J.W.G. Jacobs1, M.J. Welsing1, G. Cavet2, D. Chernoff2 and D.J. Haney3. 1University Medical Center Utrecht, Utrecht, Netherlands, 2Crescendo Bioscience, Inc., 3.Crescendo Bioscience, 1, Crescendo Bioscience, 3;

Background/Purpose: The CAMERA II study (Computer Assisted Management in Early RA) demonstrated that the addition of prednisone to a MTX-based tight control strategy increased effectiveness of therapy, including reductions in disease activity, disability, and joint erosion, increased likelihood of achieving sustained remission, and less frequent need for biological treatment. The purpose of this study was to evaluate changes in biomarker levels over time with MTX and MTX + prednisone treatment.

Methods: Clinical and biomarker assessments were performed for 104 patients at multiple visits between Baseline (BL) and 1 year. The average number of visits per patient was 4. Clinical assessments were used to calculate the DAS28-ESR, and 12 serum biomarker concentrations were combined to produce a score between 1 and 100 using the MBDA algorithm, which is a validated biomarker-based measure of disease activity. Association between DAS28-ESR response and Multi-Biomarker Disease Activity (MBDA) response was assessed using Spearman’s correlation. Changes from BL were analyzed using the paired t-test.

Results: There was a significant association between change in DAS28-ESR from BL to 1 year and change in MBDA from BL to 1 year in both the MTX-only arm (r = 0.57, p < 0.001, n = 31) and in the MTX + prednisone arm (r = 0.57, p = 0.002, n = 28). Improvements in DAS28-ESR (p < 0.001) and MBDA (p < 0.01) were observed as early as 1 month post-BL in the MTX + prednisone arm. Significant reduction in disease activity in the MTX-only arm was first observed at 3 months for DAS28-ESR (p = 0.02) and at 4 months for MBDA (p = 0.03).

Conclusion: The biomarker-based MBDA test and DAS28-ESR responded quickly to combination therapy with MTX and prednisone and were correlated with one another. MBDA may be useful in combination with clinical assessment to evaluate early response to therapy with MTX or MTX + prednisone.

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Changes of Serological Markers in the Course of Traditional and Biological Disease Modifying Therapy of Rheumatoid Arthritis. Christoph Böhler1, Helga Radner1, Josef S. Smolen1 and Daniel Aletaha2. 1Medical University of Vienna, Vienna, Austria; 2Medical University of Vienna and Hietzing Hospital, Vienna, Austria

Background/Purpose: Rheumatoid factor (RF) and antibodies against citrullinated peptides (ACPAs) are established markers in the diagnostic approach to rheumatoid arthritis (RA). Both auto-antibodies (AAB) also have a prognostic value, since they are associated with more aggressive, destructive disease. Therefore decreases in AAB levels may be highly relevant to improve the long-term outcome of RA. We aimed to investigate the changeability of ACPA and RF levels under anti-rheumatic therapy, with special focus on the influence of treatment response.

Methods: We obtained data of outpatients from a long-term observational database with prospective entry data. We retrieved clinical and serological data of patients treated with traditional disease modifying anti-rheumatic drugs (DMARDs) and/or biological response modifiers from the treatment start and after 6 months of therapy. We used non-parametric tests to analyse changes of ACPA and RF levels between the two visits, as well as differences between treatment responders and non-responders. SDAI50 criteria were used to define treatment response. Furthermore, we investigated the trend of ACPA, RF and SDAI over a period of 18 months.

Results: 143 ACPA and RF positive patients were included. As depicted in Figure 1, the median (25th/75th percentile) relative changes after six months were −35.6% (−63.3; −8.3) for RF, and −15.2% (40.0; 10.0) for ACPA (p < 0.001 for both). The changes of RF levels were significantly greater than those seen for ACPA (p < 0.001). SDAI50 response was achieved in 60 (42%) patients. As can be seen in Figure 2, the decrease of ACPA and RF was significantly higher in patients with treatment response than in those without (p = 0.034 and p = 0.01, respectively). After 3 months the decline of ACPA, RF, and SDAI amounted to 4.6%, 13.2%, and 23.5%, respectively; after 12 months it was 16.9%, 31.4% and 40.5, and after 18 months 23.8%, 35.2%, and 44.3%, respectively.

Conclusion: RF and ACPA levels decreased significantly after 6 months of therapy. Reduction of both AAB were closely linked to a reduction of disease activity. RF declined faster, to a larger extent and in greater numbers of patients with treatment response than in those without (p = 0.034 and p = 0.01, respectively). After 3 months the decline of ACPA, RF, and SDAI amounted to 4.6%, 13.2%, and 23.5%, respectively; after 12 months it was 16.9%, 31.4% and 40.5, and after 18 months 23.8%, 35.2%, and 44.3%, respectively.

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Figure 1. Fractional rank depiction of relative ACPA and RF changes.

Figure 2. Differences of ACPAs and RF changes between responders and non-responders due to SDAI 50 criteria.

Rheumatoid Arthritis (RA) Patients Discordant for Rheumatoid Factor and Anti-CCP Positivity Have Different Clinical and Laboratory Features Than RA Patients Seropositive or Seronegative for Both Markers, Swati Modi1, Yong Colon2, Danielle Goudeau3, Donald M. Jones2, Christine L. Amity1, Lynne M. Frydrych2, Kelly A. Reckley3, Heather Eng4, Stephen R. Wisniewski3, Larry W. Moreland1 and Marc C. Levesque1. 1University of Pittsburgh, Pittsburgh, PA, 2Univ of Pittsburgh Med Ctr, Pittsburgh, PA, 3Univ of Pittsburgh, Pittsburgh, PA, 4University of Pittsburgh School of Medicine, Pittsburgh, PA, 5University of Pittsburgh, Graduate School of Public Health, Pittsburgh, PA

Background/Purpose: Rheumatoid factor (RF) and anti-cyclic citrullinated peptide (CCP) positive rheumatoid arthritis (RA) patients develop more extra-articular disease manifestations and erosions, and have a worse prognosis than seronegative RA patients. Levels of RA and CCP may be regulated independently. Therefore, our aim was to identify demographic and clinical differences between RA patients grouped according to RF and CCP status. Methods: Subjects were from the Rheumatoid Arthritis Comparative Effectiveness Research (RACER) registry performed. The analysis included data from the first visit at which both RF and CCP levels were available (n=884). Patients were categorized based on clinical cut-offs: RF+CCP+, RF+CCP-, RF-CCP+, RF-CCP-. The following demographic and clinical data were compared across RF-CCP groups: age, race, gender, disease duration, RF, CCP, disease activity (DAS28, CDAI), extra-articular nodules, morning stiffness, physician/patient global health assessment, and medication use (ever used DMARD, biologic, corticosteroid). Categorical and continuous variables were analyzed using chi-square and Kruskal-Wallis tests, respectively.

Results: 60% of subjects were RF+CCP+, 12% RF+CCP-, 10% RF-CCP+ and 18% RF-CCP-. Disease duration, RF, CCP, CRP, DAS28 score, presence of rheumatoid nodules, morning stiffness, and use of biologic therapy were statistically significantly different across groups (p<0.05). RF+CCP+ patients had longer disease duration than other patients (median 143 vs 88–93 months), and higher median RF (122 vs 20–28) and CCP (118 vs 2–47). Mean CRP ranged from 2.8 (RF+CCP+) to 8.1 (RF-CCP-). Morning stiffness was most common in the RF-CCP+ group (54% vs 26–40%), while rheumatoid nodules were more common in the CCP+ groups (12–15% CCP+ vs 5–6% CCP-). The proportion of patients ever having used biologic therapy ranged from 28% (RF+CCP-) to 56% (RF-CCP+). There were no statistically significant differences for the remaining demographic and clinical characteristics.

Conclusion: There were statistically significant demographic, clinical and laboratory differences between RA subjects grouped on the basis of RF and CCP positivity. RF+CCP+ subjects had longer disease duration but were similar in age to the other groups, suggesting that earlier age of RA onset may be associated with the development of high levels of both RF and anti-CCP. The associations of disease activity measures with RF levels (and not with CCP), suggests that RF levels vary with the degree of inflammation and disease activity (as does CRP) and are likely regulated by different factors than those that govern CCP levels. The greater use of biologic therapies by CCP+ subjects suggests that these RA patients may experience greater disease severity. An understanding of the differences between RA subjects grouped on the basis of RF and CCP status may allow for individualized treatment and will form the basis for future studies of the mechanisms differentially regulating RF and CCP levels.

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Matrix Metalloproteinase 3: A Biomarker of Disease Activity in Rheumatoid Arthritis, Sandra Reuter1, Torsten Matthias2 and Bruno Larida3, 1AIRA e.V., AESKU.KIPP Institute, Wendelsheim, Germany, 2AESKU.Diagnostics GmbH & Co. KG, Wendelsheim, Germany, 3AESKU.DIAGNOSTICS INC, Oakland, CA

Background/Purpose: New biomarkers for monitoring Rheumatoid Arthritis (RA) disease activity and prognosis of progression are urgently needed to individually optimize drug therapy and prevent joint destruction. Serum Matrix Metalloproteinase 3 (MMP-3) has been proposed to be such a marker. Thus we set out to correlate MMP-3 serum levels in Rheumatoid Arthritis patients with their individual disease activity.

Methods: 64 sera from adult patients (44 female, 20 male) with established RA and 97 control sera from adult healthy donors (48 female, 49 male) were analyzed using the AESKULISA DF MMP-3 kit. The 64 RA patients were classified as “Active” or “Inactive” according to their individual disease activity based on clinical data. Both RA groups were correlated to their individual MMP-3 serum concentrations (termed as “elevated” and “non-elevated” MMP-3 levels). The normal range of MMP-3 concentration in serum was determined by calculating the 95\(^{th}\) percentile of the measured MMP-3 concentrations for each gender.

Results: Of the 64 RA patients, 35 were classified as “Active” and 29 as “Inactive” based on their individual disease activity. Normal MMP-3 serum concentrations were determined as up to 60 ng/ml and up to 120 ng/ml for females and males, respectively. 89% (31/35) of “Active” patients had elevated and only 11% (4/35) had normal or borderline MMP-3 levels. 90% (26/29) of “Inactive” patients had normal and only 10% (3/29) had elevated MMP-3 levels.

Conclusion: Serum concentration of MMP-3 exhibits a high correlation with RA disease activity.

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Dickkopf-1 Is Increased in Rheumatoid Arthritis of Recent Onset and Might Be a New Biomarker of Structural Progression, Data From the Espoir Cohort, Raphaelle Seror1, Stephan Pavy2, Thierry Schaeverbeke3, Alain Sarau1, Xavier Mariette1 and Corinne Micheli-Richard1, 1Universite Paris Sud, Le Kremlin Bicetre, France, 2Hopital Bicetre, Paris, France, 3Groupe Hopitalier Pellegrin, Bordeaux, France, 4CHU de la Cavitye Blanche, Brest Cedex, France, 5Universite Paris-Sud, Le Kremlin Bicetre, France

Background/Purpose: Dickkopf-1 (DKK-1) is an inhibitory protein of the Wnt signalling pathway that could be involved in subchondral bone erosions occurring in rheumatoid arthritis (RA). Few studies have investigated the role of DKK1 in RA. We aimed to investigate DKK-1 serum levels in patients with recent inflammatory arthritis fulfilling ACR/EULAR criteria for RA and to investigate the parameters associated with DKK-1 increase and the relationship between DKK-1 levels and radiographic changes in RA.

Methods: The ESPHOIR cohort is a prospective, multicenter French cohort of patients with early arthritis, including 813 patients between 2002 and 2008. DKK-1 serum levels were assessed at baseline on the whole cohort by sandwich ELISA (Biomedica, Vienna). DKK-1 serum levels were further analyzed at inclusion in the subgroup of patients fulfilling ACR/EULAR criteria for RA after 7 years of follow-up (N=694, 85.3%) and compared with serum levels from 70 age and sex-matched controls (without autoimmune or chronic inflammatory disease). Uni and multivariate analyses were conducted to look for parameters associated or correlated with DKK-1 serum levels. DKK-1 serum levels were also compared between patients with and without radiographic change at baseline and after 2 years of follow-up.

Results: Among the 813 patients with early arthritis, 694 of them (85%) fulfilled ACR/EULAR criteria for RA (mean age 48.5±12.3, 78.2% female, with mean baseline DAS28=5.3±1.2, 54.6% anti-CCP positive). Serum DKK-1 level was significantly increased in RA patients compared to healthy controls (28.0±13.2 vs 10.8±9.3; p<0.0001). In univariate analysis, the level of DKK-1 was significantly correlated with the level of CRP (r=0.16, p<0.0001), ESR (r=0.11; p=0.005), patient global assessment (PGA) (r=0.08; p=0.046) and DAS28 (r=0.09; p=0.02). In addition, we found that DKK-1 level was significantly higher in patients with typical erosion related to RA at baseline, compared to those without (32.4±14.0 vs 27.2±12.9; p=0.0001). In the multivariate analysis adjusted for DAS28, PGA, and smoking status, only CRP levels and the presence of typical erosions related to RA remained associated with DKK-1 levels. Last, the most interesting result was that baseline DKK-1 levels was predictive of radiological progression (defined by increase of modified Sharp score >1) (29.3±13.0 in patients with progression vs 16.7±12.1 in patients without progression; p=0.025). Nevertheless, DKK-1 was no more associated with radiological progression in a model including other main predictors of severity (erosion at baseline, and anti-CCP positivity) in the multivariate analysis.

Conclusion: This study conducted in a large cohort of patients presenting with early onset RA clearly showed an increase in DKK-1 serum levels, associated with disease activity, biological inflammation and bone erosions at baseline. More interestingly, increase in DKK-1 serum levels were predictive of structural progression at 2 years and, then might be an interesting new structural biomarker in early RA.

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Studies of Disease and Therapy-Response Biomarkers in Early Rheumatoid Arthritis Treated with Methotrexate. Aase Haj Hensvold1, Saedis Saevarsdottir4, Wanyiang Li2, Vivianne Malmström2, Guy Cavet3, Lars Klareskog2 and Anca Irinel Catrina1. Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2Crescendo Bioscience Inc. 341 Oyster Point Blvd South San Francisco, CA 94080, San Francisco, CA, 3Crescendo Bioscience Inc., South San Francisco, CA, 4Karolinska Institute, Stockholm, Sweden 1equally contributed

Background/Purpose: To identify disease and therapy response serum biomarkers in early untreated RA patients started on methotrexate as the only DMARD.

Methods: 186 patients with early treatment naïve RA (symptom disease duration less than 1 year), started on methotrexate (MTX) monotherapy at diagnosis were included in the current study. All patients are part of a larger cohort of early RA named EIRA (epidemiology investigation of rheumatoid arthritids) and had available blood samples at baseline and a median of 3 months after treatment initiation. Concentrations of 12 serum biomarkers were measured at baseline and a median of 3 months after treatment start to calculate multi-biomarker disease activity (MBDA) scores [1]. Additionally ELISA for CCP-2 was performed at baseline. Associations between different biomarkers were calculated using Spearman’s rank correlation. The ability of MBDA score in tracking and differentiating clinical response was estimated by correlation between the change of MBDA score and the change of DAS28ESR from baseline to 3-months visit, and also by calculating area under the ROC curves (AUROCs) for classifying good/moderate EULAR responders versus non-responders at 3-months visit.

Results: No differences in the baseline characteristics were observed between patients included in the current study and MTX treated patients in the original large EIRA cohort (n=873) with a median (IQR) age of 52 (42–59), % female of 72%, % anti-CCP positive of 67% and median (IQR) DAS28ESR of 5.7 (5.0–6.2). At 3 months, 29% of the patients were good EULAR responders, 37% were moderate responders and 34% were non-responders. The change of MBDA score from baseline to 3-months visit was significantly correlated with the change of DAS28ESR and able to differentiate EULAR responders and non-responders (AUROC = 0.79, p-value<0.001). The median decrease in the MBDA score was significantly greater in the anti-CCP negative group than in the positive group but correlated with DAS28ESR changes in both groups.

Conclusion: We confirm the value of MBDA as a surrogate marker for measuring clinical disease activity and differentiate clinical response in early RA patients treated with MTX whether they were anti-citrullinated-protein antibodies (ACPA) negative or positive.

[1] J. R. Curtis, Validation of a Novel Multi-Biomarker Test to Assess Rheumatoid Arthritis Disease Activity, Arthritis Care & Research, accepted, to be online

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An Evaluation of Prognostic Factors for Orthopaedic Joint Surgery in Rheumatoid Arthritis. Results From Two Multicentre UK Inception Cohorts (1986–2011). Elena Nikiphorou1, Lewis Carpenter2, Sam Norton3, David James3, Patrick D. Kiely4, David Walsh4, Richard Williams4 and Adam Young4. 1ERAS, St Albans City Hospital & University College London (UCL), London, United Kingdom, 2University of Hertfordshire, Hatfield, United Kingdom, 3ERAS, St Albans City Hospital, St Albans, United Kingdom, 4Diana Princess of Wales Hospital, Grimsby, United Kingdom, 5St. Georges Hospital, London, United Kingdom, 6City Hospital, Nottingham, United Kingdom, 7City Hospital, Newcastle, United Kingdom, 8St Albans City Hospital, St Albans, United Kingdom

Background/Purpose: The need for orthopaedic surgery in rheumatoid arthritis (RA) is the result of failed medical treatment and a surrogate marker for joint destruction. Reliable prognostic markers are currently limited but have a potential role in guiding clinicians in early management decisions.

Methods: Standardised clinical, laboratory and X-ray measures were performed at baseline, prior to DMARD therapy and then yearly in both the Early RA Study (ERAS, n=1465, 1986–1998) and Early RA Network (ERAN, n=1236, 2002–2011), median follow up 18 and 6 years respectively, maximum 25 years. Treatment of patients included disease modifying, steroid and biologic therapies according to standard UK practices for management of hospital based RA patients. Source data of all orthopaedic interventions included clinical data (patient records and medical records from 1986) and national data: Hospital Episode Statistics and the National Joint Registry. Length of follow up was based on the National Death Registry. For analysis, interventions were grouped into major (total large joint replacements), intermediate (mainly synovectomies, arthroplasties and fusion procedures of wrist, hand, hind/forefoot), and minor (mainly soft tissue and tendon surgery).

Results: 1602 procedures were performed in 770 out of 2701 patients (29%). 576 were large joint replacements (mainly of hips and knees) in 354 (out of 2701) patients (13%), 392 intermediate in 221 (8%), 552 minor in 361 (13%), 55 internal fixations for hip fracture in 53 (2%), 9 cervical spine fusions and the remainder were miscellaneous/not classified procedures. 232 (8.0%) patients had more than one major and/or intermediate procedure. 1255 had minimum 10 year follow up (64%) of whom 531 (42%) had orthopaedic surgery. In univariate analysis, baseline and 1 year Health Assessment Questionnaire (HAQ), Erythrocyte Sedimentation Rate (ESR), high Disease Activity Scores (DAS), erosions and low haemoglobin(HB) all predicted major and intermediate surgery with odds ratios (ORs) all significant around 1.5–2, but these variables were stronger predictive of minor surgery. Strongest predictors for major surgery were low HB (OR 2.6, 95% CI 2–3.3), high Body Mass Index (BMI) only for total knee replacements (OR 1.7, 95% CI 1.2–2.4), for intermediate surgery were women (OR 3.2, 95% CI 2.2–4.7), DAS (OR 3.8, 95% CI 2.1–7.0) and RA related shared epitope (SE, OR 1.6, 95% CI 1.0–2.4). For multiple surgery, strongest predictors were erosions (OR 2.7, 95% CI 1.6–4.3), HAQ (OR 2.6, 95% CI 1.6–4.2), HB (OR 3.4, 95% CI 2.3–4.9), ESR (OR 3.1, 95% CI 1.9–4.7), SE (OR 1.9, 95% CI 1.2–3.4), ESR (OR 3.3, 95% CI 2.3–4.8). In Cox regression, sex, onset age and erosions predicted intermediate surgery, and sex, onset age and HB predicted major surgery.

Conclusion: Orthopaedic surgery is an important and common outcome in RA, not often reported and difficult to predict. HB does not normally perform well as a predictor of outcome in RA, but did for orthopaedic intervention, especially major and multiple surgery.

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Disease Activity and Anti-CCP Status, but Not Sociodemographic Factors or Patient Comorbidities, Affect Time to Diagnosis in Early Rheumatoid Arthritis. Cheryl Barnabe1, Juan Xiong2, Giles Boire3, Carol A. Hitchon1, Boulos Harroui1, Janet E. Pope1, J. Carter Thorne1, Edward Keystone8, Diane Tin7, Vivian P. Bykerk9 and Canadian ArThri- tis ColIort6. 1University of Calgary, Calgary, AB, 2University of Toronto, CHUS -Sherbrooke University, Sherbrooke, QC, 3University of Manitoba, Winnipeg, MB, 4Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Montreal, QC, 5St. Joseph’s Health Care London, London, ON, 6Southlake Regional Health Centre, Newmarket, ON, 7University of Toronto, Toronto, ON, 8Hospital for Special Surgery, New York, NY. 9Toronto

Background/Purpose: Delays in patient presentation to primary care providers, subsequent referral for rheumatology assessment, and recognition of rheumatoid arthritis (RA) by the rheumatologist increase time to diagnosis. This time period is a modifiable determinant of joint damage and affects the odds of entering remission, and factors impacting this time must be elicited. Our aim was to evaluate whether time to diagnosis is influenced by measures of disease severity or a family history of RA, sociodemographic factors affecting access to care (age, sex, socioeconomic status (SES), education level, ethnicity), or comorbidities that may influence the physical examination, such as obesity, mental health conditions, or other musculoskeletal pain conditions.

Methods: A prospective national cohort of patients with confirmed or possible RA by 2010 ACR criteria (n=1,151) was evaluated for predictors of time to diagnosis. Variables examined in univariate analysis are summarized in Table 1. Simple linear regression was applied to each variable, and significant predictors carried forward to multivariate linear regression.
Table 1. Variables Assessed in Univariate Analysis for Time to Diagnosis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>7.789</td>
<td>7.257–8.322</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Swollen Joints</td>
<td>-0.051</td>
<td>-0.089–0.031</td>
<td>0.0085</td>
</tr>
<tr>
<td>ESR</td>
<td>-0.016</td>
<td>-0.026–0.006</td>
<td>0.0001</td>
</tr>
<tr>
<td>Patient Global Score</td>
<td>-0.085</td>
<td>-0.161–0.009</td>
<td>0.0280</td>
</tr>
<tr>
<td>Damaged joint count</td>
<td>-0.090</td>
<td>-0.2040.023</td>
<td>0.1192</td>
</tr>
<tr>
<td>Anti-CCP Positive</td>
<td>0.814</td>
<td>0.383–1.245</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

Conclusion: Recognition of RA is not affected by a family history, sociodemographic factors, body habitus, mental health conditions, or other musculoskeletal pain syndromes. Worse patient global, more swollen joints, higher ESR and anti-CCP status influence time to diagnosis. The impact of fewer swollen joints and normal laboratory parameters on delay to diagnosis merits further consideration.

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Relationship Between Clinical Response and Radiographic Outcomes in Patients with Moderate Rheumatoid Arthritis. Josef S. Smolen1, Ronald F. van Vollenhoven1, Andrew S. Koenig2, Ronald Pedersen3, Annette Szumski4 and Eustratios Banias3. 1Medical University of Vienna and Hietzing Hospital, Vienna, Austria, 2The Karolinska Institute, Stockholm, Sweden, 3Pfizer Inc., Collegeville, PA

Background/Purpose: Clinical evidence has established the importance of early, intensive treatment of rheumatoid arthritis (RA) to decrease disease activity and prevent joint damage.1 The objective of this analysis is to examine the relationships between disease activity and inhibition of radiographic progression after 36 weeks of etanercept (ETN) + methotrexate (MTX) therapy in patients with moderate RA.

Methods: In the PRESERVE trial, patients with moderately active RA (DAS28 3.2–5.1) despite stable MTX for ≥3 months received open-label ETN 50 mg once weekly + MTX for 36 weeks. Week 36 (final time point) mTSS, defined as the sum of baseline mTSS and mTSS progression rate (units/year), was analyzed in relationship to disease activity by CDAI and DAS28.

Results: 704 patients who received ≥1 dose of ETN 50 mg + MTX and had available X-rays were included in this analysis. The percentage of patients achieving CDAI and DAS28 remission was 28% and 69%, respectively, and LDA including remission was seen in 87% and 88%. Both week 36 CDAI and week 36 DAS28 remitters had lower week 36 mTSS progression rate (units/year) compared with non-remitters (P<0.05). Week 36 CDAI remitters also had lower baseline mTSS and lower week 36 mTSS (P<0.05; Table). CDAI and DAS28 week 36 disease activity categories (remission, LDA excluding remission, and NR) had similar proportions of patients (80–87%) who achieved radiographic non-progression (mTSS Δ ≤0.5). A significant relationship (P<0.001) was observed between baseline mTSS quartiles and week 36 mTSS progression rate categories (<0.5, ≥0.5–3, >3); the lowest baseline mTSS quartile (<0.5) had the highest proportion of non-progressors (<0.5); 28% and the highest quartile (≥3) yielded the highest percentage (54%) of patients with large radiographic progression (≥3). A similar, significant (P<0.01) relationship was seen between baseline mTSS quartiles and week 36 CDAI response categories, with the lowest quartile having the highest proportion of CDAI remitters (33%) and highest quartile having the largest proportion of CDAI NR (31%).

Conclusion: A large proportion of patients treated with ETN+MTX achieved remission as measured by CDAI and DAS28 which inhibited radiographic progression regardless of week 36 disease activity. Overall, patients had less radiographic progression if they also achieved remission compared to LDA or NR. These results indicate that achievement of clinical goals in moderate RA has implications for structural benefits.


Disclosure: J. S. Smolen, Abbott, Amgen, Astra-Zeneca, BMS, Celseine Centocor-Janssen, Glaxo, Lilly, Pfizer (Wyley), MSD (Schering-Plough), Novo-Nordisk, Roche, Sandoz, and UCB, 2, Abbott, Amgen, Astra-Zeneca, BMS, Celseine Centocor-Janssen, Glaxo, Lilly, Pfizer (Wyley), MSD (Schering-Plough), Novo-Nordisk, Roche, Sandoz, and UCB, 5; R. F. van Vollenhoven, Abbott Laboratories, 2, Bristol-Myers Squibb, 2, GlaxoSmithKline, 2, Human Genome Sciences, Inc., 2; MSD, 2, Pfizer Inc, 2, Roche Pharmaceuticals, 2, UCB Pharma, 2, Abbott Laboratories, 5, Bristol-Myers Squibb, 5, GlaxoSmithKline, 5, Human Genome Sciences, Inc., 5; MSD, 5, Pfizer Inc, 5, Roche, 5, Pfizer Pharmaceuticals, 5, UCB Pharma, 5; A. S. Koenig, Pfizer Inc, 3, Pfizer Inc, 1; R. Pedersen, Pfizer Inc, 3, Pfizer Inc, 1; A. Szumski, None; E. Banais, Pfizer Inc, 1, Pfizer Inc, 3.

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The Changed Prognosis of Patients with Early Rheumatoid Arthritis. Karin Britzemer1 and D. van Schaardenburg2. 1Jan van Breemen Research Institute / Reade, Amsterdam, Netherlands, 2Jan van Breemen Research Institute / Reade, Amsterdam, Netherlands

Background/Purpose: The treatment of rheumatoid arthritis (RA) has changed greatly during the past fifteen to twenty years. Major steps in this development were the introduction of methotrexate in the early nineties, the use of combination therapies including high-dose corticosteroids in the late nineties and the introduction of biologic therapies in the past decade. These improvements resulted in a better outcome and clinical remission became an attainable goal for many patients. This study documents trends in patient outcome over the last decades.

Methods: Five-year follow-up data was used from consecutive early RA patients (according to the 2010 ACR/EULAR criteria), included in the periods 1995–1999, 2000–2004 and 2005–2009. Disease activity (DAS28), functional status (HAQ) and employment status (hours paid work per week) were used as outcome measures.
Results: 322, 369 and 389 patients were included in the three time periods, respectively. Median follow-up was 2 years. Patients included in 1995–1999 were older compared to the patients from the other periods, while the percentage of ACPSA positive patients was higher in the last period. General practitioners referred patients increasingly sooner during the last 15 years. In the periods 1995–1999, 2000–2004 and 2005–2009 new patients with RA were treated in the first year with combination therapy in 13, 45 and 59% and/or biologics in 0, 9 and 19%, respectively. The baseline values of DAS-28, but not HAQ and hours paid work, showed a slight decrease over the three periods. However, after 5 years follow-up these differences were no longer significant. The trends in HAQ did not show differences between the three groups. The hours paid work of patients included in 2005–2009 remained stable during follow-up while the other groups showed a decrease over time. Data on radiographic progression are currently being analyzed.

Table. Baseline differences between patients of the three time periods

<table>
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<tr>
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<tbody>
<tr>
<td>Age, yr</td>
<td>57 (15)</td>
<td>55 (14)</td>
<td>&lt;0.001</td>
<td>53 (13)</td>
<td>&lt;0.001</td>
<td>ns</td>
</tr>
<tr>
<td>Female, %</td>
<td>69</td>
<td>72</td>
<td>ns</td>
<td>72</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>ACPSA, %</td>
<td>91</td>
<td>61</td>
<td>ns</td>
<td>78</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>BF, %</td>
<td>57</td>
<td>56</td>
<td>ns</td>
<td>55</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Disease duration, mos</td>
<td>5.0 (1.4–8.0)</td>
<td>4.3 (2.6–7.2)</td>
<td>0.015</td>
<td>2.8 (1.4–5.9)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>GP-delay, wk</td>
<td>3.9 (2.0–9)</td>
<td>4.0 (2–11)</td>
<td>&lt;0.001</td>
<td>4.1 (3–13)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DAS-28</td>
<td>5.1 (2.2)</td>
<td>5.1 (1.3)</td>
<td>ns</td>
<td>4.9 (1.3)</td>
<td>0.021</td>
<td>0.012</td>
</tr>
<tr>
<td>HAQ</td>
<td>1.15 (0.5–1.75)</td>
<td>1.15 (0.75–1.75)</td>
<td>ns</td>
<td>1.13 (0.63–1.63)</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Work, h/wk</td>
<td>32.9 (15.9)</td>
<td>30.0 (11.0)</td>
<td>ns</td>
<td>32.8 (12.8)</td>
<td>ns</td>
<td>ns</td>
</tr>
</tbody>
</table>

Values are expressed as mean (SD) or median (IQR) * p-value compared to period 1995–1999 $ p-value compares period 2000–2004 vs 2005–2009

Conclusion: The results document an increasingly better prognosis of early RA patients over the last 15 years. Early recognition and referral by general practitioners has led to a lower disease activity at baseline. Next, more intensive treatment resulted in improved outcomes. However, despite a favorable trend in work participation, there still remains ample opportunity for a further reduction of disease activity and improvement of function.

Disclosure: K. Britsemmer, None; D. van Schaardenburg, None.

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Trabecular Bone Texture parameters are Correlated with Magnetic Resonance Imaging (MRI) bone Edema At Hand and Wrist in Active Rheumatoid Arthritis (RA), Thao Pham1, Sophie Trijau 1, Roland Chappurat1, Damien Leouille1, Thierry Schaeverbeke2, Christian Roux2, Claude-Laurent Benhamou3, Olivier Vittecoq4, Jean Sibilia4, Frederic Mistretta4 and Cécile Hacquard-Bouder10 1Sainte Marguerite Hospital, Marseille, France, 2Hôpital Edouard Herriot, Lyon, France, 3CHU Brabois, Vandoeuvre les Nancy, France, 4Groupe Hospitalier Pellegrin, Bordeaux, France, 5Paris Descartes University, Paris, France, 6EA 4708 University Orleans, Orleans, France, 7Rouen University Hospital & INSERM905, University of Rouen, Rouen Cedex, France, 3CHU Hautepierre, Strasbourg, France, 4Lyon, France, 9Abbott France, Rungis, France

Background/Purpose: In RA, bone marrow edema (BME) is predictive of erosive progression. Bone erosions are assumed to appear through activation of local bone resorption mechanisms, reflected by periarticular osteopenia. Measurement of periarticular bone mineral density by DXA requires specific hand software limiting its application in large population, and does not assess bone texture. A new high resolution direct digital X-ray device has been recently developed to provide bone texture analysis reflecting changes in trabecular bone architecture, with a very low radiation exposure.

Objectives: To assess the correlation between MRI bone edema and trabecular bone texture parameters in active RA.

Methods: Study design: cross-sectional multicenter study. Comparative MRI and high resolution X-rays of the dominant hand and wrist were obtained from 55 patients with active RA according to ACR/EULAR criteria (DAS 28 ≥ 3.2). Clinical examination and radiographs of the hands and feet were also performed. High resolution direct digital X-ray (BMA™, D3A Medical Systems): The fractal trabecular bone texture parameter (Hmean) was evaluated on the 2nd and 3rd metacarpal head, capitatum and lunatum. MRI: BME was scored according to the RA MRI score (RAMRIS) by two independent and experienced radiologists (central reading). BME was also specifically assessed on the 4 bones where Hmean was evaluated (BME4 score). Radiographs: plain radiographs were scored using the modified Sharp-van der Heijde method. Analysis: Inter-reader reliability: ICC. Correlation between BME and Hmean: Spearman test.

Results: Data from 53 patients were analyzable. The main patients characteristics were (mean ± SD): age 57 ± 14 years, 75% women, disease duration 8.6 ± 9.2 years, DAS28 5.4 ± 3.1, anti-CCP 76%, Sharp-DviDh 23.8 ± 31.3, currently treated with DMARDs 74%, biologics 47%, corticosteroids 60% (mean daily dosage 9.1 ± 6.6 mg). The mean ± SD [median] RAMRIS BME, BME4 and Hmean scores were 12.7 ± 14.6 [5.0], 2.7 ± 2.8 [1.0] and 0.60 ± 0.66 [0.61], respectively. RAMRIS BME inter-reader reliability: ICC=0.96. Correlations between Hmean and both RAMRIS BME and BME4 scores were r=-0.31 (p=0.022) and r=-0.32 (p=0.016), respectively. When evaluated only on the 2nd and 3rd metacarpal head, Hmean was significantly correlated with the total BME score r=0.28 (p=0.038) whereas it was not when evaluated on lunatum and capitatum (r=0.22 – p=0.120).

Conclusion: This study demonstrated trabecular bone texture parameters are correlated to MRI bone edema scores. It would be interesting to assess if bone texture impairment, measured with a high resolution digital X-ray device, could predict RA radiographic progression in a wider range prospective study.

Disclosure: T. Pham, Abbott Immunology Pharmaceuticals, 5; S. Trijau, None; R. Chappurat, Abbott Immunology Pharmaceuticals, 5; D. Leouille, Abbott Immunology Pharmaceuticals, 5; C. Roux, Abbott Immunology Pharmaceuticals, 5; C. L. Benhamou, Abbott Immunology Pharmaceuticals, 5; O. Vittecoq, Abbott Immunology Pharmaceuticals, 5; J. Sibilia, Abbott Immunology Pharmaceuticals, 5; F. Mistretta, Abbott Immunology Pharmaceuticals, 5; C. Hacquard-Bouder, Abbott Immunology Pharmaceuticals, 3.

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Alcohol Use and Radiographic Disease Progression in African Americans with Recent Onset Rheumatoid Arthritis. Marshall Davis1, Kaleb Michaud1, Harlan Sayles2, Doyt L. Conn2, Larry W. Moreland3, S. Louis Bridges Jr.4 and Ted R. Mikuls4, 1University of Nebraska Medical Center, Omaha, NE, 2Emory Univ School of Medicine, Atlanta, GA, 3University of Pittsburgh, Pittsburgh, PA, 4Marguerite Jones Harbert-Jene V. Ball, MD Professor of Medicine, and Director, Division of Clinical Immunology and Rheumatology, University of Alabama at Birmingham, Birmingham, AL

Background/Purpose: Previous studies have shown that alcoholic beverage consumption can modify levels of circulating inflammatory cytokines and alter expression of innate immune system receptors. Recognizing these changes, investigators have sought to identify the association of alcohol consumption with rheumatoid arthritis (RA) risk and progression. To date, studies have primarily been limited to patients of European ancestry and have yielded conflicting results. To address this gap of knowledge we sought to investigate alcohol consumption and RA disease progression in African Americans; a historically under-studied cohort. Specifically, the aim of our study was to determine if alcohol consumption, stratified by dose, is associated with radiographic disease progression in African Americans during the early stages of RA.

Methods: RA patients included in the study were participants in the Consortium for the Longitudinal Evaluation of African Americans with Early Rheumatoid Arthritis (CLEAR) registry with < 2 years disease duration from symptom onset. Patients reported the average number of alcoholic beverages consumed per month and a modified Sharp/van der Heijde score was computed to assess disease progression using joint space narrowing and erosion totals in radiographs of the wrists, hands, and
feet. Upon visual inspection, a clear natural break with an inflection in the slope was identified at 15 beverages per month. Patients were subsequently categorized into two groups: those consuming < 15 beverages per month versus those consuming ≥ 15 per month. Associations of radiographic disease progression over a one to three year period of observation with alcohol consumption was evaluated using generalized estimating equations adjusting for patient demographics, current RA therapy, anti-CCP, RF-IgM, c-reactive protein, and smoking status.

**Results:** There were 166 patients included in the study; 139 reported that they consumed, on average, < 15 alcoholic beverages per month and 27 reported consuming ≥ 15 per month. A “checkmark-shaped” relationship of alcohol consumption and radiographic disease progression was identified and is shown in Figure 1. In patients consuming ≥ 15 alcoholic beverages per month, alcohol intake was associated with an increased risk of radiographic disease progression (p = 0.017) after multivariate adjustment. There was no evidence of a relationship in those consuming < 15 beverages per month (p = 0.802).

**Conclusion:** There appears to be a dose-dependent relationship between alcohol use and radiographic disease progression in African Americans with RA. Individuals who consume 15 or more alcoholic beverages per month may have accelerated rates of radiographic joint damage compared to those with lower levels of consumption.

**Disclosure:** M. Davis, None; K. Michaud, None; H. Sayles, None; D. L. Conn, None; L. W. Moreland, None; S. L. Bridges Jr., None; T. R. Mikuls, None.

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**Contribution of Disease Activity, Joint Damage and Comorbidity to Impairment (SOFI) and Disability (HAQ) in Rheumatoid Arthritis Patients Over 20 Years.** Meliha C. Kapetanovic¹, Elisabet Lindqvist², Jan-Ake Nilsson³, Pierre Geborek⁴, Tore Saxne⁴ and Kerstin Eberhardt⁴.

¹Dept of Clinical Sciences Lund, Section of Rheumatology, Lund University, Lund, Sweden, ²Department of Clinical Sciences Lund, Section of Rheumatology, Skåne University Hospital, Lund University, Lund, Sweden, ³Lund University, Malmö, Sweden, ⁴Sweden, ⁵Dept of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden

**Background/Purpose:** To study the contribution of disease activity, joint damage and co-morbidity on development of impairment measured by signals of functional impairment (SOFI) and disability measured by health assessment questionnaire (HAQ) in rheumatoid arthritis (RA) patients prospectively followed over 20 years after diagnosis.

**Methods:** 183 RA patients diagnosed between 1985 and 1989 were prospectively monitored over 20 years. There were 116 (63 %) women, mean (SD) age was 52 (12) years and symptom duration before inclusion was 11 (7) months. Disease activity was measured by 44-joint DAS, joint damage by Larsen score of radiographs of hands and feet, comorbidity by Charlson Comorbidity Index (17 diagnoses each weighted by mortality risk), impairment by SOFI (3-parts performance based index measuring hand, arm and leg function) and disability by HAQ. Two separate multiple regression models with SOFI and HAQ as outcome variables at 0, 5, 10, 15 and 20 year follow up were created.

**Results:** Altogether, disease activity, radiographic joint damage and co-morbidity explained 22–38% of SOFI and 14–38% of HAQ (figure). For SOFI, DAS contributed with 2–27% with a peak at 5 years. Radiographic damage contributed increasingly (6–35%). For HAQ, DAS contributed significantly at all follow up times (7–28%), with a peak at 5 years whereas radiographic damage had minor contribution (0–10%). Comorbidity showed minor contribution both to SOFI and HAQ.

**Conclusion:** In the long-term perspective impairment is increasingly explained by radiographic joint damage, whereas disability is less well explained by RA related factors over time. Comorbidity contributed only to small extent to both impairment and disability.

**Disclosure:** M. C. Kapetanovic, None; E. Lindqvist, None; J. Nilsson, None; P. Geborek, None; T. Saxne, None; K. Eberhardt, None.
Racial and Ethnic Disparities in Rheumatoid Arthritis Outcomes in Community-Based U.S. Rheumatology Practices: Results From the Consortium of Rheumatology Researchers of North America Registry.

Jeffrey D. Greenberg1, Tanya Spruill2, Gbenga Ogudejo1, Joel M. Kremer3, Ying Shan4, Katherine C. Saunders5, Yusuf Yazici6 and Leslie R. Harrold7
NYU Hospital for Joint Diseases, New York, NY, 2NYU School of Medicine, New York, NY, 3New York University School of Medicine, New York, NY, 4Albany Medical College and The Center for Rheumatology, Albany, NY, 5UMass Medical School, Worcester, MA, 6CORRONA, Inc., Southborough, MA, 7New York University, New York, NY

Background/Purpose: Disparities in medication use and clinical outcomes have been reported in patients with rheumatoid arthritis (RA) and other chronic diseases. However, there is little information regarding whether disparities exist in RA clinical outcomes in black and Hispanic patients treated in community-based rheumatology practices in the U.S.

Methods: We examined data from RA patients (pts) participating in the Consortium of Rheumatology Researchers of North America (CORRONA) registry, an independent registry collecting patient and physician-derived data from both academic-affiliated and community-based practice sites. Among the 30,869 RA pts enrolled in the registry across 146 academic and community-based sites, we examined data from 26,640 RA pts under the care of 109 community-based rheumatology practices. We performed a cross-sectional study using data collected from the most recent registry visit as of 05/05/2012. We compared medication use and RA outcomes across race/ethnic groups, comparing non-Hispanic white RA pts versus black and Hispanic RA pts based on self-reported race/ethnicity categories. Specifically, we compared measures of RA disease activity (DAS28 and CDAI), as well as patient-reported outcomes (pain VAS and HAQ score). Pairwise statistical comparisons were performed versus the white RA cohort.

Results: The study cohorts included 23,396 non-Hispanic whites, 1,890 black and 1,354 Hispanic pts. The mean duration of RA was greater for whites (11.6 yrs) vs blacks (9.4 yrs, p<0.001) and Hispanics (10.8 yrs, p<0.001). Similar proportions of Hispanics (58.3%) and white pts (59.7%) were treated with methotrexate (MTX), and more blacks (62.4%) were treated with MTX versus whites. Prescribed MTX dosages were comparable across groups, although blacks and Hispanics reported taking significantly lower dosages. Estimated MTX adherence calculated as patient-reported dosage divided by the prescribed dosage varied from 89% in whites to 78.5% in blacks and 82.6% in Hispanics. Slightly higher rates of biologic use were observed for whites (44.9%) vs. blacks (42.8%), although not significantly different (p=0.07). In comparison to whites, Hispanics actually had higher rates of biologic use (48.7%, p<0.01). Higher levels of disease activity using both the CDAI and DAS28 were observed for blacks and Hispanics vs. whites (p<0.001, see Table). Higher patient pain scores (p<0.001) and worse functional status (p<0.001) were also reported by both black and Hispanic RA pts vs. whites.

<table>
<thead>
<tr>
<th>Table. Medication Use and Outcomes by Racial and Ethnic Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White</strong> (N=23,396)</td>
</tr>
<tr>
<td>Disease Activity Score (DAS28), mean</td>
</tr>
<tr>
<td>Disease Activity Index (CDAI)</td>
</tr>
<tr>
<td>MD global VAS, mean</td>
</tr>
<tr>
<td>Patient global VAS, mean</td>
</tr>
<tr>
<td>Tender joint count, mean</td>
</tr>
<tr>
<td>Swollen joint count, mean</td>
</tr>
<tr>
<td>Patient Pain Score (VAS), mean</td>
</tr>
<tr>
<td>Functional Status (HAQ Score), mean</td>
</tr>
<tr>
<td><strong>RA Treatment</strong></td>
</tr>
<tr>
<td>Biologic prescribed currently (%)</td>
</tr>
<tr>
<td>MTX prescribed currently (%)</td>
</tr>
<tr>
<td>MTX dose prescribed, mean (mg/wk)</td>
</tr>
<tr>
<td>MTX dose self-reported, mean (mg/wk)</td>
</tr>
<tr>
<td>Note: ***p&lt;0.001, **p&lt;0.01, *p&lt;0.05</td>
</tr>
</tbody>
</table>

Conclusion: Although some differences in RA medication prescribing were observed, both black and Hispanic pts treated in community-based practices demonstrated higher RA disease activity, higher pain scores and worse functional outcomes than white RA pts.

Disclosure: J. D. Greenberg, Corrona, 4; AstraZeneca, Novartis, Pfizer, CORRONA; 5; T. Spruill, None; 6; G. Ogudejo, None; 7; J. M. Kremer, Corrona; 8; J. Y. Shan, None; 9; K. C. Saunders, Corrona; 3; Y. Yazici, BMS, Genentech, Abbott, Merck, Pfizer, UCB, Celgene, Horizon, 5; L. R. Harrold, NIH-K23AR058586, 2; Corrona, 5.


Disclosure: M. Reintert, None; L. Trupin, None; P. P. Katz, None; E. Yelin, None; J. Barton, None; J. B. Imboden, None.

2140

A Longitudinal Study of Prognostic Factors in Patients with Early RA Providing Direction for Future Clinical Treatment- Predict Study. Paul Bird1, David Nicholls2, Julien P. de Jager3, Hedley Griffiths4, Lynden Roberts5, Kathleen Tymms6, Jane Zochling7, Mark H. Arnold8, Geoffrey O. Littlejohn9 and OPAL Consortium10

1Combined Rheumatology Practice, Sydney, Australia, 2Coast Joint Care, Maroochydore, Australia, 3Suites 1, 2, Osler House, Southport, Australia, 4Barwon Rheumatology Service, Geelong, Australia, 5James Cook University, Townsville, Australia, 6Canberra Rheumatology, Canberra, Australia, 7Menzies Research Institute Tasmania, Hobart, Australia, 8Level 2 The Gallery, Chatswood, Australia, 9Monash Medical Centre, Melbourne, Australia, 10Melbourne, Australia

Background/Purpose: Although the effects of tobacco use on disease onset, severity, and response to therapy have been well studied in rheumatoid arthritis (RA), there is little data addressing the effect of smoking on the functional status of patients with RA. This study assesses the relationship between tobacco use and change in functional status over time in patients with RA.

Methods: Retrospective analysis of 121 subjects with confirmed RA in an ethnically diverse outpatient rheumatology clinic at a public hospital. Primary outcome was the difference between baseline HAQ score and repeated assessment of HAQ 2–5 years later. Primary predictor variable was current smoking at baseline. Covariates included time between HAQ assessments, age, gender, rheumatoid factor positivity, baseline HAQ and DAS28-ESR scores, synthetic DMDAR use, biologic use, and disease duration. Student’s t-test was used to compare the mean change in HAQ over time between smokers and non-smokers. Association between smoking and change in HAQ over time, controlling for all covariates, was assessed with multivariate linear regression. Multivariate logistic regression was then used to assess the odds of achieving the accepted clinically meaningful improvement in HAQ score of ≤0.22 during this time period.

Results: Of the 121 subjects, 14 (12%) were current smokers at baseline assessment. 108 (89%) were female, and 114 (94%) were non-Caucasian. Mean age was 53 (+13). Mean baseline HAQ score was 1.32, mean time between HAQ assessments was 3.5 years, and mean change in HAQ over time was 0.088. Individual change in HAQ score ranged from −1.88 to 2.0. Mean change in HAQ was 0.411 among smokers and 0.046 among non-smokers (p = 0.043). One of 14 smokers (7%), and 33 of 107 non-smokers (31%), achieved a clinically meaningful improvement in HAQ during this time period. Multivariate linear regression demonstrated that smoking is independently associated with a worsening HAQ over time (coefficient= 0.33, p = 0.047). Multivariate logistic regression demonstrated that smoking decreased the odds of achieving a clinically meaningful improvement in HAQ (OR 0.07, 95% CI 0.01–0.83).

Conclusion: Cigarette smoking was associated with worsening functional status among patients in this cohort over a mean time of 3.5 years. In addition, the odds of achieving a clinically meaningful improvement in functional status during this follow-up period were significantly lower in smokers as compared to non-smokers.

Disclosure: M. Reintert, None; L. Trupin, None; P. P. Katz, None; E. Yelin, None; J. Barton, None; J. B. Imboden, None.
Results: 1,121 patients were included in the analysis (71% female, 29% male). 434 patients were RF positive, 265 CCP positive. Mean age 61.3 years (SD 13.4).

The strongest baseline predictors of DAS28ESR remission at 12 months were younger age, male and low disease activity at baseline. There was no statistically significant association between joint onset patterns, mode of onset, RF or CCP status and smoking status.

The association between DAS28ESR remission at 12 months and age was borderline significant. Odds ratio for age was 0.985 (95% CI (0.969, 1.01)). For each additional decade of age, the odds of being in remission at 12 months decreased by 15% (p = 0.057).

For female patients the odds of being in remission at 12 months was 0.887; for male patients the odds of being in remission at 12 months was 2.00; therefore the odds of a male patient being in remission at 12 months was 2.256 times greater than those for female patients (OR 2.256, 95% CI 1.384, 3.675), P=0.001."

Conclusion: The strongest baseline predictors of DAS remission at 12 months were younger age, low baseline disease activity and male gender. Traditional prognostic factors associated with outcome such as smoking and CCP status were not strong predictors of outcome at 12 months. The study identifies potential high-risk groups that may benefit from more frequent clinical evaluation and therapy adjustment. The cohort will be followed over the next five years to provide data on long-term outcome.

Disclosure: P. Bird, None; D. Nicholls, None, J. P. de Jager, None; H. Griffiths, None; L. Roberts, None; K. Tymms, None; J. Jochling, None; M. H. Arnold, None; G. L. Littlejohn, None;

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Effects of Cigarette Smoking On Early Arthritis (CONART). Maria Haye Salinas1, Ana C. Alvarez2, Rafael Chaparro del Moral3, Mariana Benegas4; Christian A. Waimann5, Rodolfo Perez Alamino6, Rodrigo Garcia Cullen7, Santa Fe, Argentina, 7Centro Integral de Reumatologia, Santiago del Estero, Argentina, 8Hospital Privado, Córdoba, Argentina, 9Hospital Tornu, Buenos Aires, Argentina, 10Instituto de Rehabilitación Psicofísica, Buenos Aires, Argentina, 11Hospital Rivadavia, Buenos Aires, Argentina, 12Hospital Padilla, Tucumán, Argentina, 13Hospital San Martín, La Plata, Argentina, 14Rheumatology Section, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 15Hospital Jose Maria Cullen, Santa Fe, Argentina, 16Centro Integral de Reumatologia, Santiago del Estero, Argentina, 17Centro de enfermedades Reumaticas, Santiago Del Estero, Argentina, 18Hospital Señor del Milagro, Salta, Argentina, 19Sanatorio Adventista del Plata, Entre Rios, Argentina, 20Hospital Tornu, Buenos Aires, Argentina, 21Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, 22Instituto de Rehabilitación Psicofísica, Buenos Aires, Argentina, 23Hospital privado de Córdoba, Córdoba, Argentina

Background/Purpose: According to recent reports the cigarette smoking persons have 2–4 times greater risk of developing rheumatoid arthritis (RA). The cigarette smoking is associated with an early onset, a greater seeropositivity, erosion and severity in patients with early arthritis. The purposes of our study was to analyze the effects of cigarette smoking on the disease activity, serology, presence of extra-articular manifestations (ExM) and radiographic damage in patients with early arthritis.

Methods: The study utilised point of care clinical software to collect data from 20 participating rheumatology treatment centres. Newly diagnosed RA patients over the age of 18 years treated at a participating clinic were eligible. Patients were required to have attended the clinic on at least two occasions in 6 months and have at least two available DAS assessments. Clinical predictors of outcome were identified and the list was refined by consensus. Data captured included baseline demographics, mode of disease onset, pattern of joint involvement at onset, smoking status, DAS, RF and CCP titre, time from onset of symptoms to presentation and disease activity at baseline. Statistical analysis utilized a univariate and multivariate logistic regression of DAS28ESR remission 12 months after the first assessment.

Results: 1,121 patients were included in the analysis (71% female, 29% male). 434 patients were RF positive, 265 CCP positive. Mean age 61.3 years (SD 13.4).

The strongest baseline predictors of DAS28ESR remission at 12 months were younger age, male and low disease activity at baseline. There was no statistically significant association between joint onset patterns, mode of onset, RF or CCP status and smoking status.

The association between DAS28ESR remission at 12 months and age was borderline significant. Odds ratio for age was 0.985 (95% CI (0.969, 1.01)). For each additional decade of age, the odds of being in remission at 12 months decreased by 15% (p = 0.057).

For female patients the odds of being in remission at 12 months was 0.887; for male patients the odds of being in remission at 12 months was 2.00; therefore the odds of a male patient being in remission at 12 months was 2.256 times greater than those for female patients (OR 2.256, 95% CI 1.384, 3.675), P=0.001.

Conclusion: The strongest baseline predictors of DAS remission at 12 months were younger age, low baseline disease activity and male gender. Traditional prognostic factors associated with outcome such as smoking and CCP status were not strong predictors of outcome at 12 months. The study identifies potential high-risk groups that may benefit from more frequent clinical evaluation and therapy adjustment. The cohort will be followed over the next five years to provide data on long-term outcome.

Disclosure: P. Bird, None; D. Nicholls, None, J. P. de Jager, None; H. Griffiths, None; L. Roberts, None; K. Tymms, None; J. Jochling, None; M. H. Arnold, None; G. L. Littlejohn, None;

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Magnetic Resonance Imaging-Proven Osteitis At Baseline Predicts the Early Rheumatoid Arthritis Patients Who Will Develop Rapid Radiographic Progression: MRI Is Beneficial to Find the Window of Opportunity in Early RA. Mami Tamai1, Yoshikazu Nakashima2, Takahisa Suzuki3, Yoshiro Hori4, Akitomo Okada5, Junko Kita6, Shin-ya Kawashiri7, Naoko Iwamoto8, Kunihiro Ichinose2, Kazuhiko Arima1, Hideki Nakamura1, Hiroshi Nakagawa1, Ai Watanabe2, Atsushi Kawakami2, 1Nagasaki University, Nagasaki, Japan, 2Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan, 3Sasebo City General Hospital, Sasebo, Nagasaki, Japan

Background/Purpose: Windows of opportunity exists in the earlier phase of rheumatoid arthritis (RA), thus, early recognition of the RA patients who will develop rapid radiographic progression (RPP) is crucial. We have reported an importance of magnetic resonance imaging (MRI)-proven symmetrical synovitis, osteitis and bone erosion of wrist and finger joints toward...
the early classification of RA from the prospective early arthritis cohort at Nagasaki University, Nagasaki, Japan. To investigate whether MRI assessment of joint injury at baseline predict the development of RRP at 2 years in patients with early RA by our cohort.

**Methods:** One hundred-eleven RA patients, who fulfilled 2010 RA classification criteria and introduced disease-modifying anti-rheumatic drugs (DMARDs) including biologics within the first 1 year, were consecutively enrolled in this study. These patients were referred to the RA patients in the present study. Patients gave their informed consent to be subjected to the protocol that was approved by the Institutional Review Board of Nagasaki University. All of the subjects had been examined by gadolinium-diethylenetriamine pentaacetic acid (Gd-DTPA)-enhanced MRI and plain radiograph of both wrist and finger joints at the same day every 6 months during 2 years. MRI-proven synovitis, osteitis and bone erosion were evaluated by RAMRI scoring (RAMRIS) technique. RRP was defined as yearly progression of Genant-modified Sharp score >3.0 during 2 years. We have examined what variables at entry, including MRI features, and the therapies during 2 years predict the development of RRP at 2 years by logistic regression analysis.

**Results:** The mean disease duration, age, % female, prevalence or titer of rheumatoid factor (RF) and anti-citrullinated peptide antibodies (ACPA), disease activity score (DAS) 28-ERP at entry were 4.0 months, 56.2 y.o., 66.7%, 60.4% or 95.5 ± 186.7 IU/ml, 58.6% or 160.3 ± 345.4 U/ml and 4.38, respectively. The frequency of MRI-proven symmetrical synovitis, osteitis and bone erosion at baseline was 80.7, 54.5, 37.2%. Biologics were administrated in 17.1% of the patients during 2 years. Multivariate analysis of HAQ score change in five years from the baseline. The HAQ score change is calculated as the Year 5 value minus the baseline. Factors associated with the HAQ score change were recently proposed. The patients fulfilling ACR/EULAR criteria at baseline developed a 39.1% reduction of DAS 28 scores, as compared to a 18.6% reduction in the 2 groups. Average DAS28 score, recent onset of the disease, older age of onset and male sex are also associated with the better HAQ change, while RF positivity and BMI at the baseline are not associated with HAQ change.

<table>
<thead>
<tr>
<th>Table</th>
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<tr>
<td>Factor</td>
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</tr>
<tr>
<td>RF</td>
</tr>
<tr>
<td>Average DAS28</td>
</tr>
<tr>
<td>Gender (female)</td>
</tr>
<tr>
<td>BMI</td>
</tr>
<tr>
<td>Year of onset</td>
</tr>
<tr>
<td>Age</td>
</tr>
</tbody>
</table>

**Conclusion:** The lower levels of average DAS28 score, recent onset of the disease, older age of onset and male sex are associated with the better HAQ change. The results of this study may help patients without these factors to get early and aggressive intervention.


**2144**

**Early RA Patients Fulfilling the New 2010 ACR/EULAR Criteria, Display Better Clinical Responses to DMARD Therapy but Have Higher Radiographic Damage Progression Than Patients with Early RA Not Fulfilling the 2010 ACR/EULAR Criteria, Ruediger Mueller1, Toni Kaege1, Axel Finckh2 and Johannes von Kempis 1. 1MD, St. Gallen, Switzerland, 2Geneva University Hospitals, Geneva 14, Switzerland

**Background/Purpose:** New ACR/EULAR criteria for the classification of rheumatoid arthritis (RA) were recently proposed. The aim of this analysis was to examine the impact of fulfilling the 2010 ACR/EULAR criteria at the initial visit on long-term progression of disease and radiographic progression.

**Methods:** For this observational cohort study within the Swiss RA registry SCQM, we included patients suffering from early RA or undifferentiated arthritis (UA, disease duration ≤1 year), as defined by the treating rheumatologist, who had not received any previous DMARDs. Baseline diagnosis of RA/UA was reassessed according to the 2010 ACR/EULAR criteria at baseline. Patients were separated into 2 groups depending on whether or not they fulfilled the 2010 ACR/EULAR criteria at baseline (=6 points versus <6 points). The primary outcome measures were the DAS 28 and erosions as measured by the Ratingen score over time.

**Results:** A total number 592 patients was analysed. 352 of them fulfilled the 2010 ACR/EULAR at baseline, 240 were not classifiable as RA according to the new criteria at baseline. The score calculated by the new ACR/EULAR criteria correlated with disease activity at disease onset. Treatment was initiated with DMARDs, mostly MTX, in all patients. There were no significant differences in the therapeutic strategies between patients fulfilling the classification criteria or not. The patients fulfilling ACR/EULAR criteria at baseline developed a 39.1% reduction of DAS 28 scores, as compared to a 33.6% reduction in ACR/EULAR-negative patients after 6 months, independent of their respective treatments. After 1 year of follow-up no differences were found comparing the mean DAS28 scores in the 2 groups. Average radiographic progression was higher among ACR/EULAR-positive patients (progression of Ratingen score/year 0.50 vs. 0.32, resp., p=0.03) after 3 years of follow up.

**Conclusion:** The 2010 ACR/EULAR criteria appeared to select a subset of patients among early RA/UA patients with a favourable clinical response to conventional anti-rheumatic therapy. Despite this therapy, radiographic progression was higher in 2010 ACR/EULAR positive patients.

**Disclosure:** R. Mueller, None; T. Kaege, None; A. Finckh, Roche, Pfizer, BMS, 2, Roche, Pfizer, BMS, 5; J. von Kempis, None.
2145
Age At Onset Determines Severity and choice of Treatment in Early Rheumatoid Arthritis. Lena Innala1, Bozena Möller2, Lotta Ljung3, Torgny Smedby1, Anna Södergren1, Staffan Magnusson4, Ewa H. Berglin1, Solbritt M. Rantanä-Dahlqvist1 and Solveig Wållberg-Jonsson1. 
1Institution of Public health and clinical medicine/Rheumatology, University of Umeå, Umeå, Sweden, 2Department of Rheumatology, Sunderby Hospital, Luleå, Sweden, 3Department of Rheumatology, Östersund hospital, Östersund, Sweden, 4Department of Internal Medicine, Sundsvall Hospital, Sundsvall, Sweden

Methods: All patients from the 4 most northern counties of Sweden diagnosed with RA (<12 months symptoms) are consecutively included in a large survey on the progress of the disease and its co-morbidities. Up till now 950 (649f, 301m) patients have been included. Median age at disease onset was 58 years (range 18–89). All patients have been followed on a regular basis; a survey of co-morbidities was made at inclusion and after 5 years, measures of disease activity (ESR, CRP, tender joints, swollen joints, VAS pain and VAS global, DAS28, HAQ) and X-ray of hands (erosions, Larsen score) were assessed regularly. Disease severity (extraarticular disease, rheumatoid nodules), co-morbidities and pharmacological treatment (DMARDs, corticosteroids, biologics, NSAIDs, COX2-inhibitors) were registered. Autoantibodies (RF, ANA, ACPAs) and genetic markers (HLA-shared epitope, PTPN22 T-variant) were analysed. Young (YORA)/late (LORA) onset of RA was defined as below/above median age (58 years) at disease onset. Data analyses were based on stratification of the patients in YORA and LORA.

Results: Patients with LORA had higher ESR (34.3 vs. 26.0 mm/h, p<0.001), VAS global (47.8 vs. 42.9, p=0.085) and HAQ (1.0 vs 0.8, p=0.075) at baseline and significantly higher accumulated disease activity (AUC for DAS28) at 6 (p=0.10), 12 (p<0.01) and 24 months (p<0.05) compared to YORA. Patients with YORA had more often ACPAs (72.4% vs 65%, p<0.01) and PTPN22 T-variant (37.8 vs 29.5, p=0.056). Presence of extraarticular disease was similar however nodules tended to be more common at young onset (p=0.069) and YORA had significantly higher Larsen score (p<0.001 at 0 and 24 mo). Patients with LORA were significantly more often treated with corticosteroids (77.5 vs. 68.8%; p<0.01) and with biologics (7.6 vs. 24.9%, <0.001). Patients with YORA were treated with DMARDs earlier (within 3 months from inclusion; 94.0% vs. 85.8%; p<0.01) and overall (98.9 vs. 96.7, p=0.05). NSAID was more common in the early onset group (90 vs. 75.9%, p<0.001) with no differences for COX2-inhibitors.

Conclusion: Patients with young onset of RA presented with more risk factors for poor prognosis but those with late onset had higher disease activity. YORA were treated with more DMARDs in early disease whilst those with LORA were treated more often with corticosteroids. This may have implications for development of co-morbidities.

Disclosure: L. Innala, None; B. Möller, None; L. Ljung, None; T. Smedby, None; A. Södergren, None; S. Magnusson, None; E. H. Berglin, None; S. M. Rantanä-Dahlqvist, None; S. Wållberg-Jonsson, None.

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Impact of Severity Index for Rheumatoid Arthritis On Healthcare Costs and Utilizations in Patients with Rheumatoid Arthritis. Onur Basir1, Li Wang2, Juan Du3, Hai Wang3 and Lin Xie3. 1STATinMED Research/The University of Michigan, Ann Arbor, MI, 2STATinMED Research, Dallas, TX, 3STATinMED Research, Ann Arbor, MI

Background/Purpose: To examine the impact of a claims-based severity index for rheumatoid arthritis (SIFRA) on healthcare costs and utilizations of RA patients using large U.S. claims data.

Methods: Adult patients with at least two RA diagnoses and 12 months of continuous health plan enrollment before and after the index date (first RA diagnosis date) were identified from a large U.S. claims database (10/1/2008 to 09/30/2009). A severity index for rheumatoid arthritis (SIFRA) was developed by calculating a weighted sum of 34 RA-related indicators including laboratory, clinical and functional status, extra-articular manifestations, surgical history, and medications as assessed by an expert Delphi panel of six rheumatologists. The relationship between SIFRA terciles and healthcare utilizations and costs was also examined using histograms. A regression model was used to examine the improvement of the model fitting by adding SIFRA.

Results: A total of 23,951 RA patients (mean SIFRA: 9.14) with laboratory information were identified. Descriptive analysis showed that patients in the upper tercile of SIFRA incurred $9,123 more all-cause healthcare costs and $1,326 more RA-related healthcare costs than patients in the lower tercile of SIFRA. The most dramatic difference between highest and lowest SIFRA terciles occurred with pharmacy costs ($6,860 vs. $1,919, p<0.001). Healthcare visits followed a similar picture for healthcare costs for SIFRA terciles. Patients in the highest SIFRA tercile had total hospital visits (110.14 vs. 77.16, p<0.001) and higher RA-related visits (6.72 vs. 3.93, p<0.001) compared to patients in the lowest tercile. Regression results showed that the model was more than 6-times (61%) superior in explaining the variation in outcomes after adding SIFRA into the model.

Conclusion: SIFRA demonstrated evidence of being a significant determinant of healthcare costs and utilities for RA patients. This study suggests that SIFRA could be an important methodological tool to control for severity in RA-related outcomes research.

Disclosure: O. Basir, None; L. Wang, None; J. Du, None; H. Wang, None; L. Xie, None.

2147
Risks to Visit Emergency Room in Patients with Rheumatoid Arthritis: A Two-Year Retrospective Study. Yoshiki Nagai, Naoto Yokogawa, Kota Shimada and Shoji Sugii. Tokyo Metropolitan Tama Medical Center, Tokyo, Japan

Background/Purpose: Patients with rheumatoid arthritis (RA) suffer from both physical disabilities and medical comorbidities and tend to use emergency room for many reasons. However, the detail has not been well investigated from the perspective of emergency medicine. The aim of this study is to identify the risks to visit emergency room in RA patients.

Methods: We retrospectively reviewed all emergency room visits in RA patients followed at Tokyo Metropolitan Tama Medical Center from April 2007 to March 2009 using an electric health record system. We compared the characteristics of RA patients who visited emergency room (“ER user group”) to those who did not visit emergency room (“Control”). We compared the background characteristics between the two groups. A logistic regression analysis was performed to evaluate the risks of emergency room visits.

Results: “ER user group” and “Control” included 294 and 298 patients. The background characteristics of both groups were summarized in Table 1. By a logistic regression analysis, cardiovascular diseases, prednisolone>5mg/day, anti-TNF agents, age over 65, and pulmonary diseases predicted emergency room visits with odds ratio of 4.2, 3.5, 3.3, 1.7, and 1.6 respectively (Table 2).

Table 1: Background characteristics of “ER user” and “Control”

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ER user (294 patients)</th>
<th>Control (298 patients)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, year±5D</td>
<td>68.1±10.1</td>
<td>63.1±12.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Disease duration, year±5D</td>
<td>15.5±3.6</td>
<td>13.8±3.7</td>
<td>0.017</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>5.6% (16/294)</td>
<td>4.8% (14/298)</td>
<td>0.67</td>
</tr>
<tr>
<td>DMARDs</td>
<td>49 (17%)</td>
<td>42 (14%)</td>
<td>0.005</td>
</tr>
<tr>
<td>Pulmonary disease*</td>
<td>82 (28%)</td>
<td>49 (16%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Cardiovascular disease*</td>
<td>40 (14%)</td>
<td>8 (3%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>QRS complex</td>
<td>214 (73%)</td>
<td>140 (48%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prednisolone equivalent (mg/day)</td>
<td>4.3±6.0</td>
<td>1.2±6.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Methylxanthines</td>
<td>14 (4%)</td>
<td>14 (4%)</td>
<td>NS</td>
</tr>
<tr>
<td>Aden (TNF inhibitors)</td>
<td>28 (9%)</td>
<td>28 (9%)</td>
<td>NS</td>
</tr>
<tr>
<td>Sulfasalazine/mercaptopurine</td>
<td>54 (19%)</td>
<td>35 (12%)</td>
<td>NS</td>
</tr>
<tr>
<td>Budesonide</td>
<td>45 (15%)</td>
<td>35 (12%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

* Prednisolone diseases: intermittent eye disease, old tuberculosis, extensa, bronchiolitis, nonspecific rheumatoidarthritis, arthritis spondylitica pulmonale disease.

NS: not statistically significant.
Table 2. Multivariate logistic analysis to predict emergency room visits

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>4.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prednisone equivalent &gt;5mg/d</td>
<td>3.5</td>
<td>0.001</td>
</tr>
<tr>
<td>Anti-TNF agents</td>
<td>3.3</td>
<td>0.001</td>
</tr>
<tr>
<td>Age over 65</td>
<td>1.7</td>
<td>0.003</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.7</td>
<td>NS (0.051)</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>1.6</td>
<td>0.030</td>
</tr>
</tbody>
</table>

**1** Palmarom diseases: interstitial lung disease, old tuberculosis, asthma, bronchiectasis, nontuberculous mycobacteriosis, chronic obstructive pulmonary disease

**2** Cardiovascular diseases: heart failure, old myocardial infarction, angina pectoris

NS: not statistically significant

Conclusion: Preexisting cardiovascular disease, prednisolone >5mg/d, and anti-TNF agents were considered higher risks for emergency room visits in patients with RA.

Disclosure: Y. Nagai, None; N. Yokogawa, None; K. Shimada, None; S. Sugii, None.

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Peer to Peer Mentoring for Individuals with Early Inflammatory Arthritis: Feasibility Pilot, Mary J. Bell1, Paula Veinot1, Gayathriembdeniya2, Joyce Nylhoff-Young2, Joanna Sale3, Joan Sargeant4, Peter Tugwell4, Sydney Brooks5, Susan Ross6, Ruth Tonon7, Sharron Sandhu5, Dawn Richards8, Jennifer Boyle9, Kerry Knickle10, Nicky Britten11, Emma Bell11, Fiona Webster11 and Mary Cox-Dublanski11. 1Sunnybrook Health Sciences Centre and University of Toronto, Toronto, ON, 2Sunnybrook Health Sciences Centre, Toronto, ON, 3University Health Network, University of Toronto, Toronto, ON, 4University of Toronto, St. Michael’s Hospital, Toronto, ON, 5Dalhousie University, Halifax, NS, 6University of Ottawa, Ottawa General Hospital, Ottawa, ON, 7The Arthritis Society, Ontario Division, Toronto, ON, 8Canadian Arthritis Network Consumer Advisory Council, Toronto, ON, 9University of Toronto, Toronto, ON, 10University of Exeter, Exeter, United Kingdom, 11St. Mary’s General Hospital, Kitchener, ON

Background/Purpose: The goal of this research is to examine the potential benefit of early peer support to improve the health and quality of life of individuals with early inflammatory arthritis (EIA). This poster presents preliminary findings of a pilot study, as part of a complex healthcare intervention, to assess acceptability and feasibility of a peer support intervention for individuals with EIA.

Methods: Qualitative and quantitative methods were used to evaluate a feasibility pilot of a peer mentoring intervention for individuals with EIA. Individuals with IA (diagnosed at least 2 years and managing well) were recruited through a rheumatology clinic. The Arthritis Society, and research team to be trained as peer mentors A peer mentor training model was developed consisting of 18 hours of didactic and interactive sessions over 4 non-consecutive days. Individual with EIA (mentees; disease duration 6–52 weeks) were recruited through 2 rheumatology clinics. Trained peer mentors were paired with an individual with EIA to provide one-on-one support (face-to-face or telephone) up to once a week over a 12 week period. Peer mentor self-efficacy was assessed at baseline, immediate post-training, immediate post-peer mentoring program and 3-months follow-up. Mentees were assessed at baseline, immediate post-program and 3-months follow-up re: disease modifying anti-rheumatic drugs (DMARDs)/biologic treatment use, self-efficacy, self-management, health-related quality of life, anxiety, coping-efficacy, social support and disease activity. Results were examined using descriptive statistics, and effect sizes were calculated to determine clinically important changes (changes >0.3 considered important). One-on-one interviews with participants were also conducted to examine acceptability and feasibility of study procedures and outcome measures and to gain perspectives on the value of peer support. Key themes were identified through constant comparison.

Results: Nine pairs participated. The training was well-received by peer mentors. Peer mentors’ self-efficacy increased significantly after training completion. Mentees experienced improvement in overall arthritis impact on life, coping, and social support (effect size >0.3). Mentees perceived emotional, informational, appraisal, and instrumental support, while mentors themselves reported benefits (e.g., new self-management techniques, lifestyle changes), and learned from mentees’ fortitude and self-management skills. Participants’ experience of peer support was informed by the unique relationship they forged with their peer partner. All participants were unequivocal about the need for peer support for the newly diagnosed.

Conclusion: Early peer support is proposed as a way to augment current care in rheumatology. The intervention was well-received. The training process, peer support program, and outcome measurements were demonstrated to be feasible with modifications. This intervention has been expanded to a small pilot RCT study to demonstrate effectiveness of peer support in EIA management.

Disclosure: M. J. Bell, None; P. Veinot, Consultant, 5; G. Embdeniya, Sunnybrook Health Sciences Centre, 3; J. Nylhoff-Young, None; J. Sale, None; J. Sargeant, None; P. Tugwell, UCB, Chelsea, 5, BMS, 5, Actelion, Alderhoh, Arqne, Ardea Biosciences, Astra Zeneca, Bristol Myers Squibb, 6, Jazz Pharmaceuticals, Merck, Novartis, Novo Nordisk, Pfizer, Regerenon, Savient, Takeda, 6, Eli Lilly & Boehringer-Ingelheim, Genentech, Genzyme, Celgene, Cytochrome, 6, Abbott, Roche, Schering Plough, Merck, UCB, BMS, 5; S. Brooks, The Arthritis Society, 3; S. Ross, None; R. Tonon, None; S. Sandhu, None; D. Richards, None; J. Boyle, None; K. Knickle, None; N. Britten, None; E. Bell, Consultant, 5; F. Webster, None; M. Cox-Dublanski, None.

2149

Atsttrin-à, an Engineered Protein Derived From Reguiarumin Growth Factor, Binds To TNF Receptors and Exhibits Potent Anti-Inflammatory Activity In Mice. Yunpeng Zhao1, Qingyun Tian1, Haicheng Song1, Fanhua Wei2 and Chuang Liu3. 1NYU Hospital for Joint Diseases, New York, NY, 2New York University, New York, NY

Background/Purpose: Reguiarin (PGRN) is a multifunctional growth factor. Recently, we reported that PGRN and its derived protein Atsttrin-à (referred to as “Atstrin” in our previous publication) directly bound to TNF receptors (TNFR), blocked the binding of TNF to TNFR and inhibited TNF activity (Tang, W., et al, Science, 2011 Apr 22;332 (6028):478–484). It is well established that TNF family ligands bind to receptors in a heteroaxenic 3 complex. Atstrin-à was comprised of the three functional fragments of PGRN, thus we hypothesized that the three fragments of Atstrin-à act independently for interacting with TNFR. If so, change of order of the three fragments would not affect binding activity to TNFRs. In this study, we created a novel engineered protein, Atstrin-à which comprised the same fragments as Atstrin-à but in a different order. The purpose of this project is to determine whether the novel protein Atstrin-à is able to block the binding of TNF-à to TNFR, and has therapeutic effect in inflammatory arthritis, as does Atstrin-à.

Methods: Yeast-two hybrid assay was used to compare the binding to TNFR between Atstrin-à and Atstrin-β. Solid-phase binding was performed to determine the Atstrin-β inhibition of TNF-α binding to TNFRs: Collagen-induced arthritis (CIA) in DBA-1J mice and TNF-α transgenic (hTNF-tg) mice that spontaneous inflammatory arthritis. Mice were divided into various groups and injected intraperitoneally with PBS, etanercept, Atstrin-α and Atstrin-β. Clinical assessment for arthritis scores, micro CT for bone erosion and histological analysis of joint sections were performed.

Results: Yeast-two hybrid assay showed that Atstrin-β bound to TNFR1 and TNFR2. This binding assay revealed that Atstrin-β inhibited TNF-α from binding to TNFRs in a dose-dependent manner. Clinical scores, micro CT and histological analysis of joints from CIA model and hTNF-tg mice demonstrated that Atstrin-β attenuated synovial proliferation, infiltration of inflammatory cells, cartilage destruction and bone erosion compared with vehicle-treated mice, and these effects were shown in dose-dependent manners.

Conclusion: These findings suggest the three functional fragments of Atstrin-α worked independently in binding to TNFRs and blocking TNF-α activity, and the novel engineered protein Atstrin-β has anti-inflammatory effect and may represent a promising alternative in treatment of rheumatoid arthritis.

Disclosure: Y. Zhao, None; Q. Tian, None; H. Song, None; F. Wei, None; C. Liu, None.

2150

Action of Tofacitinib Via Human Dendritic Cells. Satoshi Kubo, Kunihiro Yamaoka, Shigeru Iwata and Yoshiha Tanaka. University of Occupational and Environmental Health, Japan, Kitakyushu, Japan

Background/Purpose: Tofacitinib, an oral Janus Kinase (JAK) inhibitor, has gathered attention in treatment of Rheumatoid arthritis (RA). Although JAKs are well known for its importance in lymphocyte development and...
expressed in monocyte lineage cells, the effect of tofacitinib on the maturation and function of human dendritic cells (DCs) remains unknown.

**Methods:** Human monocyte-derived DCs were generated with granulocyte macrophage colony-stimulating factor and IL-4. DCs were matured with lipopolysaccharide (LPS) in the presence of tofacitinib in vitro for 48 hours and cytokine production, cell survival and surface markers were assessed by flow cytometry. After washout of tofacitinib, DCs were co-cultured with CD4+ (CD45RA- naive) T cells purified from healthy donor, and allogeneic-naive T cells resulted in reduction of 2,3-dioxygenase (IDO), an immunomodulatory enzyme in DCs. Co-culture of tofacitinib-treated DCs with allogeneic naive T cells resulted in reduction of IFN-β from DCs was not affected. Notably, tofacitinib increased the levels of indoleamine 2, 3-dioxygenase (IDO), an immunomodulatory enzyme in DCs. Co-culture of tofacitinib-treated DCs with allogeneic naive T cells resulted in reduction of T-cell proliferation and IFN-γ production. However, CD4+CD25+ FoxP3+ regulatory T cell population was not affected.

**Conclusion:** In addition to the previously known effect of tofacitinib on acquired immunity, our results indicate that tofacitinib could affect the innate immunity. Importantly, tofacitinib attenuated the LPS-induced upregulation of costimulatory molecules during DC maturation. This result in a decreased allo-reactive T cell response. Moreover, tofacitinib suppressed inflammatory cytokine production and induced IDO expression. Taken together, these data provide novel potential mechanisms of action of tofacitinib, the restoration of immunoregulation as well as anti-inflammation, in patients with rheumatoid arthritis.


**5215**

**Inhibitory Effect of Type I Interferon On Interleukin-17 Response in Rheumatoid Arthritis Fibroblast-Like Synovocytes.** Eva Ruizciza1, Han-nelle F. Semmelink2, Gyula Poor3, P. P. Tak3 and L.G.M. van Baarsen4.

1Budapest, Hungary, 2Amsterdam, Netherlands, 3National Inst of Rheumatology, Budapest, Hungary, 4Academic Medical Center/University of Amster-dam, Amsterdam, Netherlands, 5Division of Clinical Immunology and Rheumatology, Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands

**Background/Protocol:** Type I interferon (IFN) response genes are upregulated in several inflammatory diseases, including systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) and multiple sclerosis (MS). Whereas in SLE this type I IFN signature is associated with disease severity, IFN-beta (IFNβ) is a beneficial treatment in two-third of the patients with MS. In RA the functional role of the type I IFN signature in disease pathogenesis is unclear. The effects of type I IFN may be dependent on the specific type of interferon, the disease and the tissue. Recent studies have shown that administration of type I IFN can confine the inflammatory response by inhibiting Th17 development. The recently discovered interleukin (IL)-17 producing Th17 cells appear to play a pro-inflammatory role in the pathogenesis of RA. IL-17 has been shown to act on several cell types in order to protect against microbial infection but can also promote and maintain inflammatory processes. Accordingly, tight regulation of the IL-17 response is required to prevent inflammation and autoimmunity.

Giving the above mentioned function of type I IFN in limiting the Th17 response, we investigated whether type I IFN can modulate the pro-inflammatory effect of IL-17 on fibroblast-like synovocytes (FLS).

**Methods:** Synovial tissues were obtained from rheumatoid arthritis patients (RA), two osteoarthritis patients (OA) and four non-disease control individuals (HD). Subsequently, FLS were isolated and cultured in the presence of TNF (1 ng/ml), IFNβ (100 U/ml), IL-17A (50 ng/ml), or combinations thereof. Supernatants were collected 24 or 48 hours after treatment and levels of IL-6 and IL-8 were measured by ELISA.

**Results:** We examined the modulatory effect of type I IFN on IL-17A induced IL-6 and IL-8 production by FLS in the presence and absence of TNF (Table 1). A large variation in IL-17 response between different donors was observed with respect to production of IL-6 and IL-8. As expected, TNF had a synergistic effect on the IL-17 induced cytokine response. On group level, IFNβ had no inhibitory effect on the IL-17 induced IL-6 cytokine production, but there was a large variation in IFNβ sensitivity between donors. While in some donors IFNβ had no effect on the IL-17 induced cytokine response, in other donors IFNβ had a clear inhibitory effect. Interestingly the IL-17 induced IL-8 production could be inhibited by IFNβ, after both 24 and 48 hours. No differences were observed between the different diagnoses.

**Conclusion:** These findings suggest that in a pro-inflammatory environment IFNβ can modulate the IL-17 response by inhibiting IL-6 production in FLS, whereas the effect on IL-6 production is donor dependent. These data provide further insight into the anti-inflammatory role of IFNβ in inflammatory diseases with possible implications for treatment.

**Disclosure:** E. Ruizciza, Novo Nordisk A/S, 9; H. F. Semmelink, None; G. Poor, None; P. P. Tak, Chief Scientific Office, 3; L. G. M. van Baarsen, None.

**5215**

**Inhibition of Fucose Incorporation Abrogates the Development of Arthritis by Suppressing the Inflammatory Macrophage Development and TNF-α Production.** Jun Li1, Hui-Chen Hsu2, Ping Ar Yang1, Qi Wu1, David M. Spalding1, W. Winn Chatham1, Robert P. Kimberly1, S. Louis Bridges Jr.1


**Background/Protocol:** Type I interferon (IFN) response genes are upregulated in several inflammatory diseases, including systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) and multiple sclerosis (MS). Whereas in SLE this type I IFN signature is associated with disease severity, IFN-beta (IFNβ) is a beneficial treatment in two-third of the patients with MS. In RA the functional role of the type I IFN signature in disease pathogenesis is unclear. The effects of type I IFN may be dependent on the specific type of interferon, the disease and the tissue. Recent studies have shown that administration of type I IFN can confine the inflammatory response by inhibiting Th17 development. The recently discovered interleukin (IL)-17 producing Th17 cells appear to play a pro-inflammatory role in the pathogenesis of RA. IL-17 has been shown to act on several cell types in order to protect against microbial infection but can also promote and maintain inflammatory processes. Accordingly, tight regulation of the IL-17 response is required to prevent inflammation and autoimmunity.

Giving the above mentioned function of type I IFN in limiting the Th17 response, we investigated whether type I IFN can modulate the pro-inflammatory effect of IL-17 on fibroblast-like synovocytes (FLS).

**Methods:** Synovial tissues were obtained from rheumatoid arthritis patients (RA), two osteoarthritis patients (OA) and four non-disease control individuals (HD). Subsequently, FLS were isolated and cultured in the presence of TNF (1 ng/ml), IFNβ (100 U/ml), IL-17A (50 ng/ml), or combinations thereof. Supernatants were collected 24 or 48 hours after treatment and levels of IL-6 and IL-8 were measured by ELISA.

**Results:** We examined the modulatory effect of type I IFN on IL-17A induced IL-6 and IL-8 production by FLS in the presence and absence of TNF (Table 1). A large variation in IL-17 response between different donors was observed with respect to production of IL-6 and IL-8. As expected, TNF had a synergistic effect on the IL-17 induced cytokine response. On group level, IFNβ had no inhibitory effect on the IL-17 induced IL-6 cytokine production, but there was a large variation in IFNβ sensitivity between donors. While in some donors IFNβ had no effect on the IL-17 induced cytokine response, in other donors IFNβ had a clear inhibitory effect. Interestingly the IL-17 induced IL-8 production could be inhibited by IFNβ, after both 24 and 48 hours. No differences were observed between the different diagnoses.

**Conclusion:** These findings suggest that in a pro-inflammatory environment IFNβ can modulate the IL-17 response by inhibiting IL-6 production in FLS, whereas the effect on IL-6 production is donor dependent. These data provide further insight into the anti-inflammatory role of IFNβ in inflammatory diseases with possible implications for treatment.

**Disclosure:** E. Ruizciza, Novo Nordisk A/S, 9; H. F. Semmelink, None; G. Poor, None; P. P. Tak, Chief Scientific Office, 3; L. G. M. van Baarsen, None.
(200 mg/kg BW, every 2-3 days) was administered via I.P. initiated on Day 1. FACS, ELISA and histopathology analysis were performed on Day 40.

**Results:** In FACS sorted cells from fresh human RA synovial fluid, the expression of *Fut1* and *Fut3* was five-fold higher in M1 inflammatory MΦ (CD68*CD80*) compared to M2 MΦ (CD68*CD80*), with lower expression in Th1, Th17, total memory and naïve CD4 T cells. In *in vitro* 2-D-gal treatment for 3 days lead to dramatic cell death of purified human MΦ and reduced levels of TNF-α (3800 pg/ml vs 450 pg/ml, p<0.001) in the supernatant. There was, however, no inhibitory effect of 2-D-gal on human Th1 or Th17 differentiation in *in vitro*. In *in vivo* treatment of 2-D-gal in DAE/II mice immunized with bovine CII abrogates the development of arthritis whereas the same dose of fucose exacerbated it (arthritis scores: control, 9.5±1.7; 2-D-gal, 0.5±0.3; Fucose, 15.3±2.2, p<0.01). FACS analysis revealed that the percentages of inflammatory MΦ (CD11b*TNF-α*) in the draining LN were reduced by 2-D-gal but were increased by Fucose (control 1.1±0.23; 2-D-gal, 0.6±0.10; Fucose, 1.5±0.32, p<0.05). 2-D-gal treatment also resulted in significantly decreased levels of TNF-α (1301 vs 39.4 pg/ml, p<0.05) and anti-CII total IgM and IgG in the serum. Joint histopathology showed a significantly decreased macrophage infiltration, synovial hyperplasia, cartilage damage, and bone erosion in 2-D-gal treated mice. No significant liver and renal toxicity and dysfunction was observed.

**Conclusion:** Our results show that *Futs* are highly expressed in inflammatory MΦ and fucosylation is a critical process regulating MΦ differentiation and TNF-α production. Inhibition of fucose incorporation by 2-D-gal significantly impairs inflammatory macrophage development and function, completely blocking development of arthritis without systemic toxicity. Our results suggest that MΦ fucosylation may be a new therapeutic target for RA.

**Disclosure:** J. Li, None; H. C. Hsu, None; P. Yang, None; Q. Wu, None; D. M. Spalding, None; W. W. Chatham, None; R. P. Kimberly, None; S. L. Bridges Jr., None; J. D. Mountz, None.

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**Target-Directed Development of a Proposed Biosimilar Rituximab (GP2013): Comparability of Antibody-Dependent Cytotoxicity Activity and Pre-Clinical Pharmacokinetics and Pharmacodynamics with Originator Rituximab.** Antonio da Silva, Ulrich Kronthaler, Ines Meyer, Anastassia Papandrikopoulou, Thomas Stangler and Jan Marinus Visser, Sandoz Biopharmaceuticals / HEXAL AG, Holzkirchen, Germany

**Background/Purpose:** Biosimilars are biologics approved by highly-regulated markets as similar to existing agents, with the aim of offering more affordable treatment and thereby increase patient access. Development of a biosimilar involves extensive characterization of the originator product over several years and a target-directed iterative development process to ensure a product that is highly comparable to the originator with similar clinical efficacy, safety and quality. Using antibody-dependent cellular cytotoxicity (ADCC), a main mode of action of rituximab, we illustrate how functional/structural relationship can be engineered into a biosimilar to ensure comparability at the in vitro level. Here we present pre-clinical data confirming in vivo comparability for the proposed biosimilar rituximab GP2013, in terms of pharmacokinetics (PK), pharmacodynamics (PD) and efficacy.

**Methods:** By employing a highly sensitive glycan quantitation method, relevant post-translational glycosylation patterns were assessed for their impact on *in vitro* ADCC relative potency data using the Raji and NK3.3 cell lines as target and effector cells, respectively. Subsequently, bioactivity of GP2013 and originator rituximab were evaluated in a dose-response manner across a wide concentration range against SU-DHL-4 (diffuse large B-cell lymphoma) and Daudi (Burkitt’s lymphoma) cells using freshly purified human NK cells. *In vivo* anti-tumor activity was assessed in two xenograft SCID mouse models of non-Hodgkin’s lymphoma (SU-DHL-4 and Jeko-1 cell lines). Comparative PK and PD were assessed in single (5 mg/kg, n=14) and multiple (20 or 100 mg/kg, n=8) dose studies in cynomolgus monkeys, the pharmacologically most relevant species.

**Results:** GP2013 and originator rituximab showed similar ADCC potency against both SU-DHL-4 and Daudi cells, with ADCC being reflective of engineered glycosylation patterns and structure-function relationships. In both xenograft mouse models, GP2013 and originator rituximab inhibited tumor growth to a similar extent, including at the more sensitive sub-optimal dose levels that are most likely to identify any potential differences. In primates, PK analysis confirmed bioequivalence between GP2013 and originator rituximab with nearly identical AUC values and 90% CIs entirely within the standard acceptance range of 0.8–1.25. Bioequivalence of PD response (B-cell depletion) was also shown, with 95% CIs of areas under the effect-time curves (AUEC) ratios for relative change from baseline in B-cell populations within the 0.8–1.25 acceptance range. The use of different doses indicated that comparable exposure and PD response can be expected for GP2013 and originator rituximab using indication-specific dosing regimens.

**Conclusion:** This pre-clinical comparability exercise confirms that GP2013 and originator rituximab are pharmacologically similar with regard to ADCC potency, anti-tumor activity, PK exposure (AUC) and B-cell depletion. As such, GP2013 is anticipated to show similar efficacy and safety as the originator product in ongoing clinical trials across different clinical indications.

**Disclosure:** A. da Silva, Sandoz Biopharmaceuticals / HEXAL AG; U. Kronthaler, Sandoz Biopharmaceuticals / HEXAL AG; I. Meyer, Sandoz Biopharmaceuticals / HEXAL AG; A. Papandrikopoulou, Sandoz Biopharmaceuticals / HEXAL AG; T. Stangler, Sandoz Biopharmaceuticals / HEXAL AG; J. M. Visser, Sandoz Biopharmaceuticals / HEXAL AG.

2154

**Regulation of Folate Pathway Related Genes in Methotrexate naïve and Methotrexate Treated Patients with Rheumatoid Arthritis.** Marjolen Blits1, Gerrit Jansen, Saskia Vossalamber2, Yehuda G. Assaraf and Cornelis L. Verweij1, VU University Medical Center, Amsterdam, Netherlands, “Haifa, Israel

**Background/Purpose:** Rheumatoid arthritis (RA) is one of the most prevalent systemic autoimmune disorders. The folate antagonist methotrexate (MTX) is an anchor drug in the treatment of RA. Here, we aim to provide insight into the pharmacological effects of MTX by gene expression analysis

**Methods:** Subanalysis of microarray data was performed for a set of 18 genes involved in methotrexate/folate pathway using peripheral blood gene expression data of 10 MTX naïve RA patients (MTX-), 25 RA patients treated with MTX (MTX+), and 15 healthy controls which were age and sex-matched (test cohort). Multiplex realtime PCR of these methotrexate/folate pathway related genes was performed on second cohort consisting of 28 MTX naïve RA patients (MTX-), 180 RA patients treated with MTX (MTX+) and 24 healthy controls (validation cohort). Statistical analysis was performed using Student’s t test or Mann-Whitney U test. P-values of <0.05 were considered to be statistically significant.

**Results:** Several folate/MTX-related genes were markedly and significantly altered between the three study groups in the test cohort. Metabolizing enzymes (MTX-), 180 RA patients treated with MTX (MTX+), and 15 healthy controls which were age and sex-matched (test cohort). Multiplex realtime PCR of these methotrexate/folate pathway related genes was performed on second cohort consisting of 28 MTX naïve RA patients (MTX-), 180 RA patients treated with MTX (MTX+) and 24 healthy controls (validation cohort). Statistical analysis was performed using Student’s t test or Mann-Whitney U test. P-values of <0.05 were considered to be statistically significant.

**Conclusion:** Overall, these results indicate that, under inflammatory conditions, basal folate metabolism is altered in peripheral blood of RA patients compared to HC. Treatment with MTX restores expression of these genes to the levels within the range of the HC group.

**Acknowledgements:** Prof. Dr. Y.G. Assaraf (Technion, Haifa, Israel) was a recipient of a visiting professor fellowship provided by the Dutch Arthritis Foundation to the VU University Medical Center Amsterdam. This study is partly supported by the “TRACER" consortium of the Center for Translational and Molecular Medicine (CTMM), and the Dutch Arthritis Foundation.

**Disclosure:** M. Blits, None; G. Jansen, None; S. Vossalamber, None; Y. G. Assaraf, None; C. L. Verweij, None.

2155

**The Annualized Progression of Radiologic Damage in Placebo Arms of Rheumatoid Arthritis Trials Is Much Lower Than the Mean Annual Progression Since Disease Onset.** Jean-Marie Berthelot and Celine Cozic, Nantes University Hospital, Nantes, France

**Background/Purpose:** A previous meta-analysis by Graudal and Ju¨rgens (Arthritis Rheum. 2010;62:2852–63) challenged the belief that biologics better protect rheumatoid arthritis (RA) from joint destruction than DMARDs or glucocorticoids. In this analysis, the annualized progression rates had been expressed as percentages of the maximal scores and annualized. We aimed to re-analyse this work and: 1-seek for differences in baseline radiologic scores, and mean progression of destruction rates since the onset of RA, according to the subset of drug tested
(DMARD, combination of DMARDS, glucocorticoids, biologics); 2-compare destruction rates since RA onset and during the period of the trial, both in the verum arms and placebo arms.

Methods: All studies from groups II to V of this meta-analysis were retrieved and re-analysed by two independent readers. Destruction rates could be calculated both since RA onset and per-trials in 41/55 studies (41 verum arms, and 43 control arms).

Results: Baseline scores were higher in patients from biologic trials, but duration of RA was also longer. Consequently, destruction rates before baseline were even lower in biologic trials. In absolute values, difference between verum and controls were not superior in trials of biologics, but when expressed as % of reduction as compared to per-trial destruction rates in the control arms, biologics seemed more efficient (71% +/- 19, median: 78%), than DMARDs (52% +/- 41, median: 64%) and glucocorticoids (52% +/- 22, median: 48%). The per-trial mean destruction rates were (much) lower than the mean destruction rates since RA onset in the four groups, even in the placebo arms, especially in biologic trials. Only placebo arms appear in the figure below. Boxplots represent median, lower and upper quartile, and 95th percentiles.

Conclusion: 1-The difference of per-trial radiographic progression might have biased the results of the previous meta-analysis. When expressed as ratio of destruction rates between verum and control arms, biologics performed better, although DMARDs and glucocorticoids were also clearly effective; 2-`expected worsening' as a substitute for placebo arms is inappropriate, and should be banned.

Disclosure: J. M. Berthelot, None; C. Cozie, None.

2156

Anti-Cyclical Citrullinated Protein Antibodies As a Predictor of Response to Tocilizumab in Patients with Rheumatoid Arthritis A Prospective Study, Kensoke Kume1, Kanzo Amano2, Susumu Yamada3, Kuniki Amano4, Kazuhiko Hatta5, Hiroyuki Ohta6 and Noriko Kuwaba7. 1Hiroshima Clinic, Hiroshima, Japan; 2Sky Clinic, Hiroshima, Japan; 3Hatta Clinic, Kure, Japan; 4Hiroshima, Japan; 5Sanki Clinical Link, Hiroshima, Japan

Background/Purpose: Tocilizumab, interleukin-6 receptor antibody is very effective in patients with rheumatoid arthritis (RA). Anti-cyclic citrullinated protein antibodies (ACPA) are highly specific and sensitive for RA. There are several reports that the correlation between the efficacy of anti-tumor necrosis factor and the titer of ACPA. To investigate the Tocilizumab on ACPA, and its association with treatment response.

Methods: RA patients were eligible if they had active disease despite treatment with methotrexate (MTX). Fifty four consecutive IgM-rheumatoid factor positive patients with RA were treated with infusion of 8mg/kg tocilizumab every 4 weeks. Disease activity was assessed by DAS28 score. ACPA titer was measured by a commercial ELISA at Week 0 and Week 24. The primary outcome was correlation between clinical response to therapy and ACPA titer. Secondary outcome was the change of ACPA titer from baseline to week 24.

Results: Primary outcome: There was a significant correlation between clinical response to therapy and ACPA titer(r=0.54, p<0.02). Secondary outcome: There was no change of ACPA titer from baseline to week 24(p=0.76). No patient at baseline turned negative at week 24 for ACPA (negative cut off<4.5U/ml).

Conclusion: ACPA titer might be predictor of the efficacy of Tocilizumab in patients with RA. Tocilizumab treatment didn’t affect the change of ACPA titer.

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2157

Resveratrol Counters Pro-Atherogenic Effects of Systemic Lupus Erythematosus and Rheumatoid Arthritis Plasma On Cholesterol Efflux in Human Macrophages, Allison B. Reiss, Iryna Voloshyna, Otek Hai, Michael J. Littlefield, Elise Belilos, Kristina B. Belostocki, Lois A. Bonetti, Gary C. Rosenblum and Steven E. Carson. Winthrop University Hospital, Mineola, NY

Background/Purpose: Our group has demonstrated that resveratrol, a plant polyphenol, possesses atheroprotective properties, enhancing expression of reverse cholesterol transport (RCT) proteins. We have reported that Systemic Lupus Erythematosus (SLE) and rheumatoid arthritis (RA) patients manifest a pattern of disturbance in expression of RCT genes that is atheroma-promoting. The cholesterol efflux proteins 27-hydroxylase, ATP binding cassette transporter (ABC) A1 and ABCG1 are suppressed by plasma from persons with these autoimmune rheumatic diseases. These proteins are crucial for efficient cholesterol efflux from macrophages, a process that prevents foam cell formation (FCF) and protects against atherosclerosis. This study examines whether resveratrol can protect macrophages from pro-atherogenic effects of SLE and RA plasma on cholesterol metabolism.

Methods: ABCA1, ABCG1 and 27-hydroxylase expression were evaluated in THP-1 human macrophages, a pertinent model of atherosclerosis. Cells were incubated for 18h in 10% pooled SLE, RA or normal human plasma (NHP) ± resveratrol (25μM). mRNA was isolated and reverse transcribed. The resulting cDNA was subjected to quantitative PCR with specific primers for each gene. Cell extracts were prepared for immunoblotting after 24h. FCF was quantified as % of red O stained cells. Studies were done in triplicate.

Results: 10% SLE plasma suppressed ABCA1 and ABCG1 expression by 58.3 ± 15.5% (n=3, P<0.001) and 48.3 ± 18.7% (n=3, P<0.01) below NHP, respectively (NHP set as 100%). 10% RA plasma induced similar levels of ABCA1, ABCG1 and 27-hydroxylase message level fell by 36.2 ± 12.8% and 49.1 ± 14.7% (n=3, P<0.01) below NHP, respectively for SLE and RA plasma. Whereas in THP-1 macrophages incubated with SLE or RA plasma ± resveratrol, the resveratrol significantly negated downregulation of efflux proteins, restoring levels to that observed with NHP (Fig 1). FCF by THP-1 macrophages was significantly reduced by addition of resveratrol compared to SLE or RA plasma alone (by 22.2±5.1% and 35±7.5%, respectively [n=3, P<0.01]).

Conclusion: Resveratrol is able to counteract pro-atherogenic factors in SLE and RA plasma. Resveratrol acts as an anti-atherogenic agent by preventing lipid overload via effects on cholesterol transport. Since resveratrol has a strong safety profile and is well-tolerated, low cost, and can be used in combination with multiple other therapies without contraindication, these findings provide the rationale for a novel therapeutic approach to decrease the cardiovascular consequences of RA and SLE. Administration of resveratrol in these groups of patients might restore a critical defense mechanism against atherosclerosis and cardiovascular disease progression. Further in vivo studies are indicated for this promising treatment option.

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Fig 1. * P<0.05; ** P<0.01; *** P<0.001 vs. NHP; # P<0.05, ## P<0.01 vs. corresponding plasma without resveratrol.
Baseline Folate Related Biomarkers in Serum and erythrocytes Are Not Associated with Methotrexate Response and Adverse Events in Rheumatoid Arthritis. Maurits C.F.J. De Rotte,1 Saskia M.F. Pluijm,1 Maja Bulutovic,1 Johanna M.W. Hazes1 and Robert De Jonge1.1 Erasmus Medical Center, Rotterdam, Netherlands, 2Erasmus Medical Center, Rotterdam, Netherlands, 3University Medical Center Utrecht, Netherlands

Background/Purpose: Methotrexate (MTX) is the most commonly used drug in rheumatoid arthritis (RA). 30% of patients fail to respond to the drug or suffer from adverse events. Therefore, there is a need to identify determinants of MTX response and adverse events in RA. MTX is an antagonist for folate and interacters with folate homeostasis. We investigated whether folate-related biomarkers, including homocysteine (Hcy), vitamin B6, B12 and folate, measured at baseline were associated with MTX response and adverse events over nine months of treatment.

Methods: The study included patients from two longitudinal cohorts who were diagnosed with RA according to the 2010 ACR criteria and were treated with MTX therapy. 285 patients from the treatment in Rotterdam Early Arthritis Cohort (tREACH) (1) and 99 from the Methotrexate in Rotterdam (MTX-R) study. Serum concentrations of Hcy, B6, B12 and folate, and folate in erythrocytes were determined at baseline (t0). MTX response was assessed with the disease activity score (DAS)-28 at 0, 3, 6 and 9 months after MTX start and EULAR response criteria at 3, 6 and 9 months. Positive association at 6 months (standardized β = 0.18, p = 0.001), whereas folate in erythrocytes was only associated negatively with DAS28 at 3 months (st-β = −0.14, p = 0.017). Analyses with biomarkers divided into quintiles or tertiles showed similar results. In addition, no associations were found between any of the baseline biomarkers and EULAR response criteria or adverse events.

Table. Analysis of covariance for the association between folate related biomarkers and DAS28

<table>
<thead>
<tr>
<th>Biomarker</th>
<th>3 months</th>
<th>6 months</th>
<th>9 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardized-β (p)</td>
<td>Standardized-β (p)</td>
<td>Standardized-β (p)</td>
</tr>
<tr>
<td>Hcy</td>
<td>−0.06 (0.278)</td>
<td>0.18 (0.001)*</td>
<td>−0.03 (0.650)</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>−0.01 (0.912)</td>
<td>−0.03 (0.633)</td>
<td>−0.08 (0.197)</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>0.01 (0.792)</td>
<td>−0.08 (0.141)</td>
<td>0.00 (0.949)</td>
</tr>
<tr>
<td>Folate in serum</td>
<td>−0.04 (0.396)</td>
<td>−0.05 (0.415)</td>
<td>−0.01 (0.928)</td>
</tr>
<tr>
<td>Folate in RBC</td>
<td>−0.14 (0.017)*</td>
<td>−0.07 (0.296)</td>
<td>0.06 (0.394)</td>
</tr>
</tbody>
</table>

* = significant. All analyses are adjusted for age, gender, DAS28 at baseline, MTX dose, MTX route of administration, other DMARDs, NSAIDs, steroids and study cohort.

Conclusion: In this first longitudinal study, folate-related biomarkers were unrelated to MTX treatment outcome in RA.

Disclosures: M. C. F. J. De Rotte, None; S. M. F. Pluijm, None; M. Bulutovic, None; J. M. W. Hazes, None; R. De Jonge, Dutch Arthritis Association, 2.

Correlation of a Multi-Biomarker Disease Activity Response Assessment to Disease Activity Score 28 (C-Reactive Protein) Response Assessment and Omeract Ramris Scores in a Placebo-Controlled Rheumatoid Arthritis Trial with Abatacept (ASSET-I). DJ Haney1, R. Alten2, G. R. Burnmester2, P. P. Tak1, Anka, I. Catrina1, C. Garcia1, M. Le Bars1, S. Connolly7 and R. Townsend2. 1Crescendo Bioscience Inc., South San Francisco, CA, 2Crescendo Bioscience, Inc., South San Francisco, CA, 3Université Catholique de Louvain, Brussels, Belgium, 4Scholekpark-Kliniik, University Medicine, Berlin, Germany, 5Charité-Universitätsmedizin, Berlin, Germany, 6Academic Medical Center/University of Amsterdam, Amsterdam, the Netherlands; GlaxoSmithKline, Stevenage, United Kingdom, 7Karolinska Institute, Stockholm, Sweden, 8Bristol-Myers Squibb, Ruei Malmaison, France, 9Bristol-Myers Squibb, Princeton, NJ

Background/Purpose: A novel multi-biomarker disease activity (MBDA) score has been validated and is a tool for monitoring disease activity in RA. Here, we evaluate the relationship between MBDA scores and both clinical and MRI assessments in patients (pts) from the ASSET trial (NCT00420199) who received abatacept (ABA) or placebo (pbo).

Methods: Fifty pts with active RA, baseline (BL) DAS28-ERP >3.2 or Tender Joint Count and Swollen Joint Count >6 and CRP > upper limit of normal and inadequate response to MTX were randomly assigned 1:1 to ABA or pbo plus MTX, administered intravenously at BL; Days 15, 29; and every 28 days up to and including Day 113. Concentrations of 12 serum biomarkers including inflammatory cytokines and receptors (IL-6, TNF-R1), growth factors (EGF, VEGF-A), matrix metalloproteinases (MMP-1, MMP-3), skeletal-related protein (YKL-40), hormones (leptin, resistin), acute phase proteins, and markers of systemic inflammation (CRP and SAA1) were measured in pt serum at BL, 2 and 4 wks to calculate MBDA scores between 1 and 100. Disease activity measures (DAS28-ERP) were evaluated at BL, Wks 2 and 4, and every 4 wks until Wk 16, EULAR response was assessed at Week 16, and OMERACT RAMRIS scores (components: erosion, osteitis, and synovitis scores) were evaluated at BL and Mth 4. Associations between MBDA scores and DAS28-ERP, and between MBDA scores and OMERACT RAMRIS scores, were evaluated post hoc using Spearman’s rank correlation. The relationships of early changes in DAS28-ERP and MBDA score with subsequent EULAR response were evaluated by two-sample t-test. Comparisons of changes in disease activity scores between treatment arms were evaluated by two-sample t-tests.

Results: Statistically significant correlations were observed between DAS28-ERP and MBDA score (r = 0.47, p < 0.001, n = 146; all time points combined), and between change in DAS28-ERP and change in MBDA score from BL to Wk 4 (r = 0.58, p < 0.001, n = 48). Pts in the ABA + MTX arm experienced significantly greater improvements in MBDA score and DAS28-ERP versus pbo + MTX arm at Wk 4 (p = 0.003 in each case). A significant association was observed between changes in DAS28-ERP from BL to Wk 4 and EULAR good response at Wk 16 (p = 0.02) was observed, as well as a marginally significant association between change in MBDA at Wk 4 and good EULAR response at Wk 16 (p = 0.05). There was a significant correlation between MBDA score and OMERACT RAMRIS synovitis and osteitis scores at BL (Table).

Conclusion: In the ASSET trial, pts receiving abatacept had a better improvement in both clinical disease activity and disease activity biomarkers than pts in the pbo group. The MBDA score was correlated with disease activity and the OMERACT RAMRIS synovitis and osteitis scores. Monitoring of changes in MBDA score may be useful in RA pts in combination with clinical assessment.


Disclosure: D. Haney, Crescendo Bioscience, 1, Crescendo Bioscience, 3; G. Cavet, Crescendo Bioscience, 1, Crescendo Bioscience, 3; P. Durez, BMS (less than US$2000), 8; R. Alten, Abbott, Bristol-Myers Squibb, Novartis, Pfizer, UCB, 2, Abbott, Bristol-Myers Squibb, Novartis, Pfizer, UCB, 5, Abbott, Bristol-Myers Squibb, Novartis, Pfizer, UCB, 6, G. R. Burnmester, Abbott, BMS, MSD, Pfizer, Roche, MSD, 2, Abbott, BMS, MSD, Pfizer, Roche, MSD, 5, Abbott, BMS, Pfizer, Roche, MSD, 8; P. P. Tak, Employee of GSK, 3; A. I. Catrina, None; C. Garcia, Full time Bristol Myers Squibb; M. Le Bars, Bristol-Myers Squibb, 3; S. Connolly, Own BMS stock, 1, Full time employee of BMS, 3; R. Townsend, Bristol-Myers Squibb, 1, Bristol-Myers Squibb, 3.
Fcy Receptor IIIb Polymorphism Is Associated with Injection Reaction to Adalimumab in Patients with Rheumatoid Arthritis. Masako Tsukamoto1, Yosuke Hashimoto1, Tatsuhiro Ohshige2, Keiko Yoshimoto3, Yuki Kaneko2, Hitoto Kameda2 and Tsutomu Takeuchi2. 1Keio University School of Medicine, Tokyo, Japan, 2Keio Univ School of Medicine, Shinjuku-ku, Japan

Background/Purpose: Biological agents targeting a specific molecule provide an effective means for therapeutic management of rheumatoid arthritis (RA), but infusion/injection reaction is a major adverse event in patients with RA treated with biological agents. We previously reported that a high affinity Fcy receptor (FcγRII) IIb polymorphism (NA1/NA1) is an independent risk factor for the development of infusion reaction to infliximab in RA patients (Ann Rheum Dis 70:299,2011). In this study, we investigated whether FcγRII IIb polymorphisms are related with injection reaction to adalimumab (ADA), a fully human anti-TNFα monoclonal antibody in patients with RA.

Methods: Consecutive patients with RA who fulfilled the 1987 revised criteria of the American College of Rheumatology (ACR) for the classification of RA or the 2010 ACR/EULAR RA Classification Criteria were invited to participate in the study after informed consent. Peripheral blood samples and clinical records were obtained from 65 RA patients (56 females and 9 males) treated with ADA between July 2008 and May 2012. The genomic DNA was extracted from peripheral blood mononuclear cells. Genetic polymorphisms for FcγRII IIb were genotyped in FCRGR3B NA1/1 alleles by real allelic discrimination assay. Clinical records in 65 patients were collected retrospectively. Genetic polymorphisms were subjected to logistic regression analysis to evaluate the association with clinical parameters.

Results: Injection reaction to ADA was observed in 8 patients, 2 patients of those discontinued ADA due to those injection reactions. There was no significant difference in clinical background between patients with injection reaction and those without. The FCGR3B NA1/NA1 genotype was found in 75.0% (6/8) of the patients with injection reaction whereas in only 28.1% (16/57) of those without injection reaction, indicating that this genotype is predictive marker for the development of injection reaction to ADA as well as infusion reaction to infliximab in Japanese RA patients.


Methotrexate Polyglutamate Concentrations in Erythrocytes Are a Potential Tool for Therapeutic Drug Monitoring of Methotrexate Response in Rheumatoid Arthritis. Maurits C.F.J. De Rotte1, Ethan den Boer1, Maja Bulatovic2, Saskia M.F. Pluijm3, Saskia M.F. Pluijm4, Johanna M.W. Hazes1 and Robert De Jonge1. 1Erasmus Medical Center, Rotterdam, Netherlands, 2Erasmus University Hospital, Rotterdam, Netherlands, 3University Medical Centre Utrecht, Netherlands, 4Erasmus Medical Center, Rotterdam, Netherlands

Background/Purpose: Methotrexate (MTX) is the most commonly used drug in rheumatoid arthritis (RA). 30% of patients fail to respond to the drug or suffer from adverse events. Therefore, there is a need for therapeutic drug monitoring (TDM). MTX plasma concentrations decrease in a few hours, whereas MTX polyglutamates (MTX-PG) are accumulated intracellular over months inside cells, and therefore may be a tool for TDM.

Methods: The study included patients from two longitudinal cohorts who were diagnosed with RA according to the 2010 ACR criteria and were treated with MTX therapy: 285 patients from the treatment in Rotterdam Early Arthritis Cohort (rEACH) (1) and 99 from the Methotrexate in Rotterdam (MTX-R) study. We measured MTX with a tail of 1,2,3,4 and 5 glutamates in erythrocytes at 3 months after MTX start with an LC-MS/MS assay. As outcome measure for MTX response we defined disease activity score (DAS) 28 at 0.3,6,9 and 9 months after MTX start and EULAR response criteria at 3.6 and 9 months. Adverse events were measured as gastro intestinal intolerance and overall complaints at 3.6 and 9 months. DAS28 was analyzed with analysis of covariance (ANCOVA). EULAR response and adverse events were analyzed with logistic regression. All MTX-PGs were analyzed as continuous variables, quintiles and tertiles. All analysis were adjusted for age, gender, DAS28 at baseline, MTX dose, MTX route of administration, other DMARDs, NSAIDs, steroids and study cohort.

Results: Concentrations at 3 months (mean/SD) were: MTX-PG1: 17.99 nmol/l (18.28), MTX-PG2: 9.25 nmol/l (4.61), MTX-PG3: 18.26 nmol/l (7.66), MTX-PG4: 7.78 nmol/l (5.95), MTX-PG5: 2.41 nmol/l (3.02) and total MTX-PG: 58.07 nmol/l (27.47). DAS28 was 4.76 (1.26) at baseline and 3.08 (1.20), 2.91 (1.22), 2.68 (1.16) at 3.6 and 9 months, respectively. At 3 months 52% had gastrointestinal complaints, at 6 months 26% and at 9 months 24%, 46%, 49% and 47% of the patients reported to have one or more adverse events at 3, 6 and 9 months. Lower DAS28 scores at 3.6 and 9 months were associated with higher MTX PG1, MTX-PG2 and total MTX-PG concentrations (table). Analysis in quintiles revealed that MTX-PG1,2 and total MTX-PG concentrations were non-linearly associated with EULAR response. As compared with patients in the lowest quintiles, patients in the highest quintiles had a higher chance to respond. No associations were found among any of the MTX-PG concentrations and adverse events.

Conclusion: In this first longitudinal study, higher MTX-PG1,2 and total MTX-PG concentrations in erythrocytes were associated with MTX response over the first 9 months treatment and are therefore a potential tool for TDM of MTX in RA.

Funds: RDJ: Dutch Arthritis Association (nr. 06-02-402, 09-1402).


Disclosure: M. C. F. J. De Rotte, None; E. den Boer, None; M. Bulatovic, None; S. M. F. Pluijm, None; J. M. W. Hazes, None; R. De Jonge, Dutch Arthritis Association, 2.

Correlation of A Multi-Biomarker Disease Activity (VECTRA™ DA) Score with Clinical Disease Activity and Its Components with Radiographic Progression in Rheumatoid Arthritis Patients Treated with Tofacitinib, Kunihiro Yamakoa1, Satoshi Kubo1, Koshiro Sonomoto1, Shin-taro Hirata1, Guy Cavet2, Rebecca Bolce2, Michael W. Rowe2, David Chernoff2, Nadine Defranouxs3, Kazuyoshi Saito1 and Yoshiha Tanaka1. 1University of Occupational and Environmental Health, Japan, Kitakata, Japan, 2Crescendo Bioscience Inc., South San Francisco, CA

Background/Purpose: A multi-biomarker disease activity (MBDA) score has been developed for evaluation of disease activity of rheumatoid arthritis (RA) to complement clinical assessment and to provide information about underlying disease processes. We have reported the usefulness of MBDA as clinical measures of disease activity. However, relation of MBDA score with clinical features in RA patients treated with a JAK-inhibitor tofacitinib is unknown.

Methods: DAS28(ESR), SDAI, MODA and modified total sharp score (mTSS) were evaluated at baseline and 1 year in 37 patients (31 women, mean age: 54.6 years, mean disease duration: 78.9 months) enrolled in phase II and III clinical trials of tofacitinib. Patients were randomized to different doses of tofacitinib or placebo for the first 3 to 6 months (8 patients with dosed tofacitinib as monotherapy and 29 patients with concomitant MTX). All patients were treated with tofacitinib 5 mg or 10 mg BID after 6 months. MBDA combines 12...
A sequential analysis of patients before and after abatcept exposure showed a significant differentiation from peripheral blood was impaired in abatacept-treated patients. There were no clinically significant differences between controls and adalimumab and methotrexate. The bone resorbing osteoclasts origin from monocytes. We have recently shown that binding of abatacept (CTLA4-Ig) to CD80 and CD86 on the surface of monocytes blocks their differentiation into osteoclasts in vitro. Abatacept therapy impairs the potential of osteoclast differentiation in rheumatoid arthritis patients in vivo.

Methods: We compared the frequency of CD11b+/CD115+ osteoclast precursors in the peripheral blood of 60 patients with rheumatoid arthritis (RA), 19 patients with SLE, 15 patients with psoriatic arthritis, 15 patients with osteoarthritis, and 15 healthy volunteers using FACS analysis. We also performed osteoclast differentiation assays from the peripheral blood mononuclear cells from these patients to quantify osteoclast gene expression in RA disease activity.

Results: The frequency of osteoclast precursors in the peripheral blood was significantly lower in abatacept-treated patients (82.4 ± 1.8%) than in untreated controls (97.4 ± 0.6%), whereas no significant differences between controls and adalimumab and methotrexate treated patients, respectively, were found. In addition, osteoclast differentiation from peripheral blood was impaired in abatacept-treated patients, whereas osteoclast number per well = 32.5 ± 3.5 was compared to untreated controls (mean osteoclast number per well = 145.6). In addition, sequential analysis of patients before and after abatcept exposure showed reduced potential of osteoclast precursors to differentiate into osteoclasts.
Utility of Vectra-DA™ On Assessment of Rheumatoid Arthritis Disease Activity and Golimumab Response: Results of a Pilot Study From a Phase 3 Trial in Patients with Active Rheumatoid Arthritis Despite Methotrexate Therapy. Sarah Lambeth, Yauheniya Cherkas, Carrie Brodmerkel and Mark Curran. Janssen Research and Development, LLC, Spring House, PA

Background/Purpose: Currently, disease activity in Rheumatoid Arthritis (RA) is measured using scoring systems that rely primarily on a collection of subjective measures from patients and clinicians. To improve care and treatment for RA patients, objective measurements of disease activity and response to treatment are desirable. Using a small cohort derived from an ongoing study of intravenously administered golimumab (GO-FURTHER), we evaluated the performance of Vectra-DA™ (Crescendo Biosciences), a multi-biomarker serum-based test designed to measure RA disease activity through correlation with DAS28-CRP and sensitive to anti-TNF therapy.1 This analysis examines if Vectra-DA™ correlates with disease activity and golimumab response in a clinical trial setting.

Methods: 137 serum samples collected in a Phase III study of intravenously administered golimumab in patients with active RA despite methotrexate (MTX) therapy was analyzed using Vectra-DA™ (Crescendo Biosciences©; San Francisco, CA, USA). Samples were collected at weeks 0, 2, 4, and 14 from patients treated with IV placebo + MTX (PBO; n=48) or IV golimumab 2mg/kg + MTX (GLM; n=89) who received study medications at Weeks 0, 4, and every 8 weeks thereafter. Healthy control serum samples (n=21) were obtained from Bioreclamation (Hicksville, NY).

Results: A subset of subjects was chosen for analysis with Vectra-DA™ from the GO-FURTHER study. The subset had an ACR50 response to golimumab of 35.8% (PBO 7.1%) at week 14 and 48.4% (PBO 16.7%) at week 24. Correlation of Vectra-DA™ and DAS28-CRP scores was r 0.51 (95% CI: 0.45–0.57) using all four timepoints tested. Study subjects had statistically higher mean Vectra-DA™ scores (64.2 at wk 0; 45.5 at wk 2; 50.2 at wk4; 44.9 at wk14) compared to healthy controls (35.2). At baseline, there were no significant differences in GLM and PBO-treated subjects by Vectra-DA™ or DAS28-CRP scores. As early as week 2, GLM-treated subjects had a significant drop in Vectra-DA™ score of Δ = -18.7 (p = -2.2×10^-16). The decrease in Vectra-DA™ score was maintained through week 14, whereas PBO-treated subjects did not have a significant change in Vectra-DA™ scores from baseline to weeks 2, 4, 8 and 14. Vectra-DA™ scores were statistically different between GLM-treated subjects who achieved an ACR50 response at week 14 versus non-responders at weeks 0 (p=0.024), 4 (p=0.013), and 14 (p=0.009). Vectra-DA™ scores were not statistically different between GLM-treated subjects who achieved an ACR50 response at week 24 versus non-responders at all timepoints tested, though a trend was seen at week 14 (p = 0.054).

Conclusion: Vectra-DA™ offers a molecular measurement of RA disease activity that can discriminate between normal and RA subjects, and also PBO and GLM-treated subjects as early as week 2 post-treatment. GLM treated week 14 responders had significantly lower Vectra-DA™ scores compared with non-responders. The Vectra-DA™ score reflects a patient’s disease activity before and after the treatment with intravenous golimumab.

1Weinblatt ME, Shadick NA, Manning W, et al. Use of a Multi-Biomarker Score for Rheumatoid Arthritis Disease Activity (Vectra™ DA) to Assess Response to Therapy. (Poster Session I: May 26, 2011, 11:45 BST); EULAR Congress 2011.

Disclosure: S. Lambeth, Janssen Research and Development, LLC, 3; Y. Cherkas, Janssen Research and Development, LLC, 3; C. Brodmerkel, Janssen Research and Development, LLC, 3; M. Curran, Janssen Research and Development, LLC, 3; None;}

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Serum Based Biomarkers of Joint Destruction Can Identify Responders and Non-Responder to Tocilizumab. Anne C. Bay-Jensen,1 Inger Byrjalsen,3 Claus Christiansen1 and Morten Asser Karsdal1. 1Nordic Bioscience A/S, Herlev, Denmark, 2Nordic Bioscience, Herlev, Denmark, 3CCBR, Ballerup, Denmark

Background/Purpose: RA is characterized by poly-articular synovial inflammation, cartilage loss and erosion of subchondral bone. It is critical to diagnose and effectively treat the disease early to suppress inflammation and halt destruction of the joint. Thus, identification of the patients most likely to respond to a given intervention should be pursued for optimal benefits for both patients and payers. The objectives were i) to investigate the early changes in biomarkers of bone, cartilage, synovium and inflammation (TCZ) treatment, and ii) to identify profiles associated with responders and non-responders biomarker profiles.

Methods: The prospective biomarker substudy of the LITHE trial included 626 patients. The LITHE trial (Roche WA17823) was a 2-year phase III, 3-arm randomized, double-blind, placebo-controlled, parallel group study to investigate whether early changes in serum biomarkers were predictive of ACR50 response at week 52 to 4 and 8 mg/kg tocilizumab (TCZ) treatment and to identify profiles associated with responders and non-responders biomarker profiles.

Results: A total of 183 patients 33 escape-therapies. Data is shown as mean geometric mean percentage change from baseline (Mann-Whitney test) as response was calculated. The level of serum CRP was decreased to 72% in the responder group and only to 83% in the non-responder group (OR 4, 0.004). Cartilage degradation - C2M - was reduced to 39% of baseline levels upon treatment with TCZ in the responder group whereas the level of serum C2M remained unaltered or increased to 102% of baseline level in the non-responder group (OR 5.8, 0.0003). The synovial turnover measure, serum C3M, was decreased to 73% of baseline in the responder group compared to 88% in the non-responder group (OR 9.6, 0.0004). There were only minimal differences in the bone resorption and formation markers, as well as in serum MMP-3, ICTP and VICM.

Conclusion: Biomarkers of cartilage and synovial turnover were able to discriminate between responders and non-responders to anti-IL-6r intervention at an early time point, in contrast to traditional CRP and the standard bone markers. These responder and non-responders profiles can enable identification of the optimal treatment for the individual patients, so-called IL-6 super-responders. Whether these response profiles are specific for IL-6 interventions or other biological treatments or other novel interventions remain to be investigated.

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Identification of Serological Biomarker Profiles Associated with Response to IL-6 Inhibition in Rheumatoid Arthritis. Mark Morten Asser Kasaral1, Anne C. Bay-Jensen2, Inger Byrjalsen1, Andrew Kernwright3, Adam Platt4, C. Morten Asser Karsdal1 and Claus Christiansen4. 1Nordic Bioscience A/S, Herlev, Denmark, 2Nordic Bioscience, Herlev, Denmark, 3CCBR, Ballerup, Denmark

Background/Purpose: RA is characterized by synovial inflammation, cartilage loss and erosion of subchondral bone. It is critical to diagnose and effectively treat the disease early to suppress inflammation and stop destruction of the joints. Biomarkers provide new insights into the release of tissue fragments in the release of tissue fragments in the joints that reflect disease activity which are measurable in serum. Identification of the patients who would most likely respond and not respond to treatment would bring optimal benefits for patients. The objective of the study was to investigate whether early changes (within 4 weeks) in serum biomarkers were predictive of ACR50 response at week 52 to 4 and 8 mg/kg tocilizumab (TCZ) treatment of RA patients.

Methods: The prospective biomarker substudy of the LITHE trial included 693 patients. The LITHE trial (Roche WA17823) was a 2-year phase
The patients were randomized: TCZ 7.5 mg/kg (n = 244), TCZ 25 mg/kg (n = 207) or placebo (PBO, n = 242) on a background of MTX. Biomarkers were measured in serum from baseline and 4 weeks: C2M (cartilage degradation), C3M (synovial inflammation), MMP3, total CRP, CRPM (MMP-degraded CRP), VIMC (Citrullinated and MMP-degraded Vimentin), and ICTP (MMP destruction; osteoclast activity). Results: For each marker, the cut-off value for optimal sensitivity and specificity for dichotomized values of the markers and the ACR50 response was determined by ROCs with best likelihood ratio for i) the individual markers at baseline, ii) changes from 4 weeks, and iii) ratio between markers. Decision trees (CART) were constructed using the cut-off values and the predictive values for ACR50 response were calculated by ×2 diagnostic test.

Results: The proportion of ACR50 responders at week 52 for TCZA and PBO was 29% and 8.2%, corresponding to a number needed-to-treat ratio (NNT) of 3.5 and 12.2, respectively. CART#1 (baseline C2M/CRP and C3M/CRPM ratio): A positive test resulted in identification of 68 TCZA cases which led to a PPV of 40% and a NPV of 76% PBO; 1 out 19 cases with a positive test were responder (NNT 2.3). CART#2 (baseline MMP3 and C3M/CRPM ratio): A positive test resulted in identification of 86 TCZA cases, which led to a PPV of 43% and a NPV of 80%. PBO 2 out 27 cases with a positive test were responder (NNT 2.3). CART#3 (CART#2 + 4-week change in osteocalcin and CTX1/C2M ratio): A positive test resulted in identification of 30 TCZA cases, which led to a PPV of 63% and a NPV of 79% (NNT 1.6). No PBO cases were selected. Similar data was obtained independently for TCZ 25 mg/kg.

Conclusion: WE identified more than 76% of the patients that did not respond to TCZ treatment. This increased the response rate from 29% up to 63%. We found that measurement of baseline biomarkers the need-to-treat ratio could be reduced from 3.5 to 2.3. If early changes in biomarkers were included then this need-to-treat ratio could be further reduced to 1.6. Whether this is an IL6 pathway-specific serological profile need to be investigated in additional clinical settings.

Disclosure: A. C. Bay-Jensen: Nordic Bioscience Diagnostic, 3; I. Bjyrjelsen: Nordic Bioscience Diagnostic, 3; J. Christiansen: Nordic Bioscience A/S, CRB, Synure, 4; Loïc Guillevin: 18, Hotel Dieu University Paris, France, 14CHU de ROUEN, Rouen, France, 15Department of Internal Medicine, Claude Huriez Hospital, University of Lille, France, 17EA4438 Laboratoire Physiopathologie des Arthrites, Illkirch-Strasbourg, France, 18Hotel Dieu University Paris, France, 2168

65 and aged 75 years or more) was studied too. The primary efficacy outcome was EULAR response (good, moderate and no response), the secondary outcome was drug discontinuation rates due to side effects. Results: Among the 1709 patients having at least 2 years of follow up, 608 were ≥ 65years of whom 191 were ≥ 75years old, and 1101 were < 65years. At baseline, the elderly patients showed a longer disease duration, a higher rate of CRP and ESR (medians respectively 21 vs 14mg/L, p < 0.001, and 35 vs 22 mm, p < 0.001), lower rate of previous anti TNF therapy (71% vs 79%, p < 0.001) and duration of previous anti TNF therapy (median 1 and 2 years respectively). Disease activity, previous DMARDs rates, rheumatoid or aCCP rates and corticotherapy (yes/no) were not statistically different between the 2 groups. At 24 months, no significant difference was showed between groups for RTX discontinuation rates for side effects: 5.8% if ≤ 65years, 4.9% if ≤ 65 years and 4.2% if ≥ 75years old. However, death rates increased with age: 2.5% if ≤ 65years, 7.7% if ≥ 65 years and 16.2% if ≥ 75years old, p < 0.001. The EULAR response criteria were not statistically different after 2 years (n = 506) in the younger (<65 years, n = 554) and older groups (≥ 65 years, n = 152) with respectively 64.1% and 68.4% of responders including 39.5% and 48% moderate responders, and 24.6% and 20.4% good responders respectively. However, there were significant differences concerning very old patients (>75 years). Before adjustment younger patients and patients between 65 and 75 years had more chances to be good responders at one year follow-up (n = 642) than patients ≥ 75 years old, with respectively OR = 3.54 (95% IC = [1.2-10.47]) and OR = 4.53 (95% IC = [1.12-12.33]). After adjustment, this difference was only significant between the old (≥ 65 years) and very old patients (≥ 75 years): OR = 3.71, 95% IC = [1.12-12.33] (n = 475). At 24 months, these differences were no longer significant with or without adjustment. Concerning remission, there was no significant difference between the young and the elderly, either at 1 year or at 2 years, respectively 12.0% vs 13% (adjusted p = 0.372), and 15.6% vs 11.0% (adjusted p = 0.410).

Conclusion: This study is the first to date to compare tolerance and effectiveness of RTX between elderly and younger patients with RA. No significant difference in efficacy or discontinuation rate after 2 years of follow-up. Increase of mortality in the oldest patients is probably due to the decrease of life expectancy with age.

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Short to Medium Term Safety of Glucocorticoid Therapy in Rheumatoid Arthritis: A Systematic Review and Dose-Response Analysis of Randomized Controlled Trials. Simon Tan,1 Daniel E. Furst,2 John R. Kirwan,3 Maarten Boers,4 Henning Bliddal,1 Thasia Woodworth,5 Else Marie Bartels,1 Bente Frederiksen1, Marian Kaldas2 and Robin Christensen1. 1The Parker Institute, Copenhagen University Hospital at Frederiksberg, Copenhagen F, Denmark, 2University of Amsterdam, 3VU University Medical Center, Amsterdam, Netherlands, 4Leading Edge Clinical Research LLC, Florida, FL, 5Lund University, Lund, Sweden, 6University of Copenhagen, Copenhagen, Denmark

Background/Purpose: Concerns regarding Adverse Effects (AEs) often dominate decisions on applying Glucocorticoid (GC) therapy. Evidence of AEs is mainly based on observational data without proper control groups. Thus, an examination of Randomized Controlled Trials (RCTs) for short to medium term AEs from GC would be useful. Our aim was to assess the risk of selected AEs, ranked as most worrisome among patients and rheumatologists (1), in relation to dose.

Methods: A systematic search in MEDLINE, EMBASE, and CENTRAL was performed. Inclusion criteria were RCTs in patients with Rheumatoid Arthritis (RA) with any Prednisone Equivalent Dose Differences (PEDD) between trial arms, independent of type of administration, type of GC, or study duration. RCTs of GCs without a prednisone equivalent conversion factor were excluded. One reviewer extracted the data from the included trials and a second reviewer checked the extracted data. Analyses were based on differences in dose between trial arms (more vs. less) and therefore an assumption for linearity in response, e.g. 10 mg/d PEDD in trials of 10 vs. 0 mg was equal to 70 vs. 60 mg. For the meta-analyses, a random-effects (REML) model was used to estimate the pooled Risk Ratios (RR) with 95% Confidence Intervals (CI). The average daily and accumulated PEDD in mg between trial arms were estimated and categorized in following dose-groups:
low (≤7.5 mg), medium (>7.5, ≤30 mg), and high (>30 mg) for each RCT. Meta-regression and stratified analyses were conducted to explore dose-response, using daily and accumulated PEDD as covariates and dose-groups as strata for each outcome.

Results: Of 2821 references identified, 524 were reviewed in detail, and 59 RCTs (66 Randomized Comparisons with a total of 4831 patients) were eligible for inclusion. Overall, the risks of the selected AEs over 24 to 104 weeks were not increased when comparing more vs. less GC (Table). Although none of the analyses showed statistical significance, some of the meta-regression and stratified analyses suggested a trend for a dose-response for GC given up to doses of maximum 75 mg PEDD. There was a trend towards an increasing risk of osteoporosis (from RR 1.07 to 3.41 when applied in medium dose), cardiovascular diseases (from RR 1.9 to 2.75 when applied in high dose). Interestingly, with data for the high dose relatively limited, the dose-response pattern for both non-viral infections and diabetes showed a tendency to decreasing risk with increasing GC dose.

Conclusion: This study presents empirical evidence, based on RCTs, that: (1) there is no statistical evidence to support concerns of an overall increased risk of the selected side effects of GCs, when the GC is used over a period of 24 to 104 weeks; (2) a tendency to a dose-dependent increased risk was noted for osteoporosis and cardiovascular side effects, while there may be decreasing risk for diabetes and non-viral infections.

References

Disclosure: S. Tarp, Mundipharma; 2. D. E. Furst, Abbott, Actelion, Amgen, BMS, Gilead, GSK, NIH, Novartis, Pfizer, Roche/Genentech, UCB, 2, Abbott, Actelion, Amgen, BMS, BiogenIdec, Centocor, Gilead, GSK, NIH, Novartis, Pfizer, Roche/ Genentech, UCB, 2, Abbott, Actelion, 2; 3. J. R. Kirwan, Norwegian University, horizon, 2; M. Boers, horizon and Mundipharma, 5; H. Biddulfi, Mundipharma, 2; T. Woodworth, None; E. M. Bartels, Mundipharma; 2; R. Dannesiold-Samsoe, Mundipharma, 2; L. E. Kristensen, Mundipharma, 5; Mundipharma, 3; S. Thirstrup, None; M. Rasmussen, None; M. Kaldus, None; R. Christiansen, Mundipharma, 2.

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Methotrexate and Interstitial Lung Disease in Rheumatoid Arthritis – A Systematic Literature Review and Meta-Analysis, Richard Conway 1, Candice Low 2, Robert J. Coughlan 3, Martin O’Donnell 4 and John J. Carey 5, 1St James’s Hospital, Dublin, Ireland, 2St James Hospital, Dublin, Ireland, 3Galway University Hospitals, Galway, Ireland

Background/Purpose: Methotrexate is commonly prescribed for a variety of diseases including rheumatoid arthritis. Methotrexate has frequently been implicated as a causative agent in interstitial lung disease. Patients with rheumatoid arthritis can develop pulmonary disease for a variety of reasons including infection and rheumatoid interstitial lung disease. Methotrexate lung toxicity from other activities is vital in the clinical setting as methotrexate is an effective treatment for rheumatoid arthritis. The aim of this study was to evaluate if methotrexate is associated with an increased risk of lung disease in rheumatoid arthritis.

Methods: We performed a systematic literature search from 1st January 1990 to 31st March 2011 using Pubmed and Cochrane databases. The inclusion criteria for study selection were: (1) randomised controlled trials; (2) human patients with rheumatoid arthritis; (3) studies in English; (4) studies consisting of a minimum of two arms, at least one receiving methotrexate and at least one not receiving methotrexate; (5) studies including only adult (>18 years); (6) trials of ≥6 months duration; (7) studies of ≥100 patients; (8) studies reporting respiratory side effects for methotrexate and comparator groups individually. Random effects meta-analysis using the Mantel-Haenszel method was used to assess total respiratory events, infectious respiratory events and non-infectious respiratory events. Results were expressed as relative risks (RR) with 95% confidence intervals.

Results: 21 studies with a total of 8276 participants met our study’s inclusion criteria and were included in the meta-analysis. Methotrexate was not associated with an increased risk of total adverse respiratory events, RR 1.1 (95% CI 1.0–1.2, I 2 =8%), Figure 1. No difference was identified in the risk of adverse events when analysed separately for infectious and non-infectious outcomes, RR 1.09 (95% CI 1.0–1.19, I 2 =49%) and 1.11 (95% CI 0.68–1.81, I 2 =48%) respectively. There was no difference in the risk of pulmonary death between the 2 groups, RR 1.41 (95% CI 0.43–4.63, I 2 =0%). A subgroup analysis of studies specifically reporting pneumonitis revealed an increased risk in the methotrexate group, RR 6.99 (95% CI 1.57–31.05, I 2 =0%); however none of the publications since 2001 in our study reported any cases of pneumonitis.

Conclusion: Our study did not find a significant increase in the risk of lung disease in RA patients treated with methotrexate. One subgroup analysis showed a significant increased risk of pneumonitis; however publications after 2001 have not reported this association.

Disclosure: R. Conway, Roche Pharmaceuticals, 2, UCB Pharma, 2, Merck Pharmaceuticals, 7, C. Low, Roche Pharmaceuticals, 2, UCB Pharma, 2, Merck Pharmaceuticals, 7, R. J. Coughlan, None; M. O’Donnell, None; J. J. Carey, None.

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Comparative Efficacy of Biologics As Monotherapy and in Combination with Methotrexate in Rheumatoid Arthritis Patients with an Inadequate Response to Conventional DMARDs: A Network Meta-Analysis, Felicity Buckley 1, Axel Finckh 2, Tom W. J. Huizinga 2, Fred Depjockheere 3 and Jeroen P. Jansen 1, 1MAP Consultancy, Boston, MA, 2University Hospital of Geneva, Geneva, Switzerland, 3Leiden University Medical Center, Leiden, Netherlands, 4H. Hoffmann-La Roche Ltd, Basel, Switzerland

Background/Purpose: A number of meta-analyses compare the efficacy of biologics for rheumatoid arthritis (RA). However, systematic reviews comparing the efficacy of biologics as monotherapy versus combination with DMARDS are rare, and none include all currently approved biologics. Our objective was to compare ACR response at 24 weeks in RA patients with an inadequate response to conventional DMARDS (DMARD-IR) receiving approved biologics as monotherapy or in combination with methotrexate (MTX).

Methods: A systematic literature review was undertaken to identify RCTs that assessed approved biologic therapies as monotherapy or in combination with MTX in DMARD-IR RA patients. 22 RCTs were identified that evaluated tocilizumab (TCZ), adalimumab, certolizumab pegol, etanercept, golimumab, infliximab, abatacept, or anakinra. ACR responses at 24 weeks were extracted and combined by means of Bayesian network meta-analyses to obtain treatment effect estimates between all interventions included in the analysis, whether directly or indirectly compared. As shown elsewhere,1,2 an assumption was made that the effects of anti-TNF-α agents (aTNFs) are
exchangeable. Given this, and the limited data identified for these therapies in monotherapy, aTNF data were pooled.

Results: Using random effects models, TCZ + MTX was shown to be comparable to other biologics + MTX across the ACR outcomes. A higher expected treatment effect was seen with TCZ + MTX for ACR70, in line with earlier analyses. When comparing biologic monotherapies with biologics + MTX, TCZ showed a comparable likelihood of ACR20, ACR50, and ACR70 response versus TCZ + MTX ([RR 0.98 (95% credible interval [CrI]: 0.70, 1.71)], [RR 0.92 (95% CrI: 0.62, 1.56)], and [RR 1.04 (95% CrI: 0.58, 2.08)], respectively). aTNF as monotherapy was likely to be less efficacious compared to aTNFs + MTX in terms of ACR20 and ACR50 response (probability better=13% [RR 0.71 (95% CrI: 0.48, 1.64)] and probability better=5% [RR 0.52 (95% CrI: 0.31, 1.25)], respectively).

Between monotherapies, the chance of ACR20, ACR50, and ACR70 response for TCZ was found likely to be greater compared to responses for aTNFs (probability better=88%, 97%, and 96%, respectively), in line with recently reported outcomes of a trial comparing TCZ and adalimumab.

Figure 1. Expected ACR50 response at 24 weeks with combination therapy and monotherapy (random effects network meta-analysis)

Conclusion: Our network meta-analysis, involving indirect comparison of trial findings, suggests that in DMARD-IR patients, TCZ + MTX shows comparable efficacy to other biologics + MTX. In monotherapy, TCZ is likely to have a greater efficacy than aTNFs and shows comparable efficacy compared to TCZ + MTX, whereas aTNFs are likely to show lower efficacy compared to aTNFs + MTX.

References

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Background/Purpose: ADACTA trial (Gabay C et al EULAR June 2012) showed that tocilizumab (TCZ) monotherapy was superior to adalimumab (ADA) monotherapy in reducing signs and symptoms of adult rheumatoid arthritis (RA) patients who were either intolerant to methotrexate (MTX) or for whom continued MTX treatment was inappropriate. The aim of the current study was to develop a cost-effectiveness analysis of TCZ vs. ADA in MTX-intolerant/contraindicated patients.

Methods: An economic evaluation based on the ADACTA study was conducted to estimate the incremental cost-effectiveness ratio (ICER) of TCZ vs. ADA. Time horizon was 24 weeks. In ADACTA study, patients were randomly assigned (1:1) to TCZ 8 mg/kg IV every 4 weeks or ADA 40 mg subcutaneously every 2 weeks. Baseline characteristics were similar between the TCZ and ADA. Mean weight considered in the analysis was 68 kgs (C. Rubio-Terres et al Farm Hosp 2007; 31: 78–92). To estimate treatment cost for each drug it was considered doses for TCZ and 12 doses for ADA treatment. Patient’s response in the model was measured through ACR responses (ACR20/ACR50/ACR70) and DAS28 remission. Results were presented as incremental cost of TCZ vs. ADA per response. The analysis was conducted from the perspective of the Spanish National Healthcare System, considering drug costs. Unitary costs (€, 2012) were obtained from a Spanish database. Simple univariate sensitivity analyses were performed, for this analysis it was considered weight and infusion cost.

Results: ACR20 response rates were achieved in 65% and 49.4% in the TCZ and ADA groups respectively (p<0.010). ACR50 response rates were achieved in 47.2% and 27.8% in TCZ and ADA groups (p<0.010) and ACR70 response rates in 32.5% and 17.9% in TCZ and ADA groups.
Natural History of Sjögren’s Syndrome Phenotypic Features in the Sjögren’s International Collaborative Clinical Alliance Registry. Caroline Shiboski, Alan N. Baer, Mi Y. Lam, Stephen Challacombe, Hector Lanfranchi, Morten Schiodt, Hisanori Umehara, Frederick B. Vivino, Yan Zhao, Yi Dong, Bruce W. Kirkham, Kenneth E. Sack, Susumu Sugai, Cristina F. Vollenweider, Wen Zhang, John S. Greenspan, Troy Daniels, Linda A. Criswell, Sjoergen’s International Collaborative Clinical Alliance, University of California San Francisco, San Francisco, CA, Johns Hopkins University, Baltimore, MD, Kings College London, London, United Kingdom, University of Buenos Aires, Buenos Aires, Argentina, Rigshospitalet, Copenhagen, Denmark, Kanazawa Medical University, Ishikawa, Japan, Penn Presbyterian Med Ctr, Philadelphia, PA, PUMCH, Beijing, China, Guys Hospital, London, United Kingdom, Univ of California San Francisco, San Francisco, CA, German Hospital, Buenos Aires, Argentina, University of California San Francisco, CA.

Background/Purpose: Sjögren’s syndrome (SS) is known to be a relatively stable or slowly progressing disease, however, few studies have actually followed patients over time while taking into account all its components. We explore changes in the phenotypic features (serologic/ rheumatologic, oral, and ocular) of SS, and in SS status, using the new American College of Rheumatology (ACR) classification criteria for SS, among participants in the Sjoergen’s International Collaborative Clinical Alliance (SICCA) registry over a 2-year time interval.

Methods: SICCA is an international registry enrolling participants with signs and/or symptoms suggestive of SS in 9 centers across 7 countries. It was created to develop new classification criteria, establish a patient data and biospecimen repository and make these available to the scientific community to explore the genotype, phenotype, pathogenesis and epidemiology of this chronic autoimmune disease. All participants found to have any objective measures of salivary hypofunction, ocular dryness, focal lymphocytic sialadenitis in a lip salivary gland (LSG) biopsy, or anti-SSA and/or B antibodies, are recalled 2 years after their baseline examinations to repeat all examinations and specimen collections. We explored change in phenotypic features and in SS status.

Results: As of September 30, 2011, 2510 participants had enrolled in SICCA, and 703, or nearly one third, presented for a 2-year follow-up visit. We found remarkable stability over time of both individual phenotypic features of SS and of SS status. For most phenotypic variables the percent unchanged exceeded 80%, ranging from 77% (for Schirmer’s test) to 96% (for anti-SSA/B). The ocular staining score (OSS that may range from 0 to 12) increased from baseline (median=5) to follow-up (median=6) (p<0.0001; signed-rank test). Among 168 participants found to have SS using the 2012 ACR classification criteria, 90% again met these criteria after 2 years. Among those who did not meet the ACR classification criteria at baseline, 11% had progressed and met them at the follow-up visit. One case of mucosa-associated lymphoid tissue lymphoma was detected in a follow-up LSG biopsy. Three other cases of non-Hodgkin’s lymphoma were diagnosed during the follow-up period by a study-independent physician.

Conclusion: There was remarkable stability over a 2-year time period of both individual phenotypic features of SS and of SS status. This suggests that to fully characterize longitudinal outcomes and progression, a longer follow-up interval may be needed. Funded by NIH/NIDCR/NEI N01-DE32636.

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Background/ Purpose: The reported frequency of pulmonary involvement in primary Sjögren’s Syndrome (pSS) varies widely ranging from 8% to 75% depending on the detection method employed and consists of various forms of airways disease. There is little information regarding interstitial lung disease (ILD) patterns other than lymphocytic interstitial pneumonia occurring in pSS in terms of frequency and risk factors. We aimed to assess incidence, and mortality of ILD in a well-characterized, population-based cohort of patients with pSS.

Methods: We examined a population-based incidence cohort of patients diagnosed with pSS in 1976–2005. All subjects were followed longitudinally through their complete community medical records, until death, migration or August 2011. ILD was defined using strict, validated composite criteria developed by an expert panel including pulmonologists and rheumatologists. These criteria included physician diagnosis, radiologic data, pulmonary function parameters, lung biopsy and autopsy findings. Cumulative incidence adjusted for the competing risk of death was estimated. A Cox model with a time-dependent covariate for development of ILD was used to examine the impact of ILD on survival in patients with pSS.

Results: 105 patients with pSS were identified (mean age 58.1 years; range 23–95; 91% female). Lung disease was present prior to diagnosis of pSS in 12 patients and developed after diagnosis of pSS in 35 patients with a median follow-up time of 9.2 years (1206 total person-years). Among pSS patients without prior ILD, the cumulative incidence of ILD in patients with pSS was 10% (±3%) at 1 year after diagnosis of pSS and increased to 20% (±4%) by 5 years after pSS. The development of lung disease in pSS was associated with poor survival with a hazard ratio of 2.16 (95% CI: 0.99, 4.74) adjusted for age, sex, and calendar year. ILD was identified as the most frequent type of lung disease detected at or after pSS diagnosis (53%) followed by emphysema (13%).

Conclusion: Our findings emphasize the high incidence of ILD and the adverse effect on survival in patients with pSS. Patients with pSS should be carefully assessed for diagnosis and treatment of ILD in order to improve the detrimental survival experience.

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2176 Pulmonary Manifestations and Treatment of Primary Sjögren’s Syndrome-Associated Lung Involvement Patients: A Prospective Study. Hui Gao, Xuewu Zhang, Jing He, Min Feng, Wei Zhao, Yan Ding and Zhan-guo Li, Peking University People’s Hospital, Beijing, China.

Background/ Purpose: Pulmonary involvement is common in primary Sjögren’s syndrome (pSS). Clinicopathologic pulmonary manifestations associated with pSS have yet to be reviewed in a large series. However, the pulmonary functional and radiological characteristics of pSS-associated lung disease which are more practical in clinic were less studied. Besides, the treatment of those patients has hardly been explored before. Most studies were specifically designed to evaluate sicca features. We aimed to describe the clinical, radiologic, and pulmonary Functional characteristics in a large Chinese pSS patient with lung involvement, and to analyze efficacy and safety of corticosteroid therapy combined with hydroxychloroquin (HCQ) or intravenous cyclophosphamide (CTX) in pSS-associated lung disease.

Methods: A total of 112 hospitalized patients with pSS-associated lung disease were retrospectively analyzed. The high-resolution computed tomography (HRCT) was re-evaluated by two experienced chest radiologists. Autoantibodies, inflammation markers, arterial blood gas (ABG) and PFT results were obtained.
A total of 15 patients were recruited in the prospective study. Prednisone was prescribed initially at a dosage of 30–40mg/day, and was tapered to 7.5mg/d within 4 months. HCQ was administered at a dosage of 200mg, twice a day. CTX was administered intravenously at an initial dosage of 400mg, every 2 weeks for 6 months, and then tapered to 400mg every 4 weeks.

**Results:** Among the 112 pSS patients with lung involvement, 102 (91.0%) were female. The mean age was 61.74 ± 10.24 years old. The disease duration was 60 months (12.00–97.00 months). Elevated IgE was prominent in those patients. There were more frequent and severer of the lower lung lobes involve- ment. The most frequent HRCT findings were linear opacities (94.2%), ground-glass attenuation (87.0%), reticular pattern (65.2%) and pleural involvement (65.2%). Impaired diffusing capacity was the most significant (74.3%). Among the 36 patients who took ABG, 20 patients had hypoxia and 7 had Type 1 respiratory failure.

Seven patients took oral prednisone combined with HCQ and 8 patients received oral prednisone combined with intravenous CTX. One patient from CTX group withdrew from the study for stopping DMARDs to have surgery. The rest were followed up for 11.57 ± 4.91 months. There was evidence of improvement in HRCT for most of the patients, and no obvious deterioration of PFT was observed. One patient in HCQ group presented hypoleukemia, which was ameliorated after reducing to 100mg, twice a day. Two patients had pneumonia and one had herpes zoster virus (HZV) infection in CTX group.

**Conclusion:** The distribution of the abnormalities and severe parenchymal involvement are most pronounced in the lower lobes of pSS patients. Impaired diffusing capacity is the most significant PFT abnormalities. Hypoxia is not rare for pSS-association lung involvement patients. Corticosteroid therapy combined with hydroxychloroquine or intravenous cyclophosphamide is administered with a favorable response seen in the majority of patients. This should be further confirmed in a large cohort.

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**2177**

**The Forced Oscillation Technique Is a Sensitive Method for Detection of Obstructive Airway Disease in Patients with Primary Sjogren's Syndrome.** Anna M. Nilsson¹, Elke Theander², Roger Hesselstrand¹, Per Wollmer² and Per Hesselstrand³

**Background/Purpose:** To assess the value of 18-Fluorodeoxyglucose Positron Emission Tomography (PET) in patients with primary Sjogren's Syndrome (pSS).

**Methods:** All patients with confirmed pSS (AECG) from 3 French university centers who underwent PET were retrospectively analysed. PET was realized to assess activity in SS-related interstitial lung disease (ILD) (n=24), lymphoma suspicion (n=10) or systematically (n=5). Positive PET was defined as FDG uptake >2.5 SUVmax. A control group constituted of patients with PET for isolated pulmonary nodule (n=17).

**Results:** Thirty-nine patients with pSS were included (table 1). FDG uptake was noted in 30 cases (83%): salivary gland (n=20 (57%); median SUVmax 3.1 [2.8–4.4]); lymph nodes (n=24 (67%); median SUVmax 5 [4–8]; pulmonary uptake (n=13 (33%); median SUVmax 3,3 [3–6]) and thyroids (n=3). Salivary gland uptake was more frequent and SUVmax was higher in pSS than in the control group (median 3 [2,8–4] versus 2 [1,5–2,5]; p<0.001).

**Conclusion:** PET allowed the diagnosis of active ILD in these patients, with 100% respiratory test difference between ILD patients with/without FDG uptake, and 93% in non-ILD patients. PET was realized in both ILD and non-ILD patients (n=24).

**Disclosure:** A. M. Nilsson, None; E. Theander, None; R. Hesselstrand, None; P. Wollmer, None; T. Mandl, None.
In 10 patients with PET for suspected lymphoma, PET confirmed diagnosis in 6 cases, and confirmed the remission in 1 case.

Lymph node FDG uptake was present in 24 (67%) cases and was significantly associated with pulmonary uptake in ILD patients. With a follow-up of 2 years [0.8–4], no patient with lymph node FDG uptake developed lymphoma.

Conclusion: Whereas salivary uptake is frequent in pSS, in patients with ILD, PET could constitute an interesting tool to assess activity, and necessitate to be confirmed in prospective study.

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High Resolution CT Findings and Concomitant Nontuberculosis Mycobacterial Infection (NTM) in Patients with the Diagnosis of Primary Sjögren’s Syndrome Evaluated At a Respiratory Referral Center. Mehraz Maleki-Fischbach1 and Gloria M. Russell2. 1National Jewish Health, Denver, CO, 2Pontificia Universidad Católica Madre y Maestra, Santiago, Dominican Republic

Background/Purpose: Although lung disease can occur with primary Sjögren’s syndrome (pSS), far too little is known about the clinical phenotype or natural history of its lung involvement. The objective of this retrospective observational study was to characterize a cohort of subjects with pSS-associated lung disease. It also seems that there is an association between pSS and nontuberculous mycobacterial (NTM) infection.

Methods: We identified all subjects evaluated at our center between Jan 2008–May 2012 that fulfilled the American-European classification criteria for the diagnosis of pSS and that had respiratory symptoms along with thoracic high resolution CT (HRCT) available to review. All clinical data were extracted from the medical record by comprehensive review. We excluded patients with secondary Sjögren’s syndrome.

Results: A total of 38 subjects were identified. Mean age was 63.7 years (range 50–78) and all but one of the subjects were women. A history of past smoking was reported in 14 (37%) and only one subject was an active smoker. All reported xerostomia and keratoconjunctivitis sicca. Other pSS associated manifestations included the presence of Reynaud’s in 5 (13%), arthralgia in 8 (21.0%), esophageal reflux in 27 (71%). All of the subjects had positive SS-A and/or SS-B antibodies. 37 were SS-A positive, 26 were SS-B positive and 25 had both positive. (Mean SS-A & SS-B were 106.5 and 78.1 units respectively) Also all of the patients had positive ANA (titer range 1:160–1:2560) by direct immunofluorescence. ANA patterns identified; 26 (68.4%) speckled, 1 (2.6%) homogeneous, 1 (2.6%) centromere, 6 (15.7%) speckled and nucleolar, and 4 (10.5%) speckled and homogeneous. 22 were rheumatoid factor positive. All of the subjects had respiratory symptoms as manifested either by isolated cough (n=33, 87%), dyspnea (n=36, 95%) or both. 12 (31.6%) patients had proven infection with Nontuberculous Mycobacteriosis (NTM).

High resolution CT (HRCT) of the chest showed 24 (63.1%) patients with airway disease including 1 (2.6%) with large airway disease, 3 (7.9%) with bronchiolitis, 3 (7.9%) with bronchiectasis plus bronchiolitis and 17 (44.7) with bronchiectasis out of which 11 (28.9%) had proven NTM infection as well. 4 (10.5%) patients were found to have interstitial lung disease (ILD); 3 (7.9%) patients with lymphoid interstitial pneumonitis (LIP) and 1 (2.6%) patient with nonspecific interstitial pneumonia (NSIP). 4 (10.5%) patients had combined ILD and airway disease including 1 (2.6%) with LIP, bronchiectasis and bronchiolitis; 4 (10.5%) with LIP and bronchiectasis; 3 (7.9%) with NSIP and bronchiolitis and 2 (5.3%) with NSIP and bronchiectasis. One (2.6%) of the patients with LIP and bronchiectasis also had concomitant NTM infection.

Conclusion: There is a myriad of pulmonary manifestations associated with pSS. In this cohort, the most common lung manifestation was airway disease. It also seems that pSS may predispose patients to NTM infection and NTM having a causative effect on worsening their lung condition. Further studies are needed to better define the natural history of pSS-associated lung disease and possible relationship with NTM infection especially among middle age and elderly women.

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Coronary Flow Reserve and Asymmetric Dimethylarginine Levels: New Measurements for Identifying Subclinical Atherosclerosis in Patients with Primary Sjögren’s Syndrome. F. Atzeni2, L. Boccassini1, M.C. Signorello1, MA Carrideo2, L. Gianturco2, V. De Gennaro Colonna2, L. Drago4, M. Turili1 and P. Sarzi-Puttini1. 1Rheumatology Unit, L. Sacco University Hospital of Milan, Milan, Italy, 2IRCCS Galeazzi Orthopedic Institute, University of Milan, Department of Health Technologies, Cardiology Unit., Milan, Italy, 1Pharmacology Department, University of Milan, Milan, Italy, 2Laboratory Unit, IRCCS Galeazzi Orthopedic Institute, Department of Health Technologies, University of Milan, Milan, Italy

Background/Purpose: Clinical and biochemical data suggest that autoimmune diseases are associated with endothelial dysfunction and increased atherosclerosis. We have previously shown that asymmetric dimethylarginine (ADMA) levels and coronary flow reserve (CFR) are impaired in patients with early rheumatoid arthritis, but it is not known whether the same is true of patients with Primary Sjögren’s Syndrome (pSS). We therefore investigated sub-clinical cardiovascular involvement in primary SS patients by means of ADMA and coronary flow reserve (CFR) assessments.

Methods: The study involved 15 patients who fulfilled the ACR criteria for primary SS without any documentable cardiovascular disease to age- and gender-matched control subjects. Dipyridamole stress echocardiography was used to evaluate wall motion and CFR in the distal segment of the left anterior descending coronary artery before and after dipyridamole infusion (0.86 mg/kg over six minutes). A CFR value of <2.5 was considered a sign of impaired coronary function Plasma ADMA levels were determined using high-performance liquid chromatography. Linearity was assessed in the range of ADMA 0.1–20 μM. The mean correlation coefficient was >0.99. The ADMA limit of quantitation (LOQ) was 0.01 μM The continuous variables were expressed as mean values and standard deviations, and the non-continuous variables as median values and interquartile ranges (IQR). The data were analysed using SAS statistical software 9.2. All tests were two-tailed, and probability (p) values of less than 0.05 were considered statistically significant.

Results: All of the patients were affected by primary SS, the majority of patients were being treated with hydroxychloroquine (HCQ) at dose of 400 mg/day, two were taking methotrexate (MTX) and four azathioprine (AZA) at a mean dose of 130 mg/day (range 50–200 mg). Only 3 patients used corticosteroids—one at a dosage of 2.5 mg and two at 5 mg daily. All of the patients were ANA and/or RF and anti-SSB and/or anti-SSA positive. The patients’ mean age and ejection fraction were respectively 62 ± 8 years and 65% ± 6% (not significant). Although within the normal range, their CFR was lower than that of the controls (median 3.0, IQR 2.5–3.5 vs median 3.4, IQR 3.2–3.82, P=0.02), whereas their ADMA levels were significantly higher (median 0.80 mM, IQR 0.78–0.82 mM vs median 0.55 mM, IQR 0.49–0.59 mM respectively; P<0.0001) and their E/A ratios significantly lower (median 0.8, IQR 0.7–1.1 vs median 1.3, IQR 1.3, 1.2–1.4; P<0.0001).

Conclusion: Higher ADMA levels suggest the presence of endothelial dysfunction and sub-clinical atherosclerosis in primary SS patients, even in the case of normal CFR. Our preliminary data indicate that ADMA may be a useful marker for identifying early endothelial dysfunction in primary SS patients.

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Concomitant Atherosclerosis and Impaired Bone Health in Patients with Primary Sjögren’s Syndrome. Clio P. Mavragani1, Fotini Gravani2, Andronos Nezos1, Eleini Antrypa1, Kiki Maselou3, Dimitrios Ioakeimidis4, Michael Koutsilieris1 and Haralampos M. Mountposoulos4. 1School of Medicine, University of Athens, Athens, Greece, 2Athens General Hospital of Athens, Greece, 3General Hospital of Athens, Greece, 4General Hospital of Athens "G. Gennimatas", Greece, 4School of Medicine, University of Athens, Athens, Greece

Background/Purpose: To determine the prevalence of subclinical atherosclerosis and impaired bone health in primary Sjögren’s syndrome (pSS) patients and to explore whether they associate with clinical and
serological disease features, traditional risk factors for cardiovascular disease (CVD) and osteoporosis as well as with activation of the Receptor activator of nuclear factor kappa-B ligand (RANKL)-RANK system, previously implicated in the pathophysiology of both CVD and osteoporosis.

**Methods:** 64 consecutive pSS patients according to the American-European Classification Criteria (mean age ± SD 57.19±12.47) and 39 healthy controls (mean age ± SD 33.6±7.04) were enrolled. Demographic data, clinical, laboratory and histopathological features were recorded and classical risk factors for atherosclerosis and osteoporosis were evaluated. Patients and controls underwent an initial medical history (IMT) and bone mineral density (BMD) levels measurements. The presence of carotid/femoral plaque and fractures was also determined by ultrasound and lateral spine radiographs respectively. Serum RANKL and osteoprotegerin levels were determined by ELISA. RANKL and osteoprotegerin mRNA levels were determined in cDNA derived from minor salivary gland (MSG) tissues from 19 pSS patients, 9 pSS patients complicated by lymphoma and 11 sicca controls by real time PCR. Determinants of IMT/BMD levels and the presence of plaque were assessed by univariate and multivariate models. Comparisons between groups were performed by Fisher’s exact two tailed test and Mann Whitney test.

**Results:** Increased prevalence of subclinical atherosclerosis (defined as IMT >0.90mm) and osteoporosis/osteopenia was detected in pSS patients compared to controls (58.7% vs 27.5%, p=0.0071 and 61.2% vs 20.5%, p=0.0001) with fracture rates not significantly differing between the two groups. Multivariate analysis in the pSS group revealed age, BMI and periarterial disease (defined as periarterial, interstitial nephritis, primary biliary cirrhosis) as independent predictors of IMT, age and lymphopenia as independent determinants of carotid and/or femoral artery plaque and increased urine PH, periarterial disease and total steroid dose as independent predictors of osteoporosis and/or osteopenia. The latter was independently associated with the presence of plaque, when independent predictors for both variables were included in the multivariate model [(OR:4.75 (1.05–21.47, p=0.043)]. Compared to the control group, pSS patients displayed increased serum RANKL levels (p=0.0003) while at MSG tissue, mRNA RANKL/osteonectinogen ratio was significantly increased in pSS patients complicated by lymphoma compared to sicca controls.

**Conclusion:** pSS patients are characterized by higher levels of concomitantly occurring subclinical atherosclerosis and impaired bone health compared to their healthy counterparts, with traditional risk factors, disease related features and activation of RANKL system being potential contributors. The significance of RANKL activation in pathogenesis of SS related complications remains to be further explored.

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**2182 Prevalence of Fibromyalgia Is Increased in Primary Sjögren’s Syndrome Compared with SLE and Associated with Depression and Severe Vitamin D Deficiency.** Byoong Yong Choi, Hye Jin Oh, Jun Won Park, Bon Seung Ku, Sung Hae Chang, Eun Young Lee, Eun Bong Lee, Y. W. Song, None.

**Background/Purpose:** To describe the prevalence of lymphoproliferative complications (defined as B-cell lymphoma or definite conditions predisposing to lymphoma, i.e. cryoglobulinemic vasculitis (CV) and major salivary gland swelling) in the course of primary Sjögren’s syndrome (pSS) in a large cohort of patients followed in five Rheumatology Centres.

**Methods:** Demographic, clinical, laboratory and histopathological data in 1170 pSS were retrospectively collected according to a standard protocol. Univariate and multivariate analyses were performed. Using EULAR Sjögren’s Syndrome Disease Activity Index (ESSDAI), ESSDI, in order to assess the prevalence of FM in pSS and SLE.

**Results:** The prevalence of FM was 28% [95%CI: 17.0–38.0] in pSS and 3.0% [95% CI: 0.7–7.0] in SLE. Primary SS patients had more frequent somatic symptoms such as myalgia (p=0.016), insomnia (p=0.048), headache (p=0.018) and cognitive dysfunction (p<0.001) compared to SLE patients. The widespread pain index (WPI) and score of somatic symptom scale (SS scale) in pSS patients were also significantly higher than those of SLE. Multiple linear stepwise regression analysis showed that HAM-D, ESSDAI and serum 25-OH-D levels were the significant determinants of WPI; HAM-D and serum 25-OH-D levels were also the significant determinants of score of SS scale in pSS patients. Depression and severe 25-OH-D deficiency (<10 ng/mL) in pSS was associated with presence of FM (OR: 34.00 [95% CI: 6.72–171.9], OR: 4.15 [95% CI: 1.09–15.83], respectively).

**Conclusion:** The prevalence of FM was higher in patients with pSS compared to SLE. Depressive mood and severe vitamin D deficiency in pSS patients was associated with the presence of FM.

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**2183 Common Features in Lymphoproliferative Complications in the Course of Primary Sjögren’s Syndrome: Results From a Multi-center Cohort of 1170 Patients.** Luca Quartuccio1, Chiara Baldini2, Roberta Prior1, Elena Bartoloni Boci3, Francesco Carubbi2, Miriam Isolla4, Marta Maset4, Sara Salvini4, Nicoletta Luciano4, Giovanna Picelli5, Alessia Alunno6, Roberto Giacometti7, Roberto Gerli7, Guido Valesini7, Stefano Bombardieri7 and Salvatore De Vita8.1 1Rheumatology Clinic, DSMB, University of Udine, Italy, 2Udine, Italy, 3Rheumatology Unit Department of Clinical & Experimental Medicine, University of Perugia, Perugia, Italy, 4Rheumatology Clinic, University of L’Aquila, L’Aquila, Italy, 5Institute of Statistics, University of Udine, Udine, Italy, 6Rheumatology Unit, University of Rome, Rome, Italy, 7Rheumatology Unit, University of Perugia, Perugia, Italy, 8Rheumatology Unit, University of L’ Aquila, L’ Aquila, Italy, 9Centro Studi di Torino, Torino, Italy, 10Sapienza Universita` di Roma, Rome, Italy, 11Department of Clinical Medicine, University of Perugia, Perugia, Italy, 12Rheumatology Unit, Department of Internal Medicine, University of Perugia, Perugia, Italy, 13Department of Clinical Medicine, University of Perugia, Perugia, Italy, 14Rheumatology Clinic, DSMB, University of Udine, Udine, Italy.

**Background/Purpose:** To describe the prevalence of lymphoproliferative complications (defined as B-cell lymphoma or definite conditions predisposing to lymphoma, i.e. cryoglobulinemic vasculitis (CV) and major salivary gland swelling) in the course of primary Sjögren’s syndrome (pSS) in a large cohort of patients followed in five Rheumatology Centres.

**Methods:** Demographic, clinical, laboratory and histopathological data in 1170 pSS were retrospectively collected according to a standard protocol. Univariate and multivariate analyses were performed. Using EULAR Sjögren’s Syndrome Disease Activity Index (ESSDAI), in order to assess the prevalence of FM in pSS and SLE.

**Results:** Prevalence of lymphoma in this SS cohort was 4.4% (51/1170), prevalence of CV was 3.9% (36/1170). Presence of salivary gland swelling and/or myoepithelial syaladenitis was 30.9% (362/1170). Salivary gland swelling and/or MESA, CV and lymphoma shared many laboratory features, i.e., positive rheumatoid factor, hypocomplementemia and leucopenia, as well as a the presence of purpura as clinical hallmark of the circulating immune complexes (table 1). Interestingly, polyclonal hypergammaglobulinemia was strictly associated with salivary gland swelling, but it was not associated with CV or lymphoma; on the other hand, serum monoclonal component was significantly associated with CV or lymphoma, but not with salivary gland swelling and/or MESA (table 1). Younger age was associated with salivary gland swelling and/or MESA, while male sex with an increased risk of lymphoma (OR 5.4 95% CI 2.4–11.7) (table 1). By multivariate analyses.

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Conclusion: Salivary gland swelling, CV and B-cell lymphoma are consequent to B-cell deregulation in SS, B-cell clonal proliferation from polyclonal to monoclonal likely occurs in the pathologic target tissue of SS (i.e., salivary gland MALT tissue), predisposing to CV and/or to B-cell lymphoma.

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Pregnancy and Fetal Outcome in Patients with an Established Diagnosis of Primary Sjögren’s Syndrome. Roberta Priori1, Angelica Gattamelata2, Mariagrazia Modesti1, Serena Colafrancesco2, Marta Maser2, Luca Quartuccio2, Salvatore De Vita2, Elena Bartoloni Bocci3, Alessia Alunno3, Roberto Gerli4, Francesca Strigini2, Chiara Baldini2, Chiari Tani4, Marta Mosca4, Stefano Bombardieri4 and Guido Valesini4. 1Rheumatology Unit, University of Pisa, Pisa, Italy, 2Rheumatology Clinic, Department of Clinical & Experimental Medicine, University of Perugia, Perugia, Italy, 3Rheumatology Unit, University of Udine, Udine, Italy, 4Rheumatology Unit, Sapienza University of Rome, Rome, Italy, 4Rheumatology Unit, Department of Clinical & Experimental Medicine, University of Perugia, Perugia, Italy

Background/Purpose: The case records of 1115 patients with a diagnosis of pSS were compared with the first 8 consecutive deliveries occurred during the same month in the referral university hospital. Chi square and Mann-Whitney test, SPSS release 15.00, were used for statistical analysis.

Results: Patients' mean age was 59 yr (17–89), mean age at diagnosis 51.4 yr; 139/1075 (12.8%) were diagnosed before 35 yr. Thirty-six women (31 with anti-SSA/Ro and/or anti-SSA/La antibodies) with an established diagnosis of pSS had 45 pregnancies which ended with the delivery of 40 newborns. Two miscarriages, 2 fetal death and one induced abortion were recorded. Mean age at the first pregnancy was 33.9 yr (range 27–44), mean number of pregnancy 1.25 (1–3); 18/40 (45%) cesarean sections were performed, mean pregnancy length was 38.5 week (range 32–43) with 6 preterm delivery. The mean Apgar score at 5 minute was 8.9 (range 5–10), mean birth weight was 2920 mg (range 826–4060). Congenital heart block (CHB) occurred in 2/36 newborns (5.5%) of 31 mothers with anti-SSA and/or SSB antibodies with fatal outcome. The reported rate of breastfeeding for at least one month was 60.5% (range 1–21 months), 44.7% for 3 months. During pregnancy one patient presented thrombocytopenia and another palpable purpura. In 4/40 pregnancies (10%) a flare of disease activity was observed within a year from delivery. In the case-control subgroup analysis no significant differences were found regarding age at delivery, pregnancy duration, way of delivery, baby sex. The neonates of primary SS mothers tended to have a lower weight and a lower Apgar score but the difference was not significant.

Conclusion: Even if pSS generally starts after menopause, it can appear during the childbearing age. pSS can have successful pregnancies, which might be followed by a mild relapse. CHB, a fearful complication for women with anti-SSA/Ro and/or anti-SSB/La antibodies, is the only cause of death for offspring of pSS mothers.

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Prevalence of Severe Extra-Glandular Manifestations in a Large Cohort of Patients with Primary Sjögren’s Syndrome. Chiara Baldini1, Pasquale Pepe1, Luca Quartuccio2, Roberta Priori3, Elena Bartoloni Bocci3, Alessia Alunno2, Serena Colafrancesco1, Angelica Gattamelata1, Marta Maser2, Mariagrazia Modesti1, Antonio Tavoni1, Salvatore De Vita2, Roberto Gerli4, Guido Valesini5 and Stefano Bombardieri5. 1Rheumatology Unit, University of Pisa, Pisa, Italy, 2Rheumatology Clinic, DSBM, University of Udine, Udine, Italy, 3Rheumatology Unit, Department of Clinical & Experimental Medicine, University of Perugia, Perugia, Italy, 4Rheumatology Unit, University of Pisa, Pisa, Italy

Background/Purpose: i) to describe the clinic-serological features of a cohort of 1115 patients with primary Sjögren’s syndrome (pSS); ii) to assess the prevalence of systemic extra-glandular manifestations in the cohort; iii) to estimate the impact of the serological and immunological patients’ features on disease different phenotypes and on the utilization of immunosuppressive drugs.

Methods: The case records of 1115 patients with a diagnosis of pSS attending four Italian reference centers were reviewed. Clinical and laboratory data of the patients enrolled were retrieved according to a standard form. Independent risk factors for glandular and extra-glandular disease manifestations were identified by logistic regression.

Results: The cohort consisted of 1115 pSS patients (1067 F; 48 M; mean age at the diagnosis of 51.6±13.8 yr; mean follow-up 5.8±6.5 yrs). All the patients included fulfilled the European classification criteria for pSS, while the AECG criteria were fulfilled in 926/1115 (83%) cases. Xerostomia (93%), xerophthalmia (95%) and articular involvement (62%) were the most commonly detected clinical manifestations followed by hematological involvement (32%) and salivary gland enlargement (31%). A systemic extra-glandular involvement was diagnosed in 475/1115 (42%) patients. Severe extraglandular manifestations included: active synovitis (11%), axonal sensory-motor neuropathy (2%), diffuse purpura or ulcers (6%) renal involvement (0.7%), myositis (0.5%), cerebral vasculitis (0.5%) and transverse myelitis (0.2%). Finally, 50 cases of non-Hodgkin lymphoma were documented. Patients with a systemic disease had a lower mean age at diagnosis (p<0.0001) and a higher frequency of serologic markers (ANA, RF, anti-Ro/SS-A antibodies, anti-La/SS-B antibodies, cryoglobulins, hypergammaglobulinemia, low C3/C4 levels) in the univariate analysis. The adjusted multivariate analysis identified as independent serological risk factors for severe extraglandular involvement: low C3 (OR 2.6, 95% CI 1.6–4.1), low C4 (OR 1.9, 95% CI 1.1–3.3), hypergammaglobulinemia (OR 2.1, 95% CI 1.5–2.9), cryoglobulins (OR 7.6, 95% CI 2.6–22.3), Rheumatoid factor (OR 2.5, 95% CI 1.5–22.9). No correlation was found among pSS extraglandular involvement and fulfillment of the AECG criteria or positive minor salivary gland biopsy at the diagnosis.

Conclusion: Although the hallmark features of pSS are represented by glandular manifestations, this study support the evidence that severe systemic manifestations may occur in about the 20% of the patients.
Patients presenting an active serological profile should be more closely monitored and may deserve more aggressive immunosuppressive drugs.

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Ultrasonography of Major Salivary Glands in Primary Sjögren’s syndrome. Malin V. Jonsson1, Daniel Hammenfors2, Johan G. Brun2 and Roland Jonsson1 1University of Bergen, Bergen, Bergen, Norway, 2Haukeland University Hospital, Bergen, Norway

Background/Purpose: Minor salivary gland biopsy is part of the diagnostic process for primary Sjögren’s syndrome (pSS), but is not suitable for repeated follow-up. Ultrasound (US) represents a non-invasive imaging method of the major salivary glands that may serve as a supplement to minor salivary gland biopsy. The aim of this study was to investigate parotid and submandibular gland ultrasound in relation to sicca symptoms, glandular function and minor salivary gland inflammation.

Methods: Patients with primary Sjögren’s syndrome were recruited from Haukeland University Hospital (n = 41). The parotid and submandibular glands were examined by US using a GE LogiqE9 with a linear transducer with 6–15MHz. Glandular homogeneity and presence of hypoechogenic areas was evaluated and scored (0–3) according to Hoccevar et al 2005. Scores 0–1 were considered normal and scores 2–3 pathological. Sicca symptoms of the mouth and eyes were recorded. Salivary gland functional capacity was evaluated by unstimulated and stimulated sialometry. Tear secretion was evaluated by the Schirmer I-test. Minor salivary gland inflammation was evaluated by focus score.

Results: Ultrasound was performed in 40 patients, with scores ranging 0–1 (n = 22) and 2–3 (n = 18). Mean age of patients with normal US findings was 63 years compared to 52 years in patients with pathological US findings (p < 0.05), and correlated with ultrasound score (p < 0.05, r = -0.388, n = 40). Oral sicca symptoms correlated with sicca symptoms of the eyes (p < 0.001, r = 0.52, n = 41), ultrasound score (p < 0.05, r = 0.402, n = 40), and saliva levels (p < 0.05, r = 0.392, n = 41) and (p < 0.05, r = -0.363, n = 41), unstimulated and stimulated saliva respectively. In patients with normal and pathological US, mean unstimulated saliva was 2.2 ml/15 min and 0.5 ml/15 min (p < 0.05), and the stimulated saliva levels were 6.1 ml/5 min and 2.5 ml/5 min (p < 0.001). Levels of unstimulated and stimulated saliva correlated (p = 0.001, r = 0.509, n = 41). Ultrasound scores correlated with unstimulated (p < 0.001, r = -0.531, n = 40) and stimulated saliva (p < 0.01, r = -0.454, n = 40). 17/27 patients with unstimulated saliva ≤ 1.5 ml/15 min had pathological ultrasound changes compared to 1/13 with normal unstimulated saliva (p < 0.01). 13/17 patients with stimulated saliva ≤ 3.5 ml/5 min had pathological ultrasound compared to 5/23 with normal stimulated saliva (p < 0.01). Tear secretion by the Schirmer I-test correlated in the right and left eye (p < 0.001, r = 0.749, n = 39). Unstimulated saliva secretion correlated with tear secretion (p < 0.05, r = 0.387, n = 39) and (p < 0.05, r = 0.343, n = 39), right and left eye, respectively. Focus score was available in 31/41 patients, and correlated with ultrasound score (p < 0.05, r = 0.373, n = 30). Mean focus score was 2.6 in patients with ultrasound pathology and 1.3 in patients with normal ultrasound (p = 0.051).

Conclusion: In this cohort of patients with pSS findings from non-invasive imaging method ultrasound correlate with oral sicca symptoms, glandular function and minor salivary gland inflammation. Ultrasound of major salivary glands seems to be a useful tool for diagnostics and follow-up of patients with pSS.

Disclosure: M. V. Jonsson, None; D. Hammenfors, None; J. G. Brun, None; R. Jonsson, None.

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Safety of Minor Labial Salivary Gland Biopsy. Ziga Rotar, Alojzija Hocevar, Nataša A. Gaišersič, Branka Hostnik, Anita Antolič and Matija Tomišč. University Medical Centre Ljubljana, 1000 Ljubljana, Slovenia

Background/Purpose: Histopathological analysis of minor salivary glands is a part of the latest classification criteria for SS proposed by the American-European Consensus Group (AECG), and the ACR.1, 2 Recently it has been proposed that the presence of germinal center like structures in diagnostic minor salivary gland biopsies may be a highly predictive marker for NHL development in primary SS.3 Our aim was to prospectively evaluate adverse events of minor salivary gland biopsy performed by rheumatologists in patients suspect of having Sjögren’s syndrome.

Methods: At our rheumatology department we run a weekly diagnostic outpatient clinic where we see patients presenting with symptoms suggestive of Sjögren’s syndrome referred to us by their rheumatologists. We evaluate them using the AECG criteria. In consenting patients who cannot be classified on the basis of history, clinical tests, and serological tests we perform the minor salivary gland biopsy.

Under aseptic conditions an assistant exposes mucosa of the lower lip. We clean it with 0.2% chlorhexidine digluconate solution, and infiltrate the lateral third of the lip with approx. 0.5–1 cm3 of 2% lidocaine near one of the many orifices of the minor salivary gland excretory ducts identified by observation of nascent droplets of saliva. The rheumatologist makes an approx. 5 mm linear incision of the mucosa, removes all the exposed glands using a forceps, and places a single suture to close the wound using 4-0 absorbable braided polyglycolic acid. Removed glands are transported to pathology laboratory in 10% formalin.

Before the biopsy we informed each patient orally and in writing about possible adverse events and appropriate responses. Ten days to two weeks following the biopsy, a nurse phoned each patient to inquire about the pain (0–10 scale, VAS) during biopsy, and in the week following it; the survival of sutures, and whether the patient’s GP or dentist had to remove them; and any other adverse events experienced by the patient.

Results: From 02/01/2007 to 12/15/2010 350 patients were referred for biopsy (89.7% females, average age 56.9 ± 12.5 years). Incision length was measured and was on average 5.0 ± 0.8 mm. The average volume of the obtained tissue sample was 26.5 ± 72.8 mm3. 322 patients responded to the follow up call by the nurse. During the biopsy 89.8% pSS, 5.3%, and 1.3% reported pain on VAS of 0, 1–3, and 4–5, respectively, while 3.4% provided no answer. In the week following the biopsy the pain 78.9%, 12.4%, 2.8%, 1.9%, 0.9% scored their pain on VAS 0, 1–3, 4, 5, and 6–8, respectively, while 3.1% provided no answer. 80.1% of patients report no adverse events, the rest complained about paresthesia, wound suppuration, hematoma, irritating mucosal scar, and lower lip swelling in 5.6%, 4%, 0%, 0%, and 0.6%, respectively. All the adverse events were transient, and they have resolved within the first three days after biopsy in 95.5% of patients.

The average suture survival was 3.7±2.1 days. In 15.5% of patients sutures were removed by their GP or dentist after on average 4.8±2.3 days.

Conclusion: Minor salivary gland biopsy is a safe outpatient procedure in the hands of rheumatologists.

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How to Better Define Inclusion Criteria in a Large Controlled Trial in Primary Sjögren’s Syndrome? Valerie Devauchelle-Pensec1, Xavier Mariette1, Jacques-Eric Gottenberg2, Raphaelle Sere2, Anne-Laure Faucuish3, Olivier Vittecoq4, Veronique Le Guern5, Jacques Morel6, JJ Dubost7, Philippe Dieude8, Eric Hachulla9, Pierre yves Hatron10, C. Laroche4,7,6, Jean Poirel11, Xavier Puech12,11,13, Alain Sarazin14,15, Brest Occidentale university, Brest, France, 1Univeristé Paris-Sud, Le Kremlin Biicetre, France, 2Strasbourg University Hospital, Strasbourg, France, 3Bicêtre university hospital, LE Kremlin-Bicêtre, France, 4Hospital, Limoges, France, 5Rouen University Hospital & Inserm905, University of Rouen, Rouen Cedex, France, 6Cochin hospital, Paris, France, 7Hospital Lapeyronie, Montpellier, France, 8CHU CLERMONT-FERRAND, Clermont-Ferrand, France, 9APHP, Hospital Bichat, Paris, France, 10Department of Internal Medicine, Claude Huriez University Hospital, University of Lille, Lille CEDEX, France, 11Hôpitaux Claude Huriez, Université Lille II, Lille, France, Paris, France, 12Hospital University Bobigny, France, 13Hôpital Sud, Rennes, France, 14Hôpital Cochin, Paris, France, 15Groupe Hospitalier Pitié-Salpêtrière, Université Pierre et Marie Cure, Paris, France, 16Orleans Hospital, Orleans, France, 17Université Brest Occidentale, Brest, France

Background/Purpose: The subsets of primary Sjögren’s syndrome (pSS) patients justifying biological therapy (BT) remain a matter of debate. Our goal was [1] to describe which inclusion criteria have been used in all previous studies using BT in pSS and [2] to evaluate the proportion of patients who may be included in further trials evaluating a biologic according to the chosen criteria.

Methods: We performed a literature review using pubmed and clinical-trials. We included studies evaluating BT in pSS based on the inclusion criteria.

Then, we evaluated in the ASSESS cohort (a French national multi-center prospective cohort set up in 2006 to identify valuable predictive factors lymphoma during a 5-year prospective follow-up in which 15 tertiary centers
included 410 patients with pSS) the proportion of pSS patients who could be included in a trial according to the chosen criteria.

Results: Our literature review identified 16 studies evaluating biologics in pSS: Two open label studies and two double blind studies have been conducted to evaluate anti TNF. Only one open label study evaluated etanercept, in patients with B-cell activity. Five open-label studies and 4 randomized studies evaluated or are evaluating prospectively rituximab. Two studies are ongoing with belimumab. The main frequently used inclusion criteria were AECG criteria, disease duration (less than 4, 5 or 10 years), presence of systemic involvement (ESSDAI>1), visual analogic score (VAS) for dryness, pain, and fatigue higher to 5/10 and biological markers of activity

Results: The number of patients that could be included in a trial evaluating pSS, depends highly on the inclusion criteria. Even with a slightly selective criterion of systemic involvement (ESSDAI >1), a small number of patients with very recent disease could be included. Most reported patients 2 VAS higher to 50/100 and have biological markers of activity.

Conclusion: The number of patients that could be included in a trial evaluating pSS, is highly dependent on the inclusion criteria. Even with a slightly selective criterion of systemic involvement (ESSDAI >1), a small number of patients with very recent disease could be included. Most reported patients 2 VAS higher to 50/100 and have biological markers of activity.

Disclosure: S. De Vita, None; R. Seror, Human Genome Sciences, Inc.; L. Quartuccio, None; J. E. Gottenberg, None; A. L. Fauchais, None; O. Vittecoq, None; V. Le Guern, None; J. Morel, Roche Pharmaceuticals, S; J. Dubost, None; P. Dieude, None; E. Hachulla, None; P. Y. Hatron, None; C. Larroche, None; A. Perdriger, None; X. Puechal, Pfizer Inc; 5. Roche Pharmaceuticals, S; D. Sene Sr., None; S. Rist, None; A. Saraux, None.

Efficacy of Belimumab On Non-Malignant Parotid Swelling and Systemic Manifestations of Sjogren’s Syndrome

Background/Purpose: Sjogren’s syndrome (SS) is a chronic inflammatory autoimmune disease that is presented with lymphocytic infiltration of exocrine glands. Its secondary secretory dysfunction may involve exocrinal or extracranial tissues. Antimalariais have been used for treatment of sicca symptoms and inflammation. However its effectiveness remains controversial. The objective of this systematic review is to evaluate the effectiveness and toxicity of antimalariais to treat adults with SS.

Methods: Between September 2010 and May 2012 we conducted an electronic search in the following databases: MEDLINE, Embase, LILACS, ISI WEB OF KNOWLEDGE, Cochrane Central Register of Controlled Trials and International Clinical Trials Registry of the World Health Organization (WHO ICTRP). We included experimental, quasi-experimental and uncontrolled before and after studies. Evaluated outcomes were: improvement in xerophthalmia, xerostomia and Schirmer’s test; change in inflammatory markers and adverse events. Quality assessment of the trials was done by two authors independently. I2 and Chi-square tests were performed to estimate heterogeneity. The Mantel-Haenszel random-effects method with odds ratio (OR) as association measure were used for dichotomous outcomes, and mean difference for continuous data. All Statistical analysis was performed using RevMan 5.0
Results: 22 trials were found and 6 were included in the analysis. A total of 140 patients were included, all women. There were no statistically significant differences with respect to improvement in xerostomia (OR 2.27; 95% CI, 0.38 to 13.34), xerostomia (OR 1.0; 95% CI, 0.02 to 5) and Schirmer’s test (MD –1.03; 95% CI, –2.38 to 0.32). We observed a tendency in favor of antimalarials for decreasing erythrocyte sedimentation rate (MD –6.98; 95% CI, –20.73 to 6.76). One trial evaluated adverse effects (ocular, hepatic, hospitalization or death) without significant differences. It was not possible to explore publication bias.

Conclusion: Up to the moment the available evidence has poor quality. The best evidence did not identify a clear benefit of antimalarials in the reviewed outcomes. The analyzed data reported low incidence of adverse events. More and good quality research (RCT’s) are needed to answer this question.

Disclosure: V. A. Coy, None; C. E. Granados, None; D. Gil, None; A. Junca, None; D. Jaramillo, None; A. A. Iglesias-Gamarra, None; J. F. Restrepo, None; F. Rondon-Herrera, None.  

2192  
Phenotypic Features of Sjögren’s Syndrome Among Patients with Low-Titer SSA/B Antibodies. Mara McAdams DeMarco1, Mi Y. Lam,2 Steve Shiboski3, Lindsey A. Criswell1, Caroline Shiboski4 and Alan N. Baer1. 1Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, 2University of California, San Francisco, San Francisco, CA, 3University of California San Francisco, San Francisco, CA, 4Johns Hopkins University School of Medicine, Division of Rheumatology, Baltimore, MD

Background/Purpose: The significance of a low titer of SSA and/or SSB antibodies (SSA/B-Ab) in individuals with clinical or other laboratory findings suggestive of Sjo¨gren’s syndrome (SS) is unclear. Low titers may represent false positive immunoassay results, seropositivity in the absence of clinical disease, or true markers of a connective tissue disease, such as SS. It is unclear whether low titers represent a distinct phenotype or one more similar to those with negative titers. We sought to explore the association between SSA/B Ab levels and phenotypic features of SS, including histo-pathological characteristics.

Methods: The Sjo¨gren’s International Collaborative Clinical Alliance (SICCA) is an NIH-funded registry of individuals with suspected or established SS. Each participant undergoes a uniform and protocol-driven evaluation for SS, including rheumatologic, oral, and ophthalmologic examinations, serologic testing, labial salivary gland biopsy, and ocular staining. SSA/B-Ab testing was performed by Quest Laboratories, using an automated multiplex flow immunosay. Positive results were expressed in “antibody index” (AI) units and provided as continuous variables measure up to a level of 8 AI. Levels more than >8 AI were not quantified. We compared the mean age and prevalence of phenotypic features of SS by category of SSA/B-Ab (Higher both SSA-Ab and/or SSB-Ab>8; Low: SSA-Ab and/or SSB-Ab≤8:1 but both ≤8; Negative: both SSA-Ab and SSB-Ab≤1).

Results: Among the SICCA participants, low titers of SSA/B-Ab were present in 277 (14.1%), high titer SSA/B-Ab in 434 (22.1%) and negative SSA/B-Ab in 1256 (63.8%). The associations between these three strata of SSA/B-Ab titers and phenotypic features of SS are shown in the Table. Mean age decreased while focus score increased as SSA/B-Ab titers increased. The percentage of participants with each phenotypic feature was greater for those with high SSA/B-Ab compared with those with low titers and greater for those with low titers compared with negative titers.

Table. Phenotypic Features of Sjo¨gren’s Syndrome by SSA/B Antibody Titer  

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<tr>
<th>Age</th>
<th>High</th>
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<th>Low</th>
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<th>Negative</th>
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<td>1445 mg/dl</td>
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*FSL=focal lymphocytic sialadenitis; F/SLS=focal /sclerosing lymphocytic sialadenitis.

Conclusion: There is a higher prevalence of all phenotypic features of SS among those with higher SSA/B-Ab titer. Low antibody titers occur in approximately 14% of patients suspected of having SS and may represent an intermediary phenotype distinct from those with high or negative titers.

Disclosure: M. McAdams DeMarco, None; M. Y. Lam, None; S. Shiboski, None; L. A. Criswell, None; C. Shiboski, None; A. N. Baer, None.
Table. Sensitivity, Specificity and 95% Confidence Intervals by SSA/B Threshold

<table>
<thead>
<tr>
<th>SSA/SSB Threshold</th>
<th>SSA test alone</th>
<th>SSA test alone</th>
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<tbody>
<tr>
<td>Sensitivity</td>
<td>Specificity</td>
<td>Sensitivity</td>
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<tr>
<td>&gt;1</td>
<td>0.60 (0.56, 0.64)</td>
<td>0.84 (0.82, 0.86)</td>
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<tr>
<td>&gt;2</td>
<td>0.59 (0.55, 0.63)</td>
<td>0.86 (0.84, 0.88)</td>
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<td>&gt;3</td>
<td>0.58 (0.54, 0.61)</td>
<td>0.87 (0.85, 0.88)</td>
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<tr>
<td>&gt;4</td>
<td>0.57 (0.53, 0.61)</td>
<td>0.88 (0.86, 0.89)</td>
</tr>
<tr>
<td>&gt;5</td>
<td>0.56 (0.52, 0.60)</td>
<td>0.89 (0.87, 0.90)</td>
</tr>
<tr>
<td>&gt;6</td>
<td>0.52 (0.49, 0.56)</td>
<td>0.90 (0.88, 0.91)</td>
</tr>
<tr>
<td>&gt;7</td>
<td>0.52 (0.48, 0.56)</td>
<td>0.90 (0.89, 0.92)</td>
</tr>
<tr>
<td>&gt;8</td>
<td>0.51 (0.47, 0.55)</td>
<td>0.91 (0.89, 0.93)</td>
</tr>
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</table>

Conclusion: SSA- and SSB-Ab > 8AI had low sensitivity and the inclusion of low titers resulted in a minimal improvement in the test’s moderate sensitivity and minimal decrease in specificity. This confirms the need to perform additional objective tests, such as a lip biopsy, in the diagnosis of SS.

Disclosure: M. McAdams DeMarco, None; M. Y. Lam, None; S. Shiboski, None; L. A. Criswell, None; C. Shiboski, None; A. N. Baer, None.

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Background/Purpose: Cathepsin S (CT-S) is a lysosomal protein involved in the intracellular digestion of extracellular matrix proteins. Decreased tear CT-S activity has been associated with dry eye syndrome (DES), but the association with Sjögren’s Syndrome (SS) is not established. We examined tear CT-S activity in DES patients and compared it to SS patients.

Methods: ELISA kits for CT-S were obtained and used to measure CT-S activity in tears from subjects with DES or SS. CT-S activity was compared between groups using Mann-Whitney U test.

Results: CT-S activity was significantly lower in SS patients than in controls (p=0.003). SS patients who were anti-SSA positive also had lower CT-S activity (p=0.04) compared to anti-SSA negative SS patients.

Conclusion: CT-S activity is decreased in SS patients, suggesting a role for this protein in the pathogenesis of SS.

Disclosure: S. E. Whitt, None; K. Renduchintala, None; S. Janga, None; M. Shah, None; J. Zhu, None; K. Silka, None; S. Bricel, None; D. Bach, None; M. Heur, None; S. Christianakis, None; J. Irvine, None; D. Arkfeld, None; W. J. Mack, None; W. Stohl, None; S. F. Hamm-Alvarez, None.

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Long-Term Changes in Autoantibody Profile After Pandemic Unadjuvanted Influenza A/H1N1 Vaccine in Sjögren’s Syndrome. Sandra G. Pasoto, Ana C. Ribeiro, Vilma S.T. Viana, Elaine P. Leont, Cleonice Bueno, Mauricio Levy Neto, Alexander R. Precioso, Maria do Carmo S. Timenetskỳ and Eloisa Bonfa, 1Division of Rheumatology, - Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 2Fundação Butantan - Instituto Butantan, São Paulo, Brazil, 3Instituto Adolfo Lutz - Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil.

Background/Purpose: Despite WHO recommendations about the A/California/7/2009/H1N1-like virus vaccination, there are no studies evaluating its possible influence on clinical manifestations and autoantibody profile in (primary) Sjögren’s syndrome (SS). Objectives: To evaluate short/long-term effect of influenza A/California/7/2009/H1N1-like virus vaccination on clinical manifestations and autoantibody profile in SS.

Methods: Thirty-six SS patients (The American-European Consensus Group Criteria, 2002) and 36 gender-, age-, match-controlled healthy controls were evaluated before and 21 days after vaccination with unadjuvanted influenza A/California/7/2009/H1N1-like virus regarding seroprotection, seroconversion, factor increase in geometric mean titer (FI-GMT) and side effects. New onset of parotiditis, arthritis, uveitis, pneumonitis or neurological disorders and autoantibody profile (antinuclear antibodies (ANA), rheumatoid factor (RF), anti-SSA, anti-SSB, anti-Ro(SS-A)/La(SS-B), anti-dsDNA, anti-ANCA, anti-RO52, anti-RO56, anti-Mog, anti-myosin, anti-Sm, anti-cardiolipin) were assessed before, 21-days and 1-year after vaccination.

Results: Patients and controls had similar rates of seroconversion (78 vs. 69%, p=0.42), seroprotection (83 vs. 72%, p=0.26) and FI-GMT (p=0.85). Pre-vaccination evaluation revealed that disease duration, glucocorticoid and/or methotrexate treatment (n=31; 5.1 ± 1.75 mg/week) or azathioprine (up to 100 mg/day) did not affect seroconversion (p=0.95). Regarding short-term analysis, no change in the frequency or levels of autoantibodies was observed (p>0.05) and only mild side effects were
observed in comparable rates to controls (p > 0.05). At 1-year follow-up, the rate of new disease flares was similar to the previous year (11 vs. 19%, p = 0.51) and four seroconverted patients developed positivity to one of the following specificities: anti-Ro/SS-A, anti-La/SS-B, anti-alpha-fodrin, or IgM antitribulin. None developed other specific lupus autoantibodies. Of note, a significant increase in the mean levels of anti-Ro/SS-A (p < 0.0001) and anti-La/SS-B (p < 0.002) was detected after 1-year with no change in the other autoantibodies.

**Conclusion:** This is the first study to indicate that influenza A/H1N1 vaccine induces long-term changes in autoantibody profile restricted to SS spectrum without a deleterious effect in disease course. FAPESP grant: 2010/10749-0.

Disclosure: S. G. Pasoto, None; A. C. Ribeiro, None; V. S. T. Viana, None; E. P. Leon, None; C. Bueno, None; M. Levy Neto, None; A. R. Precioso, None; M. D. C. S. Timenetsky, None; E. Bonfa, None.

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Decreased Expression of TSLP in Labial Salivary Glands of Patients with pSS: Is Associated with Local and Systemic Disease Parameters.


**Background/Purpose:** Thymic Stromal Lymphopoietin (TSLP) is a potent immunomodulatory cytokine involved in Th2-mediated immune responses and homeostatic T-cell expansion. Reduced TSLP expression by intestinal epithelial cells was recently shown to lead to reduced Th2 responses and development of Th1-mediated experimental colitis. In addition, TSLP is described as a proinflammatory factor in rheumatoid arthritis, which is driven by Th1/Th17 responses. A Th1/Th17 polarized environment is also present in the salivary glands of patients with Primary Sjögren’s syndrome (pSS).

The aim of this research was to investigate TSLP expression in salivary glands of pSS patients as compared to non-SS Sicca (nSS) patients and to study the relationship to local and systemic disease parameters.

**Methods:** Tissue sections of minor salivary glands from 38 pSS and 18 nSS patients were stained with a monoclonal antibody (mAb) against human TSLP or an isotype control. In addition, sections were stained with a mAb against the epithelial cell marker Cytokeratin High Molecular Weight (CK HMW) or stained with alcin blue to detect mucus production. The number of cells that stained positive for TSLP was assessed. In addition, TSLP was quantified at sites where only intact (CK HMW positive), functional (alcian blue positive) structures were present. TSLP expression was correlated to local (lymphocyte focus score, LFS; %IgA positive plasma cells) and systemic (erythrocyte sedimentation rate, ESR; serum IgG levels) disease parameters.

**Results:** TSLP was almost exclusively expressed by acinar cells in both pSS and nSS patients. The number of TSLP-expressing cells per mm² was significantly decreased in pSS patients as compared to nSS patients (462 ± 42 vs. 773 ± 84, p < 0.01) and correlated negatively to LFS (r = −0.48, p < 0.001) ESR (r = −0.41, p < 0.01), serum IgG levels (r = −0.41, p < 0.01) and positively to the percentage of local IgA producing plasma cells (r = 0.35, p < 0.05). At sites with intact, functional epithelium TSLP expression tended to be reduced in pSS patients as compared to nSS patients (840 ± 75 vs. 1064 ± 72, p = 0.079).

Furthermore, pSS patients with a LFS equal to or higher than 3 had significantly lower numbers of TSLP-producing cells per mm² at these sites compared to nSS patients (677 ± 105 vs. 1064 ± 72, p < 0.01). Also, in intact and functional epithelium, the number of TSLP-producing cells correlated negatively to LFS (r = −0.40, p < 0.01), ESR (r = −0.32, p < 0.05) and serum IgG levels (r = −0.27, p < 0.05).

**Conclusion:** TSLP expression is reduced in pSS patients, associated with local and systemic inflammatory markers including increased lymphocytic infiltration. Considering the described role of TSLP in promoting Th2 responses at mucosal sites, we hypothesize that TSLP is constitutively expressed in salivary glands and promotes a protective Th2 milieu, whereas loss of TSLP expression may contribute to Th1/Th17 associated immunopathology in pSS.

Disclosure: M. R. Hillen, None; A. Bikker, None; A. A. Kruize, None; M. Wenting-van Wijk, None; F. P. J. G. Lafeber, None; C. E. Hack, None; J. A. G. van Roon, None.

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Diagnostic Value of Blood B-Cell Subset Profiling and Autoimmunity Markers in Anti-SSA-Negative Sjögren’s Syndrome Patients. Divi Corne, Alain Saraulx, Jacques-Olivier Pers, Sandrine Jousse-Joulin, Yves Renaudineau, Thierry Michaud and Valerie Devauchelle-Pensec, 1Brest Occidentale University, Brest, France, 2Brest Occidentale university, Brest, France.

**Background/Purpose:** Recently published ACR classification criteria for primary Sjögren’s syndrome (pSS) suggest considering antinuclear antibodies (ANA) titer and rheumatoid factor (RF) positivity in patients negative for anti-Ro/SSA antibodies. The diagnostic value of these tests for pSS has to be confirmed in independent cohorts. Besides, we have shown in a previous case-control study that blood B-cell subset profiling through (Bm2+Bm‘2)/(elbm5+Bm5) ratio computation is abnormal in pSS patients. Gammaglobulins and IgG titers are often increased in these patients. The aim of this study was to evaluate the diagnostic value of these B-cell markers for pSS and to assess if they could improve American-European Consensus Group (AECG) criteria.

**Methods:** This cross-sectional study was conducted in a monocentric cohort of patients with suspected pSS, prospectively included between November 2006 and September 2011. Clinical examination, basic biology, immunological tests and minor salivary gland biopsy (SSG) were performed systematically. For blood B-cell subset profiling, the (Bm2+Bm‘2)/(elbm5+Bm5) (referred to as B-cell ratio) was determined using flow cytometry. The gold standard for the analysis was a clinical diagnosis of pSS performed by a group of experts, blinded to the results of B-cell profiling. The diagnostic values and the independence of the different tests were compared using logistic regression analysis.

**Results:** 181 patients have been included in the study (mean age ±13 years, symptoms duration 6.0 ±6.9 years, 92.2% females). 77 patients had pSS diagnosed by the experts. No differences were found between the 2 groups concerning age, disease duration, and sex ratio. The sensitivity (Se) and specificity (Sp) of the different tests were respectively: 60.6% and 99.0% for anti-SSA/SSB; 81.7% and 61.1% for ANA ≥1; 320; 70.4% and 83.2% for ANA ≥1; 640; 45.5% and 79.8% for IgM-RF; 42.3% and 97.9% for IgA-RF; 46.5% and 92.6% for gammaglobulins ≥14 g/l; and 49.6% and 91.6% for IgG ≥14 g/l. The mean B-cell ratio was significantly higher in the pSS group than in the non-pSS group (7.4 ±6.9 vs 3.2 ±2.3, P < 0.001), and a ratio ≥5 had 52.1% Se and 83.2% Sp. Logistic regression analysis selected only ANA ≥1; 640 and B-cell ratio ≥5, with a similar weight. The combination of these two tests (ANA and ratio) displayed 37.7% Se and 96.2% Sp in the whole population, but only 12.9% Se in anti-SSA-negative patients. The association of the two tests (ANA or ratio) displayed 85.7% Se and 67.3% Sp in the whole group, and 71.0% Se in anti-SSA-negative patients. The modification of AECG criteria including the two tests in association (ANA or ratio) increased the Se from 83.1% to 90.9%, but decreased the Sp from 97.1% to 85.6%, whereas using the tests in combination (ANA and ratio) did not modify significantly their diagnostic value.

**Conclusion:** Blood B-cell subset profiling using flow cytometry is a simple test which has good diagnostic properties for pSS. However, the inclusion of this test, associated or not with ANA positivity, does not improve current classification criteria. Anti-SSA/SSB antibodies remain the best serologic item for the diagnosis of pSS.

Disclosure: D. Corne, None; A. Saraulx, None; J. O. Pers, None; S. Jousse-Joulin, None; Y. Renaudineau, None; T. Marhadour, None; V. Devauchelle-Pensec, None.
**Methods:** The archived pathology specimens of 15 patients with primary Sjögren’s syndrome related ILD who underwent lung biopsies between 1998 and 2010 were reviewed, and evaluated for the presence of Ig4 by immunohistochemical staining. Diagnosis was based on 2002 American European Consensus Group criteria for primary Sjögren’s syndrome. Patient demographic data and findings from high resolution computed tomography (HRCT) findings of the lungs of these patients were recorded.

**Results:** Among the 15 identified patients, 11 (73%) were female; mean age was 58 years. All of these patients had dry eyes and dry mouth symptoms. Anti-nuclear antibodies were present in 11 (85%) of 13 tested patients. Of 12 patients tested, 12 (100%) had anti-SSA antibodies and 9 (75%) had anti-SSB antibodies. Six (55%) of 11 tested patients were rheumatoid factor positive, and hypergammaglobulinemia was noted in 9 (75%) of 12 tested patients. Six (40%) patients had positive smoking history. Lung histopathology revealed usual interstitial pneumonia (UIP) in 6 patients; 3 patients had non-specific interstitial pneumonia (NSIP). The other patients had bronchiolitis (n=1), cryptogenic organizing pneumonia (n=1), desquamative interstitial pneumonia (n=1), follicular bronchiolitis with amyloid (n=1), obliterative pneumonitis (n=1), and lymphocytic interstitial pneumonia (n=1). Immunohistochemical staining of these lung biopsy specimens for Ig4 were negative for 7 (100%) of 7 patients. HRCT was performed in 12 of 15 patients. Linear or reticular opacities were noted in 9 patients, ground glass or non-solid opacities in 8 patients, and bronchiectasis in 8 patients. Other common HRCT findings were lymphadenopathy (n=3) honey-combing (n=3), multifocal cysts (n=3) and solid nodules (n=3).

**Conclusion:** The most common form of ILD in these patients with Sjögren’s syndrome undergoing lung biopsy is UIP, and the majority had linear and/or ground opacities on HRCT. While there are reports that dacroeniditis and sialoadenitis is associated with Ig4 deposition, we found no evidence of Ig4 in the lung tissue of patients with primary Sjögren’s syndrome suffering from ILD.

**Disclosure:** A. Jebakumar, None; C. Nannini, None; E. S. Yi, None; H. Sekiguchi, None; J. H. Ryu, None; C. S. Crowson, None; E. L. Matteson, None.

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**Elevated Ig4 Serum Levels Among Primary Sjogren’s Syndrome Patients: Do They Unmask Underlying IgG4-Related Disease?**

**Clio P. Mavragani**, George Fragoulis, Dimitra Rontogianni, Maria Kanariou, Haralampos M. Moutsopoulos

**Background/Purpose:** To determine Ig4 serum levels in a cohort of patients fulfilling the classification criteria for primary Sjögren’s (pSS) and to explore whether they associate with distinct clinical, serological and histopathological parameters.

**Methods:** Ig4 levels were measured by nephelometry in sera from 140 consecutive pSS patients and 45 healthy controls of similar age and sex distribution. Immunohistochemical Ig4 analysis was performed on paraffin-embedded salivary gland tissues from patients with high and low Ig4 serum levels.

**Results:** Raised Ig4 serum levels defined as higher than 135mg/dl were detected in 8 out of 81 pSS patients analyzed (9.9%) (“High-Ig4” group) and in none of controls (p=0.05). Compared to their counterparts with normal Ig4 serum levels, the “High-Ig4” subset is characterized by significantly increased prevalence of Ig4-related features such as autoimmune pancreatitis, cholangitis and interstitial nephritis (p=0.0066), lower rates of ANA (p=0.05) and anti-Ro/SSA (p=0.05) positivity. Although not statistically significant, sicca features and anti-La/SSB positivity occurred less frequently in the “High-Ig4” group. Multivariate logistic regression analysis revealed interstitial nephritis (p=0.048), autoimmune cholangitis (p=0.012) or pancreatitis (p=0.027) and absence of ANA (p=0.005) as independent predictors of Ig4 serum levels. Positive staining for Ig4 +/- plasma cells was detected in one out of four available MSG biopsies in the “High-Ig4” group but in none of the control patients with normal Ig4 serum levels. Analysis of the whole group is in process.

**Conclusion:** Raised Ig4 levels occur approximately in 10% of patients with pSS and characterize a subgroup with high prevalence of Ig4-related clinical and serological features. Whether these patients represent a distinct pSS subset or a misclassified Ig4-Related (Ig4-RD) disease group remains to be defined.

**Disclosure:** C. P. Mavragani, None; G. Fragoulis, None; D. Rontogianni, None; M. Kanariou, None; H. M. Moutsopoulos, None.

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**Elevated IgE and IgG4 Levels in Patients with Primary Sjogren’s Syndrome:**

**Clio P. Mavragani**, George Fragoulis, Dimitra Rontogianni, Maria Kanariou, Haralampos M. Moutsopoulos

**Background/Purpose:** To determine IgE and IgG4 antibodies against SSA, SSB, dsDNA and Sm-RNP. Subjects with autoantibody levels over the mean +2SD of the controls were considered autoantibody positive. Statistical analysis was done with the Wilcoxon test.

**Results:** Among 110 pSS patients, IG4 autoantibodies (IgG and IgE) were found in higher titers and frequencies in pSS patients compared to blood bank donors (SSA 33.8% vs 6.81%, SSB 41.67% vs 1.85% in patients vs controls respectively, p<0.0001 for both), IgG autoantibodies to Sm-RNP and albeit less frequently anti-dsDNA were also seen more commonly in pSS patients than controls (Sm RNP 25% vs 1.85%, p<0.0001 and dsDNA 15.70 vs 5.55%, p=0.0156).

The presence of IgE autoantibodies was not exclusive to the group of patients with positive IgG autoantibodies, as 29.2% of patients were discordant for SSA and 26.25% for SSB IgG and IgE antibodies.

The difference between IgG and IgE antibodies was striking for anti-Sm-RNP, as 7.25% of SS patients had IgG Sm-RNP and 25% had IgE Sm-RNP positivity.

There was no association between SSA or SSB IgG and focus scores.

**Conclusion:** IgE autoantibodies are present in a high proportion of SS patients compared to controls, and they appear independent from their respective IgG autoantibodies. Preliminary data suggest that IgE autoantibodies may be associated with hypocomplementemia, but further studies are needed to clarify their role in the cascade of events leading to disease pathogenesis.

**Disclosure:** S. Danielides, None; B. Dena, None; J. Rivera, None; G. G. Ilioi, None.

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**Involvement of Interleukin-33 in the Pathogenesis of Sjogren’s Syndrome:**

**Ahmad Awada**, Valérie Gangji and Muhammad S. Soyfoo

**Background/Purpose:** To investigate the role of IL-33/ST2 in the pathophysiology of primary Sjögren’s syndrome (pSS).

**Methods:** Serum levels of IL-33 and sST2 was determined by ELISA. The expression of IL-33 and ST2 was examined in the salivary glands of patients by immunohistochemistry and western blot. PBMC were isolated and stimulated with IL-33, IL-12 and IL-23 and the cytokine profile was examined by flow cytometry. Intracellular cytokine detection of IFN-gamma and IL-17 was performed by flow cytometry. RT-PCR was performed to detect IL-33, sST2 and ST2L transcripts after PBMC stimulation by TNF-a and IL-1b with and without LPS.

**Results:** IL-33 and sST2 was increased in pSS patients compared to controls. Expression of IL-33 was upregulated in the salivary glands of pSS patients with Chisholm scores of 2 and 3 but comparable to controls for patients with Chisholm score of 4. sST2 expression was downregulated in pSS patients. IL-33 in a dose related fashion increased the secretion of TNF, IL-1, IL-6 and IL-10. Moreover, IL-33 acts synergistically with IL-12 and...
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Classification Criteria for Sjögren’s Syndrome: Comparison of the Performance of the 2002 American-European Consensus Group Criteria (AECG) and the 2012 ACR Criteria.

Elke Theander1, Peter Olsson2, and Thomas Mandl3.

1Skane University Hospital, Lund University, Malmö, Sweden, 2Department of Rheumatology, Skåne University Hospital, Lund University, Malmö, Sweden, 3Skane University Hospital Malmo, Lund University, Malmö, Sweden

Background/ Purpose: To assess level of agreement between 2002 AECG and 2012 ACR criteria for primary Sjögren’s Syndrome syndrome (pSS) within the Malmö Sjögren’s Syndrome Registry

Methods: The Malmö Sjögren’s Syndrome Registry was established in 1984. Patients not fulfilling the AECG criteria were after 2002 designated as having Sicca Syndrome in contrast to pSS. To date 368 pSS according to AECG and 264 Sicca patients are registered. Here the ACR-criteria ocular staining score (OSS) ≥3 was substituted by van Bijsterveld score ≥3. An inter-criteria reliability analysis with Kappa statistic was performed to determine classification consistency.

Results: Of 264 Sicca patients not fulfilling AECG, 81% had sufficient data available to make a decision about fulfilling the ACR criteria. Seven patients (2.7%) fulfilled the ACR criteria but not AECG. All of these fulfilled the ACR criteria due to high titres of ANA and positive RF. None was positive for anti-Ro or La or had a positive salivary gland biopsy. Nor did they have signs of lymphoma risk or had developed lymphoma. Thus, in 97% of the evaluable sicca patients the two criteria sets agreed. Of 368 fulfilling AECG, 268 (73%) had information on all ACR criteria items available, 309 (84%) had sufficient information to evaluate fulfillment of the ACR criteria set. Forty-eight (15%) of AECG positive patients were negative when applying the ACR criteria. 261 of 309 evaluable AECG positive patients were positive according to the ACR criteria, resulting in a consensus in 85%. A calculated kappa-value of 0.781 signals a substantial agreement between the two criteria sets. Amongst the patients not identified by the ACR-criteria there were several with known risk factors for development of lymphoma (table 1). One lymphoma patients (pos biopsy, low C3, high titre ANA but no SSA/SSB or RF, low OSS) was negative in the ACR criteria. Seventeen of the 46 patients not identified by the ACR criteria were previously included in an analysis of germinal center (GC) formation in salivary gland biopsies. Two of these (12%) were positive for GC. These patients with low complement levels, polynuropathy, low salivary flow were missed applying the ACR criteria due to high titres of ANA and positive RF. None was positive for anti-Ro/La or had salivary gland biopsy. The ACR criteria are mainly the same patient population (Kappa: 0.781), when applied to the newly proposed (2012) American College of Rheumatology (ACR) criteria. We compared the performance of these two sets of criteria in a large carefully characterized sicca cohort.

Methods: In a multidisciplinary (eye, mouth, and medicine) clinic for the evaluation of sicca, we determined the classification of subjects under the AECG and new ACR criteria(n=584) and the mRNA expression profile in whole blood of a subset of 201 participants (pSS by both criteria sets n=127, ACR-/AECG+: n=77, ACR-/AECG−: n=29 and controls n=38). The data was recorded for each patient for classification purposes were: the answers to subjective eye and mouth symptoms (according to the AECG questionnaire), Schirmer’s I test, ocular dye score (lissamine green + fluorescein staining of conjunctiva and cornea quantified either by the van Bijsterveld score or the OSS score), salivary whole unstimulated flow, histopathology of minor salivary gland biopsy, serology (anti-Ro, anti-La, ANA and rheumatoid factor antibodies).

Results: The initial cohort of participants evaluated at either the Sjögren’s Clinic at Oklahoma Medical Research Foundation or the Sjögren’s Clinic at the University of Minnesota consisted of 748 individuals. Of these, a complete data set was available for 584 subjects and these constitute the study cohort. The two cohorts are comparable in terms of age, sex, race and ethnicity. Among the 584 subjects with complete data, 259 were classified as pSS under AECG, and 249 were so classified under ACR criteria while 222 matches of sets of criteria and they represent 78% of all pSS. 49% of all pSS were 78% significantly different (p<0.26, McNemar’s test; concordance = 0.77, Kappa statistic, 95% CI:72.5–82.9); the ACR criteria had a sensitivity of 0.86 (95% CI:0.81–0.90) and a specificity of 0.92 (95% CI:0.88–0.94). Thirty seven subjects were classified as pSS by AECG only (ACR-/AECG−), of whom 29 (78%) had a minor salivary gland biopsy focal score >1, while 8 (22%) had positive anti-Ro/La. On the other hand, there were 27 ACR+/AECG- and they met ACR criteria mainly due to differences in the scoring of the corneal staining (OSS ≥3 for ACR; van Bijsterveld ≥3 for AECG). Interestingly, when attempting to correlate the subgroups generated by the classification criteria with their global gene expression profiles, we were unable to identify distinct clustering.

Conclusion: When considering any subject who would meet classification for pSS by either set of criteria, only 75% would be so classified by both. Twenty five percent would be so classified by only one set, leading to heterogeneity by either. This suggests that further refinement of the criteria using molecular data was warranted.

Disclosures: A. Rasmussen, None; J. A. Ice, None; H. Li, None; K. Gründahl, None; J. A. Kelly, None; L. Radfar, None; K. S. Heinef, None; D. U. Stone, None; J. M. Anaya, None; M. Rohrer, None; G. D. Houston, None; D. M. Lewis, None; J. Chodosh, None; J. B. Harley, None; P. Hughes, None; J. S. Maier-Moore, None; C. G. Montgomery, None; N. L. Rhodus, None; A. D. Farris, None; B. M. Segal, None; C. J. Lessard, None; R. H. Scofield, None; K. Moser Sivils, None.
Overall Agreement Between Sjögren’s Minor Salivary Gland Biopsy 2002 and 2012 Classification Criteria. Laura Aline Martinez1, Candido Flores2, Alberto Arana Frausto1 and Luis H. Silveira3. 1Instituto Nacional de Cardiología Ignacio Chavez, Mexico City, Mexico, 2Instituto Nacional de Cardiología Ignacio Chavez, Mexico City, Mexico, 3Instituto Nacional Cardiología Ignacio Chávez, Mexico City, Mexico

Background/Purpose: Sjögren’s syndrome (SS) is an inflammatory autoimmune disease characterized by lymphoid infiltration of exocrine glands, although extraglandular involvement is frequently observed. Prevalence is around 0.5% to 1%. There have always been difficulties for the classification and diagnosis of patients. Several criteria have been proposed. The classification criteria used in recent years that those established by the American-European Consensus Group in 2002. Recently, new classification criteria have been published by the International Collaborative Clinical Alliance Cohort; these criteria have been approved by the American College of Rheumatology. Although minor salivary gland biopsy has been used throughout the years, its findings are not highly specific.

Objectives: Primary: To determine the agreement between a positive minor salivary gland biopsy and having at least 4 of the 6, 2002 criteria, as well as having 2 of the 3, 2012 criteria. Secondary: To determine the agreement between 2002 and 2012 SS classification criteria.

Methods: This is a retrospective study consisting of clinical chart review from patients with primary SS (pSS) and secondary SS (sSS), having minor salivary gland biopsy report. Clinical chart review included patients attending the Rheumatology Clinic at the National Institute of Cardiology in Mexico City, between January 1, 2000, and May 31, 2011. Clinical manifestations, serology, and the biopsy report were obtained in all patients. Biopsies were considered positive when a focal lymphocytic sialadenitis with a focus score ≥ 1 focus (> 50 cells)/4 mm² was observed. Biopsies were assessed by the same expert pathologist. The 2002 and 2012 criteria were applied according to their requirements. Descriptive statistic was used and kappa index was calculated as an agreement measure. A p value < 0.05 was considered significant. SPSS version 15.0 was used for the statistical analysis.

Results: A total of 75 clinical charts with a biopsy report were reviewed; 8 patients were excluded because information was incomplete. 67 patients were included in the analysis, 62 women and 5 men. 55.2% had pSS and 44.8% had SSS. The agreement between a positive biopsy and having 4 of the 6, 2002 criteria, was weak (kappa = 0.27; p = 0.01); the agreement of a positive biopsy with having 2 of the 3, 2012 criteria, was moderate (kappa = 0.5; p < 0.0001). The agreement between the 2002 criteria and the 2012 criteria was good (kappa = 0.70; p < 0.0001), when all the patients were considered. In the SSS patients, the agreement decreased (kappa = 0.44; p = 0.003).

Conclusion: The agreement between a positive biopsy and having 4 of the 2002 criteria was low, and moderate when having 2 of the 20012 criteria. The agreement between the 2002 and the 2012 criteria was very good when pSS patients were included, however, it decreased when only the SSS patients were included.

Disclosure: L. A. Martinez, None; C. Flores, None; A. Arana Frausto, None; L. H. Silveira, None.

Longitudinal Evaluation of the Performance of Different Classification Criteria in Patients with Primary Sjögren’s Syndrome. Martina Plešivčnik Novljan1, Zlga Rotar1, Aleš Ambrožič1, Gaj Vidmar2 and Matija Tomsič1. 1University Medical Centre Ljubljana, 1000 Ljubljana, Slovenia, 2University Rehabilitation Institute, 1000 Ljubljana, Slovenia

Background/Purpose: Over the past 3 decades, 10 different classification criteria for Sjögren’s syndrome (SS) had been proposed. In 2001 and 2002 222 consecutive patients suspected of having primary SS (pSS) were each evaluated for pSS using the Copenhagen (COP), Californian (CA), European (EU) and American-European consensus group (AECG) criteria. 90 patients could be classified as pSS by at least one of the criteria.1 The purpose of our current study was to prospectively compare the longitudinal performance of different classification criteria by reassessing the diagnosis in 2009 in the group of patients classified as pSS in 2001 and 2002.

Methods: Eligible patients were invited for reassessment. In each patient we repeated diagnostic tests as required by any of the respective classification criteria. Additionally, we used the new ACR criteria (ocular stain score ≥3 was replaced by Rose Bengal score ≥ 3 following the Bijsterveld’s method) to classify the patients on the data from the initial cohort and at reassessment (2).

Results: In 2009 63/90 (70%) of patients from the initial cohort consented to participate. The flow of the patients is summarized in Figure 1. During the 7.5-year follow up period we observed a transition from pSS to secondary SS (sSS) in 9/63 (14%) patients on average after 4.0±0.9 years. While cases of transition from pSS to sSS were observed for all criteria used to make the initial diagnosis of pSS, it was significantly more common if the diagnosis of pSS was initially made using AECG (17%, p=0.008), or ACR (17%, p=0.016) criteria.

In the 34 patients who underwent a full diagnostic reassessment the diagnosis retention rate was statistically significant for the CA, AECG, COP and ACR criteria, but not for the EU criteria (Table 1). At reassessment 3/32 (9%), and 2/26 (8%) of patients initially diagnosed as pSS using the EU and COP criteria, respectively could not be classified as pSS by any of the criteria. Although the difference between classification using the AECG, and new ACR criteria almost reached statistical significance for the initial 90 patients (p=0.063), the difference was lost at reassessment (p=1.000).

References

Conclusion: The longitudinal diagnosis retention rate is highest for the Californian and AECG criteria and lowest for the European criteria. Regardless of the classification criteria we observed that with time some patients develop sSS. When using classification criteria without mandatory positivity in immunoserology or histology there is a caveat of miscategorization of patients as pSS.

Disclosure: M. Plešivčnik Novljan, None; Rotar, None; A. Ambrožič, None; G. Vidmar, None; M. Tomsič, None.
 Patients Fulfiling the Imaging-Arm and Patients Fulfiling the HLA-B27+ Arm of the Assessment of Spondyloarthitis International Society Axial Spondyloarthritis Classification Criteria: Are They Similar? Rosaline van den Berg, Manouk de Hooge, Floris van Gaalen, Monique Reijnierse, Tom Huizinga and Désirée van der Heijde. Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: It is possible to classify patients as having spondyloarthitis (SpA) according to the ASAS axial SpA (axSpA) criteria HLA-B27+ arm without any signs of sacroilitis on MRI or X-ray. The question arises whether patients fulfilling the HLA-B27+ arm reflect a group of patients similar to those fulfilling the imaging-arm of the ASAS axSpA criteria. Therefore, we compared demographics, number of SpA-features and level of disease activity in patients fulfilling the imaging-arm to patients fulfilling the HLA-B27+ arm of the ASAS axSpA criteria.

Methods: The SpOndyloArthritis Caught Early (SPACE)-cohort is set-up in the Leiden University Medical Center (LUMC) aiming to diagnose and treat patients with axSpA at an earlier stage. Patients with back pain (<3 months, but ≤2 years, onset ≤45 years) visiting the rheumatology outpatient clinic were included. All patients of the SPACE-cohort (n=157) fulfilling the ASAS axSpA criteria were included in this analysis (n=60). Patients were compared on demographics, presence of SpA-features and level of disease activity.

Results: Of those 60 patients, 30 fulfilled the imaging-arm (11 patients fulfilling the modified New York (mNY) criteria; 19 patients had sacroilitis on MRI only); 30 fulfilled the HLA-B27+ arm. Patients fulfilling the HLA-B27+ arm have significantly more often a positive family history for SpA (p=0.001), are more frequently female (p=0.04) and have a significantly shorter symptom duration (p=0.02). Moreover, there was a trend toward more uveitis (p=0.07). Patients in both arms are very similar with respect to all other SpA-features and level of disease activity (BASDAI and ASDAS). Within the imaging-arm, patients with sacroilitis on X-ray did not differ significantly from patients with sacroilitis on MRI in any of the tested variables including symptom duration and disease activity.

### Imaging-arm, n=30

<table>
<thead>
<tr>
<th>Age (years) at inclusion, mean ± SD</th>
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| 28.6 ± 9.6
| 32.9 ± 8.7
| 31.2 ± 9.0
| 28.2 ± 8.4 |

<table>
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<tr>
<th>Male, n (%)</th>
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</table>
| 8 (27.7)
| 11 (37.9)
| 19 (63.3)
| 10 (33.3) |

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<th>Duration of back pain (months), mean ± SD</th>
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| 15.5 ± 8.5
| 16.0 ± 6.9
| 15.5 ± 7.68
| 11.4 ± 7.38 |

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<tr>
<th>HLA-B27 positive, n (%)</th>
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| 6 (20.7)
| 11 (36.7)
| 19 (63.3)
| 10 (33.3) |

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<tr>
<th>Pos. fam. history SpA, n (%)</th>
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| 4 (36.4)
| 5 (26.3)
| 9 (30.0)
| 22 (73.3) |

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<th>IBP, n (%)</th>
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| 9 (31.0)
| 14 (73.7)
| 23 (76.7)
| 27 (90.0) |

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<th>Psoriasis, n (%)</th>
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| 2 (8.8)
| 2 (10.5)
| 4 (13.3)
| 4 (13.3) |

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<tr>
<th>Dactylitis, n (%)</th>
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| 0 (0.0)
| 2 (10.5)
| 2 (6.7)
| 1 (3.3) |

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<th>Enthesitis, n (%)</th>
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</table>
| 2 (8.8)
| 2 (10.5)
| 4 (13.3)
| 4 (13.3) |

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<tr>
<th>Uveitis, n (%)</th>
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</table>
| 1 (9.1)
| 1 (5.3)
| 2 (6.7)
| 7 (23.3) |

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<th>IBD, n (%)</th>
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| 2 (8.8)
| 1 (5.3)
| 3 (10.0)
| 0 (0.0) |

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<th>Preceding infection, n (%)</th>
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| 0 (0.0)
| 0 (0.0)
| 0 (0.0)
| 1 (3.3) |

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<tr>
<th>CRP (mg/dl), mean ± SD</th>
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| 6.9 ± 7.2
| 7.6 ± 8.6
| 7.3 ± 8.0
| 15.6 ± 18.9 |

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<th>ESR (mm/h), mean ± SD</th>
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| 11.4 ± 13.9
| 14.2 ± 14.8
| 13.2 ± 14.3
| 9.4 ± 14.9 |

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<th>Alternating buttock pain, n (%)</th>
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| 6 (20.7)
| 5 (16.7)
| 22 (73.3)
| 7 (23.3) |

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<th>Good response to NSAIDs, n (%)</th>
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| 6 (21.4)
| 15 (50.0)
| 10 (33.3)
| 13 (43.3) |

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<th>Elevated CRP/ESR, n (%)</th>
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| 4 (36.4)
| 5 (26.3)
| 9 (30.0)
| 2 (6.7) |

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<tr>
<th>Symmetric lower limb arthritis, n (%)</th>
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| 0 (0.0)
| 4 (21.1)
| 4 (13.3)
| 4 (13.3) |

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<tr>
<th>Sacroilitis X-ray, n (%)</th>
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</table>
| 11 (100)
| 0 (0.0)
| 11 (36.7)
| 0 (0.0) |

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<tr>
<th>Sacroilitis MRI, n (%)</th>
</tr>
</thead>
</table>
| 6 (60.0)
| 19 (100)
| 25 (86.2)
| 0 (0.0) |

<table>
<thead>
<tr>
<th>BASDAI</th>
</tr>
</thead>
</table>
| 3.71 ± 1.8
| 4.01 ± 2.5
| 3.90 ± 2.3
| 3.92 ± 1.9 |

<table>
<thead>
<tr>
<th>ASDAS</th>
</tr>
</thead>
</table>
| 2.37 ± 0.7
| 2.46 ± 0.9
| 2.43 ± 0.8
| 4.44 ± 0.9 |

BP; Inflammatory Back Pain; IBD, Inflammatory Bowel Disease; age, at baseline; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; HLA-B27, Human Leukocyte Antigen; preceding infection can be balanitis, urethritis, cervicitis and/or acute diarrhea; mNY, modified New York criteria.

# represent a statistical significant difference between patients fulfilling the imaging-arm and patients fulfilling the HLA-B27+ arm (p-value <0.05).

Conclusion: Patients with sacroilitis on X-ray have the same level of disease activity and symptom duration as patients with sacroilitis on MRI only. Patients fulfilling the HLA-B27+ arm are remarkably similar to patients fulfilling the imaging-arm of the ASAS axSpA criteria, with respect to the presence of most SpA-features and level of disease activity.

References
1. Rudwaleit M et al. ARD 2009;68:777-83
2. Disclosure: R. van den Berg, None; M. de Hooge, None; F. van Gaalen, None; M. Reijnierse, None; T. Huizinga, None; D. van der Heijde, None.
Referral Patterns and Diagnosis of Patients with Axial Spondyloarthritis: Results of an International Survey. Desiree van der Heijde1, Joachim Sieper2, Dirk Elewaut3, Aileen L. Pangan4 and Dianne Nguyen5. 1. Leiden University Medical Center, Leiden, Netherlands, 2 Charité Universitätsmedizin Berlin, Berlin, Germany, 3 Ghent University Hospital, Ghent, Belgium, 4 Abbott Laboratories, Abbott Park, IL, 5 Abbott Laboratories, Singapore, Singapore.

Background/Purpose: This analysis compares referral patterns and diagnostic tools for axial spondyloarthritis (axSpA) used by rheumatologists working in academic centers and in community clinical practice settings.

Methods: The MAXIMA (Management of Axial SpA International and Multicentric Approaches) survey asked respondents questions pertaining to referral, diagnosis, and management of patients with axSpA. The survey was completed anonymously online by participants from 42 countries in Europe, Latin America, and North America. The MAXIMA survey was funded by Abbott Laboratories and conducted by a third-party vendor with guidance and approval of the questionnaire by a steering committee of SpA experts. None of the participants were compensated for completing the survey.

Results: 500 surveys were completed by 141 rheumatologists in academic practice settings (28%) and 359 rheumatologists in community practice settings (72%). Only 58% of academic rheumatologists compared to 72% of clinical rheumatologists agreed that the concept of axial SpA is clear to the rheumatology community. However, responses to various questions about referral and diagnostic work-up for patients with axSpA were generally similar in both practice settings (table). The majority of respondents (51%) reported that primary care providers referred patients with chronic back pain for 3 months and onset <45 yrs old; 47% of respondents received referrals from other specialists such as dermatologists, gastroenterologists, and ophthalmologists. Other than chronic and inflammatory back pain, referrals from non-rheumatology specialists were triggered by the occurrence of uveitis (82%), inflammatory bowel disease (48%) and skin lesions (46%). At the time of referral to the rheumatologist, 48% of patients have symptoms for ≥3 yrs. The ASAS criteria (85%) were cited as the most common classification criteria that guide respondents in the diagnosis of axSpA in clinical practice, compared to the modified New York criteria for AS (25%), ESSG (8%), and Amor (6%). In terms of diagnostic work-up, approximately half systematically request HLA-B27 typing. MRI of the sacroiliac joints is the most commonly used imaging test, closely followed by pelvic x-rays.

Table. Response rates in MAXIMA survey regarding SpA referral patterns and diagnosis

<table>
<thead>
<tr>
<th>Question</th>
<th>Rheumatology Practice Setting</th>
<th>Overall N=500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with back pain ≥3 mo, &lt;45 yrs old</td>
<td>Academic Center N=141</td>
<td>Community Clinical Practice N=359</td>
</tr>
<tr>
<td>Source of referrals*</td>
<td>82</td>
<td>89</td>
</tr>
<tr>
<td>Primary care provider</td>
<td>82</td>
<td>89</td>
</tr>
<tr>
<td>Physical therapist</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td>Private office rheumatologist</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>Other specialist*</td>
<td>50</td>
<td>46</td>
</tr>
<tr>
<td>Duration of symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 yr</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>1-2 yrs</td>
<td>36</td>
<td>45</td>
</tr>
<tr>
<td>3-4 yrs</td>
<td>41</td>
<td>30</td>
</tr>
<tr>
<td>&gt;5 yrs</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Triggers of past referrals from other specialists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uveitis</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>Chronic back pain</td>
<td>69</td>
<td>64</td>
</tr>
<tr>
<td>IBP</td>
<td>38</td>
<td>44</td>
</tr>
<tr>
<td>Skin lesions</td>
<td>47</td>
<td>45</td>
</tr>
<tr>
<td>Nail lesions</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>Diagnosis in daily practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classification guides used for diagnosis of axSpA in practice</td>
<td>ASAS</td>
<td>92</td>
</tr>
<tr>
<td>Modified New York criteria for AS</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>ESSG</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>HLA-B27 typing performed routinely</td>
<td>49</td>
<td>50</td>
</tr>
<tr>
<td>Imaging tests used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRI sacroiliac joint</td>
<td>92</td>
<td>93</td>
</tr>
<tr>
<td>Pelvic x-ray</td>
<td>88</td>
<td>85</td>
</tr>
<tr>
<td>Spinal x-ray</td>
<td>71</td>
<td>78</td>
</tr>
<tr>
<td>MRI spine</td>
<td>56</td>
<td>58</td>
</tr>
</tbody>
</table>

*Respondents may have indicated ≥1 source of referrals. *Other specialist = dermatologist, gastroenterologist, ophthalmologist, and/or rheumatologist.

Conclusion: Results of the MAXIMA survey show general agreement in referral patterns and use of diagnostic tools by rheumatologists in academic and clinical practice settings when evaluating patients for axSpA. Half of the patients are still being seen by rheumatologists several years after onset of symptoms, which indicates the need for appropriate early referral.

Disclosure: D. van der Heijde, Abbott Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth; Abbott Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth; 4, Imaging Rheumatology, 4, J. Sieper, Abbott, Merck, Pfizer, and UCB; 5, Abbott, Merck, Pfizer, and UCB; 6, D. Elewaut, Abbott Laboratories, 2, Abbott Laboratories; 7, A. L. Pangan, Abbott Laboratories; 3, Abbott Laboratories, 1; D. Nguyen, Abbott Laboratories, 3, Abbott Laboratories, 1.

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Background/Purpose: MRI is used as a diagnostic tool to detect active disease of the sacroiliac joint. T1 weighted and STIR images are generally used and the ASAS definition is based on bone marrow edema (BME). However, imaging after intravenous administration of gadolinium (Gd) may improve the detection of BME, synovitis, capsulitis and or enthesis compared to STIR sequence.

The purpose of this study is to investigate the additional value of T1 fat-sat after Gd (T1/Gd), compared to STIR and T1/Gd sequence in the detection of active lesions of the SIJ in patients with spondyloarthritis (SpA) and to assess its influence on the MRI diagnosis based on the ASAS definition of active sacroiliitis.

Methods: All patients included in the SpondyloArthritis Caught Early (SPACE)-project received MRI of the SIJ (MRI-SIJ). Inclusion criterion for this study was chronic back pain of short duration ≥3 months, ≤2 years, onset ≤45 years. Imaging was performed on 1.5T (Philips, Best, Netherlands). Acquired sequences were coronal oblique T1, STIR and T1/Gd. The parameters evaluated were BME, synovitis and capsulitis/enthesis. Parameters were scored on STIR as well as T1/Gd sequence and compared in conjunction with unenhanced T1 images. A positive MRI was defined as the presence of BME on the STIR images according to the ASAS definition. Scoring was done by three blinded trained readers.

Results: In 127 patients that were included a baseline, MRI was obtained and in 67 patients also a follow-up MRI after 3 months was obtained. 22/127 patients (17.3%) were diagnosed with active sacroiliitis according to the ASAS definition based on the STIR sequence. No additional BME was found on the T1/Gd. At baseline, in 7 patients (5.5%) in addition to present BME, synovitis and or capsulitis/enthesis were found. All patients with capsulitis also showed synovitis. In 1 patient (0.8%) synovitis was an isolated finding. This patient did not fulfill the ASAS, ESSG, Amor or modified New York classification criteria. These findings did not change at follow-up. The patients with a positive MRI, capsulitis or synovitis at follow-up were the same patients who show this signs at baseline.

Table. MRI findings in baseline and follow-up

<table>
<thead>
<tr>
<th>Baseline (n=127)</th>
<th>Follow-up (n=67)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive MRI (according to ASAS)</td>
<td>22</td>
</tr>
<tr>
<td>Enthesitis/Capsulitis</td>
<td>0</td>
</tr>
<tr>
<td>Synovitis</td>
<td>*</td>
</tr>
</tbody>
</table>

* not estimated with STIR

Conclusion: STIR sequence by itself is sufficient to detect active sacroiliitis according to the ASAS definition. The additional presence of synovitis, capsulitis/enthesis observed with gadolinium, is seen in the presence of BME, except in one patient without clinical SpA. In line with the recommendations by ASAS, our data show that Gd is not needed in the MRI assessment of patients with SpA.

References

1 Hermann K. J Rheumatol 2005;32:2056–60

Disclosure: M. de Hooge, None; R. van den Berg, None; V. Navarro-Compan, None; F. van Gaalen, None; D. van der Heijde, None; T. Huizinga, None; M. Reijnierse, None.
Background/Purpose: In the diagnostic work-up of spondyloarthritis (SpA), imaging of the sacroiliac joints by MRI (MRI-SIJ) is an important step. One study showed that in HLA-B27+ patients and male patients it might be useful to repeat an MRI-SIJ after one or two years. It is not known if repeating an MRI-SIJ after a shorter period than one year is useful. Therefore, we investigated whether it is useful to repeat an MRI-SIJ after 3 months in the diagnostic process for SpA.

Methods: Patients with chronic back pain (n=157; ≥3 months, but ≤2 years, onset <45 years) included in the SPonyDyArthritIIs Caught Early (SPACE)-cohort in the Leiden University Medical Center (LUMC) underwent an MRI-SIJ during baseline visit. All patients with SpA and possible SpA were included for follow-up (n=90) and received a second MRI-SIJ during a follow-up visit after 3 months. All MRI-SIs of both time points were scored by 3 independent readers ‘positive’ or ‘negative’ according to the ASAS definition, blinded for the time-sequence. If 2/3 reads were positive, the MRI-SIJ was marked as positive.

Univariate and multivariate regression analyses were performed to investigate which variables (IBP, elevated CRP, MRI-SIJ status at baseline, gender, HLA-B27 status and age at onset) could predict a positive MRI-SIJ at 3 months.

Results: Only patients with complete MRI-SIJ data are included in this analysis (n=90). In the univariate analysis, MRI-SIJ positivity at baseline was the strongest predictor of a positive MRI-SIJ over time (OR 51.0, 95% CI 12.2–212.8, p<0.001). Regardless MRI-SIJ status, gender and HLA-B27 status (OR 7.7, 95% CI 2.6–23.1, p<0.001 and OR 2.6, 95% CI 0.9–7.0, p=0.07, respectively) are strong predictors of a positive MRI-SIJ over time. The latter 2 variables were used in a multivariate model. Groups were made based on this model (Table). In the majority of the patients (90%), MRI-SIJ status, either positive (n=15) or negative (n=66), did not change over time. Of the patients with a negative MRI-SIJ at baseline (n=71), 5 (7%) developed a positive MRI-SIJ after 3 months, and in 4/19 (21.1%) lesions on MRI-SIJ disappeared over time. Two out of 5 patients in whom MRI-SIJ was positive for the first time at follow-up fulfilled the ASAS axial SpA criteria only at follow-up.

Conclusion: We confirmed that a positive MRI-SIJ at baseline is a very strong predictor for a positive MRI-SIJ after 3 months. In patients with a negative MRI-SIJ at baseline, male gender and HLA-B27+ are predictive for a later positive MRI-SIJ.

In this group of patients with short symptom duration, variation in MRI-SIJ positivity occurred in 10% of the patients over a very short period of only 3 months. A positive change of MRI-SIJ has led to a different classification in 2 patients (2.2%). More data are needed to decide if it is necessary to repeat MRI-SIJ, and if so, with what time interval.

References
1Van Onna M et al. ARD 2011
2Rudwaleit M et al. ARD 2009

Disclosure: R. van den Berg, None; M. de Hooge, None; V. Navarro-Compán, None; F. van Gaalen, None; M. Reijnierse, None; T. Huizinga, None; D. van der Heijde, None.

2212 How Much Does the Spondyloarthritis Research Consortium of Canada Score of the Sacroiliac Joints Change Over a 3-Month Period in Patients On Non-Biological Treatment? Rosaline van den Berg, Manouk de Hooge, Victoria Navarro-Compán, Floris van Gaalen, Monique Reijnierse, Tom Huizinga and Désirée van der Heijde. Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: The SpondyloArthritis Research Consortium of Canada (SPARCC) score of the sacroiliac joints (SIJ) is often used in clinical trials to detect changes over time. It is important to know if the SPARCC score spontaneously change over time in patients on non-biological treatment. We investigated how much change in the SPARCC score of the SJL can be detected over a 3-month period in patients on non-biological treatment.

References
1Chiowchanwisawakit et al. ARD 2010
2Hoffman et al. Arthritis Care Res 2011
3Ostergaard et al. J Rheum 2009

Disclosure: S. J. Pedersen, None; Z. Zhao, None; R. G. Lambert, None; M. Ostergaard, None; U. Weber, None; W. P. Maksymowych, None.

2211 Is It Useful to Repeat an MRI of the Sacroiliac Joints in the Diagnostic Work-up for Spondyloarthritis? Rosaline van den Berg, Manouk de Hooge, Victoria Navarro-Compán, Floris van Gaalen, Monique Reijnierse, Tom Huizinga and Désirée van der Heijde. Leiden University Medical Center, Leiden, Netherlands

Background/Purpose: Fat metaplasia has been shown to follow resolution of inflammation in axial SpA and this may be evident within one year (1). Fat metaplasia at vertebral corners has also been shown to predict the development of new syndesmophytes (2). Consequently, the scoring of fat lesions in the spine may constitute both an important measure of treatment efficacy as well as a responsive surrogate for new bone formation. Because of this, we developed and validated a new scoring system for fat lesions in the spine, the CanDen Fat SpA Spine Score (FASSS), which addresses the localization and phenotypic diversity of fat lesions in SpA.

Methods: In 2007, the Canada-Denmark MRI working group developed anatomic-based definitions of fat lesions on T1 weighted sagittal MRI scans of the spine (3). In 2011, further definitions, a reference image module, and an online spinal unit schematic for data entry were developed, which formed the basis for a scoring method. The method comprises six different types of fat lesions defined according to their anatomical location, which are recorded dichotomously (present/absent) at each vertebral endplate from C2 lower to L spine: 0–18). Two rheumatologists assessed spine MRI scans obtained at baseline (exercise 1) and from 20 new pairs of MRI scans (exercise 2) (mean 1.7 years (95% CI 0.9–2.4)). Two rheumatologists assessed spine MRI scans obtained at baseline (exercise 1) and from 20 new pairs of MRI scans (exercise 2) (mean 1.7 years (95% CI 0.9–2.4)).

In exercise 2, the change in fat scores ranged from −34 to 52 for reader A and from −38 to 61 for reader B. Inter-observer ICC scores were high to very high for the FASSSS baseline scores, and improved substantially in change scores from exercise 1 to 2 (Table). This was particularly notable for the 30 patients evaluated in both exercises. Inter-observer ICCs for baseline scores were high for all spinal segments, and change scores improved from small to moderate (C spine), and from moderate to high (L spine) and very high (T spine). For FASSSS score the mean change/year and SRM were 2.4 and 0.34 for reader A and 3.7 and 0.26 for reader B.

Table. Interobserver ICCs for spinal segments scored according to the CanDen Fat SpA Spine Score (FASSS)

<table>
<thead>
<tr>
<th>Exercise 1</th>
<th>Exercise 2</th>
<th>Change ICC (95% CI)</th>
<th>Exercise 1</th>
<th>Exercise 2</th>
<th>Change ICC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Inter-observer ICCs (C95%)</td>
<td>Baseline</td>
<td>Inter-observer ICCs (C95%)</td>
<td>Baseline</td>
<td>Inter-observer ICCs (C95%)</td>
</tr>
<tr>
<td>C spine</td>
<td>0.76 (0.62;0.85)</td>
<td>0.38 (0.10;0.57)</td>
<td>0.42 (0.27;0.56)</td>
<td>0.49 (0.29;0.68)</td>
<td>0.27 (−0.05;0.56)</td>
</tr>
<tr>
<td>T spine</td>
<td>0.89 (0.79;0.94)</td>
<td>0.55 (0.32;0.71)</td>
<td>0.81 (0.54;0.89)</td>
<td>0.94 (0.87;0.97)</td>
<td>0.42 (0.18;0.67)</td>
</tr>
<tr>
<td>L spine</td>
<td>0.77 (0.60;0.87)</td>
<td>0.49 (0.22;0.63)</td>
<td>0.32 (0.08;0.54)</td>
<td>0.74 (0.64;0.82)</td>
<td>0.44 (0.15;0.71)</td>
</tr>
<tr>
<td>FASSS</td>
<td>0.89 (0.79;0.95)</td>
<td>0.53 (0.21;0.71)</td>
<td>0.95 (0.71;0.97)</td>
<td>0.84 (0.79;0.90)</td>
<td>0.41 (0.02;0.68)</td>
</tr>
</tbody>
</table>

*The 30 patients, that were scored two times, were a subgroup of patients in exercise 1 and 2.

Conclusion: The FASSSS meets essential validation criteria for further assessment in axial SpA, and may thus be useful for follow-up of SpA in clinical trials and practice.

References
1Chiowchanwisawakit et al. ARD 2010
2Chiowchanwisawakit et al. AR 2011
3Ostergaard et al. J Rheum 2009

Disclosure: S. J. Pedersen, None; Z. Zhao, None; R. G. Lambert, None; M. Ostergaard, None; U. Weber, None; W. P. Maksymowych, None.
Methods: Ninety patients with chronic back pain (≥3 months, but ≤2 years, onset <45 years) in the SPonDyloArthritis Caught Early (SPACE)- cohort underwent a baseline and 3-month follow-up MRI of the SIJ (MRI-SIJ). All MRI-SIJs were scored according to the SPARCC score by 2 independent readers, blinded for time sequence. The mean SPARCC scores (2 readers) were used in this analysis. Delta scores in SPARCC between both time points were calculated. Patients were treated by their rheumatologist, who was unaware of the MRI scores; treatment was recorded.

Results: In 45 (50%) patients with a SPARCC score of 0; 2 with a SPARCC score of 1; 2 with a SPARCC score ≥2, the SPARCC score did not change over the period of 3 months. In 18 (20%) patients, the SPARCC score changed 1 point (increased in 10 and decreased in 8 patients). In 27 (30%) patients the SPARCC score changed ≥2 points (13 patients showed an increase and 14 patients a decrease). In the patients that showed a change, the mean (SD) change in score was −0.7 (6.0), the median (IQR) change was −1 (−17 to 16) to −3 to 1.3.

In the 45 patients without SPARCC score changes, 10 (11%) patients did not use any medication, 16 (18%) patients were on stable non-biological treatment, and 19 (21%) changed treatment (9 patients switched NSAIDs, 5 patients started NSAID treatment, 4 stopped treatment with NSAIDs, 1 patient started NSAIDs and stopped after 2 months during the follow-up period).

Conclusion: Over a short period of 3 months, the SPARCC score change without the start of a TNF-blocker in 45 patients (50%) on non-biological treatment, with a range from −17 to 16 points. The observed changes in SPARCC scores do not seem to be influenced by non-biological treatment. While analyzing results of clinical trials, it is important to keep in mind that a change in SPARCC score in patients on non-biological treatment is possible. This is important information for the power calculation of a trial.

Disclosure: R. van den Berg, None; M. de Hooge, None; V. Navarro-Compañ, None; F. van Gaalen, None; M. Reijnierse, None; T. Huizinga, None; D. van der Heijde, None.

2213

Ankylosing Spondylitis Is Strongly Related to Clinical Spine Fractures Independently of Drugs Use: A Register-Based Case-Control Study. Daniel Prieto-Alhambra1, Juan Muñoz-Ortég2, Cyrus Cooper3, Adolfo Diez-Pérez3 and Peter Vestergaard4.

Background/Purpose: Ankylosing Spondylitis (AS) is associated not only with systemic low bone mass, but also with locally increased fragility due to biomechanical changes in the spine. However, data on the impact of AS on clinical spine fracture risk is scarce. We used a large population-based registry from Denmark to investigate the association between AS and fractures, with a particular focus on the spine.

Methods: We carried out a case control study. From the Danish National Health Service Registers, we identified 124,655 fracture cases and 373,962 age- and gender-matched controls. Prevalence of AS in cases and controls was estimated. Crude odds ratios (OR) and 95% confidence intervals (CI) according to AS status were calculated using conditional logistic regression. We further adjusted the analyses for: 1. use of oral corticosteroids; and 2. use of oral corticosteroids, NSAIDs and strong analgesics. Similar analyses were repeated separately for the spine, hip and forearm fracture cases and corresponding matched controls.

Results: Among 124,655 cases, 139 (0.11%) had a diagnosis of AS, while 271 (0.07%) out of 373,962 controls had AS (crude OR 1.54 [95%CI 1.26–1.89]). Similarly, 18 (0.54%) out of 3,364 spine fracture cases compared to 10 (0.10%) matched controls had AS (crude OR 5.42 [2.50–11.70]). Among 10,530 hip fracture cases 7 (0.07%) AS patients were identified, and 27 (0.09%) of 31,356 controls suffered AS (crude OR 0.78 [0.34–1.78]). Finally, 20,035 forearm fracture cases were screened for AS, and a prevalence of 0.08% (n = 16) was found, compared to 0.04% (23) in the controls: unadjusted OR 2.09 [1.10–3.95]. The observed associations remained significant after adjustment for use of oral corticosteroids [see Table]. Conversely, all of them were attenuated when adjusted for use of NSAIDs and strong analgesics but the association between AS and clinical spine fracture (adjusted OR 4.41 [1.90–10.20]).

Conclusion: AS-affected patients are at increased risk for fractures independently of oral corticosteroid use. Clinical spine fractures are the most strongly related to AS, with a multivariate adjusted OR of almost 4.5, independent of use of drugs commonly used for the treatment of AS including oral corticosteroids and NSAIDs. Patients with AS should be fully assessed for fracture risk as part of their clinical management.

Disclosure: D. Prieto-Alhambra, None; J. Muñoz-Ortego, None; C. Cooper, Amgen, AbbVie, Novartis, Pfizer, Merck Sharp and Dohme, Eli Lilly, Servier, S. A.; Diez-Pérez, None; P. Vestergaard, None.

2214

Similar Levels of Disease Activity in Patients with Oligoarticular Vs. Polyarticular Peripheral Spondyloarthritis. Filip Van den Bosch1, Philip Mease2, Desiree van der Heijde3, Martin Rudwaleit4, Desiree van der Heijde3, Martin Rudwaleit4, Katie Obermeyer5 and Aileen L. Pangan6.

Background/Purpose: The ASAS criteria for peripheral spondyloarthritides (SpA) allow for classification of patients with SpA who present with peripheral arthritis, enthesitis and/or dactylitis. ABILITY-2, a placebo-controlled trial of adalimumab (ADA) for the treatment of peripheral SpA in patients not previously diagnosed with psoriasis or psoriatic arthritis (PsA), is the first pivotal study to use the ASAS criteria to classify patients for study entry. This analysis characterizes ABILITY-2 patients based on gender and the pattern of joint involvement – oligoarticular vs. polyarticular.

Methods: ABILITY-2 is an ongoing, randomized, controlled multicenter phase 3 study. Eligible patients were age ≥18 yrs, fulfilled ASAS peripheral SpA criteria, did not have a diagnosis of psoriasis, PsA, or ankylosing spondylitis, and had inadequate response or intolerance to NSAIDs. Required baseline disease activity at study entry included patient global assessment of disease activity (PGA) and of pain (PGA-pain) ≥40mm (0–100 mm VAS), ≥2 SJC and TJC, ≥2 digits with dactylitis or enthesitis accompanied by at least 1 joint with active arthritis, or ≥1 sites with enthesitis judged to be severe by the investigator. Subgroup analyses of baseline demographics and disease activity were conducted by gender and by pattern of joint involvement (oligoarticular 2–4 vs. polyarticular >4 joints which are either tender and/or swollen).

Results: Of the 165 patients randomized, 90 (54.5%) were male and 75 (45.5%) had polyarticular disease. Females were slightly older and had a
lower proportion with HLA-B27 positivity, but overall, had similar disease activity parameters as males (table). Predominantly lower limb involvement was observed at baseline in 57% of males, 50% of females, 59% of patients with oligoarticular disease, and 51% of patients with polyarticular disease. More patients with polyarticular were HLA-B27+ compared to those with oligoarthritis (table). Although fewer polyarticular patients had an abnormal hs-CRP at baseline, the mean hs-CRP and the proportion of patients with accompanying enthesis and dactylitis were greater in those with polyarticular disease. Otherwise, both patient and physician global assessments, BASDAI, HAQ-S and the physical component score of the SF-36v2 were similar between these 2 subgroups.

### Table

Baseline demographics and disease characteristics in subgroups of peripheral SpA patients based on gender and pattern of joint involvement.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Randomized Patients N=165</th>
<th>Male</th>
<th>Female</th>
<th>Pattern of Joint Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n=75</td>
<td>n=90</td>
<td>Oligoarticular n=34</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Age, years</td>
<td></td>
<td>38.5</td>
<td>42.3</td>
<td>39.6</td>
</tr>
<tr>
<td>Female, %</td>
<td></td>
<td>51.9</td>
<td>55.2</td>
<td>55.9</td>
</tr>
<tr>
<td>SpA symptom duration, years</td>
<td></td>
<td>6.62</td>
<td>7.67</td>
<td>6.65</td>
</tr>
<tr>
<td><strong>Disease Activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hs-CRP,mg/L</td>
<td></td>
<td>11.2</td>
<td>9.4</td>
<td>8.3</td>
</tr>
<tr>
<td>hs-CRP abnormal, %</td>
<td></td>
<td>46.7</td>
<td>41.1</td>
<td>52.9</td>
</tr>
<tr>
<td>TJC, 0–78</td>
<td></td>
<td>10.77</td>
<td>15.38</td>
<td>3.00</td>
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<tr>
<td>SJC, 0–76</td>
<td></td>
<td>6.21</td>
<td>7.11</td>
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<tr>
<td>MASES, 0–13</td>
<td></td>
<td>2.51</td>
<td>4.07</td>
<td>1.44</td>
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<tr>
<td>MASES &gt;0, %</td>
<td></td>
<td>73.3</td>
<td>75.6</td>
<td>52.9</td>
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<tr>
<td>Leeds enthesis index, 0–6</td>
<td></td>
<td>1.29</td>
<td>1.59</td>
<td>0.56</td>
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<tr>
<td>Leeds &gt;0, %</td>
<td></td>
<td>65.3</td>
<td>60.0</td>
<td>44.1</td>
</tr>
<tr>
<td>SPARC enthesis index, 0–16</td>
<td></td>
<td>3.53</td>
<td>4.28</td>
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<tr>
<td>SPARC &gt;0, %</td>
<td></td>
<td>81.3</td>
<td>75.6</td>
<td>64.7</td>
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<tr>
<td>Dactylitis count</td>
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<td>0.41</td>
<td>0.57</td>
<td>0.12</td>
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<tr>
<td>Dactylitis &gt;0, %</td>
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<td>20.0</td>
<td>24.7</td>
<td>8.8</td>
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<tr>
<td>PGA, 0–100 mm</td>
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<td>63.71</td>
<td>67.59</td>
<td>63.97</td>
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<tr>
<td>PGA-pain, 0–100 mm</td>
<td></td>
<td>62.45</td>
<td>67.01</td>
<td>62.47</td>
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<tr>
<td>PhGA, 0–100 mm</td>
<td></td>
<td>59.29</td>
<td>58.18</td>
<td>56.12</td>
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<tr>
<td>BASDAI, 0–10</td>
<td></td>
<td>5.21</td>
<td>5.97</td>
<td>5.37</td>
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<tr>
<td>SF–36v2 PCS</td>
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<td>35.65</td>
<td>33.58</td>
<td>36.77</td>
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<tr>
<td>HAQ-S</td>
<td></td>
<td>0.83</td>
<td>1.11</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Values are the mean unless otherwise indicated. N=73, 88, 34, 121, respectively. BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; HAQ-S, Health Assessment Questionnaire modified for Spondyloarthropathies; hs-CRP, high-sensitivity C-reactive protein; MASES, Maastricht Ankylosing Spondylitis Enthesitis Score; PGA, Patient’s Global Assessment of disease activity; PGA-pain, Patient’s Global Assessment of pain; PhGA, Physician’s Global Assessment; SF-36v2 PCS, Short Form-36 Health Status Survey version 2 physical component summary; SJC, swollen joint count; SpA, spondyloarthritis; SPARC, Spondyloarthritis Research Consortium of Canada; TJC, tender joint count

**Conclusion:** In non-psA peripheral SpA patients with inadequate response or intolerance to NSAIDs, similar levels of disease activity as measured by patient and physician global assessments were observed regarding less of extent of joint involvement. Likewise, functional impairment was also comparable between patients with oligo- and polyarticular joint disease.

**Reference**


**Disclosure:** F. Van den Bosch, Abbott, Merck, Pfizer, and UCBS, 5; Abbott, Merck, Pfizer, and UCBS, 8; P. Mease, Abbott, Amgen, BiogenIDEC, Bristol Myers, Celgene, Genentech, Janssen, Lilly,Merck, Novartis, Pfizer, and UCBS, 2; Abbots, Amgen, Bristol Myer, BiogenIDEC, Celgene, Genentech, Janssen, Lilly,Merck, Novartis, Pfizer, and UCBS, 5; D. van der Heijde, Abbots Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth, 5; Abbots Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth, 2; Imaging Rheumatology; 4; M. Rudwaleit, Abbott, BMS, MSD, Pfizer, Roche, and UCBS, 5; K. Obermeyer, Abbots Laboratories, 1; Abbots Laboratories, 3; A. L. Pangan, Abbots Laboratories, 3; Abbots Laboratories, 1.

### 2215

**Assessment of Vascular Age in Psoriatic Arthritis Patients.** J. Rosales-Alexander, César Magro Checa, Juan Salvatierra, Jesús Cantero Hinojosa and Enrique Raya Álvarez, University Hospital San Cecilio, Granada, Spain

**Background/Purpose:** The European League Against Rheumatism (EULAR) recommends cardiovascular risk (CV) assessment using the systematic coronary risk evaluation (SCORE) chart in inflammatory arthritis patients. However, the absolute 10 years CV risk is a statistical and epidemiological concept that could be difficult to understand by our patients, resulting in a lack of adherence to treatment. The Framingham heart study (FHS) incorporated the concept of vascular age, as the age of the arteries, a concept more easily understood by all patients. Recently, a calibrated vascular age chart (VAC) according to the SCORE scales was published for European people.

**Objective:** To assess vascular age (VA) in psoriatic arthritis (APs) patients without CV risk factors/ previous ischemic events using the VAC comparing it with healthy controls. To assess the correlation of several clinical and serological variables with VA in APs patients.

**Methods:** We included 80 consecutive APs patients, according to the CASPAR criteria without CV risk factors neither previous ischemic events and matched to 80 healthy controls according to sex, age and gender. We recorded demographic data, clinical and laboratory parameters of disease activity like ESR, CRP, tender and swollen joint counts, DAS28, patient global assessment by visual analogue scale, lipid profile and APs characteristics. We assessed VA using the VAC. Data was analyzed with the statistical software SPSS 15. Descriptive data were shown as percentages and mean±SD. To analyze data, we use simple linear regression test with correlation and the multiple linear regression analysis. The limit of statistical significance was located in the α error of 0.05.

**Results:** In APs patients, the mean chronicologic age (CA) was 47.8±12.4 years, VA was 52.48±12.82, disease duration was 11.09±7.8 and absolute CV risk was 1.99±3.5. Of these patients, 50% were female, 64% had axial and peripheral involvement and 37.5% was HLA-B27 positive. In controls, CA was 47.4±12.2, VA was 49.67±12.67 and absolute CV risk was 1.01±1.7. After applying linear regression test, VA was correlated with CA (beta 0.973, p=0.000); and there were differences in VA between both groups (beta 1.48, p=0.000). In our study, we found that APs patients without CV risk factors had higher VA than healthy controls. Also, we found a good correlation between VA and CA. Time of disease and highest values on the SCORE CV risk chart seem to predict higher VA in APs patients.

**Disclosure:** J. Rosales-Alexander, None; C. Magro Checa, None; J. Salvatierra, None; J. Cantero Hinojosa, None; E. Raya Alvarez, None.

### 2216

**Cardiovascular Risk Assessment in Spondyloarthritides Using the Score Chart and Reclassification by Presence of Plaques On Ultrasonography.** J. Rosales-Alexander, Juan Salvatierra, César Magro Checa, Jesús Cantero Hinojosa and Enrique Raya Alvarez. University Hospital San Cecilio, Granada, Spain

**Background/Purpose:** Increased cardiovascular (CV) risk have been described in patients with rheumatic diseases including spondyloarthritides (SpA). Besides traditional CV risk factors, disease specific factors have been suggested as possible etiologic factors for atherosclerosis. Increased carotid intima-media thickness (IMT) has been found to be increased in rheumatic diseases. In RA and other inflammatory arthritis, EULAR recommends annual CV risk assessment according to national guidelines, but there is not a calibrated SCORE chart for SpA patients.

**Objectives:** To assess CV risk in SpA patients using the SCORE chart calibrated for Spain (SCOREm) and to determine the percentage of patients reclassified according to the presence of plaques by the use of common carotid artery (CCA) ultrasonography (US). To analyse the factors that predict a higher global CV risk.

**Methods:** All patients with SpA, fulfilling the “Assessment of SpondyloArthritis International Society” (ASAS) classification criteria, without previous ischemic events were prospectively included in a database, containing demographic and clinical characteristics. For the study, 90 living Spanish patients were selected. Classic CV risk factors, acute phase reactants (APR), disease activity indexes and lipid profile were obtained. CV risk was calculated using the SCOREm and the presence of plaques – measure of the CCA IMT was evaluated by B-ultrasound. Chi-square or McNemar tests were used to assess differences between qualitative variables, and ANOVA with Bonferroni adjustment for comparing means. Factors predicting higher global CV risk were evaluated by multivariate linear regression analysis.

**Disclosure:** J. Rosales-Alexander, None; C. Magro Checa, None; J. Salvatierra, None; J. Cantero Hinojosa, None; E. Raya Alvarez, None.
Results: Most patients (54%) were men, 77% were HLA-B27 positive. Mean age was 46.32±14.4 years and mean disease duration was 8.8±6.8 years. Mean SCOREm was 1.3±2.7. Low CV risk was found in 64(71%) patients, intermediate, high and very high risk in 23(25.7%), 2(2.2%) and 1(1.1%) patients respectively. After CCA US was performed, plaques were found in 10(90,11.1%) patients. Of these, reclassification to high risk was done in 3 and 5 patients with low and intermediate risk respectively (p<0.001). Mean IMT was 0.61±0.11 mm. Higher global CV risk was predicted by hypertension (β 3.66; p=0.00), dyslipidemia (β -1.77; p=0.016), time of disease (β 0.075; p=0.040) and HLA-B7 positivity (β -1.82; p=0.002).

Conclusion: In our study most SpA patients have low and intermediate CV risk using the SCOREm chart, but after performing CCA US 8(8,9%) were reclassified into high risk by the presence of plaques. Besides classic CV risk factors, some disease characteristics might contribute to the expression of higher global CV risk in these patients.

Disclosure: J. Rosales-Alexander, None; J. Salvatierra, None; C. Magro Checa, None; J. Cantero Hinojosa, None; E. Raya Alvarez, None.

2217

Even After Pretreatment with up to Three Biologics, Anti-TNFs Shows Effectiveness in Active Psoriatic Arthritis Patients. Frank Behrens1, Michaela Koehm1, Diamant Thaci2, Brigitte Krunmel-Lorenz2, Gerald Greger3, Bianca Wittig4 and Harald Burkhardt5. 1CIRI/Div. Rheumatology, J.W. Goethe-University, Frankfurt/Main, Germany, 2Klinik für Dermatologie, Venerologie und Allergologie, J.W. Goethe University, Frankfurt/Main, Germany, 3CIRI/Endokrinologikum, Frankfurt/Main, Germany, 4Abbott GmbH & Co KG, Wiesbaden, Germany, 5CIRI/Div. Rheumatology, J.W. Goethe University, Frankfurt/Main, Germany

Background/Purpose: Even after pretreatment with up to three biologics, anti-TNFs show effectiveness in active psoriatic arthritis patients. The present study included patients pretreated with a maximum of 3 different anti-TNF agents (infliximab, adalimumab, etanercept). The primary objective of our observational study was to evaluate pain scores, HAQ-DI and ACR changes in patients intolerant to the previous anti-TNF therapy.

Methods: 60 patients (n=60) with psoriatic arthritis intolerant to anti-TNF therapy were enrolled into a single-center, non-comparative, open-label study. The study was divided into 3 subgroups: Group 1: patients pretreated with 1 biologic (n=20); Group 2: patients pretreated with 2 biologics (n=20); Group 3: patients pretreated with 3 biologics (n=20). The patients received golimumab (GLM, 50 mg injection every 4 weeks), as an additional therapy to their ongoing non-TNF therapy. The primary endpoint was the change of tender/swollen joint count, the ACR20, ACR50, ACR70 and HAQ-DI response rates as well as significant improvement of Sharp/van der Heijde Score (SHS).

Results: Of 60 pts randomized, 53 pts continued in the study at wk104 and 27 pts (69%) continued GLM tx through wk252. 29% of Glp pts dose escalated to GLM100mg; 25% of Glp pts decreased the dose from 100mg to 50mg. Baseline characteristics of pts who continued in the study at Wk 104 are provided in Table 1. Efficacy results are presented in Table 2. ACR and PASI responses were similar in pts tx’d with or without MTX; changes from baseline in SHS scores were minimal and numerically less in pts tx’d with GLM and MTX compared with GLM alone. Overall, 58% and 21% GLM tx’d pts experienced AE and SAE, resp. 12% of pts discontinued GLM tx due to AEs, and 5% and 4% pts experienced malignancy (including NMSC), and serious infection, resp. Antibodies to golimumab were detected in 6% of pts.

Table 1. Mean (SD) baseline characteristics

<table>
<thead>
<tr>
<th>Group 1a</th>
<th>Group 2b</th>
<th>Group 3c</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of pts continued in the study at wk104</td>
<td>88</td>
<td>118</td>
</tr>
<tr>
<td>DAS28 score</td>
<td>5.0 (0.1)</td>
<td>4.9 (1.1)</td>
</tr>
<tr>
<td>PASI (in pts with ≥3%BSA)</td>
<td>7.7 (5.7)</td>
<td>9.4 (7.6)</td>
</tr>
<tr>
<td>HAQ-DI score (0–3)</td>
<td>1.1 (0.5)</td>
<td>1.0 (0.6)</td>
</tr>
<tr>
<td>Dactylitis score (0–3)</td>
<td>5.1 (4.0)</td>
<td>5.6 (3.8)</td>
</tr>
<tr>
<td>Dactylitis score (0–60)</td>
<td>2.9 (2.0)</td>
<td>6.8 (6.6)</td>
</tr>
<tr>
<td>Total SHS (0–528)</td>
<td>19.4 (30.2)</td>
<td>26.2 (36.9)</td>
</tr>
</tbody>
</table>

Table 2. Clinical and radiographic efficacy at wk 256

<table>
<thead>
<tr>
<th>Group 1a</th>
<th>Group 2b</th>
<th>Group 3c</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of pts continued in the study at wk256</td>
<td>77</td>
<td>95</td>
</tr>
<tr>
<td>ACR20 (% of pts)</td>
<td>77.9%</td>
<td>76.8%</td>
</tr>
<tr>
<td>ACR50 (% of pts)</td>
<td>49.4%</td>
<td>58.9%</td>
</tr>
<tr>
<td>ACR70 (% of pts)</td>
<td>36.4%</td>
<td>41.1%</td>
</tr>
<tr>
<td>DAS28-66/C reaction (% of pts)</td>
<td>91.9%</td>
<td>94.5%</td>
</tr>
<tr>
<td>Mean (SD) improvement in HAQ-DI</td>
<td>0.5 (0.6)</td>
<td>0.5 (0.5)</td>
</tr>
<tr>
<td>Mean (SD) improvement in dactylitis score</td>
<td>72.7%</td>
<td>68.6%</td>
</tr>
<tr>
<td>Mean % improvement in enthesitis score</td>
<td>68.3%</td>
<td>73.7%</td>
</tr>
<tr>
<td>Mean % improvement in dactylitis score</td>
<td>74.2%</td>
<td>85.8%</td>
</tr>
<tr>
<td>Radiographic progression</td>
<td>79.2%</td>
<td>75.9%</td>
</tr>
</tbody>
</table>

Disclosures: F. Behrens, Abbott Immunology Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 8, M. Koehm, None; D. Thaci, Abbott Immunology Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 8, B. Krunmel-Lorenz, Abbott Immunology Pharmaceuticals, 5, H. Burkhardt, Abbott Immunology Pharmaceuticals, 5, H. Wittig, Abbott Immunology Pharmaceuticals, 3, H. Burkhardt, Abbott Immunology Pharmaceuticals, 5.

2219

Patients with Ankylosing Spondylitis and Non-Radiographic Axial Spondyloarthritis Show Similar Response Rates After One Year of Treatment with Etanercept - results of the Esther Trial. In-Ho Song1, Kay-Geert A. Hermann2, Hildrun Haebel3, Christian Althoff4, Denis Poddubnaya5, Joachim Listing6, Anja Weidemann7, Eckhard Lange8, Brax SPA Group9. After one year of treatment with ETA the treatment effect was similarly good in AS and nr-axSpA patients regarding age (34.4 (± 7.7) vs. 33.5 (± 9.2) years), disease duration (4.0 (± 2.2) vs. 3.1 (± 1.8), male gender (55.9% vs. 56.3%), clinical disease activity in terms of BASDAI (5.0 (± 2.0) vs. 5.4 (± 1.5), CRP (7.7 (± 8.7) vs. 11.2 (± 13.7)), HLA-B27 (91.2% vs. 75.0%) and MRI SI-joint (6.7 (± 6.2) vs. 5.1 (± 5.4)) and spine scores (2.5 (± 3.6) vs. 1.1 (± 2.1) in the AS compared to the nr-axSpA group). After one year of treatment with ETA the treatment effect was similarly good in AS and nr-axSpA (reduction of BASDAI by 2.1 (95% CI 1.5–2.7) vs. 2.4 (95% CI 1.8–2.9) and reduction of ASDAS by 1.3 (95% CI 1.0–1.5) vs. 1.2 (95% CI 0.9–1.5), respectively).

Table 1. Comparison of Efficacy Parameters between patients with AS and nr-axSpA after one year of treatment with etanercept

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ETA, AS (n=34)</th>
<th>ETA, nr-axSpA (n=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASDAI50, % (95% CI)</td>
<td>59.4 (42.0–76.3)</td>
<td>74.2 (56.9–87.4)</td>
</tr>
<tr>
<td>ASAS40, % (95% CI)</td>
<td>68.8 (50.0–83.9)</td>
<td>67.7 (50.0–83.3)</td>
</tr>
<tr>
<td>ASAS partial remission, % (95% CI)</td>
<td>28.7%</td>
<td>37.9%</td>
</tr>
<tr>
<td>ASAS major improvement, % (95% CI)</td>
<td>(19.4–42.5%)</td>
<td>(27.5–71.8%)</td>
</tr>
<tr>
<td>ASAS minor improvement, % (95% CI)</td>
<td>24.1 (10.3–42.3)</td>
<td>25.0 (10.7–44.1)</td>
</tr>
<tr>
<td>ASAS inactive disease (&lt;1.3), % (95% CI)</td>
<td>27.9%</td>
<td>27.3%</td>
</tr>
<tr>
<td>ASAS inactive disease (1.4–4.9), % (95% CI)</td>
<td>(18.7–40.5%)</td>
<td>(18.9–39.4%)</td>
</tr>
<tr>
<td>Change in BASDAI (95% CI)</td>
<td>2.1 (1.5–2.7)</td>
<td>2.4 (1.8–2.9)</td>
</tr>
<tr>
<td>Change in ASDAS (95% CI)</td>
<td>1.3 (1.0–1.5)</td>
<td>1.2 (0.9–1.5)</td>
</tr>
<tr>
<td>Change CRP (95% CI)</td>
<td>5.0 (2.3–7.6)</td>
<td>4.6 (1.9–7.3)</td>
</tr>
<tr>
<td>Change MRI SI-joint score (95% CI)</td>
<td>3.7 (3.0–4.4)</td>
<td>4.3 (3.6–5.0)</td>
</tr>
<tr>
<td>Change MRI spine score (95% CI)</td>
<td>1.1 (0.6–1.7)</td>
<td>0.9 (0.3–1.5)</td>
</tr>
</tbody>
</table>

Conclusion: The response rate to TNF-blockers does not differ between AS and nr-axSpA if the baseline data regarding symptom duration and disease activity are similar for the two groups.

Disclosure: I. H. Song, Pfizer Pharmaceuticals, Merck Sharp Dohme/Shering Plough, Abbott Immunology Pharmaceuticals, 5; K. G. A. Hermann, None; H. Haibel, Pfizer Pharmaceuticals, Merck Sharp Dohme/Shering Plough, Abbott Immunology Pharmaceuticals, 5; C. Althoff, None; D. Poddubnaya, Pfizer Pharmaceuticals, Merck Sharp Dohme/Shering Plough, Abbott Immunology Pharmaceutical, 5; J. Listing, None; A. Weiß, None, E. Lange, Pfizer Inc, 3; B. Freundlich, former employee from Pfizer, 3; M. Rudwaleit, Abbott, BMS, MSD, Pfizer, Roche, and UCB, 5; J. Sieper, Abbott, Merck, Pfizer, and UCB, 2, Abbott, Merck, Pfizer, and UCB, 5, Abbott, Merck, Pfizer, and UCB, 8.

2220

Development of the Pulsar (Program to Understand the Longterm Outcomes in Spondyloarthritides) Registry. Andreas M. Remold1, Liron Stein2, Prashant Kaushik3, Vikas Majhi4, Joel D. Taurog5, and Jessica Walsh6. 1Dallas VA and University of Texas Southwest, Dallas, TX, 2Denver VA and Unio of Colorado School of Medicine, Aurora, CO, 3George W. Ehrlein VA Medical Center, Salt Lake City, UT, 4Washington DC VAMC, Georgetown and Howard University, Washington, DC, 5Phoenix, AZ, 6Denver VA and Unio of Colorado School of Med, Aurora, CO, 7Saratton VAMC, Albany, NY, 8University of Mississippi Medical Center, Jackson, MS, 9Washington DC VA and Georgetown University, Washington, DC, 10UT Southwestern Medical Center, Dallas, TX, 11University of Utah Hospital, Salt Lake City, UT.

Background/ Purpose: The spondyloarthritides are a group of conditions characterized by inflammation in the axial skeleton or peripheral joints. The arthritis may present as the primary manifestation (e.g. ankylosing spondylitis, reactive arthritis), or a related condition may predominate (inflammatory bowel disease (IBD), uveitis, or cutaneous psoriasis). To better characterize the clinical and pathophysiologic aspects of these diseases, a registry for veterans with spondyloarthropathy and related conditions was initiated in 2007.

Methods: A set of electronic medical record templates was developed for standardization of collection of clinical information at outpatient visits for spondyloarthropathy patients. Internal Review Board (IRB) approval for the PULSAR registry was obtained at 7 VA sites (Albany, NY, Dallas, TX, Denver, CO, Jackson, MS, Phoenix, AZ, Salt Lake City, UT, Washington, DC). Data collected includes demographics (age, gender, race/ethnicity, education, smoking status, comorbidities) and disease-specific features (disease classification, disease activity measures (BASDAI, BASFI, pain and global assessments, psoriasis area and global assessments), medications, laboratory and imaging results, and HLA-B27 status). Each patient’s DNA, RNA, serum, and plasma are stored in a biorepository.

Results: The PULSAR registry has enrolled 513 patients, whose diagnoses are psoriatic arthritis (29.2%), ankylosing spondylitis (20.7%), reactive arthritis (6.2%), anterior uveitis (5.5%), and IBD-related arthritis (3.7%). Patients without arthritis but with IBD or cutaneous psoriasis make up the rest of the registry and are available as controls. To date, 3677 clinic visits have been recorded, representing 2246 patient years of observation. Patients are 92% male, with mean age of 58.5 years and 13 or more years of schooling in 61.7% of the cohort. Current tobacco use is present in 24% while 62% are former smokers. Of 275 patients tested to date, 58.5% are HLA-B27 positive. The most common comorbidities are hypertension, hyperlipidemia, osteoarthritis, diabetes, and obesity. Forty percent are currently on biologic medication, 39% take an analgesic or NSAID, 36% are on a traditional DMARD, and 29% take an osteoporosis medication. The five most commonly used medications are adalimumab, methotrexate, etanercept, hydrocodone, and ibuprofen (Table).

<table>
<thead>
<tr>
<th>Medication Use</th>
<th>Current</th>
<th>Ever</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adalimumab</td>
<td>17%</td>
<td>28%</td>
</tr>
<tr>
<td>Methotrexate</td>
<td>16%</td>
<td>25%</td>
</tr>
<tr>
<td>Etanercept</td>
<td>15%</td>
<td>23%</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>15%</td>
<td>21%</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>11%</td>
<td>20%</td>
</tr>
<tr>
<td>Tramadol</td>
<td>11%</td>
<td>18%</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>10%</td>
<td>17%</td>
</tr>
<tr>
<td>Sulfasalazine</td>
<td>9%</td>
<td>16%</td>
</tr>
<tr>
<td>Infliximab</td>
<td>8%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Conclusion: The PULSAR registry is a growing resource for study of spondyloarthritides and related conditions. Anti-TNFa medications are the most commonly prescribed drugs in the registry. Standardized multi-site data collection allows for improved disease characterization and assessment of
Major Adverse Cardiovascular Events Are More Common in Rheumatoid Arthritis Than in Psoriatic Arthritis and Are Associated with Different Risk Factors.

**Objective:** To determine if the prevalence and risk factors for MACE in PsA patients and compare with prevalence and risk factors for MACE in RA patients.

**Methods:** All patients with RA and PsA who had at least one follow-up visit were included from the Consortium of Rheumatology Researchers of North America (CORRONA) database. The incidence rates (IR) for MACE per 100 person years were calculated using the following covariates with MACE rates: age, gender, body mass index (BMI), physician global assessment of disease activity (PGDA), disease duration, bone erosion status, disease modifying anti-rheumatic drugs, steroids, aspirin, smoking, diabetes, and hypertension.

**Results:** A total of 25,700 RA patients (81,104 person years of follow-up) and 3,909 PsA patients (11,828 person years of follow-up) were included. Patients with RA were older, had a lower BMI, higher disease activity status, longer disease duration, less likely to have diabetes and less likely to be on biologic therapies but more likely to be on DMARDs or steroids than PsA patients. The percentage of previous and current smokers was similar between RA and PsA patients. The adjusted IR for MACE events in RA and PsA patients were 0.65 (95% CI: 0.60–0.71) and 0.35 (CI: 0.25–0.47) respectively. The adjusted IR for MACE events in RA patients with erosions (0.25, 0.10–0.51) was lower than in those with erosions (0.53, 0.45–0.63) but in PsA patients the IR for MACE was 0.65 (95% CI: 0.60–0.71) and 0.35 (CI: 0.25–0.47) respectively. The unadjusted IR for MACE events in RA and PsA patients were higher in patients with erosions (0.71, 0.61–0.81) compared with those without erosions (0.53, 0.45–0.63) but in PsA patients the IR was slightly higher in those without erosions (0.33, 0.19–0.55) than in those with erosions (0.25, 0.10–0.51). Age, gender, history of hypertension, disease duration, steroids, diabetes and PGDA were identified as significant risk factors for MACE in the RA population. In contrast, in PsA patients, age, hypertension, gender and PGDA were the only risk factors.

### Table 1. Hazard Ratios (HR) from Multivariate Cox Regression Models in RA and PsA patients

<table>
<thead>
<tr>
<th>HR for risk of MACE events</th>
<th>RA patients</th>
<th>PsA patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.55 [0.46, 0.67]</td>
<td>0.41 [0.21, 0.80]</td>
</tr>
<tr>
<td>Age</td>
<td>2.16 [1.46, 3.19]</td>
<td>3.32 [1.05, 10.51]</td>
</tr>
<tr>
<td>60–70</td>
<td>7.07 [4.85, 10.50]</td>
<td>8.75 [2.46, 31.05]</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1.19 [0.95, 1.48]</td>
<td>1.74 [0.85, 3.56]</td>
</tr>
<tr>
<td>Previous</td>
<td>2.28 [1.81, 2.86]</td>
<td>2.55 [1.06, 6.11]</td>
</tr>
<tr>
<td>Current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of Hypertension</td>
<td>1.39 [1.06, 1.82]</td>
<td>2.08 [1.07, 4.03]</td>
</tr>
<tr>
<td>History of Diabetes</td>
<td>1.00 [1.00, 1.01]</td>
<td>1.01 [1.00, 1.03]</td>
</tr>
<tr>
<td>Duration of disease (risk per yr)</td>
<td>1.016 [1.008, 1.024]</td>
<td></td>
</tr>
<tr>
<td>Steroid use</td>
<td>1.55 [1.30, 1.86]</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** Unadjusted MACE events are more common in RA than in PsA. Only age, gender, hypertension, and PGDA were common risk factors to both forms of arthritides, although events and follow up time in PsA patients limited the number of multiple covariates that could be examined.

**Disclosure:** A. M. Reynold, None; L. Caplan, None; D. O. Clegg, None; G. S. Kerr, None; R. Chang, None; L. A. Davi, None; P. Kauhok, None; V. Majithia, None; J. S. Richards, None; J. D. Taurog, None; J. Walsh, None.

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**Spinal Mobility Measures in Normal Individuals – the Mobility Study.**

Sofia Ramiro, Carmen Stolwijk, A. M. Van Tubergen, Desíree van der Heijde, and Robert Landewe. 1 Academic Medical Center, University of Amsterdam, The Netherlands and Hospital García de Orta, Almada, Portugal. 2 Maastricht University Medical Center, Maastricht, Netherlands. 3 Leiden University Medical Center, Leiden, Netherlands. 4 Academic Medical Center, University of Amsterdam and Atrium Medical Center, Heerlen, Netherlands.

**Background/Purpose:** Spinal mobility is one of the core outcomes recommended by the Assessment of Spondyloarthritis international Society (ASAS) for following patients with axial SpA. It is currently unknown how these spinal mobility measures perform in healthy subjects and to what extent they are influenced by age, gender and height.

**Methods:** A cross-sectional study (“MOBILITY-study”) was conducted in healthy volunteers aged 20–69 years old. Recruitment was stratified by gender, age (10-year categories) and height (10cm categories). Participants were Caucasians volunteering to be measured in the Netherlands and Portugal. The exclusion criteria were factors potentially influencing spinal mobility (such as previous back surgery, known spinal osteoarthritis or low back pain). The following measures were assessed: tragus-to-wall distance (TTW, cm), occiput-to-wall distance (OTW, cm), spinal flexion (LSF, cm), cervical rotation (CR, degrees), intermalleolar distance (IMD, cm), chest expansion (CE, cm) and Schober’s test. The Bath Ankylosing Spondylitis Mobility Index (BASMI) was computed. The effects of age, gender, height and weight were investigated using linear regression analyses (univariable followed by multivariable, forward selection procedure), adjusting for potential confounders and taking relevant interactions into account.

**Results:** 393 volunteers were included. A significant decrease in all spinal mobility measures was found by increasing age, and age was included in all multivariable models (some of the models are presented in the table). E.g. an increase of 10 years was associated with a decrease of 1.5cm in LSF or a decrease of 3.4cm in IMD. Height was associated with the following spinal mobility measures: TTW, LSF, CE, IMD and BASMI, with a higher height being associated with better mobility. E.g. every increase in height of 10cm resulted in an increase of 4.2cm in IMD, an increase of 0.3cm in LSF and an increase of 1.1cm in CE. Gender was associated with CE and CR, with women having a worse mobility. Weight was positively associated with TTW and Schober’s test. An increase of 10kg resulted in an increase of 0.3cm in TTW, 0.2cm in OTW and 0.2cm in Schober’s test. There was a significant interaction between the effects of age and gender on BASMI: in women, age was the only factor with a significant effect on BASMI (β 0.03, 95% CI 0.03; 0.04). In men, age (β 0.03, 95% CI 0.02; 0.04) and weight (β (−0.01, 95% CI −0.01; −0.00) significantly contributed to BASMI.

### Table. Effect of age, gender, height and weight on spinal mobility measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Univariable linear regression β (95% CI)</th>
<th>Multivariable linear regression β (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral spinal flexion (cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>−0.15 (−0.17; −0.13)</td>
<td>−0.15 (−0.17; −0.13)</td>
</tr>
<tr>
<td>Gender (female vs male)</td>
<td>−0.59 (−1.25; 0.19)</td>
<td>0.03 (0.00; 0.06)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>0.03 (0.00; 0.07)</td>
<td>0.03 (0.00; 0.07)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>−0.01 (−0.04; 0.01)</td>
<td>−0.01 (−0.04; 0.02)</td>
</tr>
<tr>
<td>Intermalleolar distance (cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>−0.46 (−0.42; −0.27)</td>
<td>0.03 (−0.15; 0.35)</td>
</tr>
<tr>
<td>Gender (female vs male)</td>
<td>−1.05 (−1.92; 0.83)</td>
<td>0.44 (0.33; 0.55)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>0.44 (0.33; 0.55)</td>
<td>0.42 (0.33; 0.52)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>0.14 (0.05; 0.23)</td>
<td>0.15 (0.06; 0.25)</td>
</tr>
<tr>
<td>Cervical rotation (degrees)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>−0.35 (−0.42; −0.27)</td>
<td>−0.34 (−0.42; −0.27)</td>
</tr>
<tr>
<td>Gender (female vs male)</td>
<td>−4.13 (−6.43; 1.82)</td>
<td>−3.83 (−5.97; −1.67)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>0.12 (0.03; 0.21)</td>
<td>0.15 (0.05; 0.31)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>−0.03 (−0.10; 0.04)</td>
<td>−0.03 (−0.10; 0.04)</td>
</tr>
<tr>
<td>BASMI (0–10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>0.03 (0.00; 0.04)</td>
<td>0.03 (−0.01; 0.07)</td>
</tr>
<tr>
<td>Gender (female vs male)</td>
<td>0.21 (0.05; 0.38)</td>
<td>0.21 (0.05; 0.38)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>−0.01 (−0.02; −0.00)</td>
<td>0.01 (−0.02; −0.00)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>−0.00 (−0.01; 0.00)</td>
<td>−0.00 (−0.01; 0.00)</td>
</tr>
</tbody>
</table>

**Significant interaction age X gender (see text)**
Dysregulation of Chromatin Modification Enzymes in Psoriatic Arthritis. Remy Pollock, Fawnda Pellett, Vinod Chandran and Dafna Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

Background/Purpose: Chromatin modification enzymes regulate gene expression by altering the accessibility of promoters to transcription factors. Several of these enzymes are dysregulated in rheumatoid arthritis, suggesting a role for epigenetic factors in inflammatory arthritis. We sought to determine whether they are dysregulated in psoriatic arthritis (PsA), a seronegative inflammatory arthritis that develops in 30% of patients with cutaneous psoriasis (PsC).

Methods: Total RNA was isolated from peripheral blood of psoriatic disease (PsD) patients (PsA & PsC) and controls. Quantitative RT-PCR arrays were used to profile mRNA expression of 84 genes encoding DNA modified enzymes and histone modification enzymes. Significant fold changes were calculated using the ΔΔCt method and Student’s t-test. Univariate regressions were performed to examine correlations between gene expression (ΔCt) and clinical data.

Results: Gene expression profiling was performed on 20 PsA patients satisfying CASPAR criteria (mean age 48 years, males 45%, age at psoriasis 25 years, axial disease 35%, treated with methotrexate 35% and prednisone 25%), 11 PsC patients (mean age 45 years, males 50%, age at psoriasis 25 years, PsA 52.5%, and 19 controls (mean age 43 years, males 53%). Significantly dysregulated genes (fold change >1.5 or <0.68, p<0.05) are summarized in Table 1. Two genes were significantly dysregulated in PsD vs. controls. In PsC vs. controls, no genes were significantly dysregulated (fold change >1.5 or <0.68-fold, but 6 genes were dysregulated >1.2 or <0.84-fold. Eleven genes were significantly dysregulated in PsA vs. controls: HAT1, RPS6KA3, AURKC, HDAC11 (upregulated), and ASH1L, KDM6B, EHMT2, SETD1A, MIL, HDAC9, MIL3 (downregulated). In PsA vs. PsC, 3 genes were significantly dysregulated: HAT1, PRMT8, and HDAC11. In PsA patients, SETD1A expression was positively correlated with methotrexate therapy (p=0.008, r=0.58) but negatively correlated with prednisone therapy (p=0.038, r=−0.47), active joint count (p=0.017, r=−0.53), and axial disease (p=0.014, r=−0.54).

Table 1. Significantly dysregulated genes (p<0.05, fold change >1.5 or <0.68).

Conclusion: We identified several dysregulated chromatin modification enzymes in psoriatic disease, including histone methyltransferase complex component SETD1A which was downregulated in PsA and correlated with disease expression and therapy. SETD1A is located in a PsA susceptibility region on 16p11.2 that harbors genes involved in IL-23/IL-17/NF-κB signaling. HDAC11, a histone deacetylase involved in inflammation by influencing immune activation versus tolerance was downregulated in PsA compared with PsC. Future studies will seek to validate these results, examine the role of these enzymes in the epigenetic basis of PsA, and determine whether they can serve as biomarkers of PsA susceptibility and disease expression.

Disclosure: R. Pollock, None; F. Pellett, None; V. Chandran, None; D. Gladman, None.

2224

Oral Contraceptive Pill Use in Women with Ankylosing Spondylitis Is Associated with a Younger Age At Diagnosis. Dharini Mahendra1, Arane Thavaneswaran2, Adele Carty3, Nigil Haroon4, Ammepa Anton5, Laura A. Passalent6, Khalid A. Alnabiq7, Laurie M. Savage8, Elin Aslanyan9 and Robert D. Inman10. 1St Michael’s Hospital, Toronto, ON, 2Toronto Western Hospital and University of Toronto, Toronto, ON, 3Toronto Western Hospital, Toronto, ON, 4University Health Network, Toronto Western Research Institute, University of Toronto, Toronto, ON, 5Spondylitis Association of America, Van Nuys, CA, 6Spondylitis Association of America, Van Nuys, 7Toronto Western Research Institute, University Health Network and University of Toronto, Toronto, ON.

Background/Purpose: While AS is traditionally recognized as a predominantly male disease, the impact of gender differences on AS pathogenesis has not been clearly established. Specifically, the potential role of sex hormones in mediating gender impact on both AS susceptibility and disease severity remains unanswered. Both exogenous and endogenous estrogens may play a key role in AS disease expression in women. Our objective is to elucidate the potential impact of exogenous estrogen on AS initiation and severity. We hypothesized that exogenous estrogen, in the form of oral contraceptive pills (OCP), may alter AS disease activity and severity in premenopausal women.

Methods: The study population consisted of premenopausal women with AS seen in our longitudinal clinic, as well as members of the Spondylitis Association of America (SAA). Measures of disease severity included: use of biological agents, hip replacement surgery, and BASFI scores as a surrogate marker of disability. A patient questionnaire was created and used to obtain information on patient demographics, past and present OCP use, menstrual history, pregnancy history, AS duration, medication use, and hip replacement.

Results: A total of 653 women participated in this study. This was comprised of 516 OCP users and 139 non-OCP users. The mean age of OCP users was 42.2 (+/- 11.5) and 47.9 (+/- 12.2) years in non-OCP users. While no difference was noted with respect to initial onset of back pain, OCP users were significantly younger at the age of diagnosis of AS (35.7 years vs. 38.6 years, p=0.01). (Table) There was no significant difference in anti-TNF or opioid use, pregnancy complications, nor rates of hip surgery between OCP and non-OCP users. A trend towards higher rates of pregnancy complications was noted in all OCP users, although this was not statistically significant (45.4% vs. 36.5%, p=0.13). There was no significant difference in reported BASFI scores between the groups.

Conclusion: We identified several dysregulated chromatin modification enzymes in psoriatic disease, including histone methyltransferase complex component SETD1A which was downregulated in PsA and correlated with disease expression and therapy. SETD1A is located in a PsA susceptibility region on 16p11.2 that harbors genes involved in IL-23/IL-17/NF-κB signaling. HDAC11, a histone deacetylase involved in inflammation by influencing immune activation versus tolerance was downregulated in PsA compared with PsC. Future studies will seek to validate these results, examine the role of these enzymes in the epigenetic basis of PsA, and determine whether they can serve as biomarkers of PsA susceptibility and disease expression.

Disclosure: R. Pollock, None; F. Pellett, None; V. Chandran, None; D. Gladman, None.
Conclusion: The use of exogenous estrogens in the form of oral contraceptive pills is associated with a significantly earlier diagnosis of AS in women. To date, this is the largest study investigating the potential impact of exogenous estrogens in women with AS. While exogenous estrogens are not associated with surrogate indicators of disease severity, the earlier age of diagnosis of AS among women taking OCP suggests hormone modulation of disease expression in the early stages of the disease.

Disclosure: D. Mahendra, None; A. Thavaneswaran, None; A. Curti, None; N. Haroon, None; A. Anton, None; L. A. Passalent, None; K. A. Almabi, None; L. M. Savage, None; E. Aslanay, None; R. D. Inman, None.

2225
Improvement in Signs and Symptoms of Active Ankylosing Spondylitis Following Treatment with Anti-Interleukin (IL-17A) Monoclonal Antibody Secukinumab Are Paralleled by Reductions in Acute Phase Markers CRP, ESR, and S100A8 and A9 (Calgranulin A and B).

Dominique L. Baeten,1 Stephan Beck,2 Jiawei Wei3, Arndt Brachat4, Joachim Sieper5, Paul Emery6, Jurgen Braun7, Desiree van der Heijde8, Iain B. McInnes9, Jacob M. van Laar10, R. Landewe11, Paul Wordsworth12, Jurgen Wollenhaupt13, Herbert Kellner14, Jacqueline E. Paramarta15, Arthur Berto- lino16, Andrew Wright17 and Huerber Wolfgang18. 1Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands; 2Novartis Institutes for BioMedical Research, Basel, Switzerland; 3Beijing Novartis Pharma Co. Ltd., Shanghai, China; 4Novartis Pharma AG, Basel, Switzerland; 5Charité Universitätsmedizin Berlin, Berlin, Germany; 6Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom; 7Rheumazentrum Ruhrgebiet, Herne, Germany; 8Leiden University Medical Center, Leiden, Netherlands; 9University of Glasgow, Glasgow, United Kingdom; 10Musculoskeletal Research Group, Newcastle, United Kingdom; 11Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands; 12Nuffield Orthopaedic Centre, Oxford, United Kingdom; 13Schoen-Klinik Hamburg-Eilbek Teaching Hospital of the University of Hamburg, Hamburg, Germany; 14Centre for Inflammatory Joint Diseases, Munich, Germany; 15Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands

Background/Purpose: Secukinumab has shown to be well tolerated and effective in active ankylosing spondylitis (AS) patients in a proof-of-concept trial at Week (Wk) 6. 61% (4/123) of patients on secukinumab achieved Assessment of SpondyloArthritis International Society (ASAS) 20 response vs 17% (1/6) patients on placebo and the primary endpoint was met. Here we explored the modulation of markers of inflammation following secukinumab treatment, including CRP, ESR and S100 proteins A8 and A9 (calgranulin A and B), recently postulated to play a role as markers of inflammation in inflammatory arthritis.

Methods: 30 patients were randomized 4:1 to either secukinumab 2 mg/kg or placebo (i.v. infusion, 3 wks apart). Primary endpoint was the proportion of patients achieving ASAS 20 response at Wk 6. Key secondary endpoints included safety and tolerability and ASAS responses up to Wk 24. S100 calgranulins were analyzed pre- and post-treatment using an in-house validated multiplex assay and high sensitivity (hs) CRP assay. In accordance with the protocol, descriptive statistics were applied for exploratory analyses, due to the small sample size in the placebo arm. No group comparisons were conducted between secukinumab and placebo.

Results: Measurements were taken pre-treatment (Wk 0) and post-treatment (Wk 6) were available from 21 (CRP) and 14 secukinumab patients (S100A8/9), respectively. Baseline mean (SD) CRP values were 13.84 mg/L (17.40) for CRP; 1819 (717) for S100A8; and 2013 (835) ng/mL for S100A9 (S100A8/9), respectively. Baseline mean (SD) CRP values were 13.84 mg/L (H11005) respectively.

Conclusion: In this trial of secukinumab in AS, exploratory analyses of selected inflammatory markers suggest that secukinumab reduces CRP, S100A8 and S100A9, but only S100A8/9 reductions appear to correlate with clinical responses at Wk 6. Lack of correlation of CRP reductions with Wk 6 ASAS response may be attributable to the low number of patients with baseline CRP elevations. Further studies of S100 proteins in AS and their relationship with IL-17A blockade are warranted.

References:

Disclosure: D. L. Baeten, Abbott Immunology Pharmaceuticals: Pfizer Inc; Centocor, Inc.; 2, S. B. Eiken, Novartis Institutes for Biomedical Research: 2, J. Wei, Pharma Development ILS: 3, A. Brachat, Novartis Institutes for Biomedical Research: 3, J. Sieper, None; P. Emery, None; J. Braun, None; D. van der Heijde, Abbott, Angen, AstraZeneca, BMS, Centocor, Chugai, Eli-Lilly, GSK, Merck, Novartis, Otsuka, Pfizer, Roche, Sanofi-Aventis, Schering-Plough, UCB, Wyeth; 2, I. B. McInnes, Novartis Pharmaceutical Corporation: 2, J. M. van Laar, None; R. Landewe, Abbott, Angen, AstraZeneca, BMS, Centocor, GSK, Merck, Novartis, Pfizer, Roche, Schering-Plough, UCB, Wyeth Rheumatology Consultancy BV; 2, P. Wordsworth, Abbott Laboratories, Merck Pharmaceuticals: 8; J. Wollenhaupt, None, 9; H. Kellner, None, 9; J. E. Paramata, None, 9; A. Bertolino, Novartis Institute of Biomedical Research, 3, A. Wright, Novartis Pharma AG, 3, H. Wolfgang, Novartis Institute of Biomedical Research, 3.

2226
Application of Classification Criteria for Psoriatic Arthritis to Patients of the Rotterdam Early Arthritis Cohort. Jos Van der Kaap1, Johanna M.W. Hazes2, M. Vis1, Illya Tchetverikov and Jolanda J. Luime3. 1Rotterdam, Netherlands; 2Erasmus Medical Center, Rotterdam, Netherlands; 3VU University medical center, Amsterdam, Netherlands.

Background/Purpose: Psoriatic arthritis (PsA) poses a diagnostic challenge due to lack of a clear case definition. This has led to varying reports on prevalence, which is held to be 20 to 100 per 100000 [1–3], while in the past some have even questioned whether PsA should be treated as an individual entity at all[4]. Currently, the distinction between rheumatoid arthritis (RA) and PsA is still defined on clinical grounds. We compared the number of patients clinically diagnosed with PsA with the number meeting currently used classification criteria for PsA in the REACH-population.

Methods: 1216 patients from the Rotterdam Early Arthritis Cohort were used for this analysis. Patients were eligible for REACH with confirmed arthritis in at least 1 joint or 2 painful joints and at least 2 of the following criteria: morning stiffness for more than 1 hour; inability to clench a fist in the morning; pain when shaking someone’s hand; pins and
needles in the fingers; difficulties wearing rings or shoes; a family history of RA; unexplained fatigue for less than 1 year. The criteria sets considered were the Classification of Psoriatic Arthritis (CASPAR) criteria [5], the Moll & Wright (M&W) criteria [6], and the European Spondyloarthropathy Study Group (ESSG) criteria for PsA [7]. These sets were applied at baseline using descriptive statistics in STATA12. Inflammatory spinal pain was not measured in REACH and the non-specific presence of low back pain was felt to be inappropriate due to high prevalence in the REACH cohort (50%).

**Results:** In this cohort 45 (3.7%) patients were clinically diagnosed with PsA, similar to numbers previously reported [8]. In the remaining group, 60 (4.9%) met the CASPAR criteria, 33 (2.7%) met the M&W criteria and 2 (0.2%) met the modified ESSG criteria. Patients satisfying the CASPAR criteria and M&W criteria mainly had a negative Rheumatoid Factor and presence of current psoriasis. Among patients fulfilling the CASPAR criteria (n=60) the most frequent clinical diagnoses were oligo- or polyarthritis c.e.i (n=19), arthralgia or myalgia (n=12), osteoarthritis (n=8), monoarthritis c.e.i (n=6) and rheumatoid arthritis (n=5). For fulfilling the M&W criteria inflammatory arthritis is mandatory, so compared to the CASPAR criteria, patients with arthralgia or myalgia did not fulfill these. The ESSG criteria for PsA were met in 2 patients with M. Bechet's and positive family history for PsA. The total number of patients meeting classification criteria was thus 62, not including patients clinically diagnosed with PsA (n=45).

**Conclusion:** The number of patients meeting the different classification criteria sets exceeded the total number clinically diagnosed with PsA, emphasizing the diagnostic challenge in this disease. Out of the used classification sets, the CASPAR criteria were met in most patients.


**Disclosure:** J. Van der Kaap, None; J. M. W. Hazes, None; M. Vis, None; I. Tchetverikov, None; J. J. Luime, None.

2227

**Low dosage with Escalating Dosage of Infliximab in Psoriatic Arthritis Gives the Same Treatment Results as Standard Dosage of Adalimumab or Etanercept: Results From the Nationwide Registry ICEBIO.**

**Background/Purpose:** To explore differences in response to low dosage (2.3 mg/kg) regime of infliximab with possible escalating dosage in comparison to standard dosage of etanercept and adalimumab over time in patients with psoriatic arthritis (PsA).

**Methods:** Patients with PsA who were all biologic naïve and initiating anti-TNF-α therapy were selected from the ICEBIO registry which is based on the DANBIO IT platform, Demographics and clinical differences at baseline, including DAS-28CRP, were compared in four treatment groups: 1) Those who responded to low dosage of infliximab (< 4 mg/kg) 2) those who needed to increase the dosage of infliximab above 4 mg/kg, and those who received a standard dosage of 3) etanercept or 4) adalimumab. Follow-up data at 26 ± 6 and 52 ± 6 weeks and on the last visit (at least 13 weeks after the initiation of the treatment) were also compared. The Kruskal-Wallis rank sum test was used for comparison of the groups and the Wilcoxon test was used to compare the two infliximab dosage regimens.

**Results:** 185 patients, 113 women and 72 men, were identified; 84 patients received infliximab (66 etanercept and 35 adalimumab). Only 19% of the patients (16/84) treated with infliximab needed to escalate their dosage to exceed 4 mg/kg; thus those still on a low dosage regimen had a mean dosage of infliximab 2.9 mg/kg, but those who had escalated their dosage had a mean dosage of 4.5 mg/kg, i.e. still under the recommended 5 mg/kg. At baseline those who continued low dosage infliximab had a shorter disease duration (8 vs. 10 years), while those who needed to increase their dosage of infliximab had a higher CRP (10.4 vs 17.2 g/L), but neither value reached significant differences. No significant differences were observed at baseline in respect to numbers of swollen or tender joints, HAQ, VAS pain, VAS fatigue or in DAS28-CRP values. A similar treatment response was observed in all four treatment groups on follow-up.

**Conclusion:** In respect to treatment effects a low dosage of infliximab, with starting dosage of 2.3 mg/kg with possible escalating dosage, is acceptable for the majority of psoriatic arthritis patients who are in need of biological treatment. This “low dosage treatment regimen” with infliximab significantly reduces the burden of drug cost for the society.

**Disclosure:** B. Moller, Pfizer Switzerland, 2; A. Scherer, None; J. Dudler, None; B. Weiss, None; N. Yawalkar, None; P. M. Villiger, None.
Analysis of Clinical, CRP- and MRI-Responses to TNF-Blockade in Axial Spondyloarthritis Patients with Short Vs Long Symptom Duration. Anja Weiss\textsuperscript{1}, In-Ho Song\textsuperscript{2}, Hildrun Habelt\textsuperscript{3}, Joachim Listing\textsuperscript{3} and Joachim Sieper\textsuperscript{2,4}.\textsuperscript{1} German Rheumatism Research Centre, Berlin, Germany, \textsuperscript{2}Charité Medical University, Campus Benjamin Franklin, Berlin, Germany, \textsuperscript{3}German Rheumatism Research Center, Berlin, Germany, \textsuperscript{4}Charité Universitätsmedizin Berlin, Berlin, Germany

Background/Purpose: To investigate the impact of disease duration on treatment response in patients with axial spondyloarthritis (SpA) treated with etanercept (ETA) or adalimumab (ADA).

Methods: Data of 112 patients with axial SpA originally enrolled in two randomized controlled trials were pooled and analyzed. The following outcome parameters assessed after one year of treatment with ETA n=66 (1) or ADA n=46 (2) were investigated: Bath AS disease activity index (BASDAI), functional index (BASFI), AS disease activity score (ASDAS), CRP, and active inflammation on MRI in the sacroiliac joints (SIJ) and spine. Comparisons were made between patients with a short (<4 years) versus those with a longer (>=4 years) duration of symptoms. A mixed model approach was applied to compare the changes in the outcome parameters between baseline and end of year one between the symptom duration groups after adjustment for baseline status and gender. Partial Spearman correlation coefficients were calculated to analyse the relationship between change scores after taking their dependence from the baseline scores into account.

Results: Clinical parameters such as BASDAI, BASFI and ASDAS showed significantly better improvement in short vs longer diseased patients (Table 1). No significant differences were observed for MRI scores and for CRP. Furthermore, in short diseased patients the change in BASDAI correlated significantly with the change in SIJ score (rho=-0.33, p=0.03) and the change in CRP (rho=0.40, p=0.003). In contrast, in patients with a long disease duration this correlations were poor (change in BASDAI vs change in SIJ score rho=-0.01, p=0.95, change in BASDAI vs change in CRP rho=0.22, p=0.13). We further stratified the patients into CRP positive and CRP negative patients according to their status at baseline and observed larger differences between short and longer diseased patients in the CRP negative subgroup (improvement: BASDAI 3 [2.3, 3.7] vs. 1.31 [0.7, 1.9], BASFI: 2.42 [1.8, 3.1] vs. 0.93 [0.4, 1.5]) than in the CRP positive subgroup (improvement BASDAI: 3.34 [2.7, 4] vs. 2.41 [1.5, 3.3], BASFI: 2.44 [1.8, 3] vs. 1.79 [0.9, 2.7]).

Table 1. Mean changes in clinical outcome parameters adjusted for the status at baseline and gender

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline value (mean)</th>
<th>Adjusted mean changes (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;4 years n=58</td>
<td>&gt;4 years n=54</td>
<td></td>
</tr>
<tr>
<td>BASDAI</td>
<td>5.4</td>
<td>3.2 (2.7, 3.7)</td>
<td>1.7 (1.1, 2.2)</td>
</tr>
<tr>
<td>BASFI</td>
<td>4.4</td>
<td>2.4 (2.9)</td>
<td>1.2 (0.7, 1.6)</td>
</tr>
<tr>
<td>BASMI</td>
<td>1.8</td>
<td>0.3 (0.6)</td>
<td>-0.1 (-0.4, 0.2)</td>
</tr>
<tr>
<td>ASDAS</td>
<td>3.1</td>
<td>1.5 (1.3, 1.8)</td>
<td>1.1 (0.8, 1.4)</td>
</tr>
<tr>
<td>CRP</td>
<td>8.0</td>
<td>3.8 (7.5, 9)</td>
<td>1.2 (-0.9, 3.3)</td>
</tr>
<tr>
<td>MRI spine score</td>
<td>1.8</td>
<td>0.8 (0.4, 1.3)</td>
<td>1.5 (0.8, 2.1)</td>
</tr>
<tr>
<td>MRI SIJ score</td>
<td>6.0</td>
<td>3.9 (3.3, 4.6)</td>
<td>3.7 (2.8, 4.6)</td>
</tr>
</tbody>
</table>

Conclusion: 1. Axial SpA patients with short symptom duration respond clearly better to TNF-blocker therapy. 2. A good correlation between improvement of patients’ reported outcome parameters and objective parameters of inflammation was found in short but not in longer diseased patients. 3. CRP-negative axial SpA patients respond well in case of short symptom duration. These data indicate that patients with longer symptom duration, even in absence of significant structural damage and despite good suppression of inflammation, respond less well to TNF-blockade for reasons which have still to be defined.

2. Song et al, Ann Rheum Dis 2011; 70:590–96

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The Early Clinical Response of TNF-Alpha Blockers Is a Predictor of Metrology Outcome in Ankylosing Spondylitis. Eon Jeong Nam, Jung Soo Eun, Na Ri Kim, Jong Wan Kang, Churl Hyun Im and Young Mo Kang. Kyungpook National University School of Medicine, Daegu, South Korea

Background/Purpose: TNF-α blocker is the only treatment that shows a significant effect on spinal inflammation and life quality of patients with ankylosing spondylitis (AS). However, the predicting factors for the metrology outcome in AS patients treated with TNF-α blockers have not been reported. In this study, we investigated whether the early clinical efficacy of TNF-α blockers determines the metrology outcome in AS patients.

Methods: A retrospective study was conducted in a total of 119 cases who were treated with TNF-α blockers for 21 months (85 patients with one TNF-α blocker and 17 patients with two). Patients were evaluated at baseline, after three months of TNF-α blockers, and then every six months. Clinical efficacy was evaluated using Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Bath Ankylosing Spondylitis Functional Index (BASFI), ASAS20, ASAS40, ASAS5/6, BASDAI50, and acute phase reactants (ESR and CRP). Metrology outcome was assessed by BASMI and chest expansion. Primary resistance was defined as a failure of improvement of at least 20% or of absolute improvement at least two units in BASDAII scores at month 3. Kaplan-Meier (KM) survival curves were plotted to determine the rates of continuation of TNF-α blockers (drug survival).

Results: Etanercept was used in 57 cases (47.9%), adalimumab in 49 (41.2%), and infliximab in 13 (10.3%). TNF-α blockers showed a similar drug survival rate and clinical efficacy. Primary resistance developed in 5 patients (4.2%). ASAS20 response rate was 92.9%, 91.7%, 92.4%, and 90% at months 3, 9, 15, and 21, respectively. TNF-α blockers showed a clinical response rate ranging 77.2 to 83.5% by ASAS40, 74.6 to 84.5% by ASAS5/6, and 74.3 to 92.1% by BASDAI50. TNF-α blockers were associated with significantly improved metrology indices including BASMI, BASMI components, and chest expansion at months 3, 9, 15, and 21. The changes in the BASMI significantly correlated with the changes in the BASDAI (r=0.260, P<0.001), BASFI (r=0.726, P<0.001), patient’s global assessment score (r=0.479, P<0.001), physician’s global assessment score (r=0.517, P<0.001), pain score (r=0.394, P<0.001), and acute phase reactants (ESR, r=0.184, P<0.001; CRP, r=0.118, P<0.001). ASAS20 responders at month 3 had a significant reduction in BASMI and chest expansion, compared to those of baseline (p<0.001), while ASAS20 non-responders did not show a significant change. Reduction of metrology indices was maintained until month 21.

Conclusion: Axial SpA patients with short symptom duration respond clearly better to TNF-blocker therapy. A good correlation between improvement of patients’ reported outcome parameters and objective parameters of inflammation was found in short but not in longer diseased patients. 3. CRP-negative axial SpA patients respond well in case of short symptom duration. These data indicate that patients with longer symptom duration, even in absence of significant structural damage and despite good suppression of inflammation, respond less well to TNF-blockade for reasons which have still to be defined.
Conclusion: ASAS20 response at month 3 may be a valuable predictor for metrology outcome. Further studies are required to determine whether ASAS20 at month 3 is a good predictor of radiologic results along with metrology outcome in assessment of axial involvement.

Disclosure: E. J. Nam, None; J. S. Eun, None; N. R. Kim, None; J. W. Kang, None; C. H. Im, None; Y. M. Kang, None.

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Treatment of Psoriatic Arthritis with Tumour Necrosis Factor α Antagonists Successfully Maintains Work Capacity: 2 Year Results of a Prospective Cohort Study. Leonard C. Harty1, Alex Franciosi2, Naomi Pettysan3, Paul Rushe4 and Oliver M. FitzGerald1.1Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland, 2Department of Rheumatology, St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: Treatment resistant psoriatic arthritis (PsA) may render a patient unwell, disabled and incapable of work with previous reports suggesting that unemployment levels among PsA patients range from 30–50%, higher than the current national unemployment level of 14.7%. It is argued that the clinical, functional and quality of life benefits of tumour necrosis factor α inhibitor drugs (TNFi) may not be sufficient to justify their significant economic cost (national cost, >€100 million/ year in 2010). We sought to evaluate longitudinal employment levels among PsA patients treated with TNFi therapy.

Methods: A prospective cohort study of TNFi treated PsA patients between the ages of 18–65 fulfilling the CASPAR criteria with active disease despite DMARD therapy was undertaken. Economic status and disease activity were recorded at baseline and following commencement of TNFi therapy. DDAS was undertaken. Economic status and disease activity were recorded at baseline and following commencement of TNFi therapy. DDAS >1.2 was considered a good clinical response. Descriptive variables are presented as means (Standard Deviation) or percentages.

Results: Employment status of 114 PsA patients was reviewed at a mean of 26 months (22) after starting TNFi therapy. 51% were female, mean age 48 (11) and mean duration of disease of 13 years (8). 50% patients were treated with etanercept, 38% adalimumab, 9% golimumab and 6% infliximab with 46% also receiving DMARD therapy. 2% and 14.7% were unemployed and 1 had retired. Only 4% of all patients required disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi, 14 were on disability benefit prior to starting TNFi. Of those who did not, 51% of TNFi treated PsA patients maintain their employment status with 23% of previously unemployed TNFi treated PsA patients returning to the workforce. Cumulatively, 22.8% of our TNFi treated PsA patients are unemployed, an improvement on previous published levels indicating a potential economic benefit of TNFi that may become more apparent in the future. Maintenance of an individual’s work capacity likely results in societal savings that help to offset the substantial cost of TNFi treatment.

Disclosure: L. C. Harty, None; A. Franciosi, None; N. Pettysan, None; P. Rushe, None; O. M. FitzGerald, Abbott Laboratories Ireland, Bristol-Myers Squab, 2, Abbott Laboratories Ireland, UCB, 5, Abbott Laboratories Ireland, 8.

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Performance of Berlin Criteria in Patients with EARLY Spondyloarthri-
tis. Beatriz E. Joven1, Milena Gobbo2, Miguel A. DESCALZO3, Eugenio De Miguel4 and Esperanza Group5.1HOSPITAL UNIVERSITARIO 12 DE OCTUBRE, Madrid, Spain, 2Spanish Society of Rheumatology, Madrid, Spain, 3Hospital Universitario La Paz, Madrid, Spain, 4Madrid

Background/Purpose: Berlin criteria are a diagnostic algorithm based on calculation of the likelihood ratio (LR) product of currently available diagnostic test for spondyloarthritides (SpA). However, these probabilities were calculated on a longstanding population, with different features from those of an early SpA cohort. ESPeranza (ESP) is a national health care multicentre program for the early diagnosis and treatment of SpA. ESP patient characteristics were collected from baseline to onset, so it permits to explore Bayesian probabilities of each feature and reproduce Berlin algorithm. OBJECTIVES: 1. To evaluate, in an early SpA, the LR of different symptoms and signs included in Berlin criteria. 2. To evaluate the validity of Berlin algorithm for SpA diagnosis.

Methods: Patients were referred from general practitioners according with this criteria: 1) age <45years old; 2) symptom duration 3–24 months; 3) at least one of the following: inflammatory back pain (IBP), asymmetrical arthritis, SpA features associated to back pain or arthralgias (psoriasis, inflammatory bowel disease, anterior uveitis, radiographic sacroiliitis, HLA B27 positive or a family history of SpA). Patients with axial symptoms were selected (those with only arthritis were excluded) and categorized according to expected clinical diagnosis (SpA or not SpA). Data from ESP included: demographics (gender, age), clinical features (IBP characteristics, sacroiliac syndrome, enthesitis, arthritis, dactylitis, psoriasis, inflammatory bowel disease, diarrhea, uveitis, cervices, prostatitis, positive family history for SpA or good response to NSAIDs), HLA B27 or imaging data (sacroiliitis in x-ray or MRI, according to Omeract). Descriptive analysis was performed. Sensitivity and specificity, and LR positive were calculated. Classification according to Berlin LR product method was performed. In case of an LR product >200, a classification of axial SpA is made.

Results: From the 1179 patients referred in ESP program, only 422 fulfilled inclusion criteria with axial symptoms. 316 were diagnosed as SpA. Insidious onset and >3months onset were the most frequent symptoms (73% and 84%, respectively). The most useful feature among IBP was the improvement with exercise (LR+2.2), more frequent than alternating buttock pain. Arthritis was the most useful symptom for the diagnosis (LR+7), apart from MRI, following by enthesis, but heel pain (LR 5.7). Dactyliitis and uveitis and other features were less helpful, see table. Finally, MRI was the most beneficial feature (LR+16), although it was not always available. Berlin criteria applied to this early SpA population showed a lower sensitivity (65%) and higher specificity (98%) than Berlin group.

Conclusion: Our data shows that MRI is a key symptom in early SpA, while HLA B27 was less useful than results from Berlin group. Berlin diagnostic algorithm should be revisited according to these data, at least in early SpA patients.

Disclosure: B. E. Joven, None; M. Gobbo, None; M. A. DESCALZO, None; E. De Miguel, None.
Assessing the Clinical and Economic Burden of U.S. Veteran Ankylosing Spondylitis Patients. Lin Xie,1 Omer Basner,2 Hong Huang,2 Lu Li,3 Elyse K. Fritschel1 and Li Wang.2 1SТАинMED Research, Ann Arbor, MI, 2SТАинMED Research/The University of Michigan, Ann Arbor, MI, 3SТАинMED Research, Dallas, TX

Background/Purpose: To examine the economic burden, demographic and clinical characteristics of ankylosing spondylitis (AS) in the U.S. veteran population.

Methods: A retrospective database analysis was performed using the Veterans Health Administration (VHA) Medical SAS Datasets from October 1, 2007 to September 30, 2011. Patients with AS were identified using International Classification of Disease 9th Revision Clinical Modification (ICD-9-CM) diagnosis code 720.0x. Survival was determined with the PROC LIFETEST procedure, and descriptive statistics were calculated as means ± standard deviation (SD) and percentages to measure demographics, costs and utilization distribution in the sample.

Results: In patients identified with AS (n=2,455), total survival rates in the 12-month follow-up period were 98.1% for patients age ≤39, 97.0% for those age 40–64, and 89.6% for those age ≥65. The most common comorbidities in AS patients were hypertension (62.7%), any tumor or malignancy (25.5%), and diabetes (24.1%). The percentage of patients who had follow-up inpatient visits was 14.34%, which translated into $6,240 in inpatient costs per patient. The percentage of patients who had follow-up outpatient visits was 99.88%, which translated into $6,838 outpatient costs per patient. The average number of inpatient (0.25, SD=0.79), emergency room (ER) (0.10, SD=0.58), physician office (15.99, SD=16.63) and outpatient visits (17.54, SD=17.88) were also calculated for AS patients.

Conclusion: Comorbidities may play an important role in the costs of AS treatment, since more than 20% of the study population was also diagnosed with any combination of hypertension, diabetes, and tumor or malignancy.

Disclosure: L. Xie, None; O. Basner, None; A. Huang, None; L. Li, None; E. K. Fritschel, None; L. Wang, None.

US Treatment Patterns of Psoriatic Arthritis Patients Newly Initiated On Etanercept or Adalimumab. Frank Zhang1, Stan Li1 and Jeffrey R. Curtis.2 1Celgene Corporation, Warren, NJ, 2Univ of Alabama-Birmingham, Birmingham, AL

Background/Purpose: Etanercept (ETN) and Adalimumab (ADA) are commonly used biologic disease-modifying antirheumatic drugs (DMARDs) for psoriatic arthritis (PsA) patients (pts). However, little is known about subsequent treatment changes after the initiation of these two biologics. The objective of this study was to describe treatment patterns following the initiation of ETN and ADA in PsA patients in US in a real-world setting.

Methods: Adult PsA pts were selected from MarketScan Commercial Claims database (2005–2009). First ETN/ADA prescription date was defined as the index date. Pts were required to have continuous enrollment 6-month prior to (baseline period) and 12-month post index date (study period), no use of the index biologic treatment during baseline, have received ≥2 PsA diagnoses from physician office visits at any time over the 18-month period, with at least one PsA diagnosis during baseline period, and no diagnosis of ankylosing spondylitis. ETN/ADA combo therapy was defined as having at least 28 days of concomitant use of a non-biologic DMARD following the index date; otherwise ETN/ADA monotherapy was defined. Treatment patterns were captured over the 12-month study period and were defined as the following: complete treatment discontinuation—a treatment interruption of ≥60 consecutive days past the end of the days supply (discontinuation date) and no other DMARD therapy between the discontinuation date and the end of the study period; a switch in therapy—the initiation of a new non-biologic/ biologic DMARD (not used during baseline) within 60 days of the discontinuation date; intermittent use of the index biologic—≥60 days of treatment gap of the index biologic; step-down—discontinuation of one of the DMARD therapies among patients previously on combo therapy; step-up—adding another DMARD (not used during baseline) concomitantly with the index biologic for ≥28 consecutive days. Therapy modification was defined as any switch, intermittent use, step-down or step-up.

Results: A total of 2,037 and 2,217 PsA pts were newly initiated on ETN and ADA respectively, most on monotherapy (ETN: 69.2%, ADA: 67.5%). Over the 12-month study period, the majority of the pts had ≥1 therapy change (ETN: 65.3%, ADA: 69.1%), with median time to change 113 days and 112 days respectively. Among pts who initiated only one mono therapy ETN, ADA, 40.7% ETN and 33.5% ADA pts remained on the index mono therapy. 12.1% ETN and 11.6% ADA pts discontinued the treatment, 18.2% ETN and 14.7% ADA pts had intermittent treatment, 7.0% ETN and 11.4% ADA pts switched to another mono therapy, and 21.9% ETN and 29.1% ADA pts step-up to combo therapy. Among pts initiated on ETN/ADA in combination with an oral DMARD, a proportion of pts remained on the original combo therapy (ETN: 21.4%, ADA: 26.8%). The majority of the patients ‘stepped down’ to monotherapy (ETN: 77.5%, ADA: 72.7%). Very few pts discontinued both drugs in the combo therapy (ETN: 0.5%, ADA: 0.1%) or adopting intermittent biologic therapy (ETN: 0.6%, ADA: 0.3%).

Conclusion: This study suggests that most of the PsA pts newly initiated on ETN or ADA have a therapy change over the first year. Both ‘step-up’ and ‘step down’ strategy are observed frequently.

Disclosure: F. Zhang, Celgene Corporation, 3; S. Li, Celgene, 5; J. R. Curtis, Celgene, 5.

How Important Is the Assessment of ASDAS in the Long-Term Evaluation of Disease Activity in Ankylosing Spondylitis? A Comparison with CRP and DAS28. Background/Purpose: Novel and validated clinical parameters are needed to assess disease activity in ankylosing spondylitis (AS). The Ankylosing Spondylitis Disease Activity Score (ASDAS) is currently used to assess the disease activity of AS. However, no studies have compared the performance of ASDAS-CRP vs. the BSAIDAI and ASAS outcomes in assessing and predicting clinical response in AS patients under longterm TNF-blocker therapy. We aim to compare the performance of ASDAS-CRP vs. the BASDAI and ASAS outcomes in assessing and predicting clinical response in AS patients under longterm TNF-blocker therapy.

Methods: Initially, 69 patients were included in this first study of anti-TNF treatment with infliximab in AS, of whom 43 (63.2%) finished the 3rd, 42(69.0%) the 5th and 29 (42.2%) the 10th study year (y). Low disease activity status was measured by the BASDAI (<3 units) and was found to be comparable to the ASDAS definition of low disease activity (<2.1 units), while for clinical response, the ASAS-PRI was compared to the ASDAS inactive disease status (ASDAS <1.3) at different points in time over the 10y of follow-up.

Results: There was significant decrease in both ASDAS (BL: 4.3±0.8, 3y: 1.5±0.9, 5y: 1.6±1.0, 10y: 1.7±1.0) and BASDAI (BL: 6.4±2.4, 3y: 2.4±1.9, 5y: 2.4±2.0, 10: 2.7±2.0). Overall, a BASDAI <3 was achieved by 19/29 (65.5%), 18/29 patients (62.1%), and 17/29 patients (58.6%), while ASDAS <2.1 was achieved by 23/29 (79.3%), 20/29 (69%) and 19/29 (65%) patients at 3y, 5y and 10y, respectively. In comparison, ASAS-PR was found in 10/29 (34.5%) at 3y and 5/29 (17.2%) patients at 10y while ASDAS-CRP<1.3 was found in 13/29 (44.8%) at 3y and in 12/29 (41.4%) at 5y and 10y. Clinical outcome after 12 weeks of treatment was a significant predictor for achieving ASAS-PR over the 10 years of the study: for each unit of decreasing in BASDAI status at week 12, achievement of ASAS-PR at 10y increased with an OR [95% CI] of 3.64 [1.17–11.20] (p=0.025), while the OR for each unit of decreasing in ASDAS status at week 12 in order to reach ASDAS-PR at 10y was 4.76 [1.20–18.90] (p=0.027). Similar results were found for ASDAS inactive disease at the end of year 10: for each unit of decreasing in ASDAS status at week 12, achievement of ASDAS inactive disease at 10y increased with an OR [95% CI] of 4.20 [1.00–4.86] (p=0.05), while the OR for each unit of decreasing in BASDAI status at week 12 in order to reach BASDAI inactive disease at 10y was 1.64 [1.05–2.58] (p=0.029).

Conclusion: The long-term course of BASDAI and ASDAS showed similar magnitude of improvement. Interestingly the clinical outcome after 12 weeks of treatment was a significant predictor of the outcome at the end of year 10. The significant decrease of ASAS-PR rates after 10 years can be explained by the inclusion of functional assessments (BASFI) in this measure, which are not...
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Application and Feasibility of Proposed Systemic Lupus Erythematosus Reproductive Health Care Quality Indicators At a Public Urban Rheumatology Clinic. Izizar Quinzanos1, Angela Keniston1, Joann Zell2, Jinoo Yoon3, Alyssa Nash4, Rebecca Fransen4, Jennifer Stichman4, Joel M. Hirsh1, 1Denver Health Med Ctr, Denver, CO, 2National Jewish Health, Denver, CO, 3University of California San Francisco, San Francisco, CA

Background/Purpose: Reproductive health quality indicators (QIs) for systemic lupus erythematosus (SLE) have recently been developed: anti-ssA, anti-ssB, and phospholipid antibody (aPL) screening prior to pregnancy; appropriate treatment of pregnancy-associated anti-phospholipid antibodies to prevent pregnancy (PAPS); and counseling regarding risk and contraception in women taking potentially teratogenic medications (methotrexate, azathioprine, leflunomide, mycophenolate mofetil, cyclosporine, cyclophosphamide, or thalidomide). We examined performance on these QIs, their feasibility for use in a safety net rheumatology clinic, as well as sociodemographic predictors of higher performance.

Methods: Using data from the Denver Health (DH) electronic health record (EHR), we identified rheumatology clinic patients seen between July 2006 and August 2011 who had SLE, were female, and were between the ages of 18–50 years. We queried sociodemographic and other data from the EHR including age, race/ethnicity, primary language, use of interpreter services, and primary payer. Manual EHR review was conducted to determine adherence to the QIs. As a measure of feasibility, we tracked the time spent extracting the QIs. We calculated performance on each measure. For the QI regarding teratogenicity counseling, which had the largest number of eligible patients, we used either chi-square or Student’s t-tests to identify the relationship between demographic characteristics and performance.

Results: 137 female SLE patients aged 18–50 years were identified. Of these, 15 were postmenopausal or status post tubal ligation or hysterectomy. Twelve pregnancies were documented during this 5-year period. Performance on the QI regarding anti-ssA, anti-ssB or aPL testing was 100%. We were unable to assess QI#2 as no pregnant patient met criteria for PAPS. 65 patients (53%) received potentially teratogenic medications. Only 30 of these patients (46%) had documented discussions about these medications’ potential risk to a developing fetus on their initiation. Age was the only sociodemographic or other variable and that predicted performance on QI#3. Patients who received teratogenicity counseling were younger on average than those who did not (29 ± 8 and 35 ± 10 respectively, p-value = 0.0073). The chart review time was 46 hours.

Conclusion: The new SLE reproductive health QIs allowed us to detect an important gap in counseling regarding the teratogenic risk of medications in our public health academic clinic. Greater attention to this issue is needed as only about half the patients of childbearing age received appropriate counseling, with older reproductive age women having the largest gap in care. Although extraction of the QIs was technically feasible, the time for manual EHR review was long. Electronic specification of these measures may be one way to reduce their collection burden in the future.

Disclosure: I. Quinzanos, None; A. Keniston, None; J. Zell, None; J. Yazdany, None; A. Nash, None; R. Fransen, None; J. Stichman, None; J. M. Hirsh, None.

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Alpha-Chlorofatty Acid Does Not Correlate with Baseline Subclinical Cardiovascular Disease in Systemic Lupus Erythematosus. Mary A. Mahieu1, Camelia Guild2, Carolyn J. Albert3, George Kondos3, James Curr1, Daniel Edmundowicz2, David A. Ford4 and Rosalind Ramsey-Goldman5.

1Northwestern University Feinberg School of Medicine, Chicago, IL, 2Saint Louis University, Saint Louis, MO, 3University of Illinois at Chicago, Chicago, IL, 4Temple University School of Medicine, Philadelphia

Background/Purpose: Serum alpha-chlorofatty acid (α-CIFA) directly reflects in vivo myeloperoxidase activity, an important regulator of atherogenesis. The objective of our study was to investigate whether α-CIFA may be a biomarker for detection of subclinical cardiovascular disease (CVD) in patients with systemic lupus erythematosus (SLE).

Methods: One hundred eighty-five women with SLE and 186 controls participated in this ancillary study of the Study of Lupus Vascular and Bone Long-term Endpoints (SOLVABLE). Information on demographics, CVD risk factors, SLE risk factors, and baseline laboratory assessments were obtained at the first study visit. Using stored serum, α-CIFA was measured by liquid chromatography-electrospray ionization mass spectrometry with selected reaction monitoring detections. Each sample was run in triplicate. Coronary artery calcium (CAC) and aortic calcium (AC) were measured by electron beam computed tomography.

Conclusion: Serum α-CIFA does not correlate with baseline subclinical cardiovascular disease in SLE.

Disclosure: I. Quinzanos, None; A. Keniston, None; J. Zell, None; J. Yazdany, None; A. Nash, None; R. Fransen, None; J. Stichman, None; J. M. Hirsh, None.
tomography (EBCT) or multi-detector computed tomography (MDCT), and calcium scores were calculated with a densitometric program using the Agatson method. Outcome measures were the presence of higher risk CAC or AC scores (CAC >10 or AC >100) versus lower risk scores (CAC ≤10 or AC ≤100). Descriptive characteristics and univariate analyses were used to identify significant associations. Multivariate analyses controlled for established traditional CVD risk factors and variables found to be significant in the univariate analysis by p<0.05 between cases and controls.

**Results:** SLE patients had higher baseline levels of α-CF, than controls (42.2 fmoI/ml ± 19.2 vs 34.5 fmoI/ml ± 10.9, p=0.014). Cases with higher risk CAC and AC scores had statistically higher levels of α-CF, compared to controls (42.0 fmoI/ml ± 17.6 vs 33.7 fmoI/ml ± 10.5, p=0.010 for CAC; 40.4 fmoI/ml ± 12.3 vs 33.9 fmoI/ml ± 10.5, p=0.032 for AC). In contrast, cases and controls with higher risk CAC and AC scores had similar α-CF levels (43.3 fmoI/ml ± 21.5 vs 44.0 fmoI/ml ± 14.8, p=0.951 for CAC; 39.3 fmoI/ml ± 7.8 vs 37.6 fmoI/ml ± 13.1, p=0.743 for AC). In multivariate analyses, SLE had the strongest independent association with higher risk CAC scores (odds ratio (OR) 5.81; 95% confidence interval (CI) 2.28 to 14.83), followed by dyslipidemia (OR 2.31; 95% CI 1.13 to 4.74), older age (OR 1.17; 95% CI 1.10 to 1.25), and c-reactive protein level (OR 1.05; 95% CI 1.01 to 1.11).

**Conclusion:** SLE had the strongest association with higher risk CAC and AC scores (odds ratio (OR) 5.81; 95% confidence interval (CI) 2.28 to 14.83), followed by dyslipidemia (OR 2.31; 95% CI 1.13 to 4.74), older age (OR 1.17; 95% CI 1.10 to 1.25), and c-reactive protein level (OR 1.05; 95% CI 1.01 to 1.11). α-CF was not independently associated with higher risk CAC and AC scores (OR 1.00; CI 1.00 to 1.01) or higher risk AC scores (OR 1.01. 95% CI 0.99 to 1.02).

**MLN Diagnosis**

<table>
<thead>
<tr>
<th>Category</th>
<th>All (150)</th>
<th>Spain (102)</th>
<th>NYC (48)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>43.22 ± 12.49</td>
<td>35.40 ± 12.34</td>
<td>35.85 ± 12.78</td>
<td>0.275</td>
</tr>
<tr>
<td>Sex, % males</td>
<td>58.7</td>
<td>78.4</td>
<td>69.2</td>
<td>0.650</td>
</tr>
<tr>
<td>Race (Caucasian/African/Ace)</td>
<td>90.7/10.0</td>
<td>90.9/9.1</td>
<td>92.6/7.4</td>
<td>0.145</td>
</tr>
<tr>
<td>Health Insurance (Pub/Priv/No)</td>
<td>104/22/24</td>
<td>102/0/0</td>
<td>2/22/24</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>46.7 ± 64.7</td>
<td>37.9 ± 61.2</td>
<td>68.5 ± 69.2</td>
<td>0.012</td>
</tr>
<tr>
<td>SLE duration, months</td>
<td>41.0 ± 70.6</td>
<td>39.3 ± 58.1</td>
<td>118.0 ± 114.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Proteinuria 24 h, g</td>
<td>4.64 ± 3.55</td>
<td>4.72 ± 3.54</td>
<td>4.47 ± 3.11</td>
<td>0.069</td>
</tr>
<tr>
<td>Serum Albumin, g/dl</td>
<td>3.87 ± 3.57</td>
<td>4.03 ± 6.66</td>
<td>3.03 ± 4.02</td>
<td>0.222</td>
</tr>
<tr>
<td>Nephrotic Syndrome, n patients (%)</td>
<td>97 (65.0)</td>
<td>95 (66.6)</td>
<td>36 (73.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tuberculosis, n patients (%)</td>
<td>50 (30.6)</td>
<td>44 (40.8)</td>
<td>6 (15.6)</td>
<td>0.209</td>
</tr>
<tr>
<td>Mycobacterial, n patients (%)</td>
<td>7 (5.1)</td>
<td>6 (4.8)</td>
<td>1 (2.1)</td>
<td>0.367</td>
</tr>
<tr>
<td>Diabetes mellitus, n patients (%)</td>
<td>9 (6.0)</td>
<td>5 (5.3)</td>
<td>4 (8.3)</td>
<td>0.130</td>
</tr>
<tr>
<td>Dyslipidemia, n patients (%)</td>
<td>56 (37.0)</td>
<td>48 (42.8)</td>
<td>8 (16.7)</td>
<td>0.110</td>
</tr>
<tr>
<td>White blood cells, fmoI/ml</td>
<td>6.62 ± 3.310</td>
<td>6.36 ± 3.313</td>
<td>6.24 ± 3.324</td>
<td>0.151</td>
</tr>
<tr>
<td>Lymphocytes, fmoI/ml</td>
<td>1.03 ± 1.085</td>
<td>1.06 ± 1.126</td>
<td>1.23 ± 1.339</td>
<td>0.838</td>
</tr>
<tr>
<td>Platelet count, fmoI/ml</td>
<td>257.209 ± 84.106</td>
<td>236.922 ± 90.771</td>
<td>250.267 ± 70.416</td>
<td>0.192</td>
</tr>
<tr>
<td>C3</td>
<td>75.8 ± 65.302</td>
<td>75.41 ± 73.277</td>
<td>75.36 ± 73.260</td>
<td>0.906</td>
</tr>
<tr>
<td>C4</td>
<td>22.8 ± 13.217</td>
<td>22.8 ± 13.217</td>
<td>22.8 ± 13.217</td>
<td>0.018</td>
</tr>
<tr>
<td>Positive ANA, n patients (%)</td>
<td>143 (95.3)</td>
<td>101 (99)</td>
<td>42 (87.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Serology ANA, n patients (%)</td>
<td>25 (16.7)</td>
<td>25 (16.7)</td>
<td>25 (16.7)</td>
<td>1.000</td>
</tr>
<tr>
<td>pEP, positivity, n patients (%)</td>
<td>32 (21.4)</td>
<td>32 (21.4)</td>
<td>10 (20.0)</td>
<td>0.480</td>
</tr>
<tr>
<td>Proteinuria 1 g, n patients (%)</td>
<td>42 (28.0)</td>
<td>42 (28.0)</td>
<td>6 (10.4)</td>
<td>0.110</td>
</tr>
<tr>
<td>Cholesterol, mg/dl</td>
<td>1,149 ± 35.0</td>
<td>1,149 ± 35.0</td>
<td>1,149 ± 35.0</td>
<td>1.000</td>
</tr>
<tr>
<td>CRP, mg/l</td>
<td>9.70 ± 26.52</td>
<td>6.73 ± 6.72</td>
<td>18.4 ± 6.48</td>
<td>0.005</td>
</tr>
</tbody>
</table>

**MLN Treatment**

- **Hydroxychloroquine, n patients (%)** | 47 (31.3) | 37 (36.3) | 10 (20.8) | 0.041
- **Cyclophosphamide, n patients (%)** | 12 (8.1) | 10 (9.8) | 2 (4.2) | 0.380
- **Prednisolone, n patients (%)** | 135 (90.7) | 101 (99) | 36 (75) | <0.001
- **NPH Insulin, n patients (%)** | 32 (22.4) | 26 (25.3) | 6 (12) | 0.004
- **CRP, mg/l** | 9.7 ± 26.5 | 6.7 ± 6.72 | 18.4 ± 6.48 | 0.058

**Follow-up**

- **Mean follow-up, months** | 91.18 ± 84.42 | 117.73 ± 99.03 | 44.77 ± 34.16 | <0.001
- **Proteinuria 1 g, n patients (%)** | 52 (34.4) | 37 (36.3) | 15 (29.4) | 0.503
- **Renal failure (Creatinine >2.5 mg/dl), n patients (%)** | 21 (13.1) | 12 (12.6) | 9 (17.7) | 0.126
- **ESRD, n patients (%)** | 5 (3.3) | 4 (3.9) | 1 (2.0) | 0.486
- **Death, n patients (%)** | 9 (6.0) | 4 (4.9) | 5 (10.2) | 0.728
- **Additional treatments** | 10,763 | 1,723 | 0.269

**Abbreviations:** ACEI, Angiotensin converting enzyme inhibitor; pEP, Antiphospholipidic; ARB, Angiotensin Type II Receptor Blockers; CRP, C reactive protein; ESRD, End-Stage Renal Disease; HBP, High Blood Pressure; MLN, Methylprednisolone; SLE, Systemic Lupus Erythematosus.
Conclusion: MLN usually begins with nephrotic syndrome, high proteinuria and normal serum creatinine. Its prognosis is favourable in maintaining renal function although proteinuria usually persists over time. Cardiovascular disease and some socio-sanitary factors are related with poor prognosis.

Disclosure: L. Silva, None; T. Oton, None; A. Askanae, None; P. Carreira, None; F. J. López-Longo, None; A. Riveros, None; Rúa-Figueroa, None; J. Narvaez, None; E. Ruiz-Luca, None; M. Andreu, None; E. Calvo, None; F. Toyo, None; J. J. Alegre, None; E. Tomero, None; C. Montilla, None; A. Zea, None; E. Uriarte-Isacelaya, None; J. Calvo-Alen, None; C. Marras, None; V. M. Martínez-Taboada, None; M. Belmonte, None; J. Rosas, None; E. Raya, None; G. Bonilla, None; M. Freire, None.

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1Toronto Western Hospital and University Center, Toronto, ON, 2Toronto Western Research Institute, University of Toronto, Toronto, ON, 3The Hospital for Sick Children, Toronto, ON

Background/Purpose: Nontuberculous mycobacteria (NTM) have become pathogens frequently associated with skin infection in patients on immunosuppression. NTM is not unusual in lupus patients and the unawareness of this complication delays diagnosis and treatment. Studies on infections in lupus identified the common typical bacterial pathogens and little has been published on atypical pathogens in particular NTM.

We aimed to systematically review the medical literature addressing skin NTM in lupus.

Methods: We searched Ovid Medline (1946 to March 12, 2012), Embase (1980 to March 2012) for relevant publications. A study was included in the review if: 1) it included lupus patients with NTM of mucocutaneous system or soft tissue 2) it was published up to March 2012 and 3) it had well-documented clinical summaries and relevant information to the objective of this study. We scanned the titles and abstracts for initial selection. Selected articles were retrieved in full and two reviewers assessed them for eligibility and extracted the data. Descriptive statistics were used to report the results of the analysis.

Results: Of the 1356 retrieved abstracts, 17 publications were identified and 25 cases of skin NTM were extracted. In this review we included only patients with skin NTM and in all but 5 patients the infection was limited to the skin. The majority of the cases occurred in females (92%). The mean age at the time of the infection was 41 ± 13.3 years, with mean lupus duration of 12.9 ± 5.9 years. Skin presentations in this review were painless to mildly painful and ranged from papules, plaques, nodules to ulcerative lesions and abscesses and few patients developed constitutional symptoms in particular fever.

NTM in lupus patients occurred after relatively long period from the initial diagnosis of lupus and after the patients had been exposed to steroids and immunosuppressants. NTM occurred in the setting of active as well as inactive lupus. The pathogen species identified in this review included mainly M. Chelonae (9 patient-events [PE]), M. Haemophilum (4 PE), M. Avium (3 PE), M. Kansasi (2 PE), M. Fortuitum (2 PE), M. Scrofulaceum (1 PE), M. Marinatum (1 PE), M. Szulgai (1 PE) and M. Abscessus (1 PE). In 4 PE the culture was either negative or the specific species was not identified.

Surgical intervention in particular debridement of skin lesions were considered if needed. Empirical monotherapy can be initially initiated and the final choice of antibiotics should rely on the susceptibility of the culture and clinical response. The majority of the patients’ lesions improved/recovered with treatment. Nevertheless, two patients developed disseminated M. Chelonae and Fortuitum respectively and this resulted in death.

The most commonly used antibiotics in this review were ciprofloxacin, clarithromycin, ethambutol, isoniazide, rifampicin, doxycycline, amikacin, ethambutol and minocycline.

Conclusion: A high index of suspicion in lupus patients is required to diagnose NTM, as the initial presentation of NTM can mimic lupus skin manifestations. NTM should be suspected in any patient with indolent deep-nodular skin lesions, especially if routine bacterial cultures are negative.

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1MUHC, Montreal, QC, 2West Penn Allegheny Health System, Pittsburgh, PA, 3Johns Hopkins University School of Medicine, Baltimore, MD, 4North Shore-LIJ Health System, Lake Success, NY, 5Karolinska University Hospital, Stockholm, Sweden, 6Human Genome Sciences, Inc., Rockville, MD, 7Washington Hospital Center, Washington, DC

Background/Purpose: To assess the efficacy of belimumab in patients with SLE who had high disease activity at baseline, as defined by SELENA-SLEDAI score ≥10.

Methods: In 2 randomized, double-blind, multicenter phase 3 studies, 1684 SLE patients with SELENA-SLEDAI ≥6 at baseline were treated with placebo, or belimumab 1 or 10 mg/kg, plus standard SLE therapy (NCT00017487/NCT00583362). In a post-hoc analysis, the SLE Responder Index (SRI) at wk 52, flares, corticosteroid use, fatigue, and the SF-36 vitality domain were examined in a subgroup of patients with baseline SELENA-SLEDAI ≥10.

Results: 877 patients (52%) had SELENA-SLEDAI scores ≥10 on entry to the BLISS trials: 299, 283, and 296 were randomized to placebo, and belimumab 1 and 10 mg/kg, respectively. Mean baseline characteristics were similar across treatment groups. In patients with SELENA-SLEDAI ≥10 vs < 10, >80% vs 50% were anti-double-stranded DNA positive and 55%/67% vs 34%/55% had low C3/C4 levels. In patients with SELENA-SLEDAI ≥10 vs all patients in the BLISS trials, 89%/57% had >3 organ systems involved. Belimumab 1 and 10 mg/kg significantly improved SRI response, and reduced prednisone use in high disease activity patients at wk 52 (see table). Treatment with belimumab 10 mg/kg generally resulted in a greater response than with 1 mg/kg and placebo regarding reduction in severe flare risk, and improvements in SRI response, fatigue, and SF-36 vitality at wk 52.

Efficacy in Patients With SELENA-SLEDAI Scores ≥10 at Baseline

<table>
<thead>
<tr>
<th>Response parametera</th>
<th>Placebo (n = 299)</th>
<th>Belimumab 1 mg/kg (n = 283)</th>
<th>Belimumab 10 mg/kg (n = 296)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRI response: wk 52, %</td>
<td>44.1</td>
<td>58</td>
<td>63.2</td>
</tr>
<tr>
<td>p value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>No new BILAG A and ≥1 new B score</td>
<td>65.4</td>
<td>73.5</td>
<td>74.3</td>
</tr>
<tr>
<td>p value</td>
<td>0.024</td>
<td>0.017</td>
<td></td>
</tr>
<tr>
<td>4-point reduction in SELENA-SLEDAI</td>
<td>48</td>
<td>60.4</td>
<td>66.2</td>
</tr>
<tr>
<td>p value</td>
<td>0.001</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>No worsening in PGA</td>
<td>63.1</td>
<td>73.1</td>
<td>74</td>
</tr>
<tr>
<td>p value</td>
<td>0.006</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Patients with ≥1 severe flare, %</td>
<td>28.8</td>
<td>21.6</td>
<td>18.2</td>
</tr>
<tr>
<td>p value</td>
<td>0.054</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Severe flare risk over 52 wk: HR (95% CI)b</td>
<td>0.52–1.01 (0.42–0.83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prednisone reduction ≥25% from baseline to ≤1.75 mg/day: wk 40–52, n (%)c</td>
<td>12/181 (6.6)</td>
<td>32/182 (17.6)</td>
<td>31/186 (16.7)</td>
</tr>
<tr>
<td>p value</td>
<td>0.002</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>% patients with reduction in baseline prednisone from &gt; 7.5 to ≤1.75 mg/d at week 52</td>
<td>16/181 (8.8)</td>
<td>35/182 (19.2)</td>
<td>41/186 (22.0)</td>
</tr>
<tr>
<td>p value</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean FACIT-Fatigue score improvement: wk 52</td>
<td>3.38</td>
<td>4.76</td>
<td>5.12</td>
</tr>
<tr>
<td>p value</td>
<td>0.103</td>
<td>0.024</td>
<td></td>
</tr>
<tr>
<td>Mean SF-36 vitality score change: wk 52</td>
<td>7.82</td>
<td>9.69</td>
<td>10.76</td>
</tr>
<tr>
<td>p value</td>
<td>0.019</td>
<td>0.044</td>
<td></td>
</tr>
</tbody>
</table>

a p values represent comparisons of belimumab treatment with placebo; b Cox proportional hazards model; c includes only patients with baseline prednisone > 7.5 mg/day.
Conclusion: Belimumab 10 mg/kg significantly reduced disease activity, flares, corticosteroid use, and fatigue in SLE patients with high disease activity, as defined by baseline SLEDAI-2K scores ≥10.

Disclosure: A. E. Clarke, GSK, 2, HGS, BMS, MedImmune, 5, GSK, 8; S. Manzi, SEE ATTACHED, 2, SEE ATTACHED, 5, SEE ATTACHED, 7; M. A. Petrli, HGS, GSK, 5; R. Furie, HGS, GSK, 2, HGS, GSK, 5; HGS, GSK, 8; R. F. van Vollenhoven, Abbott, BMS, GSK, HGS, MSD, Pfizer, Roche, UCB, 2; Abbott, BMS, GSK, HGS, MSD, Pfizer, Roche, UCB, 5; S. Cooper, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; Z. J. Zhong, HGS, 1, HGS, 3; W. V. Freimuth, HGS, 1, HGS, 3; A. Weinstein, HGS, Genentech, Savient, Pfizer, 2, HGS, GSK, Pfizer, 5, HGS, GSK, 8.

2242

Clinical Manifestations and Predictive Factors for Response to Induction Therapy and Maintenance of Remission in ISN/RPS Class V Lupus Nephritis. Masanori Hanaoka1, Takahisa Gono1, Yasushi Kawaguchi2, Hiro-taka Kaneko2, Kae Takagi1, Hisae Ichiwa1, Yasuhito Katsumata2, Yuko Okamoto2, Yuko Ota1, Sayuri Kataoka1 and Hisashi Yamanaka1. 1Institute of Rheumatology, Tokyo Women’s Medical University, Tokyo, Japan, 2Tokyo Women’s Medical University, Tokyo, Japan

Background/Purpose: The pathophysiology and the content of treatment differ between International Society of Nephrology/Renal Pathology Society (ISN/RPS) class III/IV lupus nephritis (LN) and class V LN. However, the differences in clinical manifestations have not been revealed in detail between class III/IV LN and class V LN. Moreover, predictive factors for the response to induction therapy and the maintenance of remission have not been sufficiently investigated in class V LN. The aim of this study was to clarify the clinical manifestations and predictive factors for the response to induction therapy and the maintenance of remission in class V LN compared with class III/IV LN.

Methods: 48 patients with ISN/RPS class III/IV LN and 23 patients with class V LN were consecutively enrolled at our institute from 2001 to 2010. Clinical manifestations, autoantibodies, and treatment outcomes were analyzed and compared between two subsets. We investigated the predictive factors for the response to induction therapy and the maintenance of remission.

Results: The disease duration was significantly longer (P = 0.0024), and complement component 3 was significantly higher (P = 0.0055) in the class V LN subset. The frequency of anti-dsDNA Ab positivity did not differ between two subsets. Anti-U1snRNP Ab and anti-Sm Ab positivity were significantly higher (P = 0.0054 and P = 0.012, respectively) in the class V LN subset. Patients who were anti-dsDNA Ab-positive and anti-U1snRNP Ab-negative experienced significantly more frequent complications with class III/IV LN (odds ratio 5.1, confidence interval [CI] 1.5–17.6, P = 0.010). In contrast, patients who were anti-dsDNA Ab-negative and anti-U1snRNP Ab-positive experienced significantly more frequent complications with class V LN (odds ratio 6.5, CI 1.2–35.5, P = 0.015). The combined complete and partial remission rate exhibited no significant differentiation between two subsets (82.6% in the class V LN subset and 73.3% in the class III/IV LN subset). In the non-remission subset with class V LN, the quantification of 24-hour proteinuria on induction therapy was significantly higher (P < 0.0001) than in the remission subset with class V LN. Based on the multivariate analysis, the quantification of 24-hour proteinuria was an independent predictive factor for remission in class V LN. The relapse rate exhibited no significant differentiation between two subsets (42.1% in the class V LN subset and 30.3% in the class III/IV LN subset). In the relapse subset with class V LN, the disease duration was significantly longer and the frequency of anti-Sm Ab positivity was higher than in the maintained remission subset with class V LN. Based on the multivariate analysis, the disease duration was an independent predictive factor for the maintenance of remission in class V LN.

Conclusion: LN patients who were anti-U1snRNP/Sm Ab-positive experienced more frequent complications with class V LN. In class V LN, the increased quantification of proteinuria and the longer disease duration on induction therapy were attributed to non-responder and relapsing populations, respectively. Early intervention may improve the rate of the maintenance of remission in class V LN.

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2243

A Comparison of Systemic Lupus Erythematous (SLE) Patients Achieving Prolonged Clinical Quiescence (PCQ) On and off Corticosteroids and/or Immunosuppressive Medications. Amanda J. Steiman1, Dafna D. Gladman2, Dominique Ibanez3, Anjali Papneja4 and Murray B. Urowitz. 1Toronto Western Hospital and University of Toronto, Toronto, ON, 2Toronto Western Research Institute, University of Toronto, University Health Network, Toronto, ON, 3University of Toronto, Toronto, ON

Background/Purpose: Some patients with SLE achieve PCQ. We previously described patients achieving corticosteroid- and immunosuppressive-free PCQ. As physicians attempt to minimize patients’ exposure to these medications given their associated morbidities, this study’s aims were to describe patients who achieve PCQ maintained on these medications and to compare them to those maintaining medication-free PCQ.

Methods: Patients followed regularly in the Lupus Clinic from July 1970–October 2011 were identified. PCQ was defined as SLEDAI-2K = 0 or ≤2 on four consecutive visits, with visits ≥18 months apart, in patients consistently maintained on corticosteroids and/or immunosuppressives (“MED”). Charts were reviewed to qualitatively characterize the PCQ period. MED demographics and clinical course before and during PCQ were then compared to patients who achieved PCQ, defined above, but without the use of corticosteroids or immunosuppressives for its duration ("NO MED"). Descriptive statistics were used. Comparisons were made using t- and McNemar’s tests.

Results: 34/1613 (2.1%) MED patients were identified. Mean MED PCQ duration was 8.5 ± 2.9 years (range 5.1–16.3 years), and ended with flares in 12 patients (35.3%). In the 22 (64.7%) patients whose PCQ did not end in flare, medications were successfully discontinued in five (14.3%), being tapered in two (5.9%) with organ transplants necessitating ongoing immunosuppression; six (17.6%) patients were maintained on a stable regimen, with no standardized drug withdrawal algorithm specified; thirteen patients (8.8%) were lost to follow up. 38/1613 (2.4%) NO MED patients were identified, with mean PCQ duration 11.6 ± 6.4 years (range 5.1–29.4 years). When the groups were compared, MED patients were younger at diagnosis (27.9 ± 11.7 years versus 36.1 ± 15.2 years; p = 0.001) and required more immunosuppression (52.9% versus 23.7%; p = 0.001) and corticosteroid (100% versus 57.9%; p = 0.0001) at higher cumulative doses (42.9 ± 39.7 versus 20.7 ± 17.2 grams (among those requiring corticosteroids; n = 22); p = 0.006) prior to PCQ. There was no between-group difference in ethnicity, SLEDAI at presentation, active serology for ≥2 consecutive years, with visits ≥18 months apart, in patients consistently maintained on corticosteroids and/or immunosuppressives.”

Conclusion: 2.1% of our cohort achieves PCQ of ≥5 years on corticosteroids and/or immunosuppressives; however, this group appears heterogeneous: the minority who flared, representing a group whose disease activity is merely suppressed by ongoing medication use, and the majority who tolerated were tolerating medication withdrawal, reflective of true PCQ (as in NO MED). Further comparison between these (remission versus suppression) subgroups compared to the NO MED cohort may be instructive as each may reflect unique pathophysiology.

Disclosure: A. J. Steiman, None; D. D. Gladman, None; D. Ibanez, None; A. Papneja, None; M. B. Urowitz, None.

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Predicting Sjögren’s Syndrome At Diagnosis of Systemic Lupus Erythematosus. Gabriela Hernandez-Molina1, Tatiana Zamora-Legofí, Juanita Romero-Diaz2, Carlos Alberto Nuñez-Alvarez3, Francisco Cárdenas-Velázquez3,1, Carlos Hernández-Hernández3,1, María Luisa Calderollo1, Martha Marroquin1, Claudia Recillas-Gispert1, Carmen Avila-Casado2 and Jorge Sánchez-Guerrero1. 1Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico, 2University Health Network, Toronto Western Research Institute, University of Toronto, University Health Network, Toronto Canada, 3Mount Sinai Hospital, Toronto Canada.

Background/Purpose: Sjögren’s syndrome (SS) overlaps with systemic lupus erythematosus (SLE) in up to 20% of patients. Attempts to identify the characteristics of the SLE patients in whom this overlap occurs have been done in prevalent patients with long disease duration.

Aim: To identify clinical variables predicting the development of SS in SLE patients.

Methods: We included all patients from a prospective cohort of lupus of recent onset (<12 months) at enrolment. At entry, and every 3–6 months a standardized evaluation including clinical assessment and laboratory tests was performed. The disease duration in the SLE patients was categorized into three groups: 0–6 months, 6–12 months, and >12 months. Logistic regression analyses were performed to identify possible clinical variables associated with the SS. Patients with SS were identified by the Sjögren’s Syndrome Study Group criteria.

Results: A total of 458 patients were included in the study. The prevalence of SS was 7.7% at diagnosis. Multivariate logistic regression analysis showed that lower recent disease activity, lower anti-dsDNA Ab positivity, and higher risk of flares were independently associated with the SS. However, no significant association was found between the development of SS and other clinical variables. These findings suggest that the SLE patients with lower disease activity and more frequent flares are the ones more prone to develop SS.

Conclusion: Lower recent disease activity, lower anti-dsDNA Ab positivity, and higher risk of flares are independently associated with the development of SS in SLE patients.

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Conclusion: Vitamin D deficiency was associated with higher hsCRP at baseline, but did not predict change of hsCRP over 2 years. In fact, in contrast to a previous study in the general population (Arn J Cardiol 2012;226–30), which showed an increase in hsCRP levels over time with higher vitamin D levels, our study found a reduction in 25-OH vitamin D in this group, as well. Thus the behavior of vitamin D and hsCRP is different in SLE than in the general population.

Disclosures: A. Kianian; None. H. Fang; None. M. Petri; None.

2246


Background/Purpose: With the recent FDA approval of belimumab, clinicians are faced with adjusting their SLE treatment paradigm. The purpose of our study was to examine the patterns of belimumab use, as well as its tolerability and efficacy in a “real world” tertiary clinical setting.

Methods: We identified belimumab-receiving patients from our SLE Registry. We retrieved the demographics, belimumab indications, medications, ACR SLE criteria, SELENA-SLEDAI and SLICC scores, and PGA from the registry; we performed a focused infusion chart review for prophylactic-medications (acetaminophen and diphenhydramine) and infusion reactions (dutarit or with >24 hours of the infusion). We analyzed the baseline and 3–6–9 month data in a descriptive fashion by stratifying based on baseline SELENA-SLEDAI scores (0, 1–5, ≥6), PGA scores (0–1.49, 1.5–2.3), and prednisone dose (>7.5, >7.5 mg).

Results: 23 patients (female: 21; mean age 38.3 ±12y; mean disease duration 11.9 ±7.0y; mean SLICC score: 1.3 ±1.1) received 134 belimumab infusions (range: 1–11) between 8/11 and 6/12. All patients except one fulfilled the ACR SLE Classification Criteria; all patients were seropositive (ANA [83%] or anti-dsDNA [57%]). Indications for belimumab therapy were active mucocutaneous disease (MC) (3), active musculoskeletal disease (MSK) (10), active MC+MS (3), CNS lupus under remission but requiring high dose corticosteroids (CS) (2), active serositis (1), active skin ulcers (1), cutaneous vasculitis (1), cryoglobulinemia/cyaentopia (1), and gastrointestinal vasculitis (1). Concomitant medications were CS 19 (83%), hydroxychloroquine 18 (78%), azathioprine 4 (17%), mycophenolate mofetil 6 (26%), and methotrexate 4 (14%). Prophylactic-medications were given to 18 (86%) patients prior to infusions; 4 (17%) experienced transient infusion reactions (itching: 1, urticarial rash: 1, headache: 1, and URI/diarrhea: 1). Table demonstrates the baseline and follow-up SELENA-SLEDAI, PGA, CS dose, dsDNA, and C3/C4. One (4%) patient discontinued the medication due to lack of clinical efficacy after 2 doses. Two (8%) patients have postponed the treatment for 3 months due to hospitalizations for unrelated events (MI, MVA).

Table: Changes in log hsCRP levels, by 25-OH Vitamin D level

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean at baseline</th>
<th>Mean after 2 years</th>
<th>Change</th>
<th>p-value for change</th>
<th>Difference in change (95% CI)*</th>
<th>p-value for difference between groups†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin D &lt;21 group (n=13)</td>
<td>1.31</td>
<td>1.04</td>
<td>-0.29</td>
<td>0.01</td>
<td>0.08</td>
<td>0.78</td>
</tr>
<tr>
<td>Vitamin D ≥21 group (n=67)</td>
<td>0.66</td>
<td>0.33</td>
<td>-0.37</td>
<td>0.0041</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Difference in change: measure in vitamin D <21 group minus measure in vitamin D ≥21 group.
† Adjusted for ethnicity.

Conclusion: Vitamin D deficiency was associated with higher hsCRP at baseline, but did not predict change of hsCRP over 2 years. In fact, in contrast to a previous study in the general population (Arn J Cardiol 2012;226–30), which showed an increase in hsCRP levels over time with higher vitamin D levels, our study found a reduction in 25-OH vitamin D in this group, as well. Thus the behavior of vitamin D and hsCRP is different in SLE than in the general population.

Disclosures: A. Kianian; None. H. Fang; None. M. Petri; None.

Tuesday, November 13

S951
Background/Purpose: Trimethoprin-sulfamethoxazole (TMP/SMX) is the most widely used prophylactic medication in immunocompromised patients. Some diseases are well-known to cause allergic reactions including human immunodeficiency virus (HIV) infection and systemic lupus erythematosus (SLE). As opposed to HIV infection, the allergic reactions in patients with SLE are often severe and result in discontinuation, which leaves the patients with high risk of serious, sometimes life-threatening infection. We examined the efficacy and safety of the TMP/SMX desensitization protocol in patients with SLE.

Methods: We conducted a retrospective cohort study in the two major urban and rural hospitals in Japan. The oral TMP/SMX desensitization protocol was applied among SLE patients who newly received TMP/SMX prophylaxis from 2009 to 2012 (Group A). The outcomes were compared with SLE patients who had been previously prescribed with usual dose of TMP/SMX prophylaxis for the first time from 1997 to 2012 (Group B). Firstly, we studied the incidence of allergic reactions to TMP/SMX prophylaxis in between Group A and B. Secondly, we assessed the risk factors for the allergic reactions using patient’s demographics and laboratory data including specific antibody status. T-test and χ² test were performed to analyze these data.

Results: A total of 17 patients (2 men and 15 women, the mean age; 45.2 years old, the average dose of steroid; 160.4 mg/day of prednisone or equivalent) were enrolled for this protocol in Group A and 30 patients (3 men and 27 women, the mean age; 38.1 years old, the average dose of steroid; 26.2 mg/day of prednisone or equivalent) in Group B. Patient characteristics including sex, age, and the mean dose of steroid between groups showed no differences when compared statistically. Our analysis revealed more than half of the reduction in the incidence of allergic reactions in Group A (3/13; 23.1%) than Group B (5/6; 83.3%) (p = 0.114). In addition, in Group B, there was a higher positive rate of anti-SS-A/Ro antibody related to allergic reactions (83.3% in allergic reactions vs 16.7% in no allergic reactions; p = 0.019), but not with other specific antibodies. Furthermore, to compare only in SLE patients with positive anti-SS-A/Ro antibody, there were significantly fewer allergic reactions in Group A (3/13; 23.1%) than Group B (5/6; 83.3%) (p = 0.013). No patients who neither required hospitalization nor increased the dose of steroid therapy due to SLE flare related to prophylaxis were documented in both Group A and B.

Conclusions: Our findings suggested that the TMP/SMX desensitization protocol would be a simple, safe, and effective means for SLE patients to prevent allergic reactions. To our knowledge, this is the first report of attempting to desensitize allergic reactions to TMP/SMX in patients with SLE. An anti-SS-A/Ro antibody positive status might be a risk factor for allergic reactions to usual dose of TMP/SMX prophylaxis and it would also predict good candidates to initiate the desensitization protocol.

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Comparison of Mycophenolate Mofetil and Intra venous Cyclophosphamide As Induction Therapy in Korean Patients with Lupus Nephritis.

Background/Purpose: Although intravenous cyclophosphamide (IVC) pulses are generally accepted as standard therapy for induction treatment of active proliferative lupus nephritis (LN), several clinical trials have suggested that mycophenolate mofetil (MMF) is at least as effective as IVC. The efficacy of IVC varies among racial and ethnic groups and IVC is less effective in patients of African or Hispanic descent. In contrast, MMF seems to be consistently effective in all racial/ethnic groups. Nevertheless, it is necessary to compare these two treatment modalities among different racial or ethnic groups, particularly in Asia. This study compared the efficacy of MMF and IVC as induction treatment for LN in ethnically homogeneous Korean patients.

Methods: This study enrolled 49 LN patients with available kidney biopsy specimens. Sociodemographic, clinical, laboratory, and treatment-related data at the time of kidney biopsy and during follow-up were obtained by reviewing the patients’ charts. The renal biopsy specimens were reclassified according to the ISN-RPS classification, by a renal pathologist blinded to the previous classification. The renal outcome, i.e., complete response (CR), partial response (PR), and non-response (NR), after 6 and 12 months was defined according to the ACR 2006 response criteria for proliferative and membranous renal disease in clinical trials.

Results: Of the 49 patients, 28 (57.1%) were treated with IVC and 21 (42.9%) with MMF, both in combination with prednisolone. The baseline characteristics of the two groups were comparable, except that the IVC-treated patients had lower platelet counts (p = 0.026), lower C3 levels (p = 0.007), and higher activity scores (p = 0.021) in the renal biopsy compared to the MMF-treated patients. CR was seen in 9 of 21 patients (42.9%) receiving MMF and 14 of 28 patients (50.0%) receiving IVC after 6 months treatment (p = 0.450) and in 11 of 21 patients (52.4%) in the MMF group and 13 of 28 patients (46.4%) in the IVC group at 1 year (p = 0.745). The number of patients achieving PR and NR did not differ significantly at 6 and 12 months between the treatment groups.
Conclusion: These findings suggest that the efficacy of oral MMF at 1 year does not differ from that of IVC in induction treatment of LN in ethnically homogeneous Korean patients. MMF may be considered first-line induction therapy for treating LN in these patients.

Disclosure: D. J. Park; None. E. K. Lee; None. T. J. Kim; None. Y. W. Park; None. S. S. Lee; None.

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A Clinical Analysis of Adult Patients with Autoimmune- and Infection-Associated Hemophagocytic Lymphohistiocytosis. Min W. So1, Bon S. Koo1, You J. Kim1, Yong-Gi Kim1, Woold J. Seo1, Chang-K Lee1 and Bin Yoo1. 1University of Ulscan College of Medicine, Asan Medical Center, Seoul, South Korea. 2Seoul Veterans Hospital, Seoul, South Korea

Background/Purpose: Hemophagocytic lymphohistiocytosis (HLH) is a rare but potentially life-threatening disease. Secondary HLH is associated with various clinical conditions, including infections, malignancies, and autoimmune diseases. Although many previous studies reviewed the clinical features, treatments, and outcomes of autoimmune- or infection-associated HLH, respectively, only a few studies have evaluated the differences between autoimmune- and infection-associated HLH to these factors. The purpose of our study was to identify and compare the clinical features, treatments, and outcomes of patients with secondary HLH caused by diseases other than malignancy at a single institution.

Methods: We retrospectively collected data on 33 adult patients who were diagnosed with autoimmune- or infection-associated HLH from 1997 to 2011 at a single tertiary hospital. Patients were eligible if they were over 15 years of age and met five criteria for HLH. Patients were classified as having autoimmune- or infection-associated HLH and the medical data on each patient were reviewed.

Results: Twelve patients were diagnosed as having autoimmune-associated HLH. Among the 12 patients, nine patients had SLE and three patients had adult-onset still's disease. Steroid therapy was given to all patients. Eleven patients recovered from autoimmune associated HLH. Twenty one patients were diagnosed as having infection-associated HLH. The most common infection associated with HLH was EBV (n=19, 90.5%) followed by hepatitis A virus (n=1, 4.8%) and parvovirus B19 (n=1, 4.8%). Thirteen patients were treated according to the HLH protocol. Among the 21 patients, five patients underwent allogenic HCT. Protocol. Among the 21 patients, five patients underwent allogenic HCT.

Conclusion: The purpose of our study was to identify and compare the clinical features, treatments, and outcomes of patients with autoimmune-associated HLH. Among the 12 patients, nine patients had SLE and three patients had adult-onset still’s disease. Steroid therapy was given to all patients. Eleven patients recovered from autoimmune associated HLH. Twenty one patients were diagnosed as having infection-associated HLH. The most common infection associated with HLH was EBV (n=19, 90.5%) followed by hepatitis A virus (n=1, 4.8%) and parvovirus B19 (n=1, 4.8%). Thirteen patients were treated according to the HLH protocol. Among the 21 patients, five patients underwent allogenic HCT. Protocol. Among the 21 patients, five patients underwent allogenic HCT.

Disclosure: C. C. Mok; None. D. Birmingham; None. L. Y. Ho; None. B. H. Rovin; Genentech and Biogen Idec Inc., 5, Teva Pharmaceuticals, 2, Lilly, 5.

2252

Epratuzumab-Treated Systemic Lupus Erythematosus Patients Improvement in Health-Related Quality of Life: Final Results from an Open-Label Extension Study (SL0006). V. Strand1, K. Hobbse2, D.J. Wallace3, K. Kaluman4, B. Kilgallen5, E. Nikol6, W.A. Wegener7 and D.M. Goldenberg8. 1Stanford University, Palo Alto, CA. 2Denver Arthritis Clinic, Denver, CO. 3Cedars-Sinai Medical Center, Los Angeles, CA. 4UCSD School of Medicine, La Jolla, CA. 5UCB Pharma, Smyrna, GA. 6UCB Pharma, Brussels, Belgium. 7Immunomedics Inc, Morris Plains, NJ. 8Centre for Molecular Medicine and Immunology, Morris Plains, NJ.

Background/Purpose: Epratuzumab, a monoclonal antibody targeting CD22, is in development for the treatment of systemic lupus erythematosus (SLE). Two randomized controlled trials (RCTs): ALLEVIATE 1 and 2 were prematurely terminated because of interruption of drug supply. SL0006 was an open-label extension study in which patients previously enrolled in the ALLEVIATE trials received epratuzumab. Assessment of health-related quality of life (HRQoL) alongside measures of disease activity and damage is recommended in SLE RCTs and provides a comprehensive view of therapeutic responses. This presentation reports final data from SL0006 on the effect of epratuzumab on HRQoL measured using the 36-item Short Form Health Survey (SF-36).

Methods: All patients enrolled in ALLEVIATE US sites who received randomized treatment (n = 60) and satisfied all inclusion criteria were eligible for enrollment in SL0006. Twenty-nine patients (90% female, 79% Caucasian, mean age 40 years) entered SL0006, having received placebo (n = 5), epratuzumab (n = 8), 360 mg/m2 epratuzumab (n = 17) or 720 mg/m2 epratuzumab during the ALLEVIATE double-blind trials. In SL0006, all patients received 12-week cycles of 360 mg/m2 epratuzumab; two infusions on days 1 and 8 of each cycle. SF-36 was assessed at screening and every 4 weeks thereafter. Mean changes were compared to ALLEVIATE baseline and SL0006 screening values.

Conclusion: SF-36 is associated with certain cardiovascular risk factors and history of arterial thrombosis. HSsCRP level correlated significantly with anti-dsDNA titer (Beta = 0.33; p < 0.001) but not with complement C3 (Beta = 0.07; p = 0.26). Significantly more patients with hsCRP > 3.0 mg/L were men and chronic smokers, and had diabetes mellitus, dyslipidemia (higher atherogenic index and total / HDL cholesterol ratio) and history of arterial thrombosis. HSsCRP level correlated significantly with SLEDAI scores in the pulmonary and endocrine system after adjustment for similar covariates.

Disclosure: C. C. Mok; None. D. Birmingham; None. L. Y. Ho; None. B. H. Rovin; Genentech and Biogen Idec Inc., 5, Teva Pharmaceuticals, 2, Lilly, 5.

2254

High Sensitivity C-Reactive Protein, Disease Activity and Cardiovascular Risk Factors in Systemic Lupus Erythematosus. Chi Chiu Mok1, Daniel Birmingham2, Ling Yin Ho3 and Brad H. Rovin1. 1Tuen Mun Hospital, Hong Kong, Hong Kong. 2Ohio State University Medical Center, Columbus, OH

Background/Purpose: To study the level of high-sensitivity C-reactive protein (hsCRP) and its relationship with disease activity, damage and cardiovascular risk factors in patients with systemic lupus erythematosus (SLE).

Methods: Consecutive patients who fulfilled ACR criteria for SLE but did not have concurrent infection were recruited. Blood was assayed for hsCRP and markers of SLE activity. Clinical activity, organ damage of SLE (SLE damage index; SDI) and cardiovascular risk factors were also assessed. Linear regression was performed for the relationship among hsCRP, SLE activity, damage and cardiovascular risk factors.

Results: 303 consecutive SLE patients were invited for this study but 14 were excluded because of evidence of active infection. Two hundred and eight-nine SLE patients were finally studied (94% women; age 39 ± 13.1 years; SLE duration 7.8 ± 6.7 years). The mean SLEDAI score was 4.9 ± 5.6 and clinically active SLE was present in 122(42%) patients. The mean hsCRP level was 4.87 ± 12.7 mg/L. and 28(33%) patients with active SLE had undetectable hsCRP (<0.3 mg/L). In contrast, 51 patients (88%) who did not have clinical or serological activity (SLEDAI score = 0; N = 64) had undetectable hsCRP. Linear regression revealed a significant correlation between hsCRP and musculoskeletal (Beta = 0.21), hematological (Beta = 0.19), renal (Beta = 0.46) and clinical SLEDAI score (Beta = 0.24), adjusting for age, sex, body mass index, creatinine and the use of various medications (p < 0.005 in all). Levels of hsCRP correlated significantly with anti-dsDNA titer (Beta = 0.33; p < 0.001) but not with complement C3 (Beta = 0.07; p = 0.26). Significantly more patients with hsCRP > 3.0 mg/L were men and chronic smokers, and had diabetes mellitus, dyslipidemia (higher atherogenic index and total / HDL cholesterol ratio) and history of arterial thrombosis. HSsCRP level correlated significantly with SDI scores in the pulmonary and endocrine system after adjustment for similar covariates.

Disclosure: C. C. Mok; None. D. Birmingham; None. L. Y. Ho; None. B. H. Rovin; Genentech and Biogen Idec Inc., 5, Teva Pharmaceuticals, 2, Lilly, 5.
and cerebrovascular disease including myocardial infarction and stroke. Association with clinical features, disease duration, SLLC McC damage index and treatment of SLE were assessed in patients with MetS and without MetS.

Results: The mean age of the patients was 40.2 ± 13.4 years and (89%) were female. The mean disease duration was 112.5 ± 84 months, and the mean SLLC McC damage score was 1.05 ± 1.5. Coronary artery disease was present in 11.1% and cerebrovascular disease was in 5.4%.

The prevalence of cardiovascular events was 15.2% and of MetS was 19%. The most frequent and the least frequent criteria of MetS in SLE patients were abdominal obesity (%51.2) and hyperglycemia (%10.3) respectively. Comparing SLE patients with MetS and without MetS, age (p < 0.001), cumulative damage (p < 0.001), disease duration (p = 0.026) and CV events (p = 0.001) were associated significantly with MetS. SLE disease features and treatment modalities were not associated with MetS. CV events were related to disease duration (p = 0.05), damage (p < 0.001), pericarditis (p < 0.001), hematologic involvement (p = 0.006), lymphopenia (p < 0.001), thrombocytopenia (p = 0.002), neurological involvement (p < 0.001) and antiphospholipid (APL) antibody positivity (p = 0.008). No relationship was found between immunosuppressive drug usage or high dose corticosteroid treatment with CV events, whereas HCQ use was found protective (p = 0.005; OR: 0.32 (0.15–0.69)).

Conclusion: In SLE patients mainly consisted of young females, the prevalence of MetS events was 19% and CV events was 15.2%. MetS was associated with CV events, age, disease duration and cumulative damage whereas clinical and serological features of SLE and treatment were not related to MetS. CV events was also associated with disease duration, organ damage, pericarditis, hematologic involvement, neurological involvement and the presence of APL antibodies. There was a significant protective effect of HCQ from CV events in SLE. The prevention of MetS and long term use of HCQ are warranted to improve prognosis in SLE.

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2254


Background/Purpose: Discoid lupus lesions occur in 20% of patients with SLE at some point in their disease course, and are often resistant to therapy. Atrophy, scarring, and pigmentation are often observed consequences. Recently poor response to hydroxychloroquine has been reported among SLE patients as compared with discoid lupus erythematosus (DLE) patients without SLE.

The purpose of this study was to evaluate clinical outcome of active discoid lesions in patients with SLE and examine associated features of active discoid lupus.

Methods: Patients with active discoid lupus were identified from the University of Toronto lupus clinic, a longitudinal observational cohort study of patients with SLE diagnosed on the basis of 4 ACR criteria or 3 criteria and a biopsy positive for lupus. For each patient, information on time of resolution and chronic changes of discoid lupus lesion were obtained from the database and confirmed through chart reviews. Associated features studied included demographic features, smoking, and disease activity (SLEDAL-2K). Descriptive statistics are used to describe the study population.

Results: 68 patients with active discoid lupus were identified from among 723 inception patients (9.4%). which represented 15% of the total number of patients who had any lupus rash. The age at diagnosis of SLE was 37.2 ± 11.9 years while age at diagnosis of DLE was 39.6 ± 11.9. 59 (86.8%) were female and 41 (60.3%) were Caucasian. 30 (44.1%) patients were smokers. SLEDAL-2K was 8.66 ± 7.72 at discoid onset and adjusted mean SLEDAL was 7.51 ± 6.68. 43 (62.2%) patients were on steroid during the episode with mean steroid dose of 16.8 ± 11.6 mg/day. 56 (82.4%) were on antimalarial agents while 18 (26.5%) were on immunosuppressive agents. During their follow up 68 patients had a total of 82 episodes of DLE. Each episode lasted for 1.77 ± 2.10 years. SLE duration at discoid start was 2.3 ± 4.1 years. Pre-existing scars from previous active DLE were present in 21 (30.9%) patients while 11 (16.2%) patients developed new scars during episode and 36 (52.9%) patients never developed scars.
Conclusion: Discoid lupus is a common rash among SLE patients. SLE patients with DLE had active lupus and were taking significant doses of steroid. The duration of the discoid episode was 1.77 ± 2.10 years and 47.1% of patients developed scars.

Disclosure: G. AllohanI, None; D. Ihanez, None; D. D. Gladman, None; M. B. Urowitz, None.

2555

Apolipoprotein B Containing Lipoprotein Subclasses and Subclinical Atherosclerosis in Patients with Systemic Lupus Erythematosus (SLE). Adnan Kami1, Hong Fang1, Ehtisham Akhter1, Carmen Quiroga2, Nancy Simpson2, Petar Alauovic2 and Michelle Petri1. 1Johns Hopkins University School of Medicine, Baltimore, MD, 2Oklahoma Medical Research Foundation, Oklahoma, OK.

Background/Purpose: Traditional classification in lipid biology using HDL, LDL and VLDL does not provide information on lipoprotein function. Apolipoproteins, which are protein components of plasma lipoproteins including A, B, C, D, E) with their different composition, metabolic and atherogenic properties provide a much deeper insight on lipoprotein functioning. In particular ApoB/A-I ratio is associated with atherogenic LDL and development of cardiovascular disease. Lipoprotein function Apolipoprotein C-III and its corresponding Apolipoprotein B subclasses have been shown to be independent risk factors for cardiovascular disease in the general population. We explored the association between these non-traditional risk factors with subclinical measures of atherosclerosis (coronary artery calcium) in SLE.

Methods: 58 SLE patients (97% female, 58% Caucasian, 40% African-American, 2% other, mean age 44±11 years) had measurement of apolipoproteins and lipoproteins measured by immunoturbidimetric procedures, electroimmunoassays and immunoprecipitation. Coronary artery calcium was measured by helical CT. The p-value in the table is adjusted for age, gender, and ethnicity.

Results: Table 1. Coronary artery calcium (CAC) and Lipoprotein Subclasses

<table>
<thead>
<tr>
<th>Measures</th>
<th>Traditional CVRF</th>
<th>Log(CAC score+1)</th>
<th>P-value (adjusted)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Abnormal</td>
<td>Normal</td>
</tr>
<tr>
<td>Total Cholesterol (mg/dl)</td>
<td>42</td>
<td>16</td>
<td>0.97 (1.64)</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>48</td>
<td>10</td>
<td>1.14 (1.57)</td>
</tr>
<tr>
<td>VLDL-C (mg/dl)</td>
<td>41</td>
<td>17</td>
<td>1.23 (1.61)</td>
</tr>
<tr>
<td>LDL-C (mg/dl)</td>
<td>40</td>
<td>14</td>
<td>1.02 (1.86)</td>
</tr>
<tr>
<td>HDL-C (mg/dl)</td>
<td>10</td>
<td>44</td>
<td>1.17 (1.30)</td>
</tr>
<tr>
<td>Lipoprotein E</td>
<td>ApoA-I</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Lip-A-I</td>
<td>38</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Lip-A-I-A-II</td>
<td>15</td>
<td>43</td>
</tr>
<tr>
<td>Atherogenic</td>
<td>Lp-B-E + Lp-B:C:E</td>
<td>39</td>
<td>19</td>
</tr>
<tr>
<td>ApoB</td>
<td>46</td>
<td>12</td>
<td>1.32 (1.82)</td>
</tr>
<tr>
<td>LpB</td>
<td>55</td>
<td>3</td>
<td>1.34 (1.99)</td>
</tr>
<tr>
<td>LpB-C</td>
<td>55</td>
<td>3</td>
<td>1.38 (1.98)</td>
</tr>
<tr>
<td>ApoC-III</td>
<td>46</td>
<td>7</td>
<td>1.30 (1.90)</td>
</tr>
<tr>
<td>ApoC-III-HS</td>
<td>23</td>
<td>30</td>
<td>0.96 (1.55)</td>
</tr>
<tr>
<td>ApoC-III-HIP</td>
<td>53</td>
<td>3</td>
<td>1.4 (2.0)</td>
</tr>
<tr>
<td>CIII-R</td>
<td>36</td>
<td>22</td>
<td>1.23 (1.78)</td>
</tr>
<tr>
<td>ApoB/ApoA-I</td>
<td>44</td>
<td>14</td>
<td>1.36 (1.92)</td>
</tr>
</tbody>
</table>

Conclusion: It has been shown that apoC-III containing apoB lipoproteins are risk factors for atherosclerotic progression in rheumatoid arthritis patients (Arthritis Care Res doi:10.1002.21646;2012). In our study there was no association between any of the markers with coronary artery calcium. However, we did show that cardioprotective properties including LpA-I and ApoA-I were decreased whereas atherogenic LpA-II:B:C:D:E was increased in our patient population compared to controls. Further studies with larger sample size are warranted to confirm our findings.

Disclosure: A. Kiani, None; H. Fang, None; E. Akhter, None; C. Quiroga, None; N. Simpson, None; P. Alauovic, None; M. Petri, None.

2256

A Population of IL-21 Producing CD4+ T Cells Correlates with Disease Damage in Systemic Lupus Erythematosus (SLE) Patients. Babak Noamani1, Stacey Morrison1, Dafna Gladman1, Jorge Sanchez-Guerrero2, Murray B. Urowitz2, Joan E. Wither3 and Carolina Landolt-Marticorena6. 1Toronto Western Research Institute, Toronto, ON, 2The Toronto Western Hospital, Toronto, ON, 3Toronto Western Hospital and University of Toronto, Toronto, ON, 4Mount Sinai Hospital, University Health Network, Toronto, ON, 5Toronto Western Research Institute, University Health Network, Toronto, ON, 6University of Toronto, Toronto, ON.

Background/Purpose: SLE mice models implicate IL-21, a T cell-derived cytokine, in disease pathogenesis with cytokine over-expression promoting the development of auto-antibodies and lupus-like clinical syndromes. IL-21 dysregulation has also been noted in human SLE with a subset of patients having an increased proportion of IL-21-producing CD4+ T cells. This study aims to examine the relationship between IL-21 synthesis and distinct clinical phenotypes in human SLE.

Methods: SLE patients (n = 42) fulfilling ≥ 4 ACR criteria were recruited from an established longitudinal lupus cohort. Clinical and biochemical assessment at the time of recruitment permitted calculation of disease activity (SLEDAI-2K) and SLICC damage index. Healthy age matched controls (n = 19) were also recruited. Peripheral blood mononuclear cells were isolated over a Ficoll gradient and stimulated for 4 hours with PMA/ionomycin in the presence of GolgiStop. Cells were analyzed by flow cytometry following cell surface (anti-CD3, -CD4) and intracellular staining (anti-IL-21, -IL-17). A Mann Whitney non-parametric test was used for comparisons between groups. Elevated IL-21 expression for selected CD4+ populations was defined as ≥ 2 standard deviations above the mean for controls.

Results: A significant proportion (26.4%) of SLE patients was found to have increased levels of CD4+ IL-21 producing T cells when compared to controls. To refine this cellular population the proportion of IL-21+ IL-17+ and double positive CD4 T cells was examined. The proportion of IL-21+ IL-17+CD4+ cells was significantly elevated in SLE patients when compared to controls (p = 0.03). The IL-17 IL-21+CD4+ SLE compartment was also increased but did not reach statistical significance. No differences were noted in the double positive (IL-21 IL-17+) CD4+ T cell populations. To examine the relationship between the IL-21 IL-17+CD4+ population and specific clinical phenotypes patients were segregated on the basis of the proportion of IL-21 IL-17+CD4+ cells into IL-21 high patients (n = 10) with an equal number of patients with the lowest IL-21 expression selected as a comparator group. No statistically significant differences between these two groups (high vs low, mean ± SD) with regards to disease activity (5.8 ± 3.5 vs 5.7 ± 6.4), anti-dsDNA antibodies (35.6 ± 39.8 vs 44.0 ± 41.9) or complement levels (0.89 ± 0.18 vs 0.98 ± 0.38) was noted. IL-21 high patients had significantly higher disease damage index (SDI, p < 0.0001) than IL-21 low individuals. As a corollary patients were stratified into quartiles based on their SDI score. Patients with the highest SDI score had statistically significant higher proportion of IL-21+ IL-17+CD4+ T cells (p = 0.02) than patients in the lowest quartile.

Conclusion: These results suggest that T cell population(s) contributing to IL-21 dysregulation in SLE reside within the IL-21 IL-17+CD4+ T cell subset. Further, as disease damage can be viewed as a surrogate marker of disease severity, this data implies that increased IL-21 synthesis may be linked to more aggressive forms of SLE.

Disclosure: B. Noamani, None; S. Morrison, None; D. Gladman, None; J. Sanchez-Guerrero, None; M. B. Urowitz, None; J. E. Wither, None; C. Landolt-Marticorena, None.

2257

Association of Low Vitamin D with High Disease Activity in an Australian Systemic Lupus Erythematosus Cohort. Kristy S. Yap1, Alberto Y. Holt2 and Eric F. Morand1. 1Monash Medical Centre, Clayton, Australia, 2Monash University, Melbourne, Australia.

Background/Purpose: Previous cross-sectional studies suggest that low vitamin D may be associated with higher disease activity in SLE. Vitamin D status varies with geographic location and no studies have been reported in the Southern hemisphere. The aim of this study was to determine the relationship between Vitamin D and disease activity in SLE patients in an Australian centre.

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Tuesday, November 13
Methods: Data was collected prospectively on patients with SLE (≥4 criteria) in the Monash Lupus Clinic in Melbourne Australia between January 1 2008 and January 1 2011 who had disease activity (SLEDAI-2k) and serum 25-hydroxyvitamin D concentration (VD25) measured at the same visit. Where multiple values were available, the assessment with lowest VD25 was used (n=119).

Results: Patients with VD25 in the lowest quartile had significantly higher SLEDAI (7.7±1.3) compared to those in the highest quartile (3.9±0.8, p=0.014). Accordingly, VD25 deficiency (VD25 ≤40, n=28) was associated with significantly increased SLEDAI (7.7±1.3) compared to patients with VD25 >40 (4.8±0.6, P=0.02). The relative risk of high disease activity (SLEDAI>8) for patients with VD25 deficiency was 1.6 (95% CI 1.1–2.2, P=0.002). In parallel, high disease activity was associated with significantly lower VD25 compared to patients with SLEDAI<8 (P= 0.048) or patients with inactive disease (SLEDAI<4, P=0.0073). When assessing all values, a significant negative correlation between SLEDAI and VD25 was observed (Spearman r =0.2, p=0.03). There was no association of VD25 with corticosteroid use, SLICC SLE Damage Index (SDI), or ethnicity. Vitamin D supplement use (n=53) was significantly more common among patients using corticosteroids (P=0.0001) and was associated with significantly higher VD25 (P=0.009). However, there was no association between Vitamin D supplementation and SLEDAI.

Conclusion: In a cohort of Australian patients with SLE, Vitamin D correlates negatively with disease activity. Prospective studies should examine the predictive value of Vitamin D levels and therapeutic effect of Vitamin D.

Disclosure: K. S. Yap, None; A. Y. Hoi, None; E. F. Morand, None.

2258

Risk Factors for Total Joint Replacement in Systemic Lupus Erythematosus Patients with Avascular Necrosis

Background/Purpose: Avascular necrosis (AVN) is a common manifestation in patients with systemic lupus erythematosus (SLE) and is associated with significant morbidity. A number of studies have been conducted to elucidate the risk factors for the development of AVN. However, clinical outcomes of AVN in patients with SLE have not been highlighted. We aimed to determine the clinical features predictive of the development of AVN in SLE patients and to elucidate the risk factors for the total joint replacement (TJR) of the affected joints in SLE patients with AVN.

Methods: The medical records of 938 patients with SLE admitted to a single center in Seoul, Korea from January 1990 to April 2012 were reviewed and 66 patients with AVN were identified. A hundred and one age-and sex-matched patients with SLE who didn’t have apparent AVN were included as disease controls. The independent risk factors for the development of AVN included the disease activity at the time of diagnosis were examined by univariate and multivariate logistic regression analyses. The timing and cumulative risk of TJR were identified by Kaplan-Meier methods. The independent risk factors for TJR were determined by univariate and multivariate Cox proportional hazards regression analyses.

Results: The prevalence AVN was 7.0%. Multivariate logistic regression analysis revealed that the independent risk factors for the development of AVN included discoid rash (odds ratio (OR) 7.861, p=0.022), lymphopenia (OR 12.316, p=0.003), cushingoid feature (OR 3.029, p=0.02). Among 66 patients with AVN, 61 had AVN of the hip, 10 had AVN of knee and 1 had AVN of shoulder. Thirty-eight patients underwent total joint replacement (TJR) surgery. In univariate analysis, male patients, bilateral joint involvement, neuropsychiatric lupus, renal involvement, advanced radiological stage of AVN (Association for Research on Osseous Circulation (ARCO) stage) at the time of diagnosis were included as predictive risk factors for TJR. In multivariate analysis, only advanced radiological stage of AVN at the time of diagnosis was included as an independent risk factor for TJR (hazard ratio 2.464, p=0.038).

Conclusion: Our results demonstrated that advanced radiological stage at the onset of AVN is an independent predictive risk factor for TJR in SLE patients with AVN.

Disclosure: J. Lee, None; D. J. Kim, None; J. H. Lee, None; S. M. Jung, None; S. K. Kwok, None; J. H. Ju, None; K. S. Park, None; S. H. Park, None; H. Y. Kim, None.

2259

Limitations of Current Treatment for Systemic Lupus Erythematosus: A Patient and Physician Survey

Background/Purpose: Current SLE treatment regimens follow an ‘add-on’ paradigm: typically, therapies are added as the activity of a patient’s disease increases. Most current treatments, particularly corticosteroids (CS) and immunosuppressants (IM), frequently have severe side effects that contribute to damage in SLE. This abstract reports an analysis of data drawn from a cross-sectional survey of physicians and their consulting lupus patients.

Methods: Data were extracted from the Adelphi Real World Lupus Disease-Specific Programme (DSP), a cross-sectional survey of 233 physicians and their patients conducted between December 2009 and May 2010 in the USA, France, Germany, Italy, Spain, and the UK. Each physician completed a comprehensive patient record form for their five most recently seen SLE patients. Data collected included subjective rating of disease activity, flare occurrence, treatment satisfaction, and drug classes received. Patients were invited to fill out a self-completion questionnaire, which included EQ5D and the FACIT fatigue scale. This analysis focused on three key drug classes: CS, IM, and antimalarials (AM).

Results: The Adelphi DSP survey included 866 patients, of whom 515 completed a self-assessment questionnaire. The population was 90% female with a mean age of 42 years. A total of 16% patients (70%) were classified as having mild disease activity, compared to 247 (28%) with moderate disease activity, and 21 (2%) with severe disease activity. The numbers of patients in each disease activity group flaring in the last 12 months were 138 (22.3%), 126 (51.0%), and 12 (51.7%), respectively. The proportions of patients receiving different regimens are listed in the table. SLE treatment regimens including CS (with or without other classes) were associated with more active disease (p<0.0001) as were regimens that included ≥2 drug classes (p<0.001). Patients reporting flares were more likely to be receiving ≥2 vs ≤ 2 key drug classes (p<0.001). A greater proportion of patients reported satisfaction with their treatment regimen when it did not include CS than when it did (81% vs 68%, p<0.01). Patients receiving CS reported lower mean EQ5D than those who were not (0.731 vs 0.792; p=0.0002). However, those receiving CS did report better fatigue levels than those who were not (35.0 vs 38.4, p=0.0001). A greater proportion of physicians also reported more satisfaction with their patient’s treatment regimen when it did not include CS (p<0.001).

Conclusion: More active disease is associated with flare in the last 12 months, ≥2 classes of therapy, and use of CS specifically. Unexpectedly, physicians and patients accepted moderate or high levels of disease activity while receiving multiple medications, suggesting that they had become resigned to uncontrolled disease activity. These results support the need for new therapies for SLE, and treatment algorithms incorporating such therapies.

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2260

Serum DNase I Anti DNase I Antibodies, CRP and Antibodies to CRP Relation to Disease Activity in Systemic Lupus Erythematosus: Longitudinal Studies

Background/Purpose: Defective clearance of both nucleosomes and immune complexes has been suggested to initiate and perpetuate the disease.
Defects in DNAse I gene in mice have shown SLE like symptoms, also in humans the decreased levels and levels of DNAse I have been shown. There are few studies in SLE patients looking at these defects, a systemic study is lacking, thus we proposed to study these mechanisms.

Methods: One hundred sixty-three patients (Female: Male 13:1) were included in the study after written consent were obtained. Eighty-four patients were having active disease as measured by Systemic lupus erythematosus disease activity index (SLEDAI) core of more than 4. Sera samples were collected and stored in aliquots at −70 degree C till use. DNAse levels in sera both before and after heating at 56 degree C for 10 minutes to destroy the inhibitors of DNAse such as G protein and actin. DNAse I level were assayed in the sera of 132 patients and 52 normals individuals were done using Radial Enzyme Diffusion assay and the levels were measured using DNAse I as standard. C3, C4 and CRP were done by nephelometry. Antibodies to dsDNA and anti-DNAse I antibodies levels in sera were quantitated by ELISA using commercial and in-house ELISA respectively. The levels of DNAse I, antibodies to DNAse I and CRP were correlated with SLEDAI and between each other statistically.

Results: In patients the median DNAase I levels for pre-heated serum was 2.9 (range 0–39) while the median levels for post heated serum (indicating the inhibitor free levels of DNAase I in serum) was 5.6 (range 3.9–39). In normal individuals the median levels in preheated serum was 8.5 (range 0–26) while median levels for post heated was 13.75 (range 0–39). The DNAase I levels was significantly higher (p < 0.0001) in inhibitor depleted sera as compared to pre-heated ones in both patients and normals. Further, post heated DNAase I levels was, significantly, (p < 0.0001) reduced in patients as compared to normals. However, there was no correlation with activity status of patients as measured by SLEDAI. DNAase I levels significantly correlated with age (r = 0.222, p < 0.05). CRP, which also helps in clearing nucleosome levels in these patients, was not significantly correlated with the levels of C3, C4 and anti-dsDNA antibodies levels. The median antibodies to DNAase I levels was 44.6 arbitrary unit (AU) (range 5.11–152.08) as compared to healthy controls of 32.4 AU (range 7.77–133.08). The level of antibodies to DNAase I was higher in patients compared to normals although difference was not statistically different. Antibodies to DNAase I correlated with r = 0.18, p = 0.26 DNAse I levels. There was no correlation between levels of anti-DNAase I antibodies with SLEDAI.

Conclusion: The levels of DNAase I are reduced in the SLE patients and the levels of inhibitor to DNAase I are high in serum of these patients. The levels of anti-DNAase I antibodies are positively correlated with the DNAase I levels. However, there was no correlation of these biomarkers with composite score of disease activity.

Disclosure: R. Misra, None; A. Pratap, None; A. Singh, None; A. Aggarwal, None.

2261

Ovarian Reserve Markers in Reproductive Age Women with Systemic Lupus Erythematosus. 
Olivio B. Malheiro, Carolina P. Rezende, Gilda A. Ferreira and Fernando M. Reis. Federal University of Minas Gerais, Belo Horizonte, Brazil

Background/ Purpose: Systemic lupus erythematosus (SLE) is a multi-system disease, which affects mostly women at reproductive age, and can promote premature ovarian dysfunction related to factors associated to rheumatic disease or its treatment. The assessment of indicators of ovarian reserve can determine if there are differences between these patients and the general population, prior to the establishment of the climacteric. The aim of this study was to evaluate if there are differences in ovarian reserve markers in systemic lupus erythematosus (SLE) patients compared to controls, and explore the relationship of such markers with clinical and treatment features of SLE patients, in addition to inflammatory activity (SLEDAI/ACR) and damage (SLICC/ACR-DI) disease scores.

Methods: This was a controlled cross-sectional study including 27 women with SLE and 27 controls. All participants were between 18 and 40 years, were eumenorrheic and did not use hormone therapy or hormone contraceptives in the past 6 months. Clinical data were assessed at a regular follow up visit, serum concentrations of follicle stimulating hormone (FSH) and anti-mullerian hormone (AMH), and through transvaginal ultrasound antral follicle count were assessed at early follicular phase of a subsequent menstrual cycle.

Results: Mean age of SLE patients was 30.9 years (SD±4.8) and had 102.7 months (SD±66.7) of length disease. We found no difference between SLE group and control group at analysis of AFC (median (interquartile interval) 7 (5–13) vs. 11 (7–12), p = 0.076), FSH [6.44 (4.19–7.69) vs. 7.5 (6.03–8.09) mIU/mL, p = 0.135] and AMH levels [1.23 (0.24–4.63) ng/mL vs. 1.52 (1.33–1.88) ng/mL, p = 0.684]. However, AMH values in SLE group were more heterogenous compared to control group. The presence of nephritis and the cumulative dose of cyclophosphamide were factors individually related to reduced ovarian reserve, by association with lower values of AFC and AMH. At multivariate logistic regression, control group was more likely to have higher AMH values than the SLE (OR 5.2, 95% CI 1.286–20.405, p = 0.021) and in the SLE group, AMH was associated with lower maximum corticosteroid doses in the follow-up (OR 0.95, 95% CI 0.894–1.000, p = 0.50). AFC was associated with lower scores of SLICC/ACR-DI (OR: 0.14, 95% CI 0.025–0.841, p = 0.031).

Conclusion: SLE patients who were eumenorrheic had average values of ovarian reserve markers similar to controls. However, AMH had a wide range of values in that group, requiring study of other markers to clarify the best clinical application for it. Ovarian function is more compromised in patients with nephritis, high cumulated dose of cyclophosphamide and higher disease damage scores.

Disclosure: O. B. Malheiro, None; C. P. Rezende, None; G. A. Ferreira, None; F. M. Reis, None.

2262

Hypogammaglobulinemia in Pediatric Systemic Lupus Erythematosus. 
Emilina Lim1, and Megan A. Cooper. 1Washington University in Saint Louis- St. Louis Children’s Hospital, St. Louis, MO, 2Washington University, Saint Louis, MO

Background/ Purpose: Systemic lupus erythematosus (SLE) is characterized by B cell activation, elevated serum IgG and prominent circulating immune complexes. However, hypogammaglobulinemia in SLE patients is thought to be rare and it is unclear whether this is associated with SLE or is a transient effect of immunosuppressive treatment. Approximately 1% of patients with common variable immunodeficiency (CVID) develop symptoms or laboratory abnormalities that support the diagnosis of SLE or will manifest an SLE-like syndrome. CVID can also rarely develop in patients with established SLE. We retrospectively reviewed our pediatric SLE cases at Washington University with the goal of identifying clinical and laboratory characteristics in patients with hypogammaglobulinemia.

Methods: 115 SLE cases seen in our Pediatric Rheumatology clinic from 1997–2011 were reviewed. Eighty six patients with inclusion criteria of having an IgG level within 3 months of diagnosis and more than one IgG level during follow-up were included in this study. Excluded were patients with insufficient data for SLEDAI scoring and presence of known immunodeficiency states. Hypogammaglobulinemia was defined as an IgG level <500 mg/dl (2 SD below mean for age in pediatric population) on more than two occasions. Analysis of the different variables was done using SPSS version 10 for Windows. 

Results: Seven percent (6/86) of pediatric SLE patients were found to have hypogammaglobulinemia with a median onset of 27 months (0–72 months) after SLE diagnosis. There was no significant difference in the mean age of patients with and without hypogammaglobulinemia (13.66 years and 14.41 years respectively). The risk of developing hypogammaglobulinemia was 10x higher in males than female (p = 0.009). There was no significant difference in the binned SLEDAI scores (>10 and <10) between cohorts.
However, presence of lupus nephritis (p-value=0.004) and an IgG level of <1500 mg/dl at diagnosis (RR=4.88; 95% CI=1.00 – 24.97; p = 0.05) were both associated with hypogammaglobulinemia. Rituximab treatment did not significantly increase risk of developing hypogammaglobulinemia. Using multivariate analysis, male gender and an IgG level of less than 1500 mg/dl at diagnosis continued to show significant association with hypogammaglobulinemia in SLE. Double stranded DNA antibody, complement and alubminuria did not correlate with hypogammaglobulinemia. Interestingly, two patients with SLE and hypogammaglobulinemia had IgG levels less than 500 mg/dl within three months of diagnosis, suggesting that their hypogammaglobulinemia preceded or coincided with the onset of SLE. Two other patients exhibited concomitantly low IgA levels without symptoms. Two patients had recurrent sinopulmonary infections with poor to no vaccine response and required replacement IVIG treatment.

Conclusion: Immunoglobulin deficiency can co-exist with pediatric SLE independent of biologic drug treatment. Measurement of immunoglobulin levels in SLE could help identify patients at greater risk for infection that require more aggressive follow-up to reduce morbidity.

Disclosure: E. Lim, None; M. A. Cooper, None.

The Association Between Prior Pregnancy Morbidity and Cardiovascular Events in Women with Systemic Lupus Erythematosus

Flora Simmons1, Natasha M. Ruth 1, Gary S. Gilkeson1 and Diane L. Kamen2. 1Medical University of South Carolina, Charleston, SC, 2Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Charleston, SC

Background/Purpose: Adverse pregnancy outcomes have been associated with increased cardiovascular disease in healthy women. We hypothesized that women with SLE and a history of adverse pregnancy outcomes would have a higher rate of cardiovascular events.

Methods: Prior pregnancy outcomes, cardiovascular risk factors and events were collected in 2010 and 2011 through a longitudinal lupus registry. Study participants were enrolled at 17 lupus centers across North America. At enrollment, each patient reported her prior pregnancies and outcomes, including live birth, week gestation (<37 weeks indicated preterm delivery), and preeclampsia. Cardiovascular events were recorded in the SLICC-Damage Index at study entry and included prior aortic or CABB, myocardial infarction, or cerebrovascular accident. Prior medical history, including a diagnosis of hypertension, diabetes, and hypercholesterolemia, current medications, and prior and current laboratory values were also reported. Univariate and multivariate analyses compared the frequency of pregnancy morbidity (a pregnancy loss, a preterm delivery, or a pregnancy with preeclampsia) among women with and without cardiovascular events. Nulliparous women were excluded from the analysis.

Results: Data are available for 602 women, of whom 316 (52.5%) had at least one prior pregnancy morbidity. The average age of SLE diagnosis and LCTC enrollment was lower for women with a pregnancy morbidity (31.2 years and 43.8 years, respectively) compared to women without a pregnancy morbidity (34.3 and 46.6 years, p<0.01). Women with a prior pregnancy morbidity were more likely to have antiphospholipid syndrome (11.1% vs 4.2%, p=0.008). The systolic blood pressure measured at enrollment, the frequency of hypertension, and the use of antihypertensive medications at LCTC enrollment were all significantly higher among women with a history of pregnancy morbidity. In contrast, the frequency of diabetes mellitus, use of anti-cholesterol medications, and hypercholesterolemia at enrollment were not significantly different between the pregnancy groups. Despite the significant increase in hypertension, the frequency of overall cardiovascular events was not significantly different between the groups: 8.23% with pregnancy morbidity vs 6.64% without pregnancy morbidity, p=0.4. A multivariate analysis demonstrated that cardiovascular events were associated with older age at LCTC enrollment, hypertension, and APS, but not race, number of pregnancies, or pregnancy morbidity.

Conclusion: Prior pregnancy morbidity is not significantly associated with cardiovascular events in this large multicenter multiethnic/racial cohort of lupus patients. This may be due to the relative young age of the cohort with the average age less than 50 years at entry. The association of pregnancy morbidity with hypertension, however, suggests that these women may be a higher risk for future cardiovascular events.

Disclosure: M. Clowse, UCB, S.; E. F. Chakravarty, None; J. Buyon, Exagen; S.; G. McGwin Jr., None.

Improving Outcomes for Pregnant Lupus Patients: Is There a Geographic Link?

Darneesh Thornton-Johnson1 and Daniel Albert2. 1Dartmouth Institute for Health Policy and Clinical Practice, Lebanon, NH, 2Dartmouth-Hitchcock Medical Center, Geisel School of Medicine, Lebanon, NH

Background/Purpose: Systemic lupus erythematosus (SLE) is stated to lead to miscarriages, preterm births, and other complications among pregnant women previously diagnosed with the disease. According to the LUMINA cohort study headed by Dr. Graciela Alarcon, this is especially true for young women of African-American or Hispanic origin as they may have a genetic predisposition and lack of resources to effectively manage the illness. Despite the landmark LUMINA findings, there remain few sources on geographic disparities experienced by lupus patients. The current literature shows potential uses for geographic analysis particularly through the process of geocoding patient zip codes and the development of Medically Underserved Areas.

Methods: The authors, in consultation with a statistician, performed a secondary data analysis using logistic regression on the STATA statistical software package. The authors analyzed the following variables: zip code, age, race, income, education, preterm birth of fetus, miscarriage/spontaneous abortion frequency, mode of delivery (vaginal or c-section) and corticosteroid injection amount (re: dosage).

Continuous variables, such as age and dosage amounts, were analyzed via descriptive statistics whereas dichotomous variables were analyzed via logistic regression. It was in the logistic regression that the authors were able to find statistically significant results. The authors soon compared the statistically significant variables with US Census-designated, Medically Underserved Areas to reveal stunning results.

Results: Data analysis gave 3 US Census-designated urban areas and 3 US Census-designated rural areas of interest. Urban areas were the following: Bessemer, Alabama; Houston, Texas; Pasadena, Texas.

Many of the patients from the aforementioned areas within the dataset have high dosages of corticosteroids and inconsistent physician visit dates—leading to more complications. Women who are able to go to the doctor regularly while pregnant can effectively manage the lupus with less corticosteroids (as indicated in the dataset) and other drugs to have a relatively safe pregnancy. If they can’t do that, the pregnancy may be more problematic.

Conclusion: Women who live in rural areas also exhibited higher rates of pregnancy complications in terms of miscarriages when taken into consideration one’s age, race, educational level and income gains. A factor why rural women suffer from the effects of the illness disproportionately may be due to educational attainment, income, and geographic distance. The results of this study can lead to better reproductive health outcomes that include full-term pregnancies, economically feasible treatment options, and a higher quality of life due to coordinated care that best serves their needs.

Disclosure: D. Thornton-Johnson, American College of Rheumatology, 2; D. Albert, None.

Clinical Manifestations of Systemic Lupus Erythematosus Vary Based On Age of Disease Onset

Flora Simmons1, Natasha M. Ruth 1, Gary S. Gilkeson1 and Diane L. Kamen2. 1Medical University of South Carolina, Charleston, SC, 2Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Charleston, SC

Background/Purpose: Systemic lupus erythematosus (SLE) is an autoimmune disease which disproportionately affects women of child-bearing age. However, onset during childhood and late adult onset can be seen. Previous studies found that age of onset may be predictive of certain clinical manifestations and childhood-onset associated with increased mortality. The purpose of our study is to compare the clinical differences between childhood, adult, and late onset SLE within a large predominantly African American cohort.

Methods: Participants enrolled in an observational database of SLE were included in this study if they met ≥4 of 11 modified ACR Classification Criteria for SLE. Data was collected prospectively from 2003 to 2012. Demographic and clinical features were collected at baseline and updated at follow-up visits. Damage was scored using the SLICC/ACR Damage Index (SDI). Age of onset was categorized in three groups: childhood onset (<18 years old), adult onset (18 – 50 years old), and late onset (>50 years old). Chi-squared or Fisher’s Exact testing was used, as appropriate, to compare
Late onset patients have a higher proportion of females to males compared to childhood onset, but are significantly less likely to be African American. Childhood onset patients have the highest prevalence of renal and neurologic involvement from SLE (p-values <0.01 and 0.01 respectively) and were more likely, although not statistically significant, to have irreversible damage as reflected by the SDI.

Conclusion: These results support childhood onset SLE being a more severe form of SLE, supporting the critical need for preventive interventions early in the course of disease. Patients with earlier onset of SLE were more likely to have renal and neurologic involvement, which are leading causes of morbidity and mortality in SLE.

Disclosure: F. Simmons; None; N. M. Ruth; None; G. S. Gilkeson; None; D. L. Kamen; None.

### Table 1. Characteristics if graft failure and graft survival patients.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Graft Failure (N=4)</th>
<th>Graft survival (N=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td><strong>F 75%</strong></td>
<td><strong>F 84%</strong></td>
</tr>
<tr>
<td><strong>Age at lupus diagnosis</strong></td>
<td>25±4.3</td>
<td>24±4.2±8.3</td>
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<td><strong>Age at transplant</strong></td>
<td>29±8±9.1</td>
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<td><strong>Lupus duration at 1st clinic visit</strong></td>
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<td>7.2±7.8</td>
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<tr>
<td><strong>Lupus duration at transplant</strong></td>
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<td><strong>Ethnicity</strong></td>
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<td>9/19</td>
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<td><strong>Positive DNA and/or low complements in 1 year after transplant</strong></td>
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</tr>
<tr>
<td><strong>SDI at transplant</strong></td>
<td>4.0±2.0</td>
<td>4.6±1.9±0(n=17)</td>
</tr>
<tr>
<td><strong>Time (duration) on dialysis prior to transplant</strong></td>
<td>3.9±2.4 (n=4)</td>
<td>5.8±5.6±0 (n=6)</td>
</tr>
</tbody>
</table>

The time to graft failure (n=4) was 5.75±4.99y. In the failure group 3 patients died by 6.5±19 years and one patient is still alive. In the graft survival group 3 patients died by 5.6±4.6 years and one patient was lost of follow-up. Cause of death was not related to renal disease in 2patients and unknown in one patient.

Conclusion: 25 of 780 lupus nephritis patients followed at the Lupus Clinic underwent RT. The persistence of serological abnormalities at the time of RT was not associated with graft failure.

Disclosure: Z. Touma; None; M. B. Urowitz; None; D. Ibanez; None; D. D. Gladman; None.

### ACR/ARHP Poster Session C

#### Systemic Lupus Erythematosus - Human Etiology and Pathogenesis

**Tuesday, November 13, 2012, 9:00 AM–6:00 PM**

#### 2266

**Outcomes of Renal Transplantation in Lupus Patients with Positive and Negative Serology: Survival of the Graft and Patients After Transplantation**

Zahi Touma, Murray B. Urowitz, Dominique Ibáñez and D. D. Gladman. Toronto Western Hospital and University of Toronto, Toronto, ON

**Background/Purpose:** Lupus nephritis (LN) occurs in 50–75% of adults with SLE and up to 20% of LN patients may advance to end stage renal disease over a 10-year period. The aims of this study were to provide an overview of the characteristics of lupus patients with renal transplantation (RT) followed in the Lupus Clinic between 1970–2012, and to determine the survival of the graft and patients after RT.

**Methods:** Patients with lupus have been followed prospectively at the lupus clinic since 1970. Patients attend the clinic at 2–6 month intervals and the standard protocol includes: complete history, physical and laboratory evaluation. Patients who underwent RT were identified from the database. RT outcomes included: a) nonfunctional graft requiring dialysis within ≤3 weeks, b) graft failure requiring permanent dialysis after 3 weeks, c) graft survival not requiring dialysis and d) death.

Descriptive analysis was used to study the characteristics of all patients. We grouped the patients into graft failure and graft survival. The duration of graft failure was defined as the time between RT and subsequent permanent dialysis. The duration of graft survival was defined as the time between RT and recipient death or the end of the study with functioning graft.

**Results:** 25 (20 F) of 1645 patients followed in the lupus cohort and of 780 with renal involvement were identified with RT. 10 (40%) were Caucasian, 7 (28%) Black, 4 (16%) Asian and 4 (16%) others. The age at diagnosis of lupus and at transplant was 30.7±13.8 and 38.1±9.6 years respectively. Lupus duration at RT was 13.3±7.6 years. 2 (8%) patients had a nonfunctional graft, 4 (16%) patients had graft failure (1 patient had failure <5 years and 3 ≥5 years) and 19 (76%) patients had graft survival (8 had S ≥5 years) (Table 1). Patients with graft survival were older and had longer lupus duration compared to patients with failure at the time of RT. 25% of the graft failures had positive lupus serology compared to 47% in the graft survival 1 year prior to RT.

#### 2267

**Genome-Wide Pathway Analysis of Genome-Wide Association Studies On Systemic Lupus Erythematosus**

Young Ho Lee1, Sung Jae Choi1, Jong Dae Ji1 and Gwan Gyung Song2. 1Korea University Medical Center, Seoul, South Korea; 2Korea Univ College of Med, Seoul

**Background/Purpose:** Genome-wide association studies (GWASs) have been successfully used to identify novel common genetic variants that contribute to susceptibility to complex diseases, but individual GWASs are limited in terms of identifying new loci. Thus, pathway-based analysis is required to identify further new loci that contribute to susceptibility to complex diseases. The aim of this study was to explore candidate single nucleotide polymorphisms (SNPs) and candidate mechanisms of systemic lupus erythematosus (SLE).

**Methods:** Two SLE GWAS datasets were included in this study. Meta-analysis was conducted using 737,984 SNPs in 1,527 SLE cases and 3,421 controls of European ancestry after quality control filtering, and ICSNPathway (identify candidate causal SNPs and pathways) analysis was applied to the meta-analysis results of the SLE GWAS datasets.

**Results:** The most significant result of SLE GWAS meta-analysis concerned rs2051549 in the human leukocyte antigen (HLA) region (p = 3.36E-22). In addition, 103 SNPs had observed p-values of less than 5 × 10⁻⁶ (genome-wide significance). In the non-HLA region, meta-analysis identified 6 SNPs associated with SLE with genome-wide significance.
2268

Hyperacetylation of Histone H4 in Systemic Lupus Erythematosus. Yu Tak Leung1, Lihua Shi2, Kelly Maurer2, Li Song2, Zhe Zhang3, Yiu Tak Leung1, Lihua Shi2, Kelly Maurer2, Li Song2, Zhe Zhang3,

Background/Purpose: Systemic lupus erythematosus (SLE) is the prototypical autoimmune disease and is characterized by multi-systemic chronic inflammation. Epigenetic processes, such as posttranslational histone modifications, can regulate gene expression without altering the underlying genomic sequence and represent important disease mechanisms that have had little attention in SLE to date. We have previously reported that histone H4 acetylation (H4ac) is globally increased across the genome in monocytes of patients with SLE as compared to in monocytes of healthy controls using a tiling array approach. In order to further characterize H4ac to determine the pathologic process responsible for the hyperacetylation, we looked for an imbalance in histone acetyltransferases (HATs) and histone deacetylases (HDACs). We further utilized flow cytometry to identify specific lysine residues hyperacetylated in SLE.

Methods: Peripheral blood monocytes (PBMCs) were obtained from 7 controls and 7 SLE patients. The patients had low SLEDAI score (mean score <2) and were on no immune suppressive medications at the time other than low-dose prednisone. Flow cytometry for different H4 lysine acetyl groups: K5, K8, K12 and K16 were run on a FacsCalibur instrument using appropriate isotype controls. H4 acetylation was defined on both T cells and monocytes. RNA-Seq studies were performed on purified monocytes from a different set of 8 controls and 8 SLE patients to examine the differential gene expression between the groups, in order to quantify mRNA for potential HAT and HDAC enzymes responsible for histone hyperacetylation in the patients with SLE.

Results: Analysis of gene expression of HATs found that PCAF-KAT2B expression was significantly increased in SLE monocytes as compared to controls; whereas, ATF2 expression was decreased significantly in the SLE group as compared to the control group. PCAF-KAT2B can associate with IRF1 and place H4K5, H4K8, and H4K16 acetylation marks. Further examination of the RNA-Seq data revealed increased expression of genes regulated by the IRF family of transcription factors. In addition, when compared to the control group, the SLE group had significantly decreased expression of HDAC3, which normally functions to deacetylate all H4 lysine acetyl groups, with a preference for acetylated H4K5 and H4K12. HDAC11 expression in SLE monocytes was also significantly reduced as compared to controls. HDAC11 has been shown to negatively regulate antigen-presenting cells’ production of IL-10, a cytokine that is known to have increased levels in SLE patients. Finally, using flow cytometry, we found H4K5, H4K8, and H4K16 acetylation clearly increased in SLE monocytes and H4K5 increased (but not significantly statistically) in SLE T cells.

Conclusion: These data demonstrate that in addition to specific gene sets being dysregulated in SLE, global alterations to H4 acetylation occur as well. These findings parallel studies that examined CpG DNA methylation and discovered evidence of global gene demethylation. The identification of a candidate HAT provides for a potential therapeutic target.

Disclosure: Y. T. Leung, None; L. Shi, None; K. Maurer, None; L. Song, None; Z. Zhang, None; M. Petri, None; K. E. Sullivan, None.

Background/Purpose: Ablation of DNA methylation and gene expression have been observed in systemic lupus erythematosus (SLE). However, patterns of DNA methylation and gene expression associated with different clinical manifestations of SLE patients have never been reported.

Methods: DNA methylation was profiled by methylated DNA immunoprecipitation combined with high-throughput sequencing (MeDIP-seq) and the expression of genes was analyzed through transcriptional sequencing (transcription-seq) in CD4+ T cells obtained from three groups [SLE with only skin lesion (S), SLE with skin lesion and renal disease (SK), Normal controls (N)] which constituted of four samples, respectively. Validations of DNA methylation status and expression levels of genes were performed with CD4+ T cells from 15 samples from each group by bisulfite sequencing and MassArray and reverse transcription quantitative PCR (RT-qPCR), respectively.

Results: According to Different Methylated Regions (DMRs) in promoter regions of genomic DNA, we identified 3056 hypo-methylated and 1965 hyper-methylated genes in S group, and 4504 hypo-methylated and 1433 hyper-methylated genes in SK group, compared with controls. Several established autoimmune-associated genes (including ITGAM, IFI44, S1PR3 and NLRP2) were confirmed to be hypo-methylated in both S and SK groups by bisulfite sequencing and MassArray, consistent with results of MeDIP-seq. Gene Ontology (GO) analysis for “biological processes” showed a significant enrichment of 86 GO terms including “induction of apoptosis” and “response to UV” in genes with DMRs in S group. Similarly, apoptosis, adherens junction and leukocyte transendothelial migration were significantly enriched via KEGG pathway analysis. Moreover, 183 GO terms were enriched significantly in SK group, including “apoptosis” and “response to DNA damage stimulus”. KEGG pathway analysis revealed a significant enrichment of “renal cell carcinoma” and several autoimmune-associated pathways such as T-cell receptor signaling pathway, MAPK-sIGNALING pathway and apoptosis. For differentially expressed genes, we observed 1500 up-regulated and 309 down-regulated genes in S group, and 944 up-regulated and 1552 down-regulated genes in SK group, compared with control. Over-expression of some genes including IFI44, ITGAM, S1PR3, NLRP2, C1QC and HLADRB was validated in S and SK groups using RT-qPCR, consistent with the results of transcription-seq. GO analysis showed that up-regulated genes were significantly enriched in immune-mediated processes including inflammation, leukocyte or complement activation. KEGG pathway analysis showed that “renal cell carcinoma” pathway was specifically enriched in down-regulated genes in SK group, suggesting aberrant DNA methylation and gene expression in this pathway may be related to lupus nephritis.

Conclusion: We characterized DNA methylation and transcriptome profiles in CD4+ T cells from SLE patients, and showed distinct patterns associated with different phenotypic disease manifestations.

Disclosure: M. Zhao, None; S. Luo, None; H. Wu, None; S. Liu, None; M. Tang, None; W. Cheng, None; Q. Zhang, None; X. Yu, None; T. M. Chan, None; Y. Xia, None; N. Yi, None; F. Gao, None; L. Wang, None; N. Li, None; Q. Lu, None.

2270

The DNA Methylation of Systemic Lupus Erythematosus (SLE) From Whole Peripheral Blood Mononuclear Cells (PBMCs). Robert Shoemaker1, Lou H. Bookbinder2, David L. Boyle3, Gary S. Fierstein4, Jonathan E. Lim1 and David W. Anderson1. 1NexDx, Inc., San Diego, CA, 2NexDx, Inc., San Diego, 3UCSD School of Medicine, La Jolla, CA

Background/Purpose: SLE is a disease where epigenetic mechanisms play a role. Methylation of DNA at CpG loci is known to influence the suppression or activation of genes that may be associated with the disease pathogenesis. Methylation associated with SLE may define unique biomarkers that may serve as novel drug targets and diagnostic tools. Studies to date have focused on candidate genes or small subsets of functional genes. We...
present the first >480,000 CpG differential methylation analysis, covering >20,000 gene promoters, in PBMCs from SLE patients.

**Methods:** Genome-wide methylation analysis of 6 SLE, 6 Rheumatoid Arthritis (RA), and 4 Osteoarthritis (OA) whole PBMC preparations from females was performed on Illumina HumanMethyl450 BeadChips. DNA was purified from Ficoll prepared whole PBMCs from clinically diagnosed patients. The Kolmogorov-Smirnov (KS) test determined differentially methylated regions (DMRs). Only loci with an average methylation difference > 0.10 between phenotypes were tested. KS p-values were converted to multiple hypothesis corrected q-values and loci with q-values < 0.15 were labeled as DM. Differentially methylated genes (DMG) contained at least one SLE/RA or SLE/OA DML in their promoter regions (~2.5 kb to 500 bp from transcription start site [TSS]). Pathway enrichment analysis of DMG was determined using Kyoto Encyclopedia of Genes and Genomes (KEGG) data and empirical p-values, based on 500,000 randomly generated background gene sets, which were converted to q-values.

**Results:** Genome-wide methylation analysis of >480,000 CpG loci identified 864 and 1,537 DML in SLE/RA and SLE/OA comparisons. Associating CpGs with TSS promoter regions narrowed these loci to 274 and 422 DML. 71% and 65% of SLE/RA and SLE/OA CpGs were hypermethylated, respectively. Hypermethylation was found in IL-23A, TNFRSF25, and PRIC265 (peroxisomal proliferator-activated receptor A interacting complex 285), genes known to regulate immune responses and inflammation. Hypomethylated CpG loci from SLE patients were identified in promoter regions associated with genes relevant to SLE, such as IFI44L (interferon-induced protein 44-like), IFITM1 (Interferon-induced transmembrane protein 1) and IL-10. Combining SLE/RA and SLE/OA genes into a single group, we found: cytokine-cytokine receptor interaction (q-value = 0.004), rheumatoid arthritis (0.004), hematopoietic cell lineage (0.004), and cell adhesion molecules (0.010) were significantly enriched KEGG pathways where differential methylation was observed. These data suggest that epigenetic mechanisms may play an important role in SLE where aberrant regulation of key immune and inflammatory genes or pathways may contribute to SLE pathogenesis and progression.

**Conclusion:** This study demonstrates that the first genome-wide DNA methylation analysis of whole PBMC samples is informative. The differential methylation pattern for SLE has the potential for identification of novel biomarkers for diagnostic applications. Associated genes and pathways provide a greater understanding of the pathogenic mechanisms of SLE and potential novel therapeutic targets. These findings justify further exploration, including subsets of immune cells and healthy controls.

**Disclosure:** O. Berggren, None; A. Alexsson, None; G. V. Alm, None; A. C. Syvänen, None; L. Rönnblom, None; M. L. Eloranta, None.

### 2272

**Gene Expression Signatures in Monocytes From Primary Antiphospholipid Syndrome, Systemic Lupus Erythematosus and Lupus with Antiphospholipid Syndrome Identify Specific Pathways Involved in the Pathogenesis of Atherosclerosis and Cardiovascular Disease.**

**Background/Purpose:** Many autoimmune diseases, e.g., systemic lupus erythematosus (SLE), have an activated type I interferon (IFN) system and about 40 SLE susceptibility loci, many within the type I IFN pathway, have been identified. We recently showed that the IFNα production by plasmacytoid dendritic cells (pDC) is regulated by both NK and B cells, and demonstrated a large interindividual difference in IFNα producing capacity among healthy individuals. We therefore investigated whether the capacity to produce type 1 IFN correlates to single nucleotide polymorphisms (SNPs) associated with different autoimmune diseases.

**Methods:** Plasmacytoid dendritic cells (pDC) (n = 130), B cells (n = 128) and NK (n = 66) were isolated from healthy blood donor PBMC genotyped with the 200K IlluminaChip (Illumina). PDC alone or in co-cultures with NK or B cells were stimulated with U1 snRNA- and SLE-IgG-containing immune complex (RNA-IC), herpes simplex virus or a synthetic oligonucleotide (ODN2216). The IFNα levels in the cell cultures were measured with an immunoassay after 24h. The association analysis was performed with PLINK software version 1.07. A total of 67 000 SNPs with minor allele frequency ≥0.20% which passed quality control were included in the analysis. The 10 most associated signals per cell type and stimuli were selected for further analysis. The IFNα production was normalized by Box-Cox transformation and the association to the genotype was analyzed by multiple linear regression with a stepwise method (SPSS 20.0).

**Results:** The IFNα production by the stimulated healthy donor pDC alone or in co-cultures with B or NK cells varied from <1 to 100000 U/ml. We found a strong association (p < 0.001) between the level of produced IFNα and several SNPs (24 to 194) depending on the combination of cell type and IFN inducer. The 7 most significant associations between IFNα production and specific SNPs among the 9 different combinations were located in C1orf222, MYO9B, TOX, between NYP1P1 and LGMNP1, and ILS4R genes (all p ≤ 0.0003).

Further analysis on the combined effect of the 10 most significant SNPs was applied on each different IFN inducer and cell type combination. For instance, the variation in IFNα production by pDC and B cells stimulated with RNA-IC could be explained to 59% by a model including SNPs located between ID4 and MBOAT1, in BLK, in MOBKL2B, in BICCI, between FAM89A and RFC1, and between IRF8 and FOX1 (p < 1 x 10^-16, r^2 = 0.59).

**Conclusion:** We found that the interindividual variation in IFNα production in healthy individuals upon stimulation with RNA containing IC as well as IFN inducers of microbial origin is associated to several autoimmune susceptibility genes. Our results may contribute to the identification of functional gene variants that directly affect the type I IFN production and IFN signature in patients with systemic autoimmune diseases. We envision that our approach using genetically characterized individuals can reveal crucial immunological targets for therapeutic intervention.

**Disclosure:** O. Berggren, None; A. Alexsson, None; G. V. Alm, None; A. C. Syvänen, None; L. Rönnblom, None; M. L. Eloranta, None.
independently predicted both atherosclerotic and thrombotic in SAPS. Moreover, a higher percentage of SAPS showed increased carotid intima-media thickness than LES patients. We further found a significant correlation of IgG-αCL titer with circulating levels of inflammatory molecules (IPA, MCP-1, TNFα, and IL-2).

Conclusion: 1) Gene expression profiling allows the segregation of APS, SAPS and SLE, with specific signatures explaining the pro-atherosclerotic, pro-thrombotic and inflammatory changes in these highly related autoimmune diseases. 2) The identification of key genes regulating specific pathophysio-
genetic pathways will permit the development of targeted therapies for each autoimmune condition. Supported by JA0246/2009, P08-CVI-04234, and PS09/01809.

Disclosure: C. Lopez-Pedrega, None; S. Messineo, None; C. Perez-Sanchez, None; P. Ruiz-Limon, None; M. A. Aguirre, None; R. M. Carretero-Prieto, None; A. Rodriguez-Arizta, None; N. Barbarroja, None; F. Velasco, None; M. A. Khamashita, None; E. Collantes-Estevez, None; M. J. Cuadra, None.

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Functional Genetic Polymorphisms in Immunoglobulin-Like Transcript 3 Are Associated with Decreased Surface Expression on Dendritic Cells and Increased Serum Cytokines in Lupus Patients. Mark A. Jensen, Karen C. Patterson, Akash A. Kumar, Marissa Kumbale, Beverly S. Franek and Timothy B. Niewold. University of Chicago, Chicago, IL

Background/Purpose: Hyperactivity of the type I interferon (IFN) pathway is involved in the pathogenesis of systemic lupus erythematosus (SLE). Immunoglobulin-like transcript (ILT3) is an immunosuppressive receptor which is induced by plasmacytoid dendritic cells (pDCs), monocytes/macrophages. Given the pathogenic role of IFN in SLE, we hypothesized that the IFN-induced immunosuppressive ILT3 receptor may be dysfunctional in human SLE.

Methods: 132 European-derived and 79 Hispanic-American SLE patients and 10 controls were studied by flow cytometry. We detected associations between ILT3 genotype and serum cytokine profiles. ILT3 expression levels on pDCs and MDCs from 18 patients and 10 controls were also studied.

Results: The rs11504761 SNP in the extracellular region was associated with decreased cell surface expression of ILT3 on circulating MDCs and to a lesser extent pDCs in SLE patients. The cytoplasmically located rs1048801 SNP was not associated with a change in DC expression of ILT3. Both SNPs were significantly and independently associated with increased levels of serum IL6, IL10 and IFNγ in SLE patients. The rs1048801 SNP was also associated with increased serum levels of TNF-α.

Conclusion: Loss-of-function polymorphisms in ILT3 are associated with increased inflammatory cytokine levels in SLE, supporting a biological role for ILT3 in SLE.

Disclosure: M. A. Jensen, None; K. C. Patterson, None; A. A. Kumar, None; M. Kumbale, None; B. S. Franek, None; T. B. Niewold, None.

2274

Genes Associated with Systemic Lupus Erythematosus Show Evidence of Selection in the Gullah African American Population. Paula S. Ramos, Satira Saujib, Yiqi Huang, Diane L. Kamen, Jasmin Divers, Kenneth M. Kaufman, John B. Harley, Robert P. Kimberly, Carl D. Langefield, Michele M. Sale, W. Timothy Garvey and Gary S. Gilkeson. 1Medical University of South Carolina, Charleston, SC; 2Wake Forest School of Medicine, Winston-Salem, NC; 3University of Virginia, Charlottesville, VA; 4Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Charlotte, SC; 5Cincinnati Children’s Hospital Medical Center, Cincinnati, OH; 6University of Alabama at Birmingham, Birmingham, AL

Background/ Purpose: In spite of its higher prevalence and severity, little is known about the genetic etiology of systemic lupus erythematosus (SLE) in African Americans (AA). Given this greater prevalence and the increasing evidence of selection at loci associated with human diseases, identification of alleles under selection may provide insight into the susceptibility to SLE. The Gullah are an AA population with limited and well defined ancestral diversity. The shorter genetic distance between the Gullah and Sierra Leonean (SL) suggests that population genetic signals, such as regions under recent selection, may be more easily detected in the Gullah than in other AA populations. Since population-specific selection may cause allele frequency differences, the goal of this study was to identify regions with minor allele frequency (MAF) differences between Gullah and SL that may increase the risk of SLE in AA.

Methods: We had available 120 Gullah and 400 SL samples, all unaffected, genotyped on the Illumina IM and Affymetrix SNP Array 6.0, respectively. After stringent quality control was applied to each population, 185,549 SNPs were retained. These included the MHC, which was previously shown to be under selection in other populations, as well as PTPN22 and TNIP2. Several other regions associated with SLE in Caucasians showed suggestive MAF differences. The region showing the most significant MAF differences was that of the complement- regulatory C5/DS1 gene, which has been associated with, among other traits, epilpsmy, multiple sclerosis, and insulin resistance in AA. Overall, our results confirmed an enrichment of genes involved in immunity and defense (BP00148; P = 0.0076).

Conclusion: We have identified several regions with significant allele frequency differences between the Gullah and SL, suggesting that population-specific selective pressures may be operating at these loci. Given the increased prevalence of SLE in AA and the homogeneity of the Gullah, identification of these regions in the Gullah has the potential to elucidate the etiology of SLE in AA.

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2275

NR1H3 (LXR alpha) Gene Polymorphisms Are Associated with Systemic Lupus Erythematosus in Koreans. Ja-Young Jeon, Hyoun-Ah Kim and Chang-Hee Suh. Ajou University School of Medicine, Suwon, South Korea

Background/Purpose: Liver X receptors are established sensors of lipid and cholesterol homeostasis. The recent studies have reported that LXRs are involved in regulation of inflammation and immune responses. We attempted to identify single nucleotide polymorphisms (SNPs) of the NR1H3 and NR1H2 genes, associated with the susceptibility to SLE in Korean populations.

Methods: Blood samples were collected from Korean SLE patients (n=300) and normal healthy controls (NC, n=217). Also, replication samples were collected from Korean SLE patients (n=160) and NC (n=143). SNPs were genotyped using an Affymetrix platform. The promoter activity was analyzed by luciferase reporter assay in Hep3B cells and COS-7 cells. To investigate the effects of the stimulation, we used a functional assay of transcriptional activity and B cell proliferation assay. To investigate whether the genetic polymorphism changed a transcription factor binding, we performed an electromobility shift assay.

Results: We have identified five polymorphisms (−1851 T>C and −1830 T>C in the promoter region, −1003 G>A, −840 C>A and −115 G>A) showed the complete linkage disequilibrium. There was significant difference in the −1830 T>C polymorphism (co: p = 0.001), −1003 G>A polymorphism (co: p = 0.002), −115 G>A polymorphism (co: p = 0.001) between SLE and NC. These results were consistent with those of replication samples. Three common haplotypes for four polymorphisms were constructed: H1 [TTGG], H2 [CTGG] and H3 [CTCG] and H4 [CTCA]. There was significant difference between SLE and NC in the observed haplotype H1 [TTGG] (p = 0.033) and H3 [CTCA] (p = 0.008). In the −1830 T>C polymorphism, arthritis was significantly more common in the SLE patients with the −1830 C allele (p = 0.005). The −1003 G>A polymorphism was significantly associated with oral ulcer (p = 0.039), arthritis (p = 0.006), anti-dsDNA (p = 0.04) and elevated triglyceride (p = 0.007). The −115 G>A polymorphism was significantly associated with oral ulcer (p = 0.024), arthritis (p < 0.001) and elevated triglyceride (p = 0.011). Luciferase activity of the constructs containing −1830 C/T and −1003 A was lower than that of the constructs containing −1830 T and −1003 G (p = 0.009 and p = 0.030, respectively). Moreover, promoter activity of the −1830 C/T and −1003 A was less enhanced when compared to that of the −1830 T and −1003 G in GW3965 and T0901317 treated cells (p = 0.034 and p = 0.001, respectively). Proliferation of −1830 TC type was increased when compared to that of −1830 TT type in basal,
GW3965 and T0901317 treated B cells from SLE patients (p = 0.011, p = 0.040 and p = 0.017, respectively). We found that transcription factor GATA-binding protein 3 (GATA3) protein preferentially bound the −1830 T promoter.

**Conclusion:** These results suggest that the NR1H3 gene genetic polymorphisms may be associated with disease susceptibility and clinical manifestations of SLE in Korean population. Specially, −1830 T>C polymorphism within NR1H3 promoter region may be involved in regulation of NR1H3 expression.

**Disclosure:** J. Y. Jeon, None; H. A. Kim, None; C. H. Suh, None.

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**Signature of Circulating Micro-RNA in Systemic Lupus Erythematosus**


1Statens Serum Institut, Copenhagen S, Denmark, 2National Institutes of Health, Bethesda, MD, 3Department of Clinical Sciences Lund, Lund, Sweden, 4Medical Prognosis Institute, Horsholm, Denmark, 5Odense University Hospital, Odense C, Denmark, 6National Cancer Institute NIH, Bethesda, MD, 7Lund, Sweden, 8Sweden, 9Copenhagen University Hospital, Copenhagen, Denmark, 10Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden

**Background/ Purpose:** Systemic lupus erythematosus (SLE) is a systemic autoimmune disease characterized by chronic inflammation sustained by a type I interferon response. The diagnostic value of circulating micro-RNA signatures in SLE has not been systematically evaluated and compared to healthy controls and other autoimmune conditions.

**Methods:** We quantified 45 mature miRNAs in 409 plasma samples from clinically well-characterized SLE patients, healthy controls, and controls with other systemic autoimmune diseases (RA and vasculitis) and immunosuppressed patients (kidney transplant recipients). SLE risk probability scores were modeled by logistic regression and validated in independent cohorts.

**Results:** Highly significant changes in 7 specific miRNAs were identified and validated independently. Up-regulated miRNAs were miR-142-3p and −181a and down-regulated miRNAs were miR-106a, −17, −20a, −92a, and −204. Four of five down-regulated miRNAs represent members of the polycistronic miR-17-92 family and, together with miR-223, were significantly lower in SLE patients with active nephritis than in patients without nephritis. A predictive model for the SLE diagnosis based on 2 miRNAs discriminated the SLE with AUC=0.89 when validated independently (accuracy: 76%, p<2×10^-8). Using a 4 miRNA model SLE cases were grouped statistically significantly different from disease controls except for vasculitis samples.

**Conclusion:** We find consistent changes of circulating miRNA profiles in SLE patients compared with healthy controls and disease controls. All 7 validated differently expressed miRNAs target genes in the TGF-β signaling pathway. Other targets implicate regulation of apoptosis, cytokine-cytokine receptors, T-cell development, and cytoskeletal organization. A four-miRNA signature was diagnostic for SLE, and patients with active nephritis showed specific subset miRNA profiles. The findings highlight possible deregulated pathways in SLE and suggest that circulating miRNA signatures may potentially be used diagnostically and for monitoring purposes in SLE.

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2277

**Familial Aggregation and Heritability of Systemic Lupus Erythematosus in Taiwan: A Nationwide Population Study**


1National Cheng Kung University, Taoyuan, Taiwan, 2Chang Gung Memorial Hospital, Taoyuan, Taiwan, 3National Institutes of Health, Bethesda, MD, 4Department of Clinical Sciences Lund, Lund, Sweden, 5Medical Prognosis Institute, Horsholm, Denmark, 6Odense University Hospital, Odense C, Denmark, 7National Cancer Institute NIH, Bethesda, MD, 8Lund, Sweden, 9Copenhagen University Hospital, Copenhagen, Denmark, 10Department of Clinical Sciences Lund, Section of Rheumatology, Lund, Sweden

**Background/ Purpose:** Familial aggregation and heritability of SLE were estimated and analyzed in a nationwide Taiwanese population. The aims of the present study were to estimate familial RR was 15.68 (95% CI, 13.66–18.00). The RRs (95% CIs) for an individual with an affected twin, sibling, offspring and parent were 30.00 (17.82–50.51), 24.69 (19.13–31.85), 11.26 (9.10–13.93) and 14.24 (12.07–16.80), respectively. The RR (95% CI) increased with the number of affected first-degree relatives, from 15.61 (13.59–17.93) and 36.12 (9.10–143.46) for one and two or more affected relatives. The heritability of SLE was 0.72 (95% CI, 0.66–0.79).

**Conclusion:** This population-based study confirms strong familial aggregation and high heritability of SLE. We provided solid evidence for the significance of genetic factor in SLE susceptibility.

**Disclosure:** C. F. Kuo, None; M. J. Grainge, None; L. C. See, None; K. H. Yu, None; S. F. Luo, None; A. M. Valdes, None; H. C. Chang, None; I. J. Chou, None; W. Zhang, None; M. Doherty, None.

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**Single Nucleotide Polymorphisms (SNPs) of Integrin-α-M (ITGAM) Are Associated with Susceptibility to Systemic Lupus Erythematosus (SLE) in an Asian Lupus Cohort.**

Weng-Giap Law1, Lok Ooi Kong2, Bernard Pui Lam Leung3, Chack-YungYu4, Yee Weng Song5, Yun Deng6, Hiiok-Hee Ching7, Betty P. Tao8 and Hwee-Siew Howe9.

1Tan Tock Seng Hospital, Singapore, Singapore, 2Center for Molecular and Human Genetics, The Research Institute at Nationwide Children’s Hospital and The Ohio State University, Columbus, OH, 3Seoul National University, Seoul, South Korea, 4David Geffen School of Medicine University of California Los Angeles, Los Angeles, CA, 5UCLA School of Medicine, Los Angeles, CA.

**Background/ Purpose:** SLE is a systemic autoimmune disease where lupus nephritis (LN) is a major cause of morbidity and mortality. Integrin-α-M (ITGAM) is critical for the adherence of neutrophils to stimulated endothelium and phagocytosis of complement coated particles. Recently, a variant of exon 3 (rs1143679) of ITGAM was found to be associated with susceptibility to SLE and LN in several ethnic groups including oriental Chinese and Thai populations. Our aim was to examine the potential association of ITGAM SNPs in our local SLE patients.

**Methods:** Custom-designed arrays were employed to study 201 SNPs covering the approximately 140kb of the ITGAM-ITGAX region in 293 Singapore SLE patients vs. 243 Asian controls. All patients satisfied the 1997 ACR revised SLE criteria. In total 147 SNPs of ITGAM-ITGAX were included in analysis. Significance difference in allelic frequencies of each SNP was examined by gPLINK 1.062 software with Bonferroni adjustment for multiple testing corrections.

**Results:** 13 SNPs spanning from 5’ upstream of ITGAM to intron 5 of ITGAM showed significant association (p<3.4×10^-5). The strongest association was detected at rs4561481 in the 5’ upstream of ITGAM (OR = 1.77 [1.34–2.32], p = 4.2×10^-5). The previously identified functional SNP of ITGAM (rs1143679, R77H) in European ancestry and African-American populations has shown a strong association for the risk allele (A). However, we observed a low frequency of the risk allele (A) in our patients (1.4% in SLE vs 0.2% in controls; p = 0.039, OR = 6.7 [0.83–53.42], and its association with disease susceptibility did not remain significant after Bonferroni correction. To localize the underlying causal variant, linkage equilibrium (LD) analysis was examined among these 13 SNPs which were located in a strong LD block (r^2 = 0.92–1.0), and the conditional association could not be applied to further distinguish the independent association in our SLE cohort.
**Significant Disease Association of 13/15 ITGAM SNPs from a Singapore SLE Cohort (n = 293 Singapore SLE vs 243 controls)**

<table>
<thead>
<tr>
<th>SNP</th>
<th>BP</th>
<th>Test Allele</th>
<th>Frequency</th>
<th>SLE Control</th>
<th>P value</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rs4561481</td>
<td>31167054</td>
<td>G</td>
<td>0.338</td>
<td>0.224</td>
<td>4.2E-05</td>
<td>1.77 (1.34–2.32)</td>
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<tr>
<td>rs8051304</td>
<td>31167513</td>
<td>C</td>
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<td>0.224</td>
<td>5.4E-05</td>
<td>1.75 (1.33–2.30)</td>
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<tr>
<td>rs889551</td>
<td>31167923</td>
<td>A</td>
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<td>0.216</td>
<td>1.0E-04</td>
<td>1.73 (1.31–2.28)</td>
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<tr>
<td>rs4889640</td>
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<td>0.228</td>
<td>1.1E-04</td>
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</tr>
<tr>
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<td>C</td>
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<tr>
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<td>rs41747994*</td>
<td>31194928</td>
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<td>5.81 (1.31–23.89)</td>
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</table>

*p value = Not significant after bonferroni correction.

**Conclusion:** All the 13 SNPs of ITGAM were associated with increased susceptibility to SLE. The most significant SNP was rs4561481, but not the previously identified functional SNP of ITGAM (rs1143679), suggesting contribution of other ITGAM variants to SLE in our cohort.

**Acknowledgement:** This study was funded by NKF Research Grant (NKFR/2008/0733) and BMRC grant 01/1/28/18/016. We thank the TSHS lupus study group for patient recruitment and sample contribution.

**Discourse:** W. G. Law, None; K. O. Kong, None; B. P. L. Leung, None; C. Y. Yu, None; Y. W. Song, None; Y. Deng, None; H. H. Chung, None; B. P. Tsao, None; H. S. Howe, None.

**2279 Genetic Markers for Circulating Vitamin D and the Associations with Risk of Systemic Lupus Erythematosus, Linda T. Hiraki1, Adrienne H. Williams2, Arun-Prasad Manoharan3, Peter Kraft4, Carl D. Langefeld5, Robert H. Graham6, and Elizabeth W. Karlson7. 1Brigham and Women's Hospital, Harvard School of Public Health, Boston, MA, 2Wake Forest School of Medicine, Winston-Salem, NC, 3Genentech, Inc., 4Program in Biostatistical Sciences, Wake Forest University School of Medicine, Winston-Salem, NC, 5Department of Biostatistical Sciences, Wake Forest University Health Sciences, Winston-Salem, NC, 6Shinko Hospital, Kobe, Japan, 7Kobe University Graduate School of Medicine, Kobe, Japan**

**Background/Purpose:** Genetic variants in the Vitamin D (25(OH)D) pathway have been associated with increased occurrence of autoimmune diseases including SLE. Studies of common single nucleotide polymorphisms (SNPs) in the genes influencing circulating 25-hydroxyvitamin D (25(OH)D) levels have demonstrated associations with type 1 diabetes, autoimmune thyroid disease, and multiple sclerosis. We performed gene based tests of 29 vitamin D associated genes identified by literature review, using the versatile gene-based association study (VEGAS).

**Results:** We did not observe a significant association between four 25(OH)D GWAS associated SNPs and SLE or with an additive GRS comprised of those 4 SNPs (OR 0.99 (95% CI 0.93, 1.07)). The 29 vitamin D genes interrogated using VEGAS, T NF was found to be significantly associated (p<0.10–5), as was CASR (p=0.002), SHBG (p=0.003), MEDI (p=0.02) and SMAD3 (p=0.03). However the four GWAS significant 25(OH)D gene regions were not found to be statistically significantly associated with SLE.

**Conclusion:** We did not observe a direct association between genetic markers of vitamin D and SLE risk. Further investigation into the mechanism by which vitamin D acts on SLE disease risk would provide insight into the pathogenesis and progression of disease.

**Disclosure:** L. T. Hiraki, None; A. H. Williams, None; A. P. Manoharan, Genentech and Biogen Idec Inc., 3; P. Kraft, None; C. D. Langefeld, None; R. R. Graham, Genentech and Biogen Idec Inc., 4; E. W. Karlson, None.

**2280 Serum Metabolomics As a Novel Diagnostic Approach for Systemic Lupus Erythematosus, Jun Saegusa1, Yasuhiro Inro1, Masamori Yoshida2, Shino Tanaka3, Yosinori Kogata4, Goichi Kageyama5, Seiji Kawano6, Goh Taji2, Shunichi Kumagai2 and Akio Morinobu1. 1Kobe University Graduate School of Medicine, Kobe, Japan, 2Shinko Hospital, Kobe, Japan, 3Kobe University Graduate School of Medicine, Kobe, Japan**

**Background/Purpose:** Metabolomics, or metabolome analysis, is the comprehensive study of low-molecular-weight metabolites. The metabolome represents the metabolic profiles of all the cellular processes in a cell, tissue, organ, or organism. Notably, because the metabolome is the last step in the omics cascade before the phenotype, alterations in the levels of metabolites may better reflect the physiological and pathological characteristics of a disease than changes in gene or protein expressions. It is now apparent that cellular metabolism has a tremendous impact on the function of various immune cells. In this study, we evaluated the differences in the serum metabolome between systemic lupus erythematosus (SLE) patients and healthy subjects, using gas chromatography/mass spectrometry (GC/MS), and sought to identify candidates for metabolic biomarkers.

**Methods:** Serum samples were obtained in the morning from fasting human patients with SLE (n = 26) and healthy volunteers (n = 26). Serum metabolite profiling was performed by GC/MS. The metabolite profiles of the patient and control groups were compared using multivariate statistical analysis.

**Results:** Sixty-two metabolites were detected in the serum. The level of 24 of them was significantly different in SLE patient compared to healthy patients. The 2D-plots of the principal component analysis (PCA) scores for all 62 metabolites showed distinct clustering for the two subject groups. The corresponding 2D-PCA- and partial least squares-discriminant analysis (PLS-DA)-loading plots revealed that variations in the levels of glutamic acid, ornithine, urea, tyrosine, and glyceral greatly contributed to the observed separation of the metabolomics profile of the SLE patients and healthy controls. Furthermore, we demonstrated that the serum levels of glutamic acid and ornithine were significantly correlated with the SLE activity index (SLEDAI) score in the patient group.

**Conclusion:** Our study suggests that GC/MS-based serum metabolomics can serve as a novel diagnostic and monitoring tool for SLE, and that the pattern of variation in metabolite levels may be useful for understanding the pathophysiology of SLE and establishing novel therapeutic strategies.

**Disclosure:** J. Saegusa, None; Y. Inro, None; M. Yoshida, None; S. Tanaka, None; Y. Kogata, None; G. Kageyama, None; S. Kawano, None; G. Taji, None; S. Kumagai, None; A. Morinobu, None.

**2281 Tartrate-Resistant Acid Phosphatase Deficiency in the Predisposition to Systemic Lupus Erythematosus, Jie An1, Tracy A. Briggs2, Nalini Agrawal1, Alice Wiedeman1, Laurence Chaperot3, Joel Plumas2, Yannick J. Crow4 and Keith B. Elkon5. 1University of Washington, Seattle, WA, 2University of Manchester, Manchester, United Kingdom, 3Immunobiology and Immunotherapy of Cancers, La Tronche, France**

**Background/Purpose:** The enzyme tartrate-resistant acid phosphatase (TRAP) is highly expressed in osteoclasts. One of the main substrates for TRAP in bone matrix is osteopontin (OPN). Biallelic mutations in the gene, ACP5, that encodes TRAP, result in an immuno-osseous disease called spondyloenchondrodysplasia (SPENCD). In addition to bone and neurological abnormalities, SPENCD patients also develop autoimmune disorders such as systemic lupus erythematosus (SLE). Of note, SPENCD patients demonstrate evidence of increased interferon-alpha (IFN-α) production in their
blood. Since very little is known about the function of TRAP in immune cells, the objectives of our study were to determine whether OPN is a substrate for TRAP and to define the consequences of TRAP deficiency in immune cells.

**Methods:** Co-localization of TRAP and OPN was determined by confocal microscopy and also by immunoprecipitation and western blot analysis (IP-western). TRAP overexpression or knockdown was performed by co-transfection of cDNAs encoding TRAP and OPN in 293 cells. We reciprocally co-immunoprecipitated TRAP and OPN as determined by western blots. Also, in macrophages, anti-TRAP antibody immunoprecipitated both TRAP and OPN, indicating that they interacted with each other in primary non-transfected cells. To confirm that OPN was indeed a substrate for TRAP, we observed that recombinant human TRAP dephosphorylated OPN by the release of free phosphate in an in vitro assay. To relate the functional significance of TRAP deficiency to IFN-γ production, we knocked down the expression of TRAP in pDC. We observed that TRAP specific shRNA, but not scrambled shRNA, increased the expression of IFN-γ.

**Results:** We observed that TRAP co-localized with OPN in early endosomes and the Golgi in both primary macrophages as well as in plasmacytoid dendritic cells (pDC). Co-localization was confirmed biochemically: following co-transfection of cDNAs encoding TRAP and OPN in 293 cells, we reciprocally co-immunoprecipitated TRAP and OPN as determined by western blots. Also, in macrophages, anti-TRAP antibody immunoprecipitated both TRAP and OPN, indicating that they interacted with each other in primary non-transfected cells. To confirm that OPN was indeed a substrate for TRAP, we observed that recombinant human TRAP dephosphorylated OPN by the release of free phosphate in an in vitro assay. To relate the functional significance of TRAP deficiency to IFN-γ production, we knocked down the expression of TRAP in pDC. We observed that TRAP specific shRNA, but not scrambled shRNA, increased the expression of IFN-γ and IFN signature genes (ISGs).

**Conclusion:** Taken together, these findings indicate that TRAP and OPN co-localize and that OPN is a substrate for TRAP in immune cells. Significantly, TRAP deficiency in pDC leads to increased IFN-γ production providing an explanation for why TRAP mutations lead to a lupus-like disease in SPENCD patients.

**Disclosure:** J. An, None; T. A. Briggs, None; N. Agrawal, None; A. Wiedeman, None; L. Chaperot, None; J. Plumas, None; Y. J. Crow, None; K. B. Elkon, Hoffmann La Roche, 5, Resolve Therapeutics, 4.
Background/Purpose: Gene expression studies of peripheral blood mononuclear cells in SLE have consistently shown an interferon signature. We previously examined monocytes from SLE patients to understand the impact of interferon expression on the cell that is integral to atherosclerosis and renal disease. In that study, we also found a gene expression signature consistent with interferon exposure. Various triggers of interferon expression have been identified and endogenous retroviral elements have been considered as possible nucleic acid stimuli. Older literature on endogenous retroviruses in SLE identified intracisternal A-type particles reminiscent of retroviruses and frequent identification of anti-retroviral antibodies. Nevertheless, there has been little direct demonstration of altered expression of endogenous retroviral elements. To better understand the altered gene expression and to examine non-coding RNAs, which are poorly represented on arrays, we performed RNA-seq.

Methods: RNA-seq on the SOLiD platform was performed on RNA from monocytes from 8 SLE patients and 8 age/gender-matched controls. Reads were aligned and mapped using BioScope. The biological samples were scored to define variability by calculating the sample-sample correlation. Group comparison statistics and FDR calculation were used to identify regions with significant RPKM group-based variations. To minimize confounders, we selected patients with a low disease activity and minimal medications.

Results: Again, we saw evidence of interferon exposure. We also noted a dramatic enrichment of genes regulated by the IRF family of transcription factors. Among the most highly expressed transcripts were non-coding RNAs, anti-sense RNAs and micro-RNAs, suggesting that array studies have captured biotone face of the ERVK. The use of RNA-seq also enabled us to look at highly repetitive transcripts such as LINE and Alu elements. Although unmannable, the total read depth was analyzed. Amongst all repetitive elements, the ERVK family was found to be 3X overexpressed in SLE monocytes relative to the controls. Other endogenous retroviral elements were expressed at comparable levels in SLE patient and controls.

Conclusion: The ERVK family of endogenous retroviruses is unusual in that it can encode gag, env, pol, reverse transcriptase and integrase proteins. Retroviruses have been implicated in murine lupus but data on human endogenous retroviruses have been limited. The recognition of the important role of TREX1 in limiting retroviral DNA induction of interferons has supported a role for retroviruses in human SLE but until the advent of next generation sequencing, it was difficult to identify specific families. This study identified many non-coding RNAs both over-expressed and under-expressed, often by 20–50-fold. Unexpectedly, the ERVK family was over-expressed out of proportion to other endogenous retroviruses, suggesting that this family may be selectively de-repressed. De-repression of ERVK elements could contribute to interferon production via accumulation of viral RNAs.

Disclosure: L. Shi, None; Z. Zhang, None; M. Petri, None; K. Sullivan, None.
Results: The expression of DDR2 mRNA and protein was significantly decreased in SSc cultured dermal fibroblasts, which was recovered after knockdown TGF-β. The knockdown of DDR2 in normal fibroblasts induced microRNA-196a expression, which led to type I collagen down-regulation, thus indicating that DDR2 itself has a negative effect on microRNA-196a expression and that it induces type I collagen expression. In SSc fibroblasts, however, the DDR2 knockdown did not affect TGF-β signaling and microRNA-196a expression. The microRNA-196a levels were significantly decreased in normal fibroblasts treated with TGF-β and in SSc fibroblasts. Taken together, these findings indicate that, in SSc fibroblasts, the intrinsic TGF-β stimulation induces type I collagen expression and down-regulates DDR2 expression. This probably acts as a negative feedback mechanism against excess collagen expression, since a decreased DDR2 expression is supposed to stimulate the microRNA-196a expression and further change the collagen expression. However, in SSc fibroblasts the microRNA-196a expression was down-regulated by TGF-β signaling.

Conclusion: DDR2-microRNA 196a-mediated negative feedback against DDR2 expression may help to increase our knowledge on the pathogenesis of SSc, identify biomarkers, and new therapeutic targets.

Disclosure: K. Makino None; M. Jinjin None; J. Aoi None; I. Kajihara None; T. Makino None; K. Sakai None; S. Fukushima None; Y. Inoue None; H. Iha None.

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Background/Purpose: High throughput study of metabolic pathways might help identify new biomarkers and therapeutic targets in autoimmune diseases. Systemic sclerosis (SSc) currently lacks prognostic biomarkers and efficacious and specific treatments. We therefore assessed serum levels of 40 metabolites in patients with SSc and healthy controls using high-resolution magic-angle spinning (HRMAS) proton magnetic resonance spectroscopy.

Methods: The blood samples of 38 successive patients with SSc (median age (range) 62 years (25–85); disease duration 8 years (1–22); limited cutaneous SSc: 62%; diffuse cutaneous SSc: 38%) and 39 healthy controls were analysed in this study. After cryopreservation at 80°C, the samples were studied using HRMAS proton magnetic resonance spectroscopy (1H-MRS). Spectra were recorded on a Bruker Avance III 500 spectrometer operating at a proton frequency of 500 MHz. The speed revolution of the tube was 3000 Hz. The 1D MR spectra were acquired during 15 min (between 0.5 and 4.7 ppm). Unsupervised clustering was performed using principal component analysis (PCA).

Results: Unsupervised clustering of the 38 samples allowed to discriminate all patients with SSc from healthy controls (R²=0.76 and Q²=0.67 (figure 1)). Interestingly, 3 metabolites were significantly more expressed in SSc blood samples than in healthy controls: acetone, acetate and formate (median 10.7 vs 8.1 μmol/l, p<0.05; 21.8 vs 5.4 μmol/l; p<0.05; 28.6 vs 7.9 μmol/l, p<0.05 respectively).

Conclusion: This first high-throughput analysis of metabolic pathways disclosed a specific metabolic signature of SSc allowing to discriminate all patients from controls. This new and very potent means of metabolic analysis may help to increase our knowledge on the pathogenesis of SSc, identify biomarkers, and new therapeutic targets.

Disclosure: E. Chatelus None; J. E. Gottenberg None; F. M. Moussallieh None; C. Sordet None; A. Theulin None; A. Meyer None; J. F. Kleimann None; J. Sibilia None; I. J. Namer None.

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The Role of TCR Vα1+ NKT Cells in Systemic Sclerosis Patients with Interstitial Pneumonitis. Seiji Segawa, Daisuke Goto, Masanobu Horikoshi, Shinya Hagiwara, Naoto Umeda, Hiroshi Ogishima, Yuya Kondo, Hiro Tohsu, Makoto Sugihara, Taichi Hayashi, Yusuke Chino, Isao Matsumoto and Takayuki Sumida. University of Tsukuba, Tsukuba City, Japan.

Background/Purpose: Interstitial pneumonia (IP) is one of the critical complications in patients with several autoimmune diseases. However, the exact mechanism of IP remains elusive. Recently, the pathological role of gd T cells was reported in several IP mouse models. Previous our data showed that IP in Interleukin (IL)-2 plus IL-18 induced mice was similar to human IP. In this mice, γδNKT cells exacerbated IL-2 plus IL-18 induced lung inflammation via the production of IFN-γ. Thus, to examine whether Vα1+ NKT cells play a crucial role, we carried out the number and function of TCR Vα1+ NKT cells in systemic sclerosis patients with IP.

Methods: 1) PBMCs were isolated from healthy controls (HC, n=22) and patients with rheumatoid arthritis (RA, n=17), systemic sclerosis (SSc, n=35), and polymyositis/dermatomyositis (PM/DM, n=14). We examined the proportion of TCR Vα1+ NKT cells in PBMCs by flow cytometry (FCM). 2) We examined the proportion of TCR Vα1+ NKT cells in patients with autoimmune disease plus IP. 3) We analyzed the correlation between the proportion of TCR Vα1+ NKT cells in PBMCs and serum KL-6 values. 4) CD161+ Vα1+ γδT and CD161+ Vα1+ γδT cells (TCR Vα1+ NKT cells) in PBMCs were sorted out from HC (n=3). We performed GeneChip analysis using these two cell populations.

Results: 1) The proportion of TCR Vα1+ NKT cells in PBMCs from SSc patients (mean±SEM, 0.55±0.13%) was significantly higher than that of HC (0.23±0.09%, p<0.05), whereas RA (0.38±0.12%) and PM/DM patients (0.23±0.11%) were not. 2) In SSc patients, the proportion of TCR Vα1+ NKT cells in PBMCs from IP-negative subjects (1.03±0.32%) was significantly higher than that of IP-positive subjects (0.28±0.07%, p<0.05). In RA and PM/DM patients, there was no difference between IP-negative and IP-positive subjects. 3) In IP-positive SSc patients, results showed a negative correlation between serum KL-6 values and the proportion of TCR Vα1+ NKT cells (r=-0.464, p<0.05). In IP-positive PM/DM patients, there were no any correlations. 4) We found highly expressed in TCR Vα1+ NKT cells compared to CD161+ Vα1+ γδT cells. One of 192 genes was CCL3 chemokine associated with IP and SSc. Exact mechanism of IP remains elusive. Recently, the pathological role of gd T cells was reported in several IP mouse models. Previous our data showed that IP in Interleukin (IL)-2 plus IL-18 induced mice was similar to human IP. In this mice, γδNKT cells exacerbated IL-2 plus IL-18 induced lung inflammation via the production of IFN-γ. Thus, to examine whether Vα1+ NKT cells play a crucial role, we carried out the number and function of TCR Vα1+ NKT cells in systemic sclerosis patients with IP.

Disclosures: S. Segawa None; D. Goto None; M. Horikoshi None; S. Hagiwara None; N. Umeda None; H. Ogishima None; Y. Kondo None; H. Tohsu None; M. Sugihara None; T. Hayashi None; Y. Chino None; I. Matsumoto None; T. Sumida None.

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Adiponectin Has Potent Anti-Fibrotic Effects Mediated Via AMP Ki-

Background/Purpose: Fibrosis in scleroderma is associated with transforming growth factor-β (TGF-β) signaling activation, collagen deposition and myofibroblast accumulation. Peroxisome proliferator activated receptor gamma (PPAR-γ) inhibits profibrotic responses, while regulates adiponectin production. Our recent studies demonstrated that adiponectin levels were reduced in patients with diffuse cutaneous scleroderma, and inversely correlated with disease activity, severity and duration. However, the function and molecular signaling of adiponectin during fibrogenesis are still unknown.
Methods: Collagen and α-smooth muscle actin (α-SMA) gene expression and TGF-β signaling by recombinant adiponectin, AICAR and metformin were examined by real-time PCR, Western blot, immunofluorescence microscopy and transient transfection assays. AdipoR1 expression on skin fibroblasts was determined by real-time qPCR. Gene expression changes were examined using microarrays.

Results: In skin fibroblasts, recombinant adiponectin inhibited the basal and TGF-β-stimulated collagen and alpha-smooth muscle actin mRNA and protein expression at dose-depend manner, while RNAi knockdown of adiponectin sensitized TGF-β-stimulated fibrotic responses. Similarly, metformin and AICAR, two agonists of S’ adenosine monophosphate (AMP)-activated protein kinase, inhibited fibrotic responses. AMPK antagonist compound C impaired the anti-fibrotic effects of adiponectin. In adiponectin-null fibroblasts, PPAR-γ ligand PGJ2 failed to inhibit TGF-β-stimulated fibrotic responses. In addition, adiponectin completely abrogated the profibrotic effects of lipopolysaccharide (LPS, a potent ligand of Toll-like receptor 4 (TLR4) with profibrotic effects). Furthermore, the adiponectin receptor 1 showed reduced expression in scleroderma skin biopsies, suggesting the defective adiponectin signaling in scleroderma.

Conclusion: Our results indicate adiponectin plays an important homeostatic role in negative regulation of collagen deposition and myofibroblast accumulation. The anti-fibrotic effects associated with pharmacological PPAR-γ ligands are at least in part due to the activation of the adiponectin signaling pathway. Restoring the adiponectin signaling axis in fibroblasts might represent a novel pharmacological approach to controlling fibrosis.

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Type I Interferon Associated Gene IRF7 in the Pathogenesis of Fibrosis in Systemic Sclerosis (SSc).

Minghua Wu1, Michael R. Blackburn2, Shervin Assassi1, Xiaochun Liu1, John D. Reveille1, Filemon K. Tan1, Sandeep K. Agarwal3 and Maureen D. Mayes1.1University of Texas Health Science Center at Houston, Houston, TX, 2The University of Texas Medical School in Houston, Houston, TX, 3Department of Rheumatology and Center of Experimental Rheumatology, Medical University in Bialystok, Bialystok, Poland, 4Department of Orthopedics and Traumatology, Medical University in Bialystok, Bialystok, Poland, 5Department of Rheumatology and Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland, 6Center of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHP), Switzerland, Zurich, Switzerland.

Background/Purpose: Systemic sclerosis (SSc) is a severe disease of unknown aetiology characterised by cellular injury and activation in early stage, followed by autoimmunity and fibrosis. Much of the work is focused on the fibroblasts however, keratinocytes are known to be able to secrete chemo-attracting agents, as well as growth factors influencing phenotype and proliferation rate of fibroblasts. We have recently shown that SSc epithelial cells exhibit an activated phenotype similar to wound healing. Data from hypertrophic scarring and keloids demonstrate that epidermis can promote dermal fibrosis. Therefore, we decided to look for evidence that in SSc injured epidermal cells are releasing chemokines and cytokines capable of recruiting immune cells to the skin and promoting fibrosis.

Methods: Forearm biopsies were taken from 12 healthy controls and 12 SSc patients. Dermis and epidermis were separated using trypsin/EDTA and the explants incubated overnight in serum free media. The conditioned media were then collected and analysed using Legend PLEX (BioLegend) for presence of G-CSF, GM-CSF, VEGF, PDGF-AA, PDGF-BB, MCP-1, PFG-2, IL-8, IL-6, IL-1α, IL-1β, and IL-1ra. Additionally, HGF, CCL20 and S100A9 were measured by ELISA (R&D Systems). Moreover, immunohistochemistry was performed on skin biopsies of 6 dSSc and 6 healthy controls using antibodies against S100A9, S100A8, loricin and involucrin. The epidermal thickness and cell area were also measured. The statistical analysis was performed using Wilcoxon rank-sum test.

Results: The conditioned media analysis revealed significantly higher levels of HGF (p<0.005) and S100A9 (p<0.05) released by SSc epidermis. Also increased levels of PFG-2, VEGF-A and PDGF-AA and IL-8 found in the SSc epidermis conditioned media showed a trend towards significance. Staining of skin sections confirmed much higher levels of S100A9 in SSc present throughout the epidermis, compared to positive staining in the healthy skin only around epidermal appendages. The SSc epidermis showed significantly increase in thickness (p<0.05) and hypertrophic cells in basal (p<0.005) and spinous layers (p<0.005). The expression of involucrin and loricin was also altered.

Conclusion: The epidermis provides a potential source of chemokines in SSc. High levels of pro-inflammatory S100A9 released by SSc dermis might contribute to the inflammation and therefore skin fibrosis. The abnormal thickness, hypertrophic keratinocytes and altered expression of differentiation markers in SSc epidermis suggest changes in terminal differentiation and signalling. The increase in HGF release by SSc epidermis is consistent with our previous report of enhanced e-Met activation in SSc epidermis and, indicates autocrine stimulation that could be responsible for the changes observed. However, more investigations are required to fully explore the mechanisms underlying S100A9 and e-Met/HGF signalling and they role of in skin fibrosis.

Disclosure: J. Nikitorowicz Buniak, None; C. P. Denton, None; D. J. Abraham, None; R. J. Stratton, None.

2291

Enhanced Release of S100A9 and Hepatocyte Growth Factor by the Epidermis in Systemic Sclerosis.

Joanna Nikitorowicz Buniak1, Christopher P. Denton2, David J. Abraham3 and Richard J. Stratton.1. UCL Medical School, London, United Kingdom, 2UCL, London, United Kingdom.

Background/Purpose: Systemic sclerosis (SSc) is a severe disease of unknown aetiology characterised by cellular injury and activation in early stage, followed by autoimmunity and fibrosis. Much of the work is focused on the fibroblasts however, keratinocytes are known to be able to secrete chemo-attracting agents, as well as growth factors influencing phenotype and proliferation rate of fibroblasts. We have recently shown that SSc epithelial cells exhibit an activated phenotype similar to wound healing. Data from hypertrophic scarring and keloids demonstrate that epidermis can promote dermal fibrosis. Therefore, we decided to look for evidence that in SSc injured epidermal cells are releasing chemokines and cytokines capable of recruiting immune cells to the skin and promoting fibrosis.

Methods: Forearm biopsies were taken from 12 healthy controls and 12 SSc patients. Dermis and epidermis were separated using trypsin/EDTA and the explants incubated overnight in serum free media. The conditioned media were then collected and analysed using Legend PLEX (BioLegend) for presence of G-CSF, GM-CSF, VEGF, PDGF-AA, PDGF-BB, MCP-1, PFG-2, IL-8, IL-6, IL-1α, IL-1β, and IL-1ra. Additionally, HGF, CCL20 and S100A9 were measured by ELISA (R&D Systems). Moreover, immunohistochemistry was performed on skin biopsies of 6 dSSc and 6 healthy controls using antibodies against S100A9, S100A8, loricin and involucrin. The epidermal thickness and cell area were also measured. The statistical analysis was performed using Wilcoxon rank-sum test.

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Disclosure: J. Nikitorowicz Buniak, None; C. P. Denton, None; D. J. Abraham, None; R. J. Stratton, None.

2292

Increased Synthesis of Leukotrienes by Peripheral Blood Mononuclear Cells Is Associated with More Severe Disease and Worse Prognosis in Patients with Systemic Sclerosis.

Otylia M. Kowal-Bielecka1, Anna Lapinskas1, Marek Bielecki1, Oliver Distler1, Izabela Domyslawa1, Lech Chyczewski2, Stanislaw Sierakowski2, Steffen Gay3 and Krzysztof Kowal2.1Department of Rheumatology and Internal Medicine, Medical University in Bialystok, Bialystok, Poland, 2Department of Medical Pathomorphology, Medical University in Bialystok, Bialystok, Poland, 3Department of Orthopedics and Traumatology, Medical University in Bialystok, Bialystok, Poland, 4Department of Rheumatology and Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland, 5Department of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHP), Switzerland, Zurich, Switzerland.

Background/Purpose: Eicosanoids are a group of arachidonic acid-derived lipid mediators which play a key role in the regulation of inflammatory response and connective tissue remodeling. Different classes of eicosanoids exert different, often opposing roles. Leukotrienes (LTs), synthesized
through the action of 5-lipoxygenase, are considered pro-inflammatory and pro-fibrotic mediators, while 15-lipoxygenase-derived products, 15-hydroxyeicosatetraenoic acid (15-HEET) and lipoxins, possess anti-inflammatory and anti-fibrotic properties, in part due to antagonizing action of LTs.

We undertook this study to investigate the role of eicosanoids in the pathogenesis of SSC trough evaluation of 1) the profile of eicosanoids synthesized by peripheral blood mononuclear cells (PBMC) and 2) relationships between eicosanoid profile of PBMC and clinical features and progression of the disease in patients with SSC.

**Methods:** Leukotriene B4 (LTB4), cysteinyl leukotrienes (CysLTs), and 15-HEET were measured by ELISA in the supernatants from ionophore-stimulated PBMC of 39 patients with SSC and 24 age- and sex-matched healthy controls (HC). Only patients, who had not received immunosuppressive drugs, aspirin or other NSAIDs before the study, were included.

Follow-up data were available in 25 SSc patients (mean +/- SD follow-up time: 34 +/- 18 months). Disease progression was defined as death due to SSC-related organ complication, development of a new or progression of pre-existing SSC-related organ involvement.

**Results:** Concentration of LTB4 was significantly higher in PBMC cultures from patients with SSC (640 +/- 518 pg/mL/10^6 cells) as compared with HC (353 +/- 216 pg/mL/10^6 cells), p<0.05. Higher LTB4 levels were associated with the presence of diffuse SSC and pulmonary fibrosis. No significant differences could be found in the concentrations of CysLTs or 15-HETE/CysLTs ratios between SSC patients and HC (data not shown). The LTB4/CysLTs ratios were lower in SSC patients (13 +/- 0.6) as compared with HC (26 +/- 28, p<0.05). Higher 15-HETE were measured by ELISA in the supernatants from ionophore-stimulated PBMC of 39 patients with SSC and 24 age- and sex-matched healthy controls (HC). Only patients, who had not received immunosuppressive drugs, aspirin or other NSAIDs before the study, were included.

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Follow-up data were available in 25 SSc patients (mean +/- SD follow-up time: 34 +/- 18 months). Disease progression was defined as death due to SSC-related organ complication, development of a new or progression of pre-existing SSC-related organ involvement.

**Conclusion:** The results of our study indicate that increased synthesis of LTs, which is not balanced by sufficient synthesis of 15-lipoxygenase derived eicosanoids, might be involved in the pathogenesis and progression of SSC. Consequently, inhibition of LTs synthesis or action might represent a new, anti-inflammatory and anti-fibrotic treatment for SSC.

**Disclosure:** O. M. Kowal-Bielecka, None; A. Lapinska, None; M. Bielecki, None; O. Distler, Actelion, Pfizer, Boehringer-Ingelheim, Bayer, Roche, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrum, Novartis and Active Biotec, 5, Actelion, Pfizer, Boehringer-Ingelheim, Bayer, Roche, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrum, Novartis and Active Biotec, 5, Actelion, Pfizer and Ergonex, 8; S. Sierakowski, None; L. Chyczewski, None; S. Sierakowski, None; S. Gay, None; K. Kowal, None.

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**2293**

**Interleukin-17A Positive Cells Are Increased in Systemic Sclerosis Skin and Their Number Is Inversely Correlated to Skin Thickness**

Recent studies demonstrated that the phenotype transition of endothelial cells (EC) into activated mesenchymal cells, typic transition of endothelial cells (EC) into activated mesenchymal cells, in vitrino and in vivo, and its expression and activation are induced by the natural phytoalexin resveratrol. We investigated SIRT1 function and regulation by resveratrol during fibrogenesis.

**Methods:** SIRT1 expression in scleroderma skin biopsies was analyzed in published microarray dataset. The effects of resveratrol on fibroblastic responses were evaluated by real-time qPCR, Western analysis, immunofluorescence, transient transfection, collagen gel contraction and cell migration assays. SIRT1 modulation of TGF-β signaling was examined using the pharmacological SIRT1 inhibitors sirtinol and nicotinamide.

**Results:** Analysis of published microarray datasets revealed significant reduction of SIRT1 mRNA levels in skin biopsies from patients with diffuse cutaneous scleroderma n=1, p<0.001). Resveratrol induced the activity of SIRT1 in explanted normal skin fibroblasts. Moreover, resveratrol blocked the stimulation of collagen gel contraction and cell migration induced by TGF-β, and abrogated TGF-β-induced collagen and α-smooth muscle actin expression, and Smad2/3-dependent transcriptional activity, in a dose-dependent manner. Ectopic SIRT1 by itself was sufficient to abrogate TGF-β stimulated collagen expression, whereas pharmacological inhibition of SIRT prevented the anti-fibrotic activities of resveratrol.

**Conclusion:** Resveratrol abrogates canonical TGF-β signaling and suppresses fibroblastic responses via the histone deacetylase and essential mitochondrial regulator SIRT1 in scleroderma skin biopsies suggests its role in regulating fibrogenesis. Accordingly, we propose that SIRT1 is a novel target for anti-fibrotic therapy, and pharmacological enhancement of the SIRT1 expression or activity might have a therapeutic potential in scleroderma.

**Disclosure:** R. G. Marangoni, None; A. Ghosh, None; J. Wei, None; J. Varga, None.

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**2295**

**Caveolin-1 Deficiency Induces Spontaneous Endothelial-to-Mesenchymal Transition (EndoMT) in Murine Pulmonary Endothelial Cells in Vitro.**

Caveolin-1 (Cav-1) is an integral plasma membrane protein that forms the coat of caveolae, specialized invaginations that facilitate lipid and cholesterol metabolism and signal transduction. Recent studies demonstrated that the phenotypic transition of endothelial cells (EC) into activated mesenchymal cells, a process known as endothelial-to-mesenchymal transition (EndoMT), may be crucial in the development of tissue and organ fibrosis in fibrotic diseases such as Pulmonary Fibrosis and Systemic Sclerosis (SSc). Furthermore, it was previously demonstrated that TGF-β induces EndoMT in murine lung epithelial cells. Owing to the important role of caveolin-1 (cav-1) in TGF-β receptor internalization and TGF-β signaling...
the role of cav-1 in induction of EndoMT in murine lung EC was investigated.

Methods: Pulmonary EC were isolated from wild-type (WT) and cav-1 knockout (cav-1 KO) mice employing sequential immunomagnetic selection with anti-CD31 and anti-CD102 antibodies followed by in vitro culture and treatment with TGF-β1. EndoMT was assessed by immunofluorescence for α-smooth muscle actin (α-SMA) and by Western blot analysis for α-SMA and type I collagen. Induction of the transcriptional repressor, Snail 1, was assessed by real time PCR. The same studies were performed in cav-1 KO pulmonary EC following restoration of functional cav-1 domains employing a cell permeable cav-1 scaffolding domain peptide.

Results: Pulmonary EC from cav-1 KO mice displayed high levels of spontaneous α-SMA and type I collagen expression which increased following TGF-β treatment. There was a remarkable increase in spontaneous Snail 1 expression. Spontaneous and TGF-β-stimulated EndoMT were abrogated by restoration of functional cav-1 domains.

Conclusion: Cav-1 plays an important role in the regulation of EndoMT by abrogating spontaneous and TGF-β-induced EndoMT and EndoMT-mediated generation of activated myofibroblasts. Since reduction of cav-1 expression is an important molecular abnormality present in SSc lung and dermal fibroblasts the results indicate that exaggerated spontaneous and TGF-β induced EndoMT caused by cav-1 deficiency may play a crucial role in the pathogenesis of SSc tissue fibrosis and vasculopathy.

Disclosure: Z. Li, None; P. J. Wermuth, None; B. Benn, None; M. P. Lisanti, None; S. A. Jimenez, None.

2297

Decrease Activity of DNA Demethylase in SSc Fibroblast and Microvascular Endothelial Cells: A Possible Mechanism for Persistence of SSc Phenotype. Bashar Kahaleh and Yongqing Wang. University of Toledo, Toledo, OH

Background/Purpose: DNA methylation is one of the best-characterized epigenetic modifications that have been implicated in numerous biologic and pathologic processes. It is initiated by DNA methyltransferases (DNMT) 3a and 3b and maintained in subsequent cellular generations by the maintenance enzyme DNMT1. Despite its role in long-term gene silencing, DNA methylation is now believed to be a dynamic process as active DNA demethylation has been observed in certain experimental systems. Thus, during cellular division a competition between DNMT1 and DNA demethylase determine the maintenance or the reversal of DNA methylation in the daughter cells. The molecular identity of DNA demethylase remains elusive but its activity can be measured by functional assay. DNMT1 expression is upregulated in SSc microvascular endothelial cells (MVEC) and fibroblasts (FB) in association with persistence of DNA methylation of the CpG islands in the promoter region of key underexpressed genes (i.e. Fli1 and NOS3). Thus we thought in this study to examine the activity of DNA demethylase in SSc and control cells and the role of microRNA (miRNA) in the regulation of DNA demethylase activities.

Methods: MVEC and FB were isolated from involved SSc skin and control subjects. DNMT1 expression levels were determined by qRT-PCR and by western blot analysis. DNA demethylase activity was measured in nuclear extracts using the EPI Quik™ DNA Demethylase Activity/Inhibition Assay Kit. Small RNA molecules including miRNA were isolated from SSc and control MVEC and FB using PureLink miRNA isolation kit. The effects of miRNA on DNA demethylase activity was examined in SSc and control cells by transfecting the cells with SSc and control miRNA.

Results: The following results were observed in this study:

1. DNMT1 expression levels were significantly upregulated in SSc cells (mean 3.2 and 2.8 folds in MVEC and FB respectively vs control cells, mean 3 cell lines each).
2. DNA demethylase activity was significantly reduced in SSc cells (42% and 51% in MVEC and FB respectively vs control cells, mean 3 cell lines each).
3. The knockdown of DNMT1 using siRNA did not affect demethylase activity.
4. Transfection of SSc cells with control miRNA results in decrease expression of DNMT1 and increase activity of DNA demethylation, while the transfection of control cells with SSc miRNA resulted in upregulation of DNMT1 and reduced DNA demethylase activity.
5. SSc MVEC and FB transfection with control miRNA normalized abnormal gene expression profile.

Conclusion: This study demonstrates upregulation of DNMT1 and diminished activities of DNA demethylase in SSc MVEC and FB and that...
DNA demethylase activity is regulated by miRNA. The characterization of the molecular mechanisms that target both DNA methylation and demethylation is essential for understanding the emergence and persistence of the pathologic phenotype exhibited by SSc cells.

Disclosure: B. Kahaleh, None; Y. Wang, None.

2298

The Arachidonate 5-Lipooxygenase Activating Protein (ALOX5AP) Polymorphism Is Associated with Risk of Scleroderma-Related Interstitial Lung Disease: A Multicenter Study From the EULAR Scleroderma Trial and Research Group, Otylia M. Kowal-Bielecka1, Sylvia Chwiesioska- Minarowska2, Pawel Bernatowicz2, Yannick Allanore3, Timothy RD Radstake4, Jasper Broen5, Marco Matucci-Cerinic6, Roger Hesselstrand7, Dorota Krasowska8, Gabriela Riemekasten9, Madelon C. Vonk9, Oksana Kowalczyk10, Marek Bielecki11, Robert Milewski11, Lech Czyzewski12, Jacek Chyczewski12, Otylia M. Kowal-Bielecka1, Sylwia Chwiesioska-Minarowska2, None; 2Department of Rheumatology and Internal Medicine, Medical University in Bialystok, Bialystok, Poland, 3Department of Cardiovascular and Thoracic Medicine, University of Bialystok, Bialystok, Poland, 4Department of Cardiovascular and Thoracic Medicine, Medical University of Lublin, Lublin, Poland, 5Charité University Hospital, German Rheumatology Research Center, a Leibniz Institute, Berlin, Germany, 6Department of Orthopaedics and Traumatology, Medical University of Bialystok, Bialystok, Poland, 7Department of Statistics and Medical Informatics, Medical University of Bialystok, Bialystok, Poland, 8Department of Pathomorphology, Medical University in Bialystok, Bialystok, Poland, 9Department of Allergology and Internal Medicine, Medical University of Bialystok, Bialystok, Poland

Background/Purpose: Systemic sclerosis (SSc, scleroderma) is an autoimmune disease characterized by chronic inflammation, vascular injury and profound fibrosis of the skin and internal organs. Leukotrienes (LTs) are a family of arachidonic acid-derived lipid mediators which play a key role in the regulation of inflammation, vascular function and connective tissue remodeling. Studies in humans have shown that increased synthesis of LTs takes place in SSc. However, the mechanisms responsible for overproduction of LTs in SSc remain unclear. The arachidonate 5-lipoxygenase activating protein (ALOX5AP) plays a key role in the regulation of synthesis of LTs through presenting arachidonic acid to 5-lipoxygenase.

In the present study we hypothesized that single nucleotide polymorphisms (SNPs) of ALOX5AP might confer risk of SSc and/or SSc-related organ involvement.

Methods: Seven SNPs of ALOX5AP (rs17222814, rs17216473, rs10507391, rs4709874, rs9315050, and rs1722842) were genotyped in a cohort of 977 patients with SSc and 539 healthy controls from European centers collaborating within the EULAR Scleroderma Trials and Research (EUSTAR) group. SSc patients were classified as having diffuse or limited SSc, according to the Medsger and LeRoy criteria. Clinical characteristics of SSc patients included the presence of SSc-related interstitial lung disease (SSc-ILD, based on chest X-ray/HRCT), pulmonary hypertension (SPAP > 35 mmHg in echocardiography), scleroderma renal crisis and digital ulcers.

In 14 SSc patients concentrations of cysteinyl leukotrienes and leukotriene B4 were measured in the supernatants of monocyte-stimulated peripheral blood mononuclear cells (PBMC) by means of commercially available ELA kits (Cayman Chemicals, MI, USA).

Results: Significant association was found for rs10507391 polymorphism (T/A) of the ALOX5AP and the risk of SSc (Odds Ratio; 95% CI: 1.26; 1.065–1.49, p = 0.0078) and SSc-ILD (OR; 95% CI: 1.4224; 1.1621–1.7412, p = 0.0007). However, only the latter association remained significant when corrected for multiple testing (p = 0.005).

PBMC from SSc carriers of rs10507391 allele A (N=5) synthesized greater amounts of cysteinyl leukotrienes (433 +/- 215 pg/mL/10^6 cells) as compared with PBMC from SSc patients with rs10507391 TT genotype (N=9, 261 +/- 99 pg/mL/10^6 cells, p=0.05). Synthesis of leukotriene B4 was comparable between the two groups (995 +/- 547 pg/mL/10^6 cells vs 796 +/- 584 pg/mL/10^6 cells, p=0.71).

No significant associations could be found between the remaining SNPs of ALOX5AP and the presence of SSc or SSc-related internal organ involvement.

Conclusion: The results of our study indicate, for the first time, that the genetic variants of ALOX5AP might play a role in the development of SSc-related pulmonary fibrosis. Moreover, our results might raise the possibility of developing genotype-specific therapy for SSc-related lung involvement. This appears particularly attractive since antileukotriene therapies are already in use in humans.

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Acroosteolysis Is Associated with Increased Propensity for Osteoclast Formation and Higher VEGF Levels in the Peripheral Blood of Systemic Sclerosis Patients. Jin Kyun Park1, Andrea Fava2, Antony Rosen3 and Francesco Boin4. 1Seoul National University Hospital, Seoul, South Korea, 2Johns Hopkins University, Baltimore, MD, 3The Johns Hopkins University, Baltimore, MD

Background/Purpose: Acroosteolysis (AO) secondary to bone resorption of distal phalanges affects up to 20% of systemic sclerosis (SSc) patients leading to shortening of the digits, impaired hand function, and disability. AO pathophysiology is not known, but chronic hypoxia secondary to SSc vasculopathy may be a contributing factor. In this study, we sought to define whether the propensity for osteoclast formation is increased in peripheral blood mononuclear cells (PBMCs) of SSc patients with AO compared to controls, and whether this may be associated with levels of the hypoxia-driven vascular endothelial growth factor (VEGF).

Methods: PBMCs obtained from 26 SSc patients (11 with and 15 without AO) and 14 healthy controls were cultured in 96-well plates in the presence of receptor activator of nuclear factor-kappaB ligand (RANKL) and M-CSF. After 9 days, osteoclast-like tartrate resistant acid phosphatase (TRAP)-positive multinucleated giant cells (MNGs) were counted. MNG formation was also assessed after VEGF (10 ng/ml) priming for 24 hours. Plasma VEGF levels were measured using an electrochemiluminescence platform (Meso Scale Discovery).

Results: SSc patients with AO formed significantly more TRAP+ MNGs at day 9 than SSc patients without AO (142.4 ± 6.96 vs. 27.2 ± 17.6 MNG/well, P < 0.01), whereas no difference was noted between SSc without AO and controls (27.2 ± 17.6 MNG/well vs. 18.7 ± 27.0 MNGs/well, P=NS). Priming with VEGF at 10 ng/ml for 24 hours significantly increased TRAP+MNGs formation by 5.3 fold (P=0.002). In plasma of SSc patients with AO, VEGF levels were significantly higher than in SSc patients without AO (165.3 ± 80.2 vs. 88.1 ± 38.1 pg/ml, P<0.05). Strikingly, plasma VEGF levels correlated with TRAP+MNG formation (Spearman rho =0.386, P<0.05).

Conclusion: AO is associated with an increased propensity of peripheral blood cells to form osteoclasts and this seems to be partly driven by higher VEGF plasma levels. Effective control of hypoxia and inhibition of terminal mediators of osteoclastogenesis may be an effective strategy to prevent and treat AO in SSc patients.

Disclosure: J. K. Park, None; A. Fava, None; A. Rosen, None; F. Boin, None.

2300

The Effects of Salvianolic Acid B in Fibrotic Models in Vivo and in Vitro. Qiming Li1, Wenyu Wu2, Wenzheng Tu3, Haiyan Chu1, Yanyun Ma1, Hejian Zou2, Xiaodong Zhou4 and Jiu-Cun Wang1. 1Ministry of Education Key Laboratory of Contemporary Anthropology, School of Life Sciences, Fudan University, Shanghai, China, 2Huashan Hospital, Shanghai, China, 3Shanghai Traditional Chinese Medicine-Integrated Hospital, Shanghai, China, 4University of Texas-Houston Medical School, Houston, TX

Background/Purpose: Scleroderma or systemic sclerosis (SSc) is characterized by the fibrosis of skin and visceral organs. Salvianolic acid B (SAB) is an important water-soluble ingredient extracted from Danshen, a kind of Chinese medicinal herbs. Clinical data showed there were good curative effects and side-effects on SSc with a compound prescription of traditional Chinese medicine including Danshen. Furthermore, SAB has been...
proved its efficacy in treating chronic liver fibrosis. Our aim is to examine whether SAB can attenuate fibrosis in the activated fibroblasts from SSc patients and fibrotic mouse models.

Methods: For in vitro studies, dermal fibroblasts trains were cultured from skin biopsies of SSc patients which constitutively over-expressed collagen genes. Cell growth was measured with the xCELLigence system to evaluate the effects of SAB on fibroblasts. Real-time quantitative RT-PCR was used to examine the transcript levels of collagen. The levels of Smad3 and p-Smad3 were assayed by Western blot. For in vivo studies, C57BL/6 female mice of 6–8 weeks (n = 5 for each treatment) were injected with bleomycin through tracheal cutting to induce pulmonary fibrosis. SAB was fed daily for 10 or 24 days from the third day before bleomycin (BLM) instillation for the Group of Prevention Study (P) or the Group of Prevention &Treatment Study (P&T), respectively. The total cell counts in BALF (broncho alveolar lavage fluid) were used to evaluate the inflammatory status. HE and Masson’s trichrome stains, gene expression analysis and Sircol assay were used to assess the effects of drug treatments on inflammatory and fibrotic changes. Immunohistochemistry was also performed to examine the α-SMA positive cells.

Results: For in vitro studies, SAB suppressed fibroblasts proliferation and decreased the synthesis of collagen mRNA in SSc dermal fibroblasts efficiently. Additionally, SAB attenuated TGF-β1-induced Smad3 phosphorylation in normal dermal fibroblasts. In the mouse model of pulmonary fibrosis, SAB significantly reduced the total cell counts in BALF in the P group, indicating the amelioration of inflammation. Furthermore, SAB potently reduced the number of myofibroblasts, the mRNA level of collagen and the collagen content in both the P group and P&T group. HE stain of mouse lung tissues further showed a significant disruption of the alveolar units and infiltration of inflammatory cells in the lungs induced by BLM, while SAB treatment improved the disruption of the alveoli with less infiltrating inflammatory cells in the P group (Figure 1).

Conclusion: SAB inhibited fibroblasts proliferation and collagen gene expression in a Smad3 dependent signaling pathway. Administration of SAB could reduce inflammation and fibrosis in mouse lungs induced by BLM. Therefore, SAB is a promising candidate for the treatment of SSc.

2301
The Interferon Type I Signature Is Increased in Monocytes From Systemic Sclerosis Patients. Zana Bricic1, Benny van Bon2, Cornelia G. van Helden-Meeuwen1, Madelon C. Vonk1, Hanneke Kraaijen1, Wim van den Berg3, Paul L. Van Dale1, Virgil A. Dahn1, Timothy Radtke2 and Marjan A. Versnel1. 1Erasmus Medical Center, Rotterdam, Netherlands, 2University Medical Center Utrecht/Radboud University Nijmegen Medical Center, Utrecht/Nijmegen, Netherlands, 3Radboud University Nijmegen Medical Center, Nijmegen, Netherlands

Background/ Purpose: Systemic sclerosis (SSc) is a complex fibrosing disease of unknown etiology. The past decade clear indications for an aberrant immune system have been revealed. SSc is classified either as limited (ISSc) or diffuse cutaneous (dSSc), of which the latter is more severe with excessive involvement of the skin. Although the pathogenesis of SSc is largely unknown, the past few years it has been appreciated that a substantial part of the SSc patients display an Interferon (IFN) type I signature. In this study we aimed to investigate whether an IFN type I signature can be found in patients from two clinics in the Netherlands and correlated the IFN type I signature with disease manifestations.

Methods: 41 patients with SSc were included and 25 healthy controls (HC). Patients were stratified as having ISSc (n=25) or dSSc (n=16), and further divided into patients with late (>3 years) or early disease (<3 years). Expression levels of 11 IFN type I inducible genes, which were previously detected by us in CD14+ monocytes from Sjogren patients, were assessed using real time quantitative PCR. Expression levels were then submitted to a principal component analysis to identify correlated groups of genes.

Results: of factor analysis showed that 4 genes (IFI44L, IFITM1, IFIT1 and MX1) explained 95% of the total variance of the 11 genes, and we therefore adopted overexpression of these 4 genes as our operational definition of positivity for an IFN type I signature. Expression levels of these 4 genes were used to calculate IFN type I scores for each subject. SSc patients positive for the IFN type I signature (IFN score≥10) and patients negative for the signature (IFN score<10) were then compared for clinical disease manifestations.

Results: IFN type I signature was present in 29% of SSc patients compared with 0% of HC. Stratifying the patients in ISSc and dSSc, we found the IFN type I signature to be present in 24% of ISSc patients and 38% of dSSc. Further dividing the patients into early and late SSc, we observed a statistically significant increase in IFN scores in the early diffuse SSc group compared with HC (P<0.001). SSc patients positive for the IFN type I signature were also significantly younger compared with the patients negative for the signature (p=0.008). Moreover SSc patients with the presence of anti-RNP had significantly higher IFN scores compared to patients without anti-RNP antibodies (P=0.003). In contrast to the presence of anti-RNP antibodies, SSc patients positive for antitrombomere antibodies (9 out of 38 patients) were all negative for the IFN type I signature. Forstraining anti-topoisomerase and anti-SSA antibodies, we observed a trend of higher IFN scores in the patients with these autoantibodies, however no significant differences were detected. When stratifying patients according to the presence of digital ulcers, lung fibrosis, pulmonary hypertension or Raynauds’s phenomenon, no differences in IFN scores were observed.

Conclusion: The monocyte IFN type I signature is present in about 1/3 of SSc patients and mainly in the early diffuse SSc group with anti-RNP autoantibodies. Such patients might benefit from treatment blocking the IFN type I production or activity.

Disclosure: None;

2302
Secreted Frizzled-Related Protein 4 Induces a Profibrotic Phenotype in Systemic Sclerosis Fibroblasts by Activating a Non-Canonical WNT Signaling Pathway. Justin Gillespie1, Paul Emery1 and Francesco Del Galdo2. 1University of Leeds, Leeds, United Kingdom, 2Leeds Musculoskeletal Biomedical Research Unit, Leeds, United Kingdom, 3Leeds Institute of Molecular Medicine and LMBRU, Leeds, United Kingdom

Background/ Purpose: Systemic Sclerosis (SSc) is a chronic fibrotic disease involving autoimmune activation, fibroproliferative vasculopathy and tissue fibrosis of skin and multiple internal organs. Several studies have indicated that activation of WNT/β-catenin signaling pathway plays an important role in the pathogenesis of tissue fibrosis. Intriguingly, tissue expression studies on SSc skin show both upregulation of canonical WNT ligands1 and consistent upregulation of a putative WNT antagonist, Secreted Frizzled-Related Protein 4 (SFRP4) both at mRNA and protein level1-4. Objectives: To determine the role of SFRP4 in modulating WNT signaling and the profibrotic phenotype of SSc fibroblasts.

Methods: Immortalized primary control and SSc fibroblasts were cultured in 10% DMEM and starved in 0.5% DMEM for 24hrs prior to stimulation with recombinant WNT-3a, WNT-5a (100ng/ml) and/or SFRP4 (70ng/ml). Gene expression was quantified by SYBR green QPCR. Canonical WNT signaling activation was assessed by TOPFlash TCF/LEF luciferase
reporter activity. Whole cell lysates were used to assess protein expression by Western Blot and c-Jun phosphorylation by Phospho-c-Jun ELISA (Cell Signaling Technology, UK). Mean ± SEM of 4 independent experiments were analyzed using Graph Prism 5.0.

**Results:** Basal SFRP4 gene expression in SSc fibroblasts was increased on average by 264% compared to normal controls (P<0.0001). Stimulation with WNT-3a upregulated SFRP4 expression by 56% (P<0.001), WNT-3a upregulated COL1A1 and α-SMA gene expression by 160% (P<0.001) and 230% (P<0.0001) in SSc fibroblasts, in contrast to 18% (P<0.05) and 72% (P<0.01) in normal fibroblasts, respectively. Consistent with canonical WNT signaling activation, WNT-3a caused a upregulation of axin-2 by 200% (P<0.0001) in SSc and 90% (P<0.001) in normal fibroblasts, respectively. TopFlash activity was also increased [P<0.0001] by 44% and 38%, respectively. Co-stimulation with SFRP4 showed no inhibitory activity of the WNT-3a effects. However, SFRP4 treatment alone was able to induce both COL1A1 by 43% [P<0.01] and α-SMA by 46% [P<0.001] only in SSc fibroblasts without any significant changes in either axin-2 expression or TOPFlash activity. Additionally, SSc fibroblasts treated with SFRP4 showed an increase in c-Jun phosphorylation reaching maximum levels at 10min by 167% [P<0.001] and again at 24hrs by 184% (P<0.001).

**Conclusion:** Increased SFRP4 in SSc may contribute to the fibrotic process through non-canonical WNT activation instead of functioning as a WNT inhibitor. The molecular events underlying this paradox response of SSc fibroblasts may reveal insightful mechanisms in the pathogenesis and perpetuation of the fibrotic response in SSc.

1Wei, J. et al., 2011, Arthritis and Rheumatism, 63(6), pp.1707–1717.

**Disclosure:** None; P. Emery, None; F. Del Galdo, None.

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**2303**

**Confirmation of TNPI1 As a Susceptibility Locus for Systemic Sclerosis in a Large Multicenter Study**

Lara Bossini-Castillo1, Jose Ezequiel Martin1, Carmen Pilar Simeon2, Lorenzo Beretta2, Olga Y. Gorlova3, Madelon C. Vonk3, Patricia Carreira4, the Spanish Scleroderma Group, Annaemie Schuerwegh5, Alexandre Voskuyl5, Anna-Maria Hoffmann-Vold6, Roger Hesselstrand7, Annemie Schuermann8, Claudia Lunardi9, Jaap Van Laar10, Paul Shiel10, Ariane Herrick11, Jane Worthington12, Carmen Fonseca13, Christopher P. Denton13, Shervin Assassi13, Bobby P.C. Koelman14, Maureen D. Mayes15, T.R.D.J. Radstake15, and Javier Martin1. 1Instituto de Parásitología y Biomedicina Lopez-Neyra (IPBLN-CSIC), Granada, Spain, 2Hospital Valle de Hebron, Barcelona, Spain, 3Hospital Universitario 12 de Octubre, Madrid, Spain, 4Charité University Hospital, Berlin, Germany, 5VU University Medical Center, Amsterdam, Netherlands, 6Hospital Universitario 12 de Octubre, Madrid, Spain, 7Leiden University Hospital, Leiden, Netherlands, 8University of Glasgow, Glasgow, United Kingdom, 9Muskoskeletals Research Group, Newcastle, United Kingdom, 10Leids Univers Medisch Centrum, Leiden, Netherlands, 11Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 12King’s College Hospital, London, United Kingdom, 13Hospital de la Santa Creu i Sant Pau, Barcelona, Spain, 14Royal Free Hospital, London, England, 15Rheumatic Diseases Centre, Salford, United Kingdom.

**Background/Purpose:** Systemic sclerosis (SSc) is a fibrotic autoimmune disease that represents a clear example of a sex biased immune disorder. The X-chromosome gene IRAK1 has been associated with SSc and systemic lupus erythematosus (SLE), being an interesting candidate to explain this sexual dimorphism. However, IRAK1 is in the same haplotypic block as MEC2P on Xq28, and recent studies suggest that functional genetic variants of the latter locus may explain the association signals with SLE observed in IRAK1. We aimed to evaluate whether the SSc-associated IRAK1 polymorphism rs1059702 (Phe196Ser) is the causal variant of the Xq28 association or whether it reflects another association signal from the nearby MEC2P.

**Methods:** Only women were included in the study. We analysed a total of 3065 SSc patients and 2630 healthy controls from five independent Caucasian cohorts (Spain, USA, Germany, The Netherlands, and UK). A tagging strategy was used to select four taggers that cover all the common genetic structure of the tested loci. Whether it reflects another association signal from the nearby MEC2P.

**Disclosures:** None; J. Martin, None; C. Simeon, None; L. Beretta, None; O. Y. Gorlova, None; M. C. Vonk, None; P. Carreira, None; A. Schuermann, None; A. Voskuyl, None; A. P. Hoftijzer, None; R. Hesselstrand, None; A. Lunardi, None; A. Van Laar, None; P. Shiel, None; A. Herrick, None; J. Worthington, None; C. Fonseca, None; C. P. Denton, None; S. Assassi, None; B. P. C. Koelman, None; M. D. Mayes, None; T. R. D. J. Radstake, None; J. Martin, None.

**2304**

**Differential Association of IRAK1 and MEC2P with Specific Systemic Sclerosis Phenotypes.** F. David Carmona1, M.C. Cenn1, L.M. Diaz-Gallo2, Carmen P. Simeon3, Patricia Carreira4, the Spanish Scleroderma Group5, Nicolas Hunzelmann5, Gabriela Riemeckaste6, Torsten Witte7, Alexander Kreuter8, Jörg HW Distler9, Paul Shiel10, Jacob M. van Laar11, Annemie Schuermann5, Madelon C. Vonk13, Alexandre Voskuyl14, Carmen Fonseca15, Christopher Denton16, Ariane Herrick11, Frank C. Arnett17, Fijenoom K. Tan18, Shervin Assassi13, T.R.D.J. Radstake15, Maureen D. Mayes15, and Javier Martin1. 1Instituto de Parásitología y Biomedicina Lopez-Neyra (IPBLN-CSIC), Granada, Spain, 2Hospital Valle de Hebron, Barcelona, Spain, 3Hospital Universitario 12 de Octubre, Madrid, Spain, 4Hospital Universitario 12 de Octubre, Madrid, Spain, 5University of Cologne, Cologne, Germany, 6Charité University Hospital, German Rheumatology Research Center, a Leibniz Institute, Berlin, Germany, 7Hannover Medical School, Hanover, Germany, 8Ruhr University Bochum, Bochum, Germany, 9Department of Internal Medicine 3 and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 10University of Amsterdam, Amsterdam, Netherlands, 11Royal Free Hospital, London, United Kingdom, 12Royal Free Hospital, London, England, 13Rheumatic Diseases Centre, Salford, United Kingdom, 14University of Texas Health Science Center at Houston, Houston, TX, 15University Medical Center Utrecht, Utrecht, Netherlands.

**Background/Purpose:** Systemic sclerosis (SSc) is a fibrotic autoimmune disease that represents a clear example of a sex biased immune disorder. The X-chromosome gene IRAK1 has been associated with SSc and systemic lupus erythematosus (SLE), being an interesting candidate to explain this sexual dimorphism. However, IRAK1 is in the same haplotypic block as MEC2P on Xq28, and recent studies suggest that functional genetic variants of the latter locus may explain the association signals with SLE observed in IRAK1. We aimed to evaluate whether the SSc-associated IRAK1 polymorphism rs1059702 (Phe196Ser) is the causal variant of the Xq28 association or whether it reflects another association signal from the nearby MEC2P.

**Methods:** Only women were included in the study. We analysed a total of 3065 SSc patients and 2630 healthy controls from five independent Caucasian cohorts (Spain, USA, Germany, The Netherlands, and UK). A tagging strategy was used to select four taggers that cover all the common genetic structure of the tested loci. Whether it reflects another association signal from the nearby MEC2P.
Results: IRAK1 rs1059702 was associated with diffuse cutaneous SSc (dSSc; P \text{FDR} = 4.12 \times 10^{-3}, OR = 1.27), and trends of association were evident in the global SSc/control (P \text{FDR} = 0.070, OR = 1.13) and anti-topoisomerase positive (ATA+) control (P \text{FDR} = 0.087, OR = 1.23) comparisons, consistent with previously published data. Similarly, the MECP2 rs17435 variant reached statistical significance after comparing the global disease group and dSSc subgroup to control with log \text{OR} = 2.68 \times 10^{-3}, OR = 1.19, and P \text{FDR} = 3.26 \times 10^{-4}, OR = 1.30. respectively. Conditional logistic regression analyses showed that the association of IRAK1 rs1059702 with dSSc was explained by that of MECP2 rs17435, because the only latter remained significant after conditioned to each other (rs1059702 conditioned P = 0.786; rs17435 conditioned P = 0.049). However, the analysis of pulmonary fibrosis (PF) data suggested that IRAK1 rs1059702 was consistently associated with this feature, since statistical significance was observed when comparing PF+ vs controls (P \text{FDR} = 0.039, OR = 1.30) and PF+ vs PF- (P = 0.025, OR = 1.26), but not PF-vs controls (P = 0.574, OR = 1.04).

Conclusion: Our data suggest the existence of two independent signals within the Xq28 region, one located in IRAK1 associated with PF, and another in MECP2 associated with dSSc.

Disclosure: F. B. Carmona, None; M. C. Cenit, None; L. M. Diaz-Gallo, None; C. P. Simón, None; P. Carreira, None; N. Hunzelnann, None; G. Riemenkasten, None; T. Witt, None; A. Kreuter, None; J. H. Döster, None; P. Shiels, None; J. M. van Laar, None; A. Schuerwegh, None; M. C. Vonk, None; A. Voskuyl, None; C. Fonseca, None; C. Denton, None; A. Herrick, None; F. C. Arnett, None; F. K. Tan, None; S. Assassi, None; T. R. D. J. Radstake, None; M. D. Mayer, None; J. Martin, None.

2305
A Putative Role for the TGFβ Accessory Receptors Betaglycan and Endoglin in pulmonary Complications of Scleroderma.

Sarah L. Trindler, Adrian Gilbane, Markella Ponticos, Johanna Donovan, Christopher P. Denton, David J. Abraham and Alan M. Holmes. UCL, London, United Kingdom

Background/ Purpose: In scleroderma (SSc) pulmonary complications such as fibrosis and pulmonary hypertension represents a significant cause of mortality. The ability of TGFβ to act as a potent pro-fibrotic mediator is well established, potently inducing the expression of numerous fibrogenic genes including type I collagen and CCN2. Cellular responses to TGFβs are markedly regulated by the accessory receptors betaglycan and endoglin. Here we sought to investigate the expression and cellular effects of these accessory receptors in SSc pulmonary fibroblast function.

Methods: Pulmonary fibroblasts explant cultured from SSc patient with lung complications were assessed for the expression of the TGFβ accessory receptors betaglycan/TGFβRII and endoglin by Q-PCR and western blot. TGFβ accessory receptor expression was further determined by immunohistochemistry on pulmonary lung sections. The cellular effect of altered expression of these receptors on fibrogenic genes through transient over-expression in pulmonary fibroblasts were assessed by Q-PCR and western blot.

Results: SSc lung fibroblasts exhibited a marked elevated expression in betaglycan and endoglin. Immunohistochemical analysis demonstrated a similar elevated expression of these receptors. Consistent with a pathological role of betaglycan and endoglin, over-expression of these accessory receptors led to altered cellular responses to TGFβ, as assessed by the expression of the fibrogenic genes CCN2, collagen type I and αSMA.

Conclusion: These data demonstrate elevated expression of the TGFβ accessory receptors betaglycan and endoglin on SSc pulmonary fibroblasts. An altered accessory receptor repertoire led to a marked change in the expression of known pro-fibrotic genes, including collagen type I and CCN2. Thus altered expression of TGFβ accessory receptors may play a significant role in the pro-fibrotic phenotype exhibited by SSc pulmonary fibroblasts.

Disclosure: S. L. Trindler, None; A. Gilbane, None; M. Ponticos, None; J. Donovan, None; C. P. Denton, None; D. J. Abraham, None; A. M. Holmes, None.

2306
Intratracheal Instillation of Omniscan in an Adenine-Induced Model of Chronic Renal Failure: A New Model of Nephrogenic Systemic Fibrosis.

Peter J. Wermuth and Sergio A. Jimenez. Jefferson Institute of Molecular Medicine, Division of Connective Tissue Diseases and Scleroderma Center, Thomas Jefferson University, Philadelphia, PA

Background/ Purpose: Nephrogenic Systemic Fibrosis (NSF), a generalized progressive fibrotic disorder, occurs in some patients with renal insufficiency exposed to various gadolinium based contrast agents (Gd-BCA). Currently, there is no animal model for human NSF. Some studies using subtotal nephrectomized rats described cutaneous lesions characterized by slight dermal fibrosis and increased infiltration of CD34+ cells following systemic GdBCA administration. These lesions, however, failed to reproduce the severe dermal and tissue fibrosis and other histomorphological changes characteristic of human NSF. One possible reason for this is that although subtotal nephrectomy replicates the decreased filtering capacity of human chronic renal failure, it fails to induce numerous other features that may be necessary for NSF development. In this study, we treated mice with adenine-induced renal failure by intratracheal instillation of the GdBCA Omniscan to develop a more relevant model of NSF.

Methods: Chronic renal failure was induced in C57BL6/J mice by ad libitum feeding of standard rodent diet supplemented with 3% adenine for 30 days. A single dose of either the GdBCA Omniscan (25 μL of a 0.5 M solution) or an equal volume of normal saline was administered to mice with normal renal function (controls) or with chronic renal failure by intratracheal instillation. Mice were sacrificed 28 days post-instillation and tissues were isolated for analysis by histological examination (hematoxylin/eosin and Masson’s trichrome stains. Assays of collagen content to assess the severity of tissue fibrosis were performed employing a standard hydroxyproline assay of hydrolyzed tissue samples.

Results: Histopathology studies showed mononuclear cell infiltration and fibrosis in lungs isolated from adenine-fed mice instilled with Omniscan but not in lungs from mice with normal renal function instilled with Omniscan or in mice with either normal or ablated renal function instilled with saline. The pattern of fibrosis was predominantly peri-branchial although substantial diffuse interstitial fibrosis was also observed. Hydroxyproline content was increased ~3 fold in the lungs of renal failure mice treated with Omniscan compared to mice in all other treatment groups.

Conclusion: The present study demonstrates for the first time the ability to induce significant tissue fibrosis and increased collagen deposition in mice with adenine induced renal failure exposure to the gadolinium contrast agent Omniscan. This inducible model of tissue fibrosis will be a valuable tool in studying the pathogenesis of NSF and other chemically-induced fibrotic disorders.

Disclosure: P. J. Wermuth, None; S. A. Jimenez, None.

2307
Role of Endosomal and Cell Membrane Toll-Like Receptors in Keratinocyte Activation by Systemic Sclerosis Autoantibodies.

James M. Watson, Joanna Nikitowicz Buniak1, Xu Shiwen2, David J. Abraham1, Christopher P. Denton3 and Richard J. Stratton1. 1UCL Medical School, London, United Kingdom, 2Royal Free Hospital, London, United Kingdom, 3Royal Free and University College Medical School, London, United Kingdom

Background/ Purpose: Systemic sclerosis (SSc) is an autoimmune rare connective tissue disorder of unknown aetiology, heterogeneous clinical manifestations and an often progressive course which includes skin changes which are partly mediated by keratinocytes. It is proposed that immunoglobulins from patients with SSc causes activation of toll like receptors (TLR) 2 and 3.

Methods: Initially, patient IgG samples which had previously been shown to up-regulate interleukins in HaCat immortalised keratinocytes were studied. More patient samples of IgG were then purified using a protein A column and TLR2 and TLR3 activation was measured using the HEK cell line which was co-transfected with either the hTLR2 or hTLR3 gene, and a secreted embryonic alkaline phosphatase (SEAP) gene. Concentrations of IgG used were 1000, 100, 10, 1 and 0.1 μg/mL.

Results: Initial assessment of signalling downstream of TLRs gave variable results but some SSc samples induced nuclear translocation of NFκB (RelA).

A total of 21 diffuse and limited SSc samples with 5 control samples were used. 13 SSc samples showed an increase in TLR2 signalling, whilst 3 SSc samples showed an increase in TLR3 signalling. No healthy control samples showed an increase in expression of TLR 2 or 3. On statistical analysis the data was grouped by disease type. At all concentrations studied p values were statistically significant showing an increase in TLR activity compared to healthy samples except for one, see figure 1 and 2.
Theresa T. Lu2, 1Weill Cornell/Rockefeller/Sloan-Kettering Tri-Institutional D. J. Abraham

Background/Purpose: Systemic sclerosis (SSc) is a heterogeneous connective tissue disease that has significant mortality and morbidity secondary to internal and cutaneous fibrosis. Though the exact pathogenesis remains poorly understood, fibroblast and myofibroblast activation are thought to be key contributors to the fibrotic process. Dendritic cells (DCs) can modulate mesenchymal cell activity in lymph nodes, and we hypothesized that they may also have a role in modulating the fibroblasts activity in skin fibrosis.

Methods: We induced fibrosis by injecting bleomycin (BLM, 20μg) subcutaneously into 3 adjacent points on shaved back skin for 17 or 28 days. After sacrifice, we took 3x 8mm biopsy punches of affected tissue for histology, flow cytometry and RNA extraction. Primary fibroblasts were derived from wild type, untreated mouse ears and used at passage 1. Bone marrow-derived DCs (BMDCs) were isolated from wild type, untreated bone marrow cultured in the presence of GM-CSF.

Results: By immunohistochemistry, we observe the association of CD11c+ cells and alpha-smooth muscle actin+ (SMA+) myofibroblasts after BLM treatment. Using CD11c-DTR transgenic mice that allow for inducible depletion of CD11c+ cells, we depleted CD11c+ cells after 15 days of BLM treatment. CD11c+ cell depletion resulted in disappearance of SMA+ cells and over 2-fold decrease in TGFβ1 transcription in total skin, suggesting that dendritic cells are required to maintain myofibroblasts and TGFβ1 levels in fibrotic skin. Culturing BMDCs with primary fibroblasts resulted in increased SMA+ and SMA+ fibroblast numbers, as well as increased SMA expression in SMA+ cells, suggesting that dendritic cells are sufficient to promote fibroblast and myofibroblast proliferation and activation.

Conclusion: These results suggest a scenario whereby dendritic cells in fibrotic skin contribute to fibrosis in part by promoting the proliferation and activation of fibroblasts and myofibroblasts, perhaps via their expression of TGFβ1.

Disclosure: J. J. Chia, None; S. Tian, None; T. T. Lu, None.

2309

Increased Levels of Ser 181 Phosphorylated SOX9 in SSc Dermal Fibroblasts: A Novel Participant in the Pathogenesis of SSc Fibrotic Process. Sonsoles Piera-Velazquez, Jolanta Fertala and Sergio A. Jimenez. Jefferson Institute of Molecular Medicine, Division of Connective Tissue Diseases and Scleroderma Center, Thomas Jefferson University, Philadelphia, PA

Background/Purpose: SOX9, a high mobility group (HMG) transcription factor is a master regulator of chondrogenesis and is essential for the maintenance of the chondrocyte-specific phenotype regulating the expression of various chondrocyte-specific gene products including type II collagen and COMP. We recently performed an analysis of the kinome of human dermal fibroblasts and demonstrated that these cells contained high levels of SOX9 phosphorylated at serine residue 181 (Ser181 phosphoSOX9). Recent studies on liver fibrosis and segmental glomerulosclerosis have suggested that SOX9 may participate in tissue fibrosis. Therefore, we explored here the involvement of Ser181 phosphoSOX9 in the fibrotic process of Systemic Sclerosis (SSc) employing cultured SSc dermal fibroblasts in vitro.

Methods: Dermal fibroblasts were obtained from skin samples from normal individuals and from clinically affected and non-affected forearm skin from patients with diffuse SSc of recent onset. Ser181 phosphoSOX9 levels were assessed by Western blot analysis of cell lysates of confluent dermal fibroblasts cultures employing a phospho-specific antibody that recognizes a SOX9 epitope containing a phosphorylated Ser 181 residue. Gene expression analyses were performed by real time PCR employing specific primers. Collagen production was assessed by Western blots of fibroblast culture media. The effects of TGF-β treatment on Ser181 phosphoSOX9 were assessed in confluent cultures in the presence or absence of TGF-β1 (10ng/mL) for 24h. The intracellular kinases responsible for SOX9 phosphorylation were examined by inhibition with specific small molecule kinase inhibitors.

Results: Dermal fibroblasts from SSc patients displayed marked elevation of Ser181 phosphoSOX9 levels in comparison with normal fibroblasts. Furthermore, fibroblasts cultured from clinically affected SSc skin had significantly greater levels of Ser 181 phosphoSOX9 than fibroblasts cultured from clinically non-affected skin from the same patients. TGF-β caused a potent stimulation of SOX9 phosphorylation in normal fibroblasts but only minor stimulation in SSc fibroblasts. The stimulation of SOX9 phosphorylation by TGF-β was inhibited by small molecule inhibitors targeting PKC-delta and Rho Kinase. Inhibitors of PI3 Kinase and other kinases were not effective. The levels of the Type I collagen production changed in parallel with the changes in Ser181 phosphoSOX9 levels.

Disclosure: None.

2308

CD11c+ Cells Are Necessary for Myofibroblast Maintenance in Bleomycin-Induced Cutaneous Fibrosis. Jennifer J. Chia1, Sha Tian2 and Theresa T. Lu2. 1Weill Cornell Rockefeller Sloan-Kettering Tri-Institutional MDPhD Program, New York, NY, 2Hospital for Special Surgery, New York, NY

Background/Purpose: We have previously shown that bone marrow derived dendritic cells (BMDCs) can modulate mesenchymal cell activity in lymph nodes, and we hypothesized that they may also have a role in modulating the fibroblasts activity in skin fibrosis.

Methods: We induced fibrosis by injecting bleomycin (BLM, 20μg) subcutaneously into 3 adjacent points on shaved back skin for 17 or 28 days. After sacrifice, we took 3x 8mm biopsy punches of affected tissue for histology, flow cytometry and RNA extraction. Primary fibroblasts were derived from wild type, untreated mouse ears and used at passage 1. Bone marrow-derived DCs (BMDCs) were isolated from wild type, untreated bone marrow cultured in the presence of GM-CSF.

Results: Using CD11c-DTR transgenic mice that allow for inducible depletion of CD11c+ cells, we depleted CD11c+ cells after 15 days of BLM treatment. CD11c+ cell depletion resulted in disappearance of SMA+ cells and over 2-fold decrease in TGFβ1 transcription in total skin, suggesting that dendritic cells are required to maintain myofibroblasts and TGFβ1 levels in fibrotic skin. Culturing BMDCs with primary fibroblasts resulted in increased SMA+ and SMA+ fibroblast numbers, as well as increased SMA expression in SMA+ cells, suggesting that dendritic cells are sufficient to promote fibroblast and myofibroblast proliferation and activation.

Conclusion: These results suggest a scenario whereby dendritic cells in fibrotic skin contribute to fibrosis in part by promoting the proliferation and activation of fibroblasts and myofibroblasts, perhaps via their expression of TGFβ1.

Disclosure: None.

References:

Conclusion: The results indicate that Ser181 phosphoSOX9 may participate in the molecular mechanisms responsible for the exaggerated fibrotic process in SSc and suggest that PKC-delta and Rho Kinase, the specific kinases responsible for SOX9 phosphorylation, may provide novel therapeutic targets for SSc and other fibrotic disorders involving Ser181 phosphoSOX9.

Disclosure: S. Piera-Velazquez, None; J. Fertala, None; S. A. Jimenez, None.

ACR/ARHP Poster Session C
T-cell Biology and Targets in Autoimmune Disease
Tuesday, November 13, 2012, 9:00 AM–6:00 PM

2310
Enhancement of CRACM1 Expression in Functionally Aberrant Naive CD4+ T Cells in Active Rheumatoid Arthritis. Shuang Liu 1, Shohei Watanabe 2, Miyuki Kuno 3, Hiromasa Miura 2 and Kazutaka Maeyama 1.
1Informational Biomedicine, Ehime University Graduate School of Medicine, Toon-shi, Ehime, Japan, 2Ehime University Graduate School of Medicine, Toon, Japan, 3Osaka City University Graduate School of Medicine, Osaka, Japan

Background/Purpose: Lymphocytes from rheumatoid arthritis (RA) patients have been reported to exhibit increased basal intracellular Ca2+ concentrations compared with the lymphocytes of healthy controls. A precise molecular explanation for the enhanced Ca2+ influx in T cells has not yet been established. To explore the molecular basis of the irregular Ca2+ influx in RA T cells, we performed a cross-sectional study to characterise the expression levels and functional status of Ca2+ release-activated Ca2+ (CRAC) channels in peripheral naive CD4+ T cells from 50 RA patients, 50 osteoarthritis (OA) patients and 15 healthy donors.

Methods: To determine whether CRACM1 channels contribute to the abnormal behavior of T cells in RA, CRACM1 expression was evaluated by western blotting and immunofluorescence analysis. We also measured Ca2+ influx and CRAC currents in naive CD4+ T cells, as well as cytokine release by activated naive CD4+ T cells, for each of the three groups.

Results: 1. Intracellular Ca2+ influx is up-regulated in naive CD4+ T cells from RA patients and is associated with RA disease activity. 2. CRACM1 channel function is increased in T cells from active RA patients. 3. CRACM1 expression in naive CD4+ T cells is higher in active RA patients than in OA patients and healthy donors.

Conclusion: Functionally aberrant naive CD4+ T cells from active RA patients exhibited an increase in Ca2+ influx, as well as up-regulated CRACM1 protein expression and function, indicating that CRACM1 might represent a new molecular target for novel RA therapies.

Disclosure: S. Liu, None; S. Watanabe, None; M. Kuno, None; H. Miura, None; K. Maeyama, None.

2311
Total Glucoside of Paeony Th1 and Th17 Cell Differentiation by Blocking STAT1 and STAT3 Activation in Vivo. Ningli Li 1 and JP Lin 2.
1Shanghai Jiao Tong University School of Medicine, Shanghai, China, 2Shanghai, China

Background/Purpose: Th1 and Th17 cells play very important role in the lesions of human rheumatoid arthritis (RA). Total glucoside of paeony (TGP), an active compound extracted from Paeony root, has been used in therapy for RA and other autoimmune diseases. However the molecular mechanism of TGP in prevention of Th1 and Th17 differentiation remains unclear.

Methods: Collagen-induced arthritis (CIA) mice were used as the RA animal model to test the therapeutic effect of TGP as well as its effect on Th1 and Th17 differentiation in vivo. Expression of cytokines was measured by ELISA, real-time PCR. Th1 and Th17 population were identified by flow cytometry, STATs activation was analyzed by western blotting.

Results: In this study, we found that TGP treatment significantly decreased clinical inflammatory score of CIA. Percentage and number of Th1 and Th17 cells in TGP-treated CIA CD4+ T cells decreased significantly compared with that of without TGP treatment. Moreover, investigation revealed that CIA-treated with TGP decreased expression of T-bet and RORC in CD4+ T cells. But we did not found regulatory T cells (Treg) was altered in TGP treatment CIA mice. Furthermore, we found that TGP treatment inhibited IL-12 and IL-6 expression, meanwhile, activation of STAT1 and STAT3 was inhibited in TGP-treated CIA mice consistently.

Conclusion: Taken together, these findings indicate that TGP inhibits inflammation and autoimmunity in RA patients possibly by reducing Th1 and Th17 cell differentiation.

Disclosure: N. Li, None.

2312
Senescent T Cells Promote Bone Loss in Rheumatoid Arthritis. Johannes Fessler, Rusmir Husic, Elisabeth Lerchbaum, Verena Schwetz, Claudia Stieglar, Barbara Obermayer-Pietsch, Winfried B. Graninger and Christian Dejaco. Medical University Graz, Graz, Austria

Background/ Purpose: To study the influence of aged CD28– T cells on systemic osteoporosis in rheumatoid arthritis (RA) patients.

Methods: Prospective, cross-sectional study on 100 patients with RA [mean age 61.9 (± SD 11.2), 75% female, median time since diagnosis 162.4 (range 5–552) months, SDAI 12.7 (±SD9.3), 81% and 50% received synthetic and/or biological DMARDs, respectively; 24% used corticosteroids, 16% were treated with biophosphonates]. Bone mineral density (BMD) was determined by lumbar spine (LS) and total hip DEXA and laboratory markers of bone metabolism included bone specific alkaline phosphatase, osteocalcin, osteoprotegerin, β-crosslaps and soluble RANKL. PBMCs were retrieved at the same day of BMD measurement and were stained with anti-RANKL, CD3, CD4, CD8, CD45RA, CD45RO and/or CD28 mAbs to measure surface expression of RANKL on T cells and to determine the frequency of T cell subsets by flow cytometry. In vitro RANKL regulation assays were performed using human TNF-α (100ng/ml), IL-6 (100ng/ml), IL-15 (100ng/ml) or solid-phase anti-CD3 (10ng/ml).

Results: A reduced BMD as determined by DEXA was found in 63% of RA patients (13% with osteoporosis, 50% with osteopenia). The prevalences of aged CD4+ CD28– and CD8+ CD28– T cells inversely correlated with T-scores of LS (corr coeff = -0.235, p = 0.028 and corr coeff = -0.266, p = 0.012, respectively) and hip (corr coeff = -0.235, p = 0.025, corr coeff = -0.253, p = 0.016 respectively). Patients with a T-score below –1.0 tended to have higher prevalences of circulating CD4+ CD28– (2.2% [0.1–4.1] vs. 0.5% (0–1.7), p = 0.065) and CD8+ CD28– T cells [44.8% ± 20.7 vs. 37.4% ± 20.1, p = 0.134] than patients with normal bone mass. No association was found between frequencies of aged T cells and blood parameters of bone metabolism. In vitro RANKL expression was higher in CD4+ CD28– T cells (3.8% [0.2–5.7]; p = 0.028) compared to naive CD4+ CD28+ CD45RA+ (2.2% [0.2–3.0]; p = 0.001) and memory CD4+ CD28+ CD45RO+ (2.8% [0.2–3.8]; p = 0.009) T cells. In the CD8+ T cell population surface expression of RANKL was higher on memory (4.4% [0.5–4.4]; p = 0.013) and naive (3.3% [0.5–4.1]; p = 0.013) and aged T cells (2.2% [0.2–20.1], p = 0.001).

In cell culture experiments IL-15 and anti-CD3 stimulation increased RANKL expression on all T cell subsets. IL-15 stimulation showed largest effects on memory CD4+ and CD8+ T cells [4.5-fold and 6-fold higher expression, respectively compared to unstimulated cells, p < 0.05] compared to aged [3.9-fold and 5-fold, respectively, p < 0.05] and naive T cells [1.5-fold and 3.8-fold, respectively, p < 0.05]. Also, activation by anti-CD3 had the largest effect on RANKL expression on memory CD4+ and CD8+ T cells [7.8-fold and 7.5-fold, respectively, p < 0.05] compared to naive [5.2-fold and 4.7-fold, respectively, p < 0.05] and aged cell subsets [2.9-fold and 3.2-fold, respectively, p < 0.05]. IL-6 and TNF-α had no effect on RANKL.

Conclusion: Aged CD28– T cells are linked with the occurrence of systemic bone loss in RA. Increased expression of RANKL on CD4+ CD28– T cells compared to other T cell subsets is compatible with direct stimulation of osteoclastogenesis by aged T cells in RA.

Disclosure: J. Fessler, None; R. Husic, None; E. Lerchbaum, None; V. Schwetz, None; C. Stieglar, None; B. Obermayer-Pietsch, None; W. B. Graninger, None; C. Dejaco, None.
The Autoantibody-Inducing CD4 T Cell (αCD4 T cell) Belongs to CCR4+CD45RBlo122lo CD4 Subpopulation: A Novel ‘Self-Organized Criticality Theory’ Explains the Cause of Systemic Lupus Erythematosus (SLE). Yumi Miyazaki1, Ken Tsuniyama2 and Shinichi Shiozawa3. 1Kyushu University Beppu Hospital/Kobe University Graduate School of Health Sciences, Beppu/Kobe, Japan, 2Kyushu University Beppu Hospital, Beppu, Japan

Background/Purpose: We found that systemic lupus erythematosus (SLE) was induced experimentally by repeatedly immunizing the mice normally not prone to autoimmune diseases by any exogenous antigen so far examined (Tsuniyama K. et al. PLoS ONE 4(12):e8382, 2009). We have then proposed a novel ‘self-organized criticality theory’ that takes place when host’s immune system is overstimulated by repeated exposure to antigen to levels that surpass the immune system’s stability limit, i.e., self-organized criticality. The autoimmune lymphocyte clones, which we name autoantibody-inducing CD4 T cells (αCD4 T cells) are newly generated via de novo T cell receptor (TCR) revision from thymus-passed non-autoantibody clones at peripheral lymphoid organs. They not only stimulated B cells to generate varieties of autoantibodies but also helped final differentiation of CD8 T cell into cytototoxic T lymphocyte (CTL) via antigen cross-presentation to induce tissue injuries identical to SLE. We here tried to identify the phenotype of αCD4 T cell, and show that αCD4 T cell belongs to CCR4+CD45RBlo122lo CD4 subpopulation.

Methods: BALB/c were repeatedly immunized with ovalbumin (OVA), keyhole limpet hemocyanin (KLH) or staphylococcal enterotoxin B (SEB). RF, anti-Sm and anti-dsDNA antibodies were measured using ELISA. To assign CD number on the αCD4 T cell, expression of effector/memory markers were studied in the CD4 T cell of repeatedly immunized mice. These CD4 T cells were isolated referring to CD45RB, CD27 and CD122 markers, and fractionated cells were adoptively transferred into naïve recipients. Autoantibodies in sera of recipient mice were measured 2 weeks after cell transfer. Further, we performed microarray analysis (Whole Mouse Genome Microarray; Agilent Technologies) to investigated gene expression of CD45RBlo122lo CD4 T cell, and flow cytometry of CD45RBlo122lo CD4 T cell to study protein expression profiles of αCD4 T cell in the mice immunized 12x with OVA.

Results: Upon repeated immunization 12x with OVA, KLH or SEB, varieties of autoantibodies including RF, anti-Sm and anti-dsDNA antibodies were generated. Simultaneously, CD45RB+, CD27+ and CD122+ CD4 T cells were significantly expanded as compared with control mice upon repeated immunization with either OVA, KLH or SEB. Adoptive transfer of fractionated CD4 T cells with either CD45RB+, CD27+ or CD122+ markers of the mice immunized 12x with OVA showed that both CD45RB+ CD4 T cell and CD122+ CD4 T cells were capable of inducing autoantibodies in the naïve recipients. However, CD27+ marker was irrelevant for inducing autoantibodies. Consequently, we transferred CD45RBlo122lo CD4 T cells into naïve mice and found that both RF and anti-dsDNA antibody were indeed significantly increased. In microarray analyses, we compared the gene expression profile between CD45RBlo122lo CD4 T cell and the rest of CD4 T cell subsets after immunization 12x with OVA. We found that chemokine (C-C motif) receptor 4 (Ccr4) was increased × 4 in the CD45RBlo122lo CD4 T cell subsets. Surface expression of CCR4 protein was also similarly significantly increased in this subset.

Conclusion: The αCD4 T cell that induces SLE belongs to a CCR4+CD45RBlo122lo CD4 subpopulation.

Disclosure: Y. Miyazaki, None; K. Tsuniyama, None; S. Shiozawa, None.

Correlation Between Abatacept and Rheumatoid Factor – Can Rheumatoid Factor Be a Predictive Factor for Abatacept? Tomonori Kobayakawa1, Masatoshi Hayashi2, Toshihisa Kanamono3, Atsushi Kaneko4, Toshihisa Kojima5 and Naoki Ishiguro6. 1Kagoshima University Hospital, Kagoshima, Japan, 2Kagoshima Prefectural University of Medicine, Tsuruga, Japan, 3Kagoshima Medical College, Kagoshima, Japan, 4Nagano Red Cross Hospital, Nagano, Japan, 5Nagoya Medical Center, Nagoya, Japan, 6Nagoya University, School of Medicine, Nagoya, Japan, 7Nagoya University, Graduate School & Faculty of Medicine, Nagoya, Aichi, Japan

Background/Purpose: Abatacept (ABT), a T-cell selective costimulatory regulator, went on the market in Japan in September 2010, with a number of reports issued on its effectiveness since. However, no report has been made on the correlation between ABT and rheumatoid factor (RF). We examined the correlation between ABT and RF.

Methods: Among the 143 patients with rheumatoid arthritis who were given ABT at Tsushinai Biologics Communication between September 2010 and August 2011, 89 cases whose RF was measured before and after the ABT administration with week 24 follow-up observation. The subjects were sorted into two groups according to the Simplified Disease Activity Index at week 24 after ABT administration: a good response (GR) group (n = 35) that exhibited remission and low disease activity and a poor response (PR) group (n = 54) that exhibited moderate and high disease activity. The correlation between the ABT responsiveness and the RF was examined for these groups. In addition, the cases with high disease activity at week zero were selected for a sub-analysis to determine the correlation between the change in disease activity and RF at 24 weeks and the correlation between the effect of ABT and RF at week 24 in terms of the duration of disease, whether or not methotrexate was concurrently used, and the history of pre-biologics administration.

Results: The percentage of men was higher and the disease activity tended to be lower at week zero in the GR group. The RF was 148.5 mg/dl and 341.1 mg/dl at week zero for the GR group and the PR group and 126.8 mg/dl and 194 mg/dl at the 24th week, respectively. In the group consisting only of subjects with high disease activity, the subjects whose disease activity had improved low at week 24 displayed significantly lower RF values at both week zero and week 24 than those whose disease activity had not improved at week 24. The sub-analysis revealed that the bio naïve patients who had experienced a crisis less than two years earlier had a significantly lower RF value at week zero and maintained the low level through to week 24. No significant difference was observed in RF change over time between those with and without concurrent methotrexate administration.

Table 1. Baseline characteristics of two groups that the RA patients treated with ABT who were enrolled in the present study.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>GR group (n = 35)</th>
<th>PR group (n = 54)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (mean ± SD)</td>
<td>64.5 ± 9.6</td>
<td>63.9 ± 11.2</td>
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</tr>
<tr>
<td>Male (%)</td>
<td>23 (67%)</td>
<td>24 (45%)</td>
<td>0.0116</td>
</tr>
<tr>
<td>RA duration, years (mean ± SD)</td>
<td>11.4 ± 12.1</td>
<td>12.0 ± 11.1</td>
<td>0.5345</td>
</tr>
<tr>
<td>Stage (III/IV)</td>
<td>9/7/10/9</td>
<td>2/14/24/12</td>
<td>0.0113</td>
</tr>
<tr>
<td>Class (1/2/3/4)</td>
<td>7/14/13/1</td>
<td>2/2/25/1</td>
<td>0.9936</td>
</tr>
<tr>
<td>MTX use (%)</td>
<td>21/35 (60%)</td>
<td>32/54 (59%)</td>
<td>0.9446</td>
</tr>
<tr>
<td>MTX dose, mg/w (mean ± SD)</td>
<td>7.3 ± 2.6</td>
<td>7.1 ± 1.9</td>
<td>0.8807</td>
</tr>
<tr>
<td>PSL use (%)</td>
<td>20/35 (57%)</td>
<td>31/54 (57%)</td>
<td>0.9053</td>
</tr>
<tr>
<td>PSL dose, mg/day (mean ± SD)</td>
<td>4.1 ± 2.2</td>
<td>4.8 ± 3.1</td>
<td>0.7962</td>
</tr>
<tr>
<td>Bio naive/2nd/3rd/4th/5th</td>
<td>23/56/1/0</td>
<td>21/14/3/4/2</td>
<td>0.1361</td>
</tr>
<tr>
<td>DSASI/ESR</td>
<td>4.68 ± 1.30</td>
<td>5.65 ± 1.30</td>
<td>0.0006</td>
</tr>
<tr>
<td>SDAI</td>
<td>18.6 ± 11.7</td>
<td>28.9 ± 14.2</td>
<td>0.0901</td>
</tr>
<tr>
<td>MMP-3</td>
<td>161.3 ± 117.2</td>
<td>258.2 ± 311.4</td>
<td>0.0319</td>
</tr>
</tbody>
</table>

GR Good response, PR poor response, RA Rheumatoid arthritis, MTX methotrexate, PSL prednisolone. DSASI/ESR 28 joint disease activity score and erythrocyte sedimentation rate, SDAI simplified disease activity index, MMP-3 matrix metalloproteinase-3.

Conclusion: We conclude that the lower the RF was at the time of ABT administration, the more effective it was. The RF tended to be lower for the bio naïve subjects who had experienced a crisis less than two years earlier. The RF can be a predictive factor for ABT.


Correlation Between Atabactin and Rheumatoid Factor – Can Rheumatoid Factor Be a Predictive Factor for Abatacept? The correlation between ABT and RF.

Conclusion: We conclude that the lower the RF was at the time of ABT administration, the more effective it was. The RF tended to be lower for the bio naïve subjects who had experienced a crisis less than two years earlier. The RF can be a predictive factor for ABT.

Foxp3+ Treg Cells Decreased in Overexpression of T-Bet in PD-1 Deficient Mice. Masahiro Tahara1, Yuya Kondo1, Hiroto Tsuboi1, Satoru Takahashii, Isao Matsumoto1 and Takayuki Sumida1. 1Department of Internal Medicine, Faculty of Medicine, University of Tsukuba, Tsukuba, Ibaraki, Japan; 2Department of Anatomy and Embryology, Faculty of Medicine, University of Tsukuba, Tsukuba city, Ibaraki, Japan

Background/Purpose: Programmed cell Death-1 (PD-1) plays an important role in peripheral T cell tolerance, therefore PD-1 deficient (PD-1 KO) mice develop strain-specific autoimmune phenotypes. C57BL/6 (B6) background PD-1 KO mice develop glomerulonephritis after 24–48 weeks of age, which is similar to human endocapillary proliferative glomerulonephritis observed in lupus nephritis. The differentiation of Th cells in PD-1 KO mice was not fully elucidated. The purpose of this study is to clarify the effect of T cell specific T-bet overexpression on autoimmune disease in PD-1 KO mice.

Methods: 1) T-bet overexpressing PD-1 KO mice were generated by crossing T-bet transgenic (T-bet Tg) mice under the promoter of CD2 gene with PD-1 KO mice (PD-1 KO X T-bet Tg mice; P/T mice). 2) In wild-type (WT) mice, PD-1 KO mice, T-bet Tg mice and P/T mice, the pathological evaluation of the kidneys was performed with H&E, PAS and PAM staining at 6–8 weeks of age. Deposition of IgG and C3 in kidneys was analyzed with immunohistochemistry. 3) The histological analyses were evaluated on the heart, spleen, mesenteric LN, lung, liver, pancreas, salivary gland and lacrimal gland with H&E staining and immunofluorescence staining in WT mice, PD-1 KO mice, T-bet Tg mice and P/T mice. 4) Proportion of lymphocytes subset and cytokine production by CD4+ T cells in spleen was analyzed by FACS. 5) FACS analysis was performed to evaluate transcription factor expression on CD4+ T cells in spleen.

Results: 1) Most of P/T mice died within 10 weeks. 2) Glomerulonephritis was not observed in WT mice, PD-1 KO mice, T-bet Tg mice and P/T mice. Deposition of IgG and C3 was observed in glomeruli in PD-1 KO mice, but not in WT mice, T-bet Tg mice and P/T mice. 3) Splenomegaly and infiltration of mononuclear cells in liver were observed only in P/T mice. 4) Immunofluorescence staining revealed that infiltrating cells were CD3+ T cells. 5) FACS analysis showed that the total cell number was increased in P/T mice (15.3 ± 3.11 × 10^6 cells), compared with WT mice (6.41 ± 0.81 × 10^6 cells, P < 0.05) and P/T mice (8.46 ± 1.77 × 10^6 cells, P = 0.006) and T-bet Tg mice (7.12 ± 2.32 × 10^6 cells, P = 0.086) and IFN-y production on CD4+ T cells observed in P/T mice (20.5 ± 3.42%) was higher than that in WT mice (3.56 ± 0.63%, P < 0.05) and PD-1 KO mice (6.85 ± 1.17%, P < 0.05). 6) Percentage of Foxp3+ T cells in CD4+ Treg cells was significantly decreased in P/T mice (2.47 ± 3.13%), compared with WT mice (13.4 ± 1.53%), PD-1 KO mice (16.9 ± 2.15%) and T-bet Tg mice (19.1 ± 2.55%) (P < 0.05).

Conclusion: In P/T mice, the reduced percentage of Foxp3+ Treg cells induced systemic inflammation, resulting in short-life span.

Disclosures: M. Tahara, None; Y. Kondo, None; H. Tsuboi, None; S. Takahashi, None; I. Matsumoto, None; T. Sumida, None.

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Generation of CD4+ Follicular Helper T cells by Complement and Immune Complexes. Anil K. Chauhan, Richard DiPaolo and Terry L. Moore1. 1Saint Louis University, St. Louis, MO, 2Saint Louis, MO

Background/Purpose: Complement opsonized immune complexes (ICs) are key players of disease pathology. We showed in superficial lupus erythematosus (SLE), ICs and complement (C) drive activation and differentiation of naive CD4+ cells into the T effector population. We also established activation-induced expression of FcγRIIIA in naive CD4+ population that is partly responsible for this activation. To further understand the role IC and C+ mediated activation in the development of autoantibody secreting plasma cells, we examined the development of Bcl6+PD1+CXCR5+ follicular helper cells (Tfh). We asked whether ICs play a role in cognate contact between Tfh cells and naive B cells in pre germinal centers (GC) and/or in secondary GC that could lead to the formation B memory and/or plasma cells.

Methods: Peripheral human naive CD4+ T cells were stimulated in vitro using ICs and the late complement complex C5b-9. They were grown in the presence of interleukin-2. Peripheral human naive CD4+ T cells were stimulated in vitro using ICs and the late complement complex C5b-9. They were grown in the presence of interleukin-2.

Results: Compared to CD4+ T cells from healthy controls, ICs over-express killer immunoglobulin-like receptors (KIRs), perforin, and other molecules that are expected to contribute to their pro-inflammatory phenotype. These genes are regulated by DNA methylation, so they are over-expressed by CD4+ T cells that are demethylated in vitro. This is a result of decreased signaling through the ERK and JNK pathways. This consequence decreases activity of the DNA methyltransferase enzymes (DNMTs) responsible for DNA methylation. Protein phosphatase 5 (PP5) is a stress induced regulator of gene expression in multiple signaling pathways, including ERK, JNK, and those involved in aging. It is expressed in CD4+CD28− T cells in patients with RA and lupus, and that over-expressing PP5 in CD4 T cells from healthy donors will induce expression of methylation sensitive genes unique to CD4+CD28− T cells.

Methods: CD4+ T cells were isolated from healthy controls and patients with RA and lupus, and PP5 mRNA expression was measured by RT-PCR.

To study the effects of PP5 on methylation sensitive genes, PBMCs from healthy donors were stimulated with phytohemagglutinin (PHA) and cultured for 3 days with IL-2. CD4+ T cells were then isolated by negative selection, transfected (Amxuka Nucleofector) with constructs encoding GFP and PP5 or GFP alone, and cultured an additional 24–72 hours. Expression of DNMT1, KIR, and perforin was assessed by RT-PCR in sorted CD4+GFP+ T cells. DNMT1 expression was measured 24 hours after transfection, and KIR and perforin were analyzed 72 hours after transfection. KIR protein expression was also measured by flow cytometry with unsorted cells 72 hours after transfection.

Results: Compared to CD4+ T cells from healthy controls, PP5 mRNA is over-expressed in CD4+ T cells from patients with lupus (1.97 fold change ± 0.18 SEM, p = 0.03) and RA (1.6 ± 0.2, p = 0.06). When transfected into CD4+ T cells from healthy donors, PP5 increased KIR mRNA expression (2.4 ± 0.7, n = 3, p = 0.04) and CD70 mRNA expression (1.38 ± 0.07, n = 3, p = 0.03). PP5 transfection also increased the percentage of cells expressing KIR proteins on their surface (33 ± 7% with control vs. 62 ± 7% with PP5, n = 7, p < 0.01). Finally, PP5 caused a corresponding 20 ± 8% decrease (n = 3, p = 0.05) in DNMT1 mRNA expression.
Conclusion: CD4+CD28− T cells, which are enriched in RA and lupus, over-express methylation sensitive genes that contribute to their pro-inflammatory phenotype. These data demonstrate, for the first time, that protein phosphatase 5 (PP5) contributes to the regulation of methylation sensitive genes in CD4+ T cells. Specifically, PP5 increases expression of KIR and perforin, and it decreases expression of DNMT1. Its effects on other methylation sensitive genes, including CD70 and IFN-γ, are currently being studied. PP5 has not been studied in T cells before, and it potentially links aging and DNA methylation with the pathogenesis of multiple rheumatologic disorders.

Disclosure: D. R. Patel, None; G. Gorelik, None; B. C. Richardson, None.

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T Follicular Helper Cell and Regulatory T Cell Frequencies Are Affected by B Cell Depletion in Patients with Granulomatosis with Polyangiitis.

Yuan Zhao1, Jessica Thomas1, Shrish Sangle1, Pamela M.K Lutalo2, Lee Meng Choong3, Jennifer R. Tyler1, Jo Spencer1, Timothy Tree1 and David P. D'Cruz4 1School of Medicine, King's College London, London, United Kingdom, 2Louise Coote Lupus Unit, St Thomas' Hospital, London, United Kingdom, 3Louise Coote Lupus Unit, St Thomas Hospital, London, United Kingdom, 4St Thomas' Hospital, London, United Kingdom

Background/Purpose: Granulomatosis with polyangiitis (GPA, formerly known as Wegener’s granulomatosis) is a rare and sometimes fatal systemic autoimmune disease. Anti-neutrophil cytoplasmic antibodies (ANCAs) specific for proteinase 3 (PR3) are associated with GPA. Remissions in GPA can be achieved through B cell depletion therapy. However, the mechanism is not yet clear.

Methods: The frequencies of T follicular helper cells (TFH) and regulatory T cells (Treg) from 27 GPA patients including 9 rituximab-treated patients and 10 healthy controls were studied by flow cytometry. Disease activity was assessed by the Birmingham Vasculitis Activity Score (BVAS) and clinical data was collected in all patients. The functional capacity of Tregs was assessed by in vitro co-culture assays.

Results: The average (range) age was 51 (25–83), and disease duration was from less than 1 year up to 25 years. The mean BVAS scores in rituximab treated patients and those on conventional therapy were 5.56 and 9.67 respectively. We observed an increased frequency of TFH (P=0.0013) and a reduced frequency of antigen experienced Treg (P<0.0001) in peripheral blood from GPA patients on conventional therapies but not in those treated with rituximab compared to healthy controls (figure A & B). The frequencies of TFH and Treg were significantly inversely correlated (P=0.0059, figure C). Furthermore, the ratio of TFH to Treg was significantly higher in GPA patients on conventional therapies (average 9.07) than in GPA patients treated with rituximab (average 2.43; P=0.0002), who were clinically improved or controls (figure D). Whereas Tregs were numerically reduced in individuals with GPA on conventional therapy (average 5.03%, P=0.0009), the suppressive capacity of Tregs on a per cell basis is not significantly altered in these individuals compared to healthy controls (P=0.23).

Conclusion: Our study demonstrates increased TFH cells and decreased antigen experienced Treg cells in GPA patients on conventional therapies compared to controls. Patients undergoing B cell depletion therapy were indistinguishable from controls. The negative correlation between TFH and Treg cells implies that the balance between T cell subsets and its B cell dependence impact on disease activity in GPA.

Disclosure: Y. Zhao, None; J. Thomas, None; S. Sangle, None; P. M. K. Lutalo, None; L. M. Choong, None; J. R. Tyler, None; J. Spencer, None; T. Tree, None; D. P. D'Cruz, None.
Superantigen Induces IL-17 Production From Extremely Polarized Th1 Clones. Kentaro Yomogida1, Yuan K. Chou1 and Cong-Qiu Chu2. 1Oregon Health & Science University, Portland, OR, 2Oregon Health & Science University VA Medical Center, Portland, OR

Background/Purpose: Differentiation of naïve CD4+ T cells is considered to be an irreversible event and, in particular, the plasticity is thought to be completely lost in Th1 subset in vitro after multiple stimulations. Superantigens produced by different types of pathogens have been linked to autoimmune diseases. Superantigen-stimulation does not prime an adaptive immune response but causes a massive production of cytokines by CD4+ T cells. We hypothesized that superantigens are capable of stimulating Th1 cells to produce inflammatory cytokine, IL-17.

Methods: MOGgs.s-specific and herpes simplex virus (HSV)-specific CD4+ T cell clones were established from PBMC of healthy individuals. These CD4+ T cell clones were stimulated by each antigen respectively under Th17-polarizing conditions (with addition of IL-1, IL-6, TGF-beta, anti-IL-12 and anti-IFN-gamma) or cultured with bacterial superantigens, SEB or TSST-1. IL-17 and IFN-gamma production was determined by ELISA, double-color ELISPOT and intracellular cytokine staining.

Results: Upon repeated Ag-specific stimulation, Th1 clones proliferated specifically to MOGgs.s and HSV respectively and produced IFN-gamma and IL-17 in a Th1-polarization condition including co-stimulation with IL-1, TNF, IL-6, IL-23, TGF-beta in combination with anti-IL-12 and anti-IFN-gamma antibodies did not induce measurable IL-17 from these Th1 clones. However, superantigen-stimulation promoted both clones to produce IL-17 at a range of 0.5–1 ng/l×10⁶ cells. Combination of SEB and TSST-1 showed additive effect on IL-17 production by Th1 clone cells where IL-17 level was greater than 2 ng/l×10⁶ cells. Using double-color ELISPOT assay, we found 30% of IFN-gamma-producing cells were positive for IL-17, suggests that superantigens promoted IL-17 production from highly polarized Th1 cloned cells. Interestingly, IL-17 production by these Th1 clones was blocked by anti-HLA class II or anti-TCR alpha/beta chain antibodies.

Conclusion: We have demonstrated that highly polarized Th1 clones can produce a significant amount of IL-17 in response to superantigen stimulation. Infections have been linked to exacerbation of autoimmune diseases such as rheumatoid arthritis and multiple sclerosis. Stimulating Th1 cells to produce IFN-g by superantigens of infecting pathogens may be responsible.

Disclosure: K. Yomogida, None; Y. K. Chou, None; C. Q. Chu, None.

Interleukin 12 Is Involved in an Interferon Type I Signature Through Crosstalk of CD4+ T Cells and Plasmacytoid Dendritic Cells. Corinne Miceli-Richard1, Nicolas Gestermann, Federico Simonetta2, Saida Boudaoud3, Gaëtan Nocturne4, Yann Lecluze4, Christine Bourgeois2 and Xavier Mariette3. 1Université Paris-Sud, Le Kremlin Bicêtre, France, 2INSERM U1012, Le Kremlin Bicêtre, France, 3Université Paris-Sud, Le Kremlin Bicêtre, France, Villejuif, France

Background/Prote: STAT4 is a transcription factor involved in Th1 polarization characterized by type I interferon (IFN) (or IFN-g) secretion and specifically activated by interleukin 12 (IL-12) binding on its receptor. Polymorphisms of STAT4 have been associated with rheumatoid arthritis, in which IFN-g may play a key role, but also with primary Sjögren’s syndrome (pSS) and systemic lupus erythematosus (SLE), which are characterized by type I IFN signature. Thus, we aimed to elucidate the extent to which STAT4 could be involved in the type I IFN signalling pathway by investigating the effect of CD4+ T cells stimulation with IL-12 on the type I IFN signature.

Methods: CD4+ T cells (isolated by magnetic beads or cell sorting) from healthy controls were activated with anti-CD3 and anti-CD28 +/- IL-12, and then mRNA was extracted. CD4+ T cells and plasmacytoid dendritic cells (pDCs) were cultured with supernatants from CD4+ T cells under various conditions. mRNA expression of interferon-induced protein with tetratricopeptide repeats 1 (IFI1-1), interferon-induced transmembrane protein 1 (IFITM1), and protein kinase R (PKR), reflecting type I IFN signature, was analysed by quantitative PCR. Profiles of cytokines secretion by unstimulated CD4+ T cells compared with IL-12 stimulated CD4+ T cells was assessed using a 27-plex LUMINEX technology.

Results: CD4+ T cells isolated by magnetic beads showed upregulated type I IFN-induced genes after IL-12 stimulation in healthy controls: IFIT-1 (n=13) (p=0.0007), IFITM1 (n=6) (p=0.06) and PKR (n=6) (p=0.035). This effect was mediated by the secretion of type I IFN since it was abrogated by anti-IFNAR antibodies. Highly purified cell-sorted CD4+ T cells did not show any type I IFN signature under the same culture conditions, which suggests that a CD4+ cellular partner was excluded by cell sorting. This cellular partner was demonstrated to be pDCs, which express a low level of IFN-α, IL-12 alone did not induce a type I IFN signature in pDCs. CD4+ T cells/pDC crosstalk was necessary to induce this type I IFN signature after IL-12 stimulation of CD4+ T cells. GMCSF was highly induced in the supernatant of IL-12-stimulated CD4+ T cells compared with unstimulated CD4+ T cells. Thus, IL-12-induced GM-CSF secretion by T cells might be a good candidate to induce the secretion of type I IFN by pDC.

Conclusion: IL-12 specifically induces type I IFN and a type I IFN signature through CD4+ T cell-pDC crosstalk possibly via GM-CSF induction. These results could explain the implications of STAT4 polymorphisms in type I IFN-dependent autoimmune diseases. Our data confirm that type I and II IFN-mediated autoimmune diseases are not in opposition and emphasizes the important role of IL-12. Thus, RA in one hand and SLE and pSS in another hand might be the “yin” and “yang” of activation by IL-12, which can stimulate both type I and type II IFN pathways pathways.

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Dynamic Regulation of T Follicular Helper Cell Differentiation Through STAT Signaling. Shingo Nakayama1, Yuka Kanno2, Golnaz Vaheedi1, John J. O’Shea1 and yoghni Tsuchiya2. 1First Department of Internal Medicine, University of Occupational and Environmental Health, Kitakyushu, Japan, 2National Institute of Arthritis and Musculoskeletal and Skin Diseases, NIH, Bethesda, MD

Background/Purpose: T follicular helper (Tfh) cells are a new subset of T cells that regulate B cell function and exert an important role in the pathogenesis of autoimmune diseases. However, their relationship with other helper lineages and the mechanisms that direct their specification are incompletely understood. As STAT family transcription factors play pivotal roles in specifying T cell lineages, we investigated the roles of STAT proteins in Tfh cell differentiation.

Methods: Naïve CD4+ T cells isolated from wild type and STAT deficient mice were activated and cultured with various cytokines. Cytokine production and expression of cell surface molecules and transcription factors were assessed by flow cytometry and qPCR. Genome-wide targets of STATs and epigenetic modifications in Tfh-like cells were evaluated by chromatin immunoprecipitation sequencing (ChIP-seq) and Dnasel hypersensitivity sequencing (DNase-seq). Expression levels of mRNA were determined by microarray analysis.

Results: IL-12 acting STAT4 directly induced IL-21- and IFN-γ-producing cells, which share features of both Tfh and Th1 cells. Although IL-4 acting STAT6 had no effect for induction of IL-21 and IFN-γ, IL-6 acting STAT3 generated cells that express IL-21 and not IFN-γ. STAT4-induced IL-21 in turn acted through STAT3 in a positive feedback loop to maximize IL-21 production. Using ChIP-seq and DNase-seq, we found that both STAT3 and STAT4 directly bound to multiple genes involved in Tfh cell development including IL21 and Bcl6, regulating gene expression and epigenetic modifications. Thus, STAT3 and STAT4 redundantly serve to induce IL-21, Bcl6 and other Tfh cell molecules. However, STAT4 also induced the transcription factor T-bet that repressed Bcl6, thereby attenuating the Tfh-like phenotype. IFN-γ-dependent activation of STAT1 induced T-bet, which produced a biphasic effect: early on it promotes, but later it inhibits, Tfh-like phenotype. Finally, the Bcl6 locus remained accessible in fully polarized effector T cells, suggesting that although Bcl6 expression can vary with different states of differentiation; this locus remains poised for transcription even in the absence of active transcription.

Conclusion: These results highlight the importance of STAT-mediated gene regulation, which underlies plasticity of Tfh cells. Like Th1? cells, Tfh cells are a fluid subset and their differentiation represents a dynamic balance of signals mediated by STATs. Thus, modulation of STAT-mediated gene regulation in Tfh cells should offer opportunities for the treatment of autoimmune diseases.

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A Genetic Polymorphism on New Zealand Black Chromosome 1 Is Associated with Abnormal Dendritic Cell Function Leading to Expansion of T follicular helper (TFH) Cells. Nafiseh Talaei1, Carolina Landolt-Marticorena2, Bethan E. Babatunde2, Babs Y. Chang3, and Joan E. Wither1. 1Toronto Western Research Institute, University Health Network, Toronto, ON. 2University Health Network, Toronto, ON.

Background/Purpose: We have previously shown that B6 mice with an intragenic homozygous New Zealand Black chromosome (c) 1 interval (70 to 100 cM) develop high titres of antinuclear antibodies and severe glomerulonephritis (GN), with approximately 40% of the mice dying by 8 months age. Using subcongenic mice with shorter intervals in this region we found that expansion of T follicular helper (TFH) subpopulations when transferred into c1(70–100) congenic Thy1.1 as compared to B6.Thy1.1 mice. This finding suggested that the increased differentiation of CD4+ T follicular helper (TFH) cells is a result of a combination of T and non-T cell defects. In this report, we further showed, using ovalbumin (OVA) as an exogenous antigen, that this was an intrinsic aspect of their immune system, resulting from a combination of T and non-T cell defects. In this report, we have investigated the role of dendritic cells (DC) in this expansion.

Methods: OVA-specific T cells from B6 or c1(70–100), c1(88–100), or c1(96–100) congenic OT-II TCR transgenic mice were adoptively transferred into B6.Thy1.1 or c1(70–100).Thy1.1 mice. Mice were immunized with OVA emulsified in CFA, sacrificed 2 weeks later, and the proportion of various splenic T cell subsets determined by flow cytometry, gating separately on Thy1.1+ (recipient) and Thy1.2+ (transferred) T cells. Bone marrow–derived dendritic cells (DC) isolated from 8 wk old c1(70–100), c1(88–100) and c1(96–100) congenic, and B6 control mice were cultured in the presence of LPS, imiquimod or CpG, or pulsed with OVA and co-cultured with naïve OT-II T cells. Production of cytokines (IL-12, IL-23, IL-6) by stimulated DC was analyzed by ELISA or flow cytometry.

Results: Adoptive transfer experiments revealed that the increased IFN-γ and IL-17 secreting cell differentiation in c1(70–100) congenic mice arises in part from intrinsic T cell defects localizing to the NZB c1 96–100 cM and 88–96 cM intervals, respectively. However, OT-II T cells from all mouse strains examined demonstrated differentiation to T follicular helper (TFH) and Treg populations when transferred into c1(70–100).Thy1.1 as compared to B6.Thy1.1 mice. This finding suggested that the increased differentiation of these T cell subsets in c1 congenic mice was also dependent upon cellular and/or cytokine cues provided by the c1(70–100) environment. Since, DC play an important role in the antigen presentation and cytokine secretion that directs T cell responses, DC function was contrasted in the various mouse strains. Following TLR stimulation, DC from c1(70–100) mice expressed significantly higher levels of MHC and co-stimulatory molecules, and secreted higher amounts of pro-inflammatory cytokines such as IL-6 and IL-12. Consistent with altered DC function, OVA-pulsed DC from c1(70–100) mice induced significantly increased differentiation of naïve OT-II cells to IFN-γ, IL-17 or IL-21 secreting cells as compared to B6 DC.

Conclusion: Our results suggest that a genetic polymorphism in the 70–88 cM interval of NZB c1 congenic mice alters DC function and acts together with intrinsic T cell defects to promote the expansion of T follicular helper (TFH) and Treg cells in c1(70–100) mice, resulting in severe GN.

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PD-1 Signaling Promotes Suppressive Function of CD4+ Regulatory T Cells in (New Zealand Black × New Zealand White) F1 Lupus-Prone Mice in a Dose-Dependent Manner. Maida Won1, Antonio La Cava2, and Bevra H. Hahn1. 1University of California, Los Angeles, Los Angeles, CA.

Background/Purpose: Programmed death-1 (PD-1) has been regarded as a negative regulatory signal in T cells. Our laboratory has shown that PD-1 is important in T cell regulation of autoimmune disease, as treatment with neutralizing anti-PD-1 Ab increased regulatory T cell function and dramatically delayed SLE onset in young BWF1 females. We hypothesized that tight regulation of PD-1 signaling is required to maintain functional CD4+ regulatory T cells (Treg), compared to CD4+ T cells, both in normal and disease states. PD-1 dysfunction and subsequent control of autoimmunity in BWF1 mice, and that regulatory capacity of the cells is sustained at least in part by resistance to apoptosis, resulting in CD4+ Treg survival, when PD-1 is expressed at a certain level—neither absent nor high.

Methods: Neutralizing Ab against PD-1 or control isotype-matched IgG were injected i.p. into BWF1 mice. Foxp3 and PD-1 expression were assessed by flow cytometry. Splenocytes from these animals were isolated for in vivo culture, and anti-PD-1 Ab at various concentrations were added in vitro to test for B cell apoptosis by Annexin V and 7-AAD, and double− cells, and the suppressive activity of these agents when they are used in autoimmune diseases or cancer.
Conclusion: PD-1 expression is central in the ability of CD4 Treg to suppress autoimmunity; their PD-1 expression has to be finely tuned to permit CD4 Treg to survive and retain suppressive capacities. One mechanism by which PD-1 sustains CD4 Treg is by reducing their susceptibility to apoptosis.

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Discovery of a Highly Potent, Selective Reversible Covalent Inhibitor of JAK3 Kinase. Ronald J. Hill1, Angelina Bisconte1, J. Michael Bradshaw1, Ken Brameld2, Eun Ok Kim1, Xiaoyan Li2, Tom Owens2, Erik Verner2 and David M. Goldstein2, Principia Biopharma, South San Francisco, CA, 2Principia Biopharma

Background/Purpose: Targeting of the JAK-STAT pathway has been shown to be efficacious for treatment of patients with rheumatoid arthritis through the successful use of pan-JAK inhibitors in clinical trials. To date, lack of selective JAK3 inhibitors has hindered the assessment of the role of JAK3 in autoimmune disorders. A JAK3 inhibitor has the potential benefit of alleviating undesirable side effects of JAK1 and JAK2 inhibition such as dyslipidemia and suppression of hematopoiesis, respectively. A new approach is presented to achieve potent, selective and durable inhibition of JAK3 by application of Principia’s reversible covalent platform targeting a cysteine residue in the active site of JAK3 that is absent from other JAK family members. Ability of these inhibitors to block IL-2 and IL-4 signaling is presented.

Methods: Enzyme potencies were measured using the Caliper platform at Nanosyn Inc. (Santa Clara, CA). IL-2 stimulated phospho-STAT5 was measured in Ficoll separated human peripheral blood mononuclear cells (PBMCs) by flow cytometry. IL-4 stimulated STAT6 activation was measured in Ramos B cells based on a STAT6 reporter assay (Invitrogen, Madison, WI). Kinase profiling was performed at DiscoveRx (San Diego, CA).

Results: We have developed a series of molecules that are highly potent and selective for JAK3. Compound 1 inhibited JAK3 enzymatic activity with an IC50 of 0.5 ± 0.3 nM, but not JAK1, JAK2, or TYK2 up to a concentration of 5 uM. The selectivity among other kinases within the Cys sub-family was also high with no inhibition exceeding 60% at 1 uM. Profiling against a panel of 442 kinases confirmed the exceptional selectivity of the series. Compound 1 forms a durable yet reversible Cys interaction with JAK3 in biochemical assays with a dissociation half-life of 9 hours.

In cell-based assays, Compound 1 completely inhibited IL-2 stimulated STAT5 phosphorylation (IC50 = 206 ± 11 nm) in PBMCs, IL-4 stimulated STAT6 phosphorylation (IC50 = 58 ± 10 nm) in Ramos B cells and IL-2 driven IFNalpha secretion (IC50 = 248 ± 8 nM) in hPBMCs. IL-6 stimulated STAT3 phosphorylation was not inhibited up to 5 uM indicating complete cellular selectivity for JAK3 over JAK1. In addition, NFAT activation downstream of TCR stimulation in Jurkat T cells was not blocked.

Conclusion: Compound 1 is a potent, selective and durable inhibitor of JAK3 and has the potential to be an efficacious treatment for rheumatoid arthritis or other T cell driven diseases with a potential for differentiation from pan-JAK inhibitors.

Disclosure: R. J. Hill, Principia Biopharma, 3; A. Bisconte, Principia Biopharma, 3; J. M. Bradshaw, Principia Biopharma, 3; K. Brameld, Principia Biopharma, 3; E. O. Kim, Principia Biopharma, 3; X. Li, Principia Biopharma, 3; T. Owens, Principia Biopharma, 3; E. Verner, Principia Biopharma, 3; D. M. Goldstein, Principia Biopharma, 3.

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CGEN-15001, a Novel Negative Costimulatory Fusion Protein Is Effective in the Collagen-Induced Arthritis Mouse Model of Rheumatoid Arthritis. Iris Hecht1, Kay McNamara2, Ilan Vaknin1, Anat Oren1, Joseph R. Podojil1, Galit Rotman2, Eyal Neria1, Stephen D. Miller2 and Richard O. Williams3, Compugen Ltd., Tel Aviv, Israel, 2Oxford University, London, United Kingdom, 3Northwestern University, Chicago, IL.

Background/Purpose: CGEN-15001 is a recombinant Fc fusion protein consisting of the extracellular domain of CGEN-15001T, a protein predicted to be a member of the B7/CD28 costimulatory family. CGEN-15001T was identified using a proprietary discovery platform based on shared bioinformatic characteristics with known members of this family. The immunomodulatory effect of CGEN-15001 on T cell activity and its efficacy in the murine collagen-induced arthritis (CIA) model were evaluated.

Methods: Murine naive CD4+ T cells were activated with plate bound anti-CD3 and either CGEN-15001 or control proteins. The effect of CGEN-15001 on activation marker expression and cytokine secretion was evaluated after 48hrs of incubation, while effects on cell division and apoptosis were evaluated after 96hrs. The effect of CGEN-15001T was studied using a similar experimental system utilizing HEK-293 transfected cells expressing CGEN-15001T or empty vector.

To study the effects of CGEN-15001 on T cell proliferation and differentiation, CD4+ T cells from DO11.10 mice were activated with OVA323–339 plus irradiated APCs in the presence of Th driving conditions and either CGEN-15001 or control Ig. Proliferation was evaluated after 72hrs and cytokine secretion after 96hrs.

To study the effect of CGEN-15001 in the CIA model, DBA/1 mice (n=7–10/group) were immunized with type II bovine collagen in complete Freund’s adjuvant. Mice were injected intraperitoneally with CGEN-15001, TNFR-Ig, CTLA4-Ig or Ig control at 100µg/mouse, three times/week for 10 days. Treatment started at onset of clinical arthritis and mice were scored daily for arthritis severity. On day 10 of arthritis, mice were sacrificed and paws were removed for histological analysis.

Results: CGEN-15001 as well as stably expressed CGEN-15001T, inhibited T cell activation demonstrated by inhibition of proliferation, inflammatory cytokine secretion and expression of early activation markers. CGEN-15001 elicited its immunomodulatory activity by skewing immune response from Th1/Th17 to Th2.

In the CIA model, CGEN-15001 demonstrated potent therapeutic efficacy when administered to mice with existing disease. Treatment with CGEN-15001 resulted in significant inhibition of clinical symptoms including joint swelling, erythema, and stiffness compared to mice treated with Ig control. Histological analysis of the diseased joints showed reduced inflammation and joint erosion compared to the control.

Disclosure: I. Hecht, Compugen, 3; K. McNamara, Oxford University, 3; I. Vaknin, Compugen, 3; A. Oren, Compugen, 3; J. R. Podojil, Compugen, 9; G. Rotman, Compugen, 3; E. Neria, Compugen, 3; S. D. Miller, Compugen, 9; R. O. Williams, Compugen, 9.

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Background/ Purpose: Autophagy is an evolutionally conserved self-degradation system. In this process, an isolation membrane engulfs cytoplasmic materials and organelles to form an autophagosome. The autophagosome then fuses with the lysosome, leading to the degradation of the enclosed materials to recycle or energy production. Autophagy is considered to play important roles in activated T cells to counteract various cellular stresses, and it would
be a potential therapeutic target in chronic inflammatory diseases. Although several methods to measure autophagy were developed, it is not easy to quantify autophagic activity in small number of human primary cells. The aim of this study is to develop a high sensitive and high throughput method for quantitative and functional analysis of autophagy in human primary T cells using flow cytometry.

Methods: Human naïve and effector memory CD4+ T cells were isolated from peripheral blood and stimulated with anti-CD3 and anti-CD28 antibody. Two days after stimulation, GFP-LC3 fusion protein which can function as an autophagy sensor was overexpressed in human activated T cells using retroviral vector system. To inhibit autophagy, dominant negative form of ULK1 (ULK1-DN) was overexpressed in human activated T cells. Autophagic activity and cell death were quantified in naïve and effector memory CD4+ T cells.

Results: Using Western blotting and electron microscopy, we confirmed that autophagy was induced in activated T cells and the reduction of fluorescence intensity of GFP-LC3 correlated with autophagy (Fig.1). Compared to naïve T cells, effector memory T cells had significantly lower autophagic activity (p = 0.025) and were susceptible to apoptotic cell death (p = 0.01). Overexpression of ULK1-DN inhibited autophagic flux and induced more apoptotic cell death in naïve and effector memory T cells. In these autophagy-defective naïve CD4+ T cells, mitochondria volumes and reactive oxygen species were increased. In contrast, enhancement of autophagy by rapamycin reduced apoptotic cell death in naïve and effector memory CD4+ T cells.

Conclusion: We established a novel method for measuring autophagic flux in activated human primary T cells. Using this assay, we first identified that effector memory CD4+ T cells had lower autophagic activity than naïve CD4+ T cells and this lower autophagic activity may contribute to more apoptotic cell death in effector memory CD4+ T cells. This novel method is helpful to examine pathological roles of autophagy and investigate autophagy as a potential therapeutic target in collagen diseases.

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Mucosal-Associated Invariant T Cells Are Inactivated by IFNα and Reduced in Systemic Lupus Erythematosus, Asako Chiba1, Naoto Tamura2, Ran Matsuda1, Takashi Yamamura1, Yoshinari Takasaki2 and Sachiko Miyake2, 1National Institute of Neuroscience, National Center of Neurology and Psychiatry, Tokyo, Japan, 2Juntendo University School of Medicine, Tokyo, Japan

Background/Purpose: Mucosal-associated invariant T (MAIT) cells are a subset of innate-like lymphocytes which are restricted by the MHC-related molecule-1 (MR1) and express an invariant TCRα chain/Vα7.2/Jα33 in humans and Vα19-Jα33 in mice with a limited set of Vδ chains. Although the function of MAIT cells is not well known, like other innate-like lymphocytes, MAIT cells have been suggested to play both proinflammatory and regulatory roles in autoimmune models. We previously demonstrated that MAIT cells exerted a suppressive activity on T cells and the frequency of MAIT cells was reduced in patients with multiple sclerosis. In this study, we sought to investigate mechanisms by which MAIT cells are activated/inactivated and whether MAIT cells are relevant to other human autoimmune diseases including systemic lupus erythematosus (SLE).

Methods: Whole blood samples or peripheral blood mononuclear cells (PBMC) of SLE patients as well as healthy volunteers were stained with anti-human monoclonal antibodies (mAb) against CD3, γδ TCR, invariant Vα7.2 TCR, and CD161 and analyzed by FACS. MAIT cells were identified as CD3+ γδ TCR Vα7.2 TCR+ CD161+ cells. PBMC or FACS sorted MAIT cells were labeled with CellTrace Violet dye and stimulated with anti-CD3 mAb and anti-CD28 mAb or various types of cytokines. 6–7 days later, the cell proliferation was analyzed by FACS.

Results: As previously demonstrated, the frequency of MAIT cells of healthy controls was about 5% among T cells. The percentages of MAIT cells of SLE patients were 10-fold lower compared with those of healthy subjects. MAIT cells proliferated upon TCR stimulation when cultured with autologous PBMC. However, sorted MAIT cells failed to respond to anti-CD3 mAb and anti-CD28 mAb stimulation. MAIT cells and γδ T cells were activated and proliferated by IL-15 even without exogenous TCR stimuli.
proliferation was markedly suppressed by IFNa, but IFNα had little effect on TCR-stimulated yetT cell proliferation.

Conclusion: This study demonstrates that MAIT cell activation greatly depends on cytokines. As IFNa is known to be related to the pathogenesis of SLE, the abnormal balance of cytokines may be responsible to the reduced frequency of MAIT cells in SLE.

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The Effects of Anti-Tumor Necrosis Factor Agents On the Expansion of T Helper-Type 17 Cells Driven by Lipopolysaccharide-Stimulated Monocytes. Gianluca Fossati1, Louise Healy2 and Andrew Nesbitt3. 1UCB Pharma, Slough, United Kingdom, 2UCB Pharma, Slough, United Kingdom

Background/Purpose: T helper-type 17 (Th17) cells are proinflamma-atory CD4+ cells characterized by the production of interleukin-17 (IL-
17). There is evidence that IL-17 and other cytokines which Th17s produce such as IL-21 are involved in the pathogenesis of RA. 1Lipopolysaccharide (LPS)-stimulated monocytes can promote differentiation of CD4+ cells into Th17 cells and produce IL-17 in vitro. 2This study examined the effect of 4 anti-tumor necrosis factor (TNF) agents (adalimumab, etanercept, infliximab, and certolizumab pegol) on the expansion of CD4+CD45RO+ memory T cells into Th17 cells driven by LPS-stimulated monocytes.

Methods: Peripheral blood mononuclear cells (PBMC) were isolated from healthy volunteers. Monocytes and CD4+ T cells were purified from the PBMC by positive and negative selection, respectively. CD4+CD45RO+ memory T cells were enriched from the CD4+ T cell fraction by positive selection. Purified monocytes and memory T cells were co-cultured at a 1:1 ratio for 7 days with CD3/CD28 Human T-Activator Dynabeads with and without 1μg/mL LPS. Cells were cultured in the presence and absence of the 4 anti-TNF agents at 10μg/mL. After 7 days the CD4+ T cells were stained for intracellular Interferon γ (IFNγ) and IL-17A and analyzed by flow cytometry. IL-17A and IL-17F secretion into the supernatant was determined by ELISA.

Results: CD4+ T cells positive for IL-17A were increased from 5.7% in the control co-cultures without LPS to 20.5% with LPS (mean of 2 experiments). The frequency of IFNγ-positive CD4+ T cells showed a smaller increase from 4.4% to 10.6% when LPS was added. IL-17A and IFN-γ were expressed largely by different cells, suggesting the expansion of both Th17 and Th1 T-helper subsets. The frequency of IL-17A-producing CD4+ T cells in co-cultures of monocytes and memory T cells plus LPS in the presence of the 4 anti-TNF agents were roughly 2.5 -fold lower than the LPS-positive control cultures generated in the absence of anti-TNF agents (mean of 4 experiments). Cells exposed to the 4 anti-TNF agents showed a similar level of CD4+ cells producing IL-17A and IFNγ. The level of IL-17A secreted into the supernatant decreased from 580 pg/mL in the LPS positive control to 180 pg/mL in co-cultures generated in the presence of the 4 anti-TNF agents. IL-17F decreased from approximately 8 ng/mL to 2 ng/mL in the LPS control and the anti-TNF exposed cultures, respectively (mean of 4 experiments). There were no significant differences in the concentration of IL-17A or IL-17F from co-cultures exposed to the 4 different anti-TNF agents.

Conclusion: The increased frequency of IL-17+ T cells and secretion of IL-17A and IL-17F suggest that LPS-activated monocytes support the expansion of Th17 cells present within the memory pool. Exposure to anti-TNF agents inhibited Th17 expansion and IL-17A production. This suggests that part of the mode of action of anti-TNF agents may be to reduce Th17 expansion and, as a consequence, IL-17A and IL-17F concentration. It is unclear whether soluble TNF or membrane TNF is responsible for this activity.


Disclosure: G. Fossati, UCB, 3; L. Healy, UCB, 3; A. Nesbitt, UCB, 1; UCB, 3.

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Suppression of PP2Ac Causes DNA Hypermethylation Through Enhan-
ced P38/Mapk/Erk Activity in T Cells. Katsue S. Watanabe1, Kamalpreet Nagpal2 and George C. Tsokos3. 1Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences, Okayama, Japan, 2Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA

Background/Purpose: Although many reports have focused on the impaired MEK-ERK signaling pathway in T cells from systemic lupus erythematosus (SLE) patients which results in suppression of DNA methyltransferase (DNMTs) expression and induction of gene transcription of methylation-sensitive genes, the involved mechanisms are still unclear. Here we investigated whether the catalytic subunit of protein phosphatase 2A (PP2Ac) which is overexpressed in SLE T cells contributes to inhibition of MEK-ERK signaling and DNA methylation.

Methods: Human peripheral CD3 positive T cells from normal subjects were treated with the selective chemical inhibitor, okadaic acid (OA) or transfected with siPP2Ac to achieve sufficient suppression of the PP2Ac enzymatic activity. After stimulation with PMA and ionomycin, DNA, RNA and protein were extracted. The ratio of phosphorylated over total MEK and ERK protein were determined by western blotting. The enzyme activity of DNMTs and the level of global DNA methylation status were calculated by ELISA. The transcription level of two methylation sensitive genes, CD70 and CD11a was quantified by real time RT-PCR.

Results: Chemical suppression or siRNA silencing of PP2Ac in T cells resulted in sustained phosphorylation of MEK and ERK following stimulation with PMA and ionomycin compared to T cells in which PP2Ac was not manipulated. PP2Ac suppression resulted in increased DNMT enzymatic activity of DNMT, DNA hypermethylation and decreased expression of methylation-sensitive genes.

Conclusion: Our results demonstrate that PP2A regulates DNA methylation levels by influencing the phosphorylation levels of the MEK/ERK pathway. We propose that enhanced PP2Ac in SLE T cells may dephosphorylate and activate the upstream signaling pathway of DNMT and disturb the tight control of methylation-sensitive genes such as CD70 and CD11a which are involved in SLE pathogenesis. In addition, based on our previous report ERK is known to be related to the pathogenesis of SLE. We propose that a cAMP response element (CRE) binding site located in the proximal promoter, and therefore PP2A may represent a potent accelerator of DNA demethylation through an additional positive feedback mechanism.

Disclosure: K. S. Watanabe, None; K. Nagpal, None; G. C. Tsokos, None.

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A Novel Subset of CD4 T Cells That Provides Help for Human Memory B Cell Responses. Sang T. Kim, Jin Young Choo, Begona Lainez and Joseph E. Craft. Yale University School of Medicine, New Haven, CT

Background/Purpose: Follicular helper T (Tfh) cells provide help to B cells in germinal centers (GCs) of secondary lymphoid organs (SLOs) following primary antigen (Ag) challenge, with formation of memory B and long-lived plasma cells. Memory B cells can be recalled in secondary responses upon Ag rechallenge, with generation of short-lived plasma or secondary GCs with further rounds of B cell maturation. Human memory B cells function better in vitro with T cell help; however, the nature of the T cells that provide such help is unclear, with the role of Tfh cells, if any, not known. Our goal is to identify and characterize human memory B helper T cells.

Methods: Tonsils were obtained from tonsillectomies (2–18 y) done at Yale New Haven Hospital, with cells used for flow cytometry, qPCR, and cytokine analyses. Autologous CD4 T cell and B cells were co-cultured for immunoglobulin (Ig) production, as a readout for T dependent B cell maturation. Confocal microscopy was performed to localize memory B cells and helper T cells.

Results: We found that human Tfh cells, as defined by classical flow cytometry markers (CXCR5hi PD-1hi), can be subdivided into two groups based upon expression of P-selectin glycoprotein ligand-1 (PSGL-1), a cell surface protein that in synergy with the T cell homing marker (CCR7) dictates residence in the T cell zone of SLOs. PSGL-1hi CXCR5hi PD-1hi cells reside in B cell follicles as Tfh cells, whereas we found by confocal microscopy that PSGL-1hi CXCR5hi PD-1hi cells reside in T cell zones outside B cell follicles. We defined the latter highly CXCR5hi PD-1hi cells as triple hi cells (Thi), finding that except for their location in T cell zones and PSGL-1 expression, they shared with GC-resident Tfh cells a similar surface marker profile. Yet, by contrast to Tfh cells, Thi cells expressed more CCR7 with lower expression of the follicular homing marker CXCR5, findings consistent with their T zone location. Bcl6, the master transcriptional regulator for Tfh cells, was expressed in both populations at equivalent levels, but expression of Blimp1, a regulator of effector T cell development, was higher in Thi cells. Thi cells and Tfh cells produced comparable levels of IL-21; however, Tfh cells produced more IL-4 whilst Thi cells exclusively produced IL-10, with the latter important in provision of B cell help. Memory B cells produced more Ig when co-cultured with Thi cells than other CD4 subsets, with such help
contact dependent and reliant upon CD40L, IL-21, and IL-10; moreover, T cells preferentially associated with memory B cells as T-B cell couplets in flow cytometry compared to Tff cells. Confocal microscopy showed co-localization of Th1 cells and memory B cells at the T-B border. Th1 cells were also found in human spleens.

**Conclusion:** We have identified a population of B T helper T cells in SLOs that promote maturation of memory B cells in a cytokine- and contact-dependent manner, with localization at the border of the T cell zone and B cell follicles in SLOs. They are distinct from classical GC-resident Th1 cells, and are likely critical for antibody recall responses. Their further characterization should pave the way for new understanding of human immune memory responses in normal and autoimmune subjects.

**Disclosure:** S. T. Kim, None; J. Y. Choi, None; B. Lainez, None; J. E. Craft, None.

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**T-Cell Cross Reactivity with Citrullinated Antigen and P. Gingivalis Membrane Antigen Following Infection with P. Gingivalis and/or Infection of Citrullinated Mouse Type II Collagen in DBA/1J Mice**


1University of Nebraska Medical Center, Omaha, NE, 2Univ of Nebraska Medical Ctr, Omaha, NE, 3Univ of Nebraska Med Ctr, Omaha, NE, 4Oma & University of Nebraska Medical Center, Omaha, NE

**Background/Purpose:** Recently, periodontal disease (PD) has been associated with the risk and progression of RA. Patients with RA complicated by PD have been shown to have higher anti-citrullinated protein antibody (ACPA) levels, which have also become predictive markers of the disease and by PD have been shown to have higher anti-citrullinated protein antibody associated with the risk and progression of RA. Patients with RA complicated by PD have been shown to have higher anti-citrullinated protein antibody associated with the risk and progression of RA.

**Methods:** TSLP levels in SF of RA patients were significantly increased compared to OA patients (mean 297 vs. 80 pg/ml, resp., p<0.01). mDC numbers from SF were significantly increased compared to PB (5.0% vs. 0.6%, resp., p<0.01) and expressed increased levels of TSLPR (MFI 24 vs. 15, resp., p<0.01). TSLP significantly stimulated the production of chemokines TARC and MIP1α by mDCs from PB and SF (TARC: PB from 1 to 42 pg/ml, p<0.05 and SF from 26 to 186 pg/ml, p<0.05; MIP1α: PB from 1268 to 5486 pg/ml, p<0.05 and SF from 2776 to 3733 pg/ml, p<0.05). Upon incubation with TSLP, TSLP-expressing mDCs from PB potentially stimulated proliferation of autologous CD4 T cells as compared to unstimulated mDCs (ratio T cell:DC 5:1, from 1503 to 16036 cpm, p<0.01). However, TSLP-mDCs from SF had a strongly increased capacity to activate CD4 T cells (ratio T cell:DC 5:1, from 26395 to 57387 cpm, p<0.05). Enhanced proliferation was associated with increased production of IFNγ (ratio T cell:DC 5:1, PB from 179 to 655 pg/ml, p<0.01 and SF from 601 to 1867 pg/ml, p<0.05). IL-17 (PB from 39 to 353 pg/ml, p<0.05 and SF from 363 to 1382 pg/ml, p<0.05) and IL-4 (PB from 17 to 246 pg/ml, p<0.01 and SF from 193 to 775 pg/ml, n.s.).

**Conclusion:** Our data indicate that increased intra-articular TSLP concentrations in RA potentially activate TSLP-expressing mDCs from SF to secrete enhanced levels of proinflammatory mediators causing T cell chemotaxis and to potentially increase arthriogenic T cell activation. This suggests that TSLP and TSLP-expressing mDCs could both play an essential role in the immunopathology of RA.

**Disclosure:** F. M. Moret, None; C. E. Hack, None; T. R. D. J. Radstake, None; J. W. J. Bijluna, None; F. P. J. G. Lafeber, None; J. A. G. van Roon, None.

### 2335

**Increased TSLP Expression in Joints of Rheumatoid Arthritis Patients Causes Increased Activation of Intra-Articular Myeloid Dendritic Cells with Enhanced Th1 and Th17 Cell Activity**


University Medical Center Utrecht, Utrecht, Netherlands

**Background/Purpose:** Thymic stromal lymphopoietin (TSLP) is well known for its potnet activation of myeloid dendritic cells (mDCs) to induce Th2-mediated immune responses. Administration of TSLP in a collagon-induced arthritis model was expected to inhibit Th1 and Th17-driven arthritis by the induction of Th2 activity. However, this resulted in an enhanced severity of inflammation and joint destruction. Additionally, prevention of TSLPR signalling strongly reduced Th17-driven experimental arthritis and immunopathology. The present study determined the levels of TSLP and numbers of TSLPR-expressing mDCs in joints of rheumatoid arthritis (RA) patients as compared to peripheral blood (PB) and studied the capacity of TSLP to induce mDC-dependent T-cell activation.

**Methods:** TSLP was measured in synovial fluid (SF) of patients with RA (n=50) and osteoarthritis (OA, n=24) by ELISA. CD1c mDC numbers and TSLPR expression on these cells were assessed by FACS analysis in paired samples of SF and PB from RA patients (n=9). CD1c mDCs, isolated from PB as well as SF of RA patients (n=6), were stimulated with TSLP for 20 h. and cytokine production was measured by multiplex immunoassay (measuring 51 cytokines). Washed TSLP-activated CD1c mDCs from PB (n=11) and SF (n=5) were added to autologous CD4 T cells in the absence of additional stimuli, cultured for 6 days and subsequently proliferation was measured. Additionally, T-cell cytokine production was measured (by ELISA) upon restimulation with TSLP.

**Results:** TSLP levels in SF of RA patients were significantly increased compared to OA patients (mean 297 vs. 80 pg/ml, resp., p<0.01). mDC numbers from SF were significantly increased compared to PB (5.0% vs. 0.6%, resp., p<0.01) and expressed increased levels of TSLPR (MFI 24 vs. 15, resp., p<0.01). TSLP significantly stimulated the production of chemokines TARC and MIP1α by mDCs from PB and SF (TARC: PB from 1 to 42 pg/ml, p<0.05 and SF from 26 to 186 pg/ml, p<0.05; MIP1α: PB from 1268 to 5486 pg/ml, p<0.05 and SF from 2776 to 3733 pg/ml, p<0.05). Upon incubation with TSLP, TSLP-expressing mDCs from PB potentially stimulated proliferation of autologous CD4 T cells as compared to unstimulated mDCs (ratio T cell:DC 5:1, from 1503 to 16036 cpm, p<0.01). However, TSLP-mDCs from SF had a strongly increased capacity to activate CD4 T cells (ratio T cell:DC 5:1, from 26395 to 57387 cpm, p<0.05). Enhanced proliferation was associated with increased production of IFNγ (ratio T cell:DC 5:1, PB from 179 to 655 pg/ml, p<0.01 and SF from 601 to 1867 pg/ml, p<0.05). IL-17 (PB from 39 to 353 pg/ml, p<0.05 and SF from 363 to 1382 pg/ml, p<0.05) and IL-4 (PB from 17 to 246 pg/ml, p<0.01 and SF from 193 to 775 pg/ml, n.s.).

**Conclusion:** Our data indicate that increased intra-articular TSLP concentrations in RA potentially activate TSLP-expressing mDCs from SF to secrete enhanced levels of proinflammatory mediators causing T cell chemotaxis and to potentially increase arthriogenic T cell activation. This suggests that TSLP and TSLP-expressing mDCs could both play an essential role in the immunopathology of RA.

**Disclosure:** F. M. Moret, None; C. E. Hack, None; T. R. D. J. Radstake, None; J. W. J. Bijluna, None; F. P. J. G. Lafeber, None; J. A. G. van Roon, None.

### 2336

**Elevated Frequency of Synovial Interleukin-21+ CD4+ T Cells Co-Expressing Tumor Necrosis Factor-α in Rheumatoid Arthritis. Maria C. Lebre, Pedro L. Vieira, Saıda Aarrass, Thomas Newsom-Davis, Paul P. Tak and Gavin R. Screaton.** Division of Clinical Immunology and Rheumatology, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands, Amsterdam, Netherlands, Imperial College London, London, United Kingdom, Academic Medical Center, University of Amsterdam and GlaxoSmithKline, Amsterdam, Netherlands

**Background/Purpose:** Rheumatoid arthritis (RA) is a chronic inflammatory disease affecting synovial tissue in multiple joints. The inflammatory process in RA is regulated by several cytokines, especially TNF, which is produced not only by macrophages and dendritic cells (DCs) but also by activated antigen-specific CD4+ T helper cells. IL-21 is a T cell-derived cytokine that has been implicated in several autoimmune diseases, including RA. Both activated CD4+ T cells and T follicular helper cells (Tfh) secrete
Vitamin D has suppressive effects on autoimmune diseases, such as rheumatoid arthritis (RA). Within these diseases, T-helper-17 (Th17) cells have been implicated to play a crucial role in the development and progression of persistent inflammation. Recently, we have shown that Th17 cells are able to activate synovial fibroblasts of patients with RA (RASF) resulting in a pro-inflammatory feedback loop. This leads to increased production of pro-inflammatory cytokines and tissue-degrading enzymes. We have found that the active vitamin D compound, 1,25(OH)2D3, has direct suppressive effects on Th17 cells from patients with early RA. In addition, 1,25(OH)2D3 is capable of inhibiting the pro-inflammatory feedback loop.

**Methods:** Primary Th17 cells were sorted from peripheral blood of treatment naïve patients with early RA. They were cultured with or without 1,25(OH)2D3 alone or together with RASF. From these cultures gene expression profiles were generated. Expression of genes of interest was confirmed by Q-PCR and/or specific ELISA.

**Results:** In the presence of 1,25(OH)2D3, protein expression of Th17 associated cytokines IL-17A and IL-22 was inhibited, while in contrast the anti-inflammatory cytokine IL-10 was induced. 1,25(OH)2D3 inhibited transcription of the cytokine receptors IL-23R and IL-7R, which are involved in Th17 survival and proliferation. Chemokines CCL20 and CXCL10 were down-regulated and chemokine receptors CCR2, CXCXR6, CXCR3 and CCR10 were up-regulated. Importantly, Rorγt, which is critically involved in Th17 differentiation and function and the cell-size regulator and oncogene e-Myc were down-regulated by 1,25(OH)2D3.

**Conclusion:** From these findings, we concluded that 1,25(OH)2D3 modulates the expression of genes involved in cytokine production, proliferation, and migration of Th17 cells. These data indicate that 1,25(OH)2D3 not only suppresses Th17 cell activity but also regulates Th17 phenotype stability and migration of these cells to sites of tissue inflammation in RA.
Lowering Fli1 Levels Decreases the Levels of Lipid Mediators in the Kidneys and T Cells of MRL/Lpr Lupus Prone Mice. Marlene Bunn1, Zainab Amani1, Andrew Mather1, Jennifer Berglind Schepp1, Leah Siskind1, Yuriy Baglaenko1, Nan-Hua Chang1, Evelyn Pau2, Christina Loh1, and Gabriel Criado1.

1Instituto de Investigación Hospital 12 de Octubre, Madrid, Spain, 2Centro de Investigaciones Biológicas-CSIC, Madrid, Spain.

Background/Purpose: The Ets factor Fli1 is implicated as a key modulator of lupus disease expression. Over-expressing Fli1 in healthy mice, results in the development of an autoimmune kidney disease similar to that observed in lupus. Lowering the global levels of Fli1 in two lupus mouse models significantly improved kidney disease and prolonged survival. Lowering the levels of Fli1 in hematopoietic cells in MRL/lpr lupus mice resulted in significantly improved kidney disease. The mechanism(s) by which Fli1 exerts this protective effect is unknown. The glycosphingolipid lactosylceramide (LacCer) is a ganglioside precursor to which steric acid (SA) residues are added by ganglioside synthases or removed by sialidases. Loss of SA residues from gangliosides on the surface of podocytes is linked to proteinuria in glomerulonephritis and lipids with distinct chain lengths are thought to possess distinct biological activities. We demonstrate that lowering Fli1 levels decreases the levels of LacCer and the sialidase Neu1 in the kidney cortex and in T cells of MRL/lpr lupus prone mice. We present additional data demonstrating that Fli1 regulates Neu1 promoter activity in T cells.

Methods: Kidney and/or spleen were harvested from 17–19-week-old MRL/MpJ mice and MRL/lpr Fli1+/+ and Fli1+/− mice. T cells were isolated by negative selection from spleen and left unstimulated or stimulated with anti-CD3/CD28. Supercritical Fluid Chromatography coupled with tandem mass spectrometry was performed on kidney cortex homogenates and isolated T cells to quantify LacCer. Gene expression was analyzed by real-time RTPCR on RNA isolated from kidney cortex and T cells. Immunohistochemistry for LacCer was performed on frozen kidney sections. Neu1 promoter activity was examined by co-transfection of Neu1 promoter/reporter constructs and a Fli1 expression construct in human and mouse T cell lines.

Results: Diseased MRL/lpr mice express a significant 2.5-fold increase in the major LacCer species C16 in the kidney compared to age-matched MRL/MpJ mice, which do not exhibit kidney disease. MRL/lpr mice that are heterozygote for Fli1 (Fli1+/−) express a significant 2-fold decrease in LacCer C16 in the (SA) compared to wild-type age-matched MRL/lpr mice. Similarly, a significant reduction in LacCer staining in cells of the glomeruli is observed by immunohistochemistry. Neu1 expression is significantly elevated 40-fold in the MRL/lpr compared to the MRL/MpJ kidney cortex, but is not significantly different in the MRL/lpr Fli1+/− compared to the wild-type MRL/lpr kidney cortex. Interestingly, Neu1 is reduced 3.4-fold and LacCer levels are significantly reduced 2.5-fold in T cells isolated from Fli1+/− compared to Fli1+/+ MRL/lpr mice. Over-expression of Fli1 results in a dose-dependent increase in Neu1 promoter activity in activated T cells.

Conclusion: Our results demonstrate that one mechanism by which reducing Fli1 levels may be protective in lupus kidney disease is to decrease LacCer levels through the regulation of Neu1 expression. We speculate that Fli1 regulates Neu1 expression in T cells that may act on gangliosides intra- (within the T cell) and inter- (on neighboring kidney cells upon infiltration in the kidney) cellularly.

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2341
Exacerbation of Collagen-Induced Arthritis by an Anti-CD3 Antibody Targeting Aminoterminal-Deficient CD3e. Maria J. Pérez-Lorenzo1, Elena Gonzalo1, José M. Rojo1, María Galindo1, Jose L. Pablos1, and Gabriel Criado1, 1Instituto de Investigación Hospital 12 de Octubre (I+12), Madrid, Spain, 2Centro de Investigaciones Biológicas-CSIC, Madrid, Spain.

Background/Purpose: We have previously characterized naturally occurring forms of CD3ε that lack the aminoterminal region (DNH2-CD3ε) and are bound with high avidity by the YCD3-1 antibody (Criado et al., J Immunol. 2008). The presence of high levels of DNH2-CD3ε results in weaker TCR-CD3 interactions and increased TCR mediated signalling and functional responses. To understand the potential contribution of DNH2-CD3ε to arthritis development, we have evaluated disease progression and functional responses in collagen-induced arthritis after treatment with YCD3-1 antibody.

Methods: Arthritis was induced in 8–10 weeks old male and female DBA/1 mice by intradermal immunization with 200 mcg of chicken type II collagen (CII) in Complete Freund Adjuvant (CFA). Mice were treated on the day of arthritis onset with YCD3-1 or control rat IgG2a (50 mcg/mouse) and arthritis severity was evaluated daily during ten days. Effect of anti-CD3 treatment in vivo was assessed by flow cytometry to detect Treg (FoxP3+), CD4+ (IL2), and CD8α+ (IFNg+) CD4 T cells in lymph nodes. To analyze T cell responses in vitro, lymph node cells were stimulated with CII, proliferation was measured by incorporation of the colorimetric reagent WST-1 and IFNg and IL17 levels were quantified by ELISA. Serum levels of anti-CII antibodies were determined by ELISA.

Results: Treatment of CIA mice with YCD3-1 decreased disease severity in female DBA/1 mice compared to control-treated mice. Differences appeared the first day after treatment and reached statistical significance on day five and later (Figure 1). A similar trend was observed in arthritic males, although differences did not reach statistical significance. Levels of anti-CII antibodies were not affected by YCD3-1 treatment.
Analysis of CD4 T cell populations in YCD3-1 treated mice showed an enrichment in FoxP3+ Treg cells (16.85 ± 4.7 % vs 10.25 ± 2.57 % in control mice, **P < 0.003). IFNg and IL17 producing cells were also increased (IFNg: 2.77 ± 2.07 % vs 0.79 ± 0.25 %, **P = 0.003; IL17: 1.74 ± 1.01 % vs 0.64 ± 0.23 %, ***P = 0.0003). Ratio of Treg to Th17 cells was reduced (10.91 ± 3.18 % vs 17.95 ± 7.21 %, P = 0.04). No significant differences were observed in Treg/Th1 ratio. In vitro stimulation with CII caused higher proliferation and production of IFNg and IL17 compared to controls. Within the Treg population, significant differences were observed between the groups, with a higher percentage of Treg expressing CD25 and Foxp3 after stimulation with CII in YCD3-1 treated mice compared to controls. These findings suggest that YCD3-1 can contribute to arthritis progression.

Conclusion: Targeting DNH2-CD3e in vivo reduces Treg/Th17 ratio and exacerbates collagen induced arthritis. Our results suggest that DNH2-CD3e can contribute to arthritis progression.

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2343

The Therapeutic Antibody Tregalizumab (BT-061) Activates Induction of Regulatory T Cells by Engaging a Unique CD4 Mediated Signaling That Strongly Differs From Signaling Events Induced by Standard Anti-CD4 Antibodies. Bianca Helling1, Benjamin Daelken1, Holger Wallmeier2, Silke Aigner1, Chantal Zuber3, Martin Koenig4, André Engling1, Frank Osterroth5, Niklas Czeloth1 and Christoph Uherek1, 1Biotest AG, Dreieich, Germany, 2Condor Scientific Computing & Consulting, Sulzbach, Germany

Background/Purpose: The humanized CD4 specific monoclonal antibody (mAb) tregalizumab is currently being tested in phase II clinical trials for rheumatoid arthritis. In contrast to other anti-CD4 antibodies, tregalizumab is able to activate the suppressive properties of regulatory T cells (Tregs). Since tregalizumab was the first and only humanized anti-CD4 antibody described to be able to activate Tregs we asked for the underlying reason for this specific and unique functionality. To elucidate the mode of action of this mAb, we focused on the signaling pathways engaged by tregalizumab.

Methods: Signaling events after cross-linking of tregalizumab, other anti-CD4 antibodies (RPA-T4, MT310, QS4120 or B-A1) or anti-CD3 (OKT-3) treatment were analyzed using intracellular staining of phosphorylated proteins (Lck, ZAP-70, LAT, SLP-76, PLC-gamma, MEK, ERK, PKC, MAPK and NF-kappaB). Furthermore, the ability of tregalizumab to induce suppressive properties in Tregs was evaluated using a mixed lymphocyte reaction system. Other CD4 antibodies were included as controls. Additionally, the binding mode of tregalizumab to soluble CD4 was analyzed by co-crystallization and subsequent x-ray crystallography with a resolution of 2.9 angstroms.

Results: Upon binding of tregalizumab to the CD4 molecule on T cells and subsequent cross-linking, an intracellular signal was induced. As described for anti-CD3 or other anti-CD4 antibodies, phosphorylation of the CD4 associated kinase Lck was observed. Nonetheless, significant differences in the signaling strength were observed between the different antibodies. Although tregalizumab induced the lowest phosphorylation signal on Lck, downstream molecules were also activated. Tregalizumab mediated signaling additionally led to phosphorylation of ZAP-70, LAT, SLP-76, PLC-gamma and MEK, thus engaging several components of the T cell receptor pathway. However, tregalizumab induced no phosphorylation of Ikk, ERK, PKC, MAPK and NF-kappaB as observed for anti-CD3 treatment or other anti-CD4 antibodies tested. Although inducing the weakest signal of all anti-CD4 antibodies, only tregalizumab was able to induce full functional activation of Tregs via CD4.

The new mode of action of tregalizumab may be explained by the special binding epitope. While all other tested anti-CD4 antibodies bound to domain 1 of CD4, the crystal structure of tregalizumab in complex with CD4 revealed binding to domain 2.

Conclusion: In summary, we hypothesize that binding to domain 2 of CD4 may be the underlying reason for inducing weak but unique signaling in CD4 T cells that is sufficient to activate the function of Tregs without activation of T effector cells. Thus, tregalizumab represents a unique and novel mode of action for treatment of autoimmune diseases with insufficient Treg activity. A phase IIb clinical trial is currently ongoing in Rheumatoid Arthritis in European countries to further evaluate clinical use of tregalizumab (Biotest Study 979).

Disclosure: B. Helling, Biotest AG, 3; B. Daelken, Biotest AG, 3; H. Wallmeier, Biotest AG, 3; S. Aigner, Biotest AG, 3; C. Zuber, Biotest AG, 3; M. Koenig, Biotest AG, 3; A. Engling, Biotest AG, 3; F. Osterroth, Biotest AG, 3; N. Czeloth, Biotest AG, 3; C. Uherek, Biotest AG, 3.
Transcriptional Regulation of Garp Expression. Sonja Haupt, Qihui Zhou, Johannes Thomas Kreuzer, Simon Herrmann, Hendrik Schulze-Koops and Alla Skapenko. University of Munich, Munich, Germany

Background/Purpose: Regulatory T cells (Tregs) contribute to immune tolerance and play a pivotal role in the prevention of autoimmune diseases such as rheumatoid arthritis (RA). In active RA, the suppressive function of Tregs is markedly reduced. Recently, a membrane-associated molecule, glycoprotein A repetitions predominant (GARP), has been identified to be specifically expressed on Tregs in response to activation. While the function of GARP is not completely understood, diminution of GARP expression attenuates the suppressive capacity of Tregs. Therefore, we hypothesized that diminished expression of GARP on the surface of Tregs in RA patients might be responsible for their reduced suppressive function. To provide insight, we investigated in detail the molecular mechanisms of GARP transcription and analyzed GARP expression on Tregs from RA patients.

Methods: To delineate transcriptional mechanisms of GARP expression, human GARP promoter sequences and several CNS regions were cloned into reporter vectors. Their transcriptional activity in response to different stimuli was assessed. To analyze the chromatin configuration state in primary Tregs, chromatin immunoprecipitation of GARP promoters and CNS regions was performed. Furthermore, transcriptional activity of GARP promoters in CD4+ T cells was measured by luciferase reporter assays. GARP expression was compared between T cells from healthy controls and patients with systemic lupus erythematosus (SLE) and RA.

Results: Two different transcript variants under the control of different promoters (denoted as promoter 1 and 2) were encoded by the GARP gene. Whereas GARP promoter 1 activity was dependent on TCR stimulation and the presence of Forkhead box protein 3 (Foxp3), the master transcription factor of Tregs, Foxp3 and retinoic acid synergistically stimulated transcription from GARP promoter 2 in a concentration-dependent manner. Histone modifications in both promoter regions and in an upstream localized CNS changed towards a more accessible chromatin configuration upon T cell activation. When GARP expression was analyzed in primary T cells, only CD25+ Foxp3+ expressing CD4 T cells upregulated GARP, confirming Treg specificity of GARP expression and its Foxp3 dependence. The upregulation of GARP expression upon TCR stimulation was however less pronounced on Tregs from RA patients as compared to healthy controls.

Conclusion: Thus, GARP expression is attenuated in RA patients. As transcriptional activity of the GARP gene is initiated by coordinate action of TCR stimulation, Foxp3 and retinoic acid synergistically induced transcription from GARP promoter 2 in a concentration-dependent manner. Histone modifications in both promoter regions and in an upstream localized CNS changed towards a more accessible chromatin configuration upon T cell activation. When GARP expression was analyzed in primary T cells, only CD25+ Foxp3+ expressing CD4 T cells upregulated GARP, confirming Treg specificity of GARP expression and its Foxp3 dependence. The upregulation of GARP expression upon TCR stimulation was however less pronounced on Tregs from RA patients as compared to healthy controls.

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HRES-1/Rab4-Mediated Loss of DRP1 Inhibits Mitophagy, Promotes Accumulation of Mitochondria and Serves As Target for Treatment in SLE. Tiffany Telarico1, David Fernandez2, Zachary A. Oaks2, Gergely Talaber3, Mark Haas4, Michael P. Madaio5 and Andras Perl3.1 SUNY Upstate Medical University, Syracuse, NY, 2SUNY, Syracuse, NY, 3Cedars-Sinai Medical Center, Los Angeles, CA, 4Medical College of Georgia, Augusta, GA, 5Upstate Medical University, Syracuse, NY

Background/Purpose: T cells from patients with systemic lupus erythematosus (SLE) exhibit accumulation of mitochondria and activation of the mammalian target of rapamycin (mTOR). Although mTOR has been implicated in blocking of autophagy and may account for increased mitochondrial mass, paradoxically, blockade of mTOR with rapamycin failed to reduce mitochondrial mass in lupus T cells. mTOR interacts and co-localizes with the small GTPase HRES-1/Rab4 on endosomes that carry autophagosomes containing mitochondrial organelles. Therefore, we investigated whether HRES-1/Rab4, that is over-expressed in lupus T cells, may mediate the accumulation of mitochondria and whether its inhibition by geranylgeranyl transferase inhibitor, 2-[3-pyridyl]-1-hydroxyethylidine-1,1-phosphonocarboxylic acid (3-PEHPC) can influence the development of disease in lupus-prone mice.

Methods: Microarray and confirmatory western blot as well as glutathione-S-transferase pull-down assays were used to map the interactome of HRES-1/Rab4 in human peripheral blood lymphocytes. Expression of Rab4, the murine homolog of HRES-1/Rab4, and its interacting partners were assessed with respect to mitochondrial mass and mTOR activity in the thymus and spleen. Furthermore, mitophagy in the subsets of lupus-prone MRL/lpr and C57BL/6, MRL/MpJ, and Black 6/lpr control mice at ages of 4 and 8 weeks. MRL/lpr mice were treated with 125 µg/kg 3-PEHPC or 1 mg/kg rapamycin in comparison to solvent controls for 10 weeks, beginning at 4 weeks of age. Disease development was monitored by antinuclear antibody (ANA) production and proteinuria. At the time of sacrifice, nephritis was assessed by histopathology, serum cytokine levels were measured by ELISA, gene expression in splenocyte subsets was measured by western blot, and mitochondrial homeostasis was evaluated by flow cytometry. Statistical analyses were done by t-tests and ANOVA, with p<0.05 considered significant.

Results: HRES-1/Rab4 was found to directly interact with Drp1 and its overexpression caused the depletion of Drp1 in human Jurkat cells (p=0.01) and mouse splenocytes (p=0.03). Rab4A was over-expressed in MRL/lpr thymocytes at 4 weeks (p=0.0002). Drp1 was reduced in MRL/lpr T cells at 4 weeks (p=0.007). MRL/lpr mice exhibited increased mitochondrial mass in thymocytes (p=0.02) at 4 weeks and in splenocytes (p=0.01) at 8 weeks of age. At 14 weeks of age, treatment with 3-PEHPC increased Drp1 (p=0.03) and reduced mitochondrial mass in MRL/lpr T cells (p=0.02), reduced ANA production (p=0.021), reduced proteinuria (p=0.00004), and reduced nephritis scores in MRL/lpr mice (p<0.001). Unlike 3-PEHPC, rapamycin reduced mTOR activity (p<0.05) but failed to affect mitochondrial mass. IL-10 production was reduced by 3-PEHPC (p=0.04), while rapamycin reduced production of IFN-γ (p=1 × 10^{-3}) and IL-17A (p=0.01).

Conclusion: These data reveal a pathogenic role of Drp1 depletion and identify the regulation of mitophagy by HRES-1/Rab4 as a promising target for treatment in SLE.

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Background/ Purpose: Regulatory T cells (Tregs) are critical to prevent autoimmune diseases such as inflammatory bowel disease and rheumatoid arthritis. Like all CD4+ T cells, CD4+ Tregs expressing the transcription factor Foxp3 develop in the thymus, though Tregs also are generated in the periphery from naïve CD4+ T cells. T cell receptor (TCR)-major histocompatibility complex class II (MHC II) signals are necessary for thymic Treg generation and provide antigen-specific signals in the periphery. Yet the role of MHC II signals in peripheral Treg maintenance has remained unclear, or in cases of tissue sites such as intestine, unstudied.

Methods: To dissect the role of MHC II in intestinal Treg maintenance, we examined K14/Abb (K14) mice that have MHC II restricted to cortical thymic epithelium but lack peripheral TCR-MHC II interactions.

Results: Intestinal Treg frequency was increased in mice lacking peripheral expression of MHCII. Treg proliferation was equivalent in the intestinal lamina proppria of young K14 and wild type mice; however, proliferation of conventional T cells was MHC II-dependent. The initial MHC II-independent Treg accumulation was not due to increased homing directly from the thymus, as intestinal Tregs in young K14 mice were not enriched for recent thymic emigrants (RTEs). Intestinal Tregs were maintained in adult K14 mice when, in contrast to young mice, Treg and Tconv proliferation and turnover were similar to wild type. In all adult mice the intestine contained no Treg RTEs. However, depletion of microbial gut flora by antibiotics in adult K14 mice partially restored the Treg frequency to wild type levels.

Conclusion: These data suggest that the intestine specifically contains a niche for regulatory T cells that does not require MHC II signals to be filled, but may rely on MHC II-independent, intestinal flora-derived signals to be subsequently maintained. These cells may represent a tissue-specific mechanism to prevent autoimmunity.

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Specificity of the New American College of Rheumatology/European League Against Rheumatism Classification Criteria for Polymyalgia Rheumatica in Comparison with the Former Ones: A Single Centre Study. Pierluigi Macchioni1, Luigi Boiardi2, Mariagrazia Catanoso2, Giulia Pazzola1 and Carlo Salvatori3. 1Arcispedale S Maria Nuova, IRCCS, Reggio Emilia, Italy, 2Arcispedale S Maria Nuova, IRCCS, Reggio Emilia, Italy, 3Arcispedale S Maria Nuova, IRCCS, Reggio Emilia, Italy

Background/Purpose: To evaluate the specificity of the new ACR/EULAR classification criteria for PMR in a consecutive series of outpatients attending an early arthritis clinic (EAC).

Methods: All patients attending our outpatients EAC are followed according to a standardized protocol which include clinical examination, determination of laboratory parameters, quality of life questionnaires and ultrasound (US) examination of shoulders, hips, hands and feet. In this 3-year prospective study we included consecutive patients aged > 50 years followed for at least 12 months. Patients entered the study if they had a definite diagnosis of non-PMR inflammatory joint condition confirmed at 12 month follow-up according to rheumatologist opinion (PM). The PMR group consisted of 136 recent onset, consecutive patients seen in our rheumatological centre during a 5 year period. C statistic were utilized to compare the new ACR/EULAR classification criteria with some of the former diagnostic/classification criteria (Hunder’s, Jones’s, Bird’s, Healey’s criteria).

Results: One hundred and twenty-eight non PMR patients entered the study (mean age 64.2±9.9y, female 70.3%, mean disease duration at first visit 12.47±9.0 w, mean ESR 35.13±25.3 mm/l/h, mean CRP 2.04±2.48 mg/dl). After one year of follow up their diagnosis was: rheumatoid arthritis (RA) 96 pts, spondyloarthropaty 32 pts. Plasma fibrinogen, CRP and ESR were assayed. An ESR value of 20mm/hr and CRP of 6mg/L (lab normal <5mg/L) were considered the upper limit for detection of remission. The upper limit of the lab normal for Fibrinogen(4g/L) was used. Sensitivity, specificity, positive predictive values and likelihood ratios was calculated for all biomarkers.

<table>
<thead>
<tr>
<th>Specificity (128 total cases)</th>
<th>AUC (SE)</th>
<th>Specificity* (96 RA patients)</th>
<th>AUC* (SE)</th>
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<tr>
<td>HUNDER</td>
<td>0.799 (.033)</td>
<td>0.783 (.035)</td>
<td>0.797 (.035)</td>
</tr>
<tr>
<td>BIRD</td>
<td>0.742 (.036)</td>
<td>0.725 (.038)</td>
<td>0.740 (.038)</td>
</tr>
<tr>
<td>JONES</td>
<td>0.810 (.030)</td>
<td>0.861 (.030)</td>
<td>0.861 (.030)</td>
</tr>
</tbody>
</table>

Conclusion: In a series of outpatients attending our EAC the new ACR/EULAR PMR classification criteria have a better specificity as compared to the previous criteria (except for Jones’s one). US shoulders and hips examination increases the specificity of the new ACR/EULAR criteria.

Disclosure: P. Macchioni, None; L. Boiardi, None; M. Catanoso, None; G. Pazzola, None; C. Salvatori, None.

2348

Plasma Fibrinogen Better Identifies Persistent Disease Activity in Polymyalgia Rheumatica Than Either ESR or CRP. EM McCarthy1, Paul A. MacMullan1, S. Al-Mudhaffer2, Anne M. Madigan1, S. Donnelly1, C. J. McCarthy1, Dermot Kenny2, Eamonn S. Molloy1 and G M. McCarthy1, 1Mater Misericordiae University Hospital, Dublin 7, Ireland, 2RCSI, Dublin 2, Ireland, 3Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: In PMR careful tailoring of the glucocorticoid dosage to the patients needs is crucial to avoid the risk of treatment-related adverse effects and the disability associated with uncontrolled inflammation. The ESR and CRP are standard assays used to guide assessment of disease activity. Studies have demonstrated a discordance between ESR and CRP of 28% making assessment of disease activity a diagnostic challenge. Any biomarker that accurately reflects disease activity in PMR, thereby facilitating appropriate adjustment of glucocorticoid dose would be welcomed. Previously we have demonstrated that plasma fibrinogen is more specific for the confirmation of response to treatment than either ESR or CRP. Here we prospectively compare the ability of the biomarkers ESR, CRP and fibrinogen to distinguish between disease remission and disease activity in PMR.

Methods: 25 patients with newly diagnosed PMR and 35 patients with a known diagnosis were assessed at baseline and 6 weeks. Patients were divided into disease remission(Group 1) or persistent disease activity(Group 2), based on the Polymyalgia Rheumatica Activity Score (PMR-AS). A PMR-AS < 1.5 indicates disease remission with a PMR-AS > 1.5 reflecting persistent disease activity. Plasma fibrinogen, CRP and ESR were assayed. An ESR value of 20mm/hr and CRP of 6mg/L (lab normal <5mg/L) were considered the upper limit for detection of remission. The upper limit of the lab normal for Fibrinogen(4g/L) was used. Sensitivity, specificity, positive predictive values and likelihood ratios was calculated for all biomarkers.

Results: Data was available from 120 patient visits. Mean age was 71.8 years. Demographic data was similar between groups. A significant difference was observed in steroid dose between groups (10mg v 3.5mg p<.001).

All biomarkers were significantly higher in those with persistent disease activity (Group 2) compared to those in remission (Group 1)(p<.0001).

Overall 24 patients were defined as being in remission as per the PMR-AS. Of these 23/24 had a normal plasma fibrinogen with 18/24 having a normal ESR and 16/24 a CRP < 6mg/L. The specificity, sensitivity, positive predictive values and likelihood ratios for the different biomarkers are shown in the table below.

<table>
<thead>
<tr>
<th>Specificity</th>
<th>Sensitivity</th>
<th>PPV</th>
<th>Likelihood Ratio</th>
<th>Fischers Exact Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrinogen</td>
<td>96%</td>
<td>34%</td>
<td>.97</td>
<td>P= .002</td>
</tr>
<tr>
<td>CRP</td>
<td>67%</td>
<td>68%</td>
<td>.88</td>
<td>P= .004</td>
</tr>
<tr>
<td>ESR</td>
<td>75%</td>
<td>43%</td>
<td>.87</td>
<td>P= .16</td>
</tr>
</tbody>
</table>

Plasma fibrinogen was more specific than ESR and CRP for differentiating between disease remission and disease activity. It also demonstrated a superior positive predictive value and likelihood ratio than ESR and CRP for identifying patients with persistent disease. The ESR showed no significant ability to distinguish between disease remission and activity (p=0.76).

Conclusion: Elevated plasma fibrinogen more accurately indicates that patients have persistent disease activity than either the ESR or CRP. Measurement of fibrinogen may therefore help treating physicians more accurately identify patients’ disease status and guide decisions with regards to glucocorticoid dosage.

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2349

Corticosteroid Therapy Restaured Treg/Th17 Balance in Patients with Polymyalgia Rheumatica. Lorena Alvarez-Rodriguez1, Marcos Lopez-Hoyos1, Jaime Calvo-Alen2, Elena Aurrecoechea2, Teresa Ruiz Jimeno3, Ignacio Villa4, Carmen Gonzalez-Vela5 and Victor M. Martinez-Taboada1. 1Hospital Universitario Marques de Valdecilla. IFIMAV, Santander, Spain, 2Hospital Universitario Santander, Torrelavega, Spain, 3Hospital de Sieralana, Torrelavega, Spain

Background/Purpose: To characterize the levels of circulating T regulatory cells (Tregs) and Th17 cells in polymyalgia rheumatica (PMR).

Methods: The study included 46 patients with active untreated PMR and 12 age-matched healthy controls (HC). Thirty one PMR patients were also studied after disease control with corticosteroid (CS) therapy. As disease controls, 9 patients with giant cell arteritis (GCA) and 14 with elderly onset rheumatoid arthritis (EORA) were also included. Analysis of circulating regulatory T cells and TH17 cells were performed by flow cytometry. The suppressive capacity of peripheral Tregs was assessed by CFSE at a 1:1 T effector ratio after polyclonal activation with anti-CD3 and anti-CD28. The frequency of CD4+IL17+ IFNγ+ and CD8+CD28+CD27+ in the peripheral blood of active PMR was not significantly different from HC. However, patients with EORA showed marginally significant lower levels than HC (p=0.048) and GCA (p=0.048) patients. Therapy with CS showed no significant effect on the frequency of Tregs during the course of the disease. The frequency of CD4+IL17+ IFNγ+ and CD8+CD28+CD27+ cells was similar in all the study groups. The frequency of TH17 cells (CD4+IL17+ IFNγ+ and CD4+IL17+ CCR6+) was significantly higher in the peripheral blood of patients with PMR compared to HC (p=0.037) and
decreased after disease control with CS therapy \((p=0.031)\). No significant differences between PMR and the other disease controls were found. Consequently, the ratio Tregs/Th17 was significantly decreased in patients with active PMR \((p=0.024)\) and restored to normal after disease control. Moreover, the suppressive capacity of Tregs was slightly increased in PMR patients compared to HC \((p=0.047)\).

**Conclusion:** Active PMR is associated with increased frequency of Th17 cells that is corrected after CS therapy. The frequency of Tregs does not change in PMR. Thus, the onset of PMR seems to be associated with increased inflammatory cells with not counterbalance by regulatory cells.

**Funding:** ISCIII-FIS, IFIMAV

Disclosure: L. Alvarez-Rodriguez, None; M. Lopez-Hoyos, None; J. Calvo-Alen, None; E. Aurrecoechea, None; T. Ruiz Jimeno, None; I. Villa, None; C. Gonzalez-Vela, None; V. M. Martinez-Taboada, None.

### 2350

**Similarities Exceeds Differences in the Pattern of Joint and Vascular Positron Emission/Computed Tomography Uptake in Polymyalgia Rheumatica and Giant Cell Arteritis.** Dario Camellino1, Silvia Morbelli1, Francesco Paparo1, Michela Massollò2, Gianmarino Sambuceti3 and Marco A. Cimmino1.

1Clinica Reumatologica, Genova, Italy, 2Medicina Nucleare, Genova, Italy, 3E.O. Ospedali Galliera, Genoa, Italy

**Background/Purpose:** Polymyalgia rheumatica (PMR) and giant cell arteritis (GCA) are two frequent overlapping diseases. The purpose of this work is to examine the relationship between these conditions by analysis of CT/PET findings.

**Methods:** Eighty consecutive patients (64 PMR diagnosed according to Bird’s criteria, 16 GCA diagnosed according to the ACR criteria, of whom 10 also had PMR) underwent simultaneous FDG-PET and CT imaging from the skull base to the knee using an integrated PET/CT scanner (Hirez; Siemens Medical Solutions, Knoxville TN, USA), after recording demographic, clinical and laboratory data. Arterial and joint uptake were scored relative to liver uptake as 0 (no uptake present), 1 (lower than liver uptake), 2 (similar to liver uptake), 3 (higher than liver uptake). All the values were further subdivided into “positive” (scores 2 and 3) and “negative” (scores 0 and 1). Fifty-five patients were women, median age was 74 years (range 50–90 years), median disease duration was 3 months (range 0.5–11 months), median morning stiffness was 52 minutes (range 0–220 minutes), median C-reactive protein (CRP) was 36 mg/L (range 2–106 mg/L). Eighty age-matched controls were enrolled, whose arterio-CT/PET for suspected neoplasic disease, but without autoimmune conditions or previous chemotherapy, radiotherapy, and glucocorticoid treatment.

**Results:** Shoulders showed more frequently increased uptake (65 patients or 81.3%, bilateral in 57) (table 1), followed by the trochanteric bursae (60 patients or 75%, bilateral in 50). Among the studied artheros, an increased uptake was seen at the aortic arch and in the ascending aorta in 35 patients (43.8%). Patients had more frequently increased uptake than controls in all arterial and joint sites, except the coxofemoral joints. Among patients groups, a significant difference in uptake frequency was observed in the ascending aorta, PMR vs. GCA, \(p=0.001\), and in abdominal aorta, PMR+GCA vs. PMR, \(p=0.04\).

**Table 1. Distribution of uptake sites in patients groups and controls**

<table>
<thead>
<tr>
<th>Arteries</th>
<th>PMR n (%)</th>
<th>PMR+GCA n (%)</th>
<th>PMR+GCA vs. PMR n (%)</th>
<th>Controls n (%)</th>
<th>PMR+GCA vs. Controls n (%)</th>
<th>(p) (PMR vs. Controls)</th>
<th>(p) (PMR+GCA vs. Controls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulders</td>
<td>55 (86)</td>
<td>8 (80)</td>
<td>2 (33)</td>
<td>14 (17)</td>
<td>0.07</td>
<td>(&lt;0.0001)</td>
<td></td>
</tr>
<tr>
<td>Sternoclavicular</td>
<td>32 (50)</td>
<td>7 (70)</td>
<td>3 (50)</td>
<td>0</td>
<td>0.5</td>
<td>(&lt;0.0001)</td>
<td></td>
</tr>
<tr>
<td>Trochanteric bursae</td>
<td>50 (78)</td>
<td>8 (80)</td>
<td>2 (33)</td>
<td>4 (5)</td>
<td>0.05</td>
<td>(&lt;0.0001)</td>
<td></td>
</tr>
<tr>
<td>Coxo-femoral</td>
<td>5 (8)</td>
<td>0</td>
<td>0</td>
<td>4 (5)</td>
<td>0.5</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Iliac arteries</td>
<td>46 (72)</td>
<td>7 (70)</td>
<td>2 (33)</td>
<td>0</td>
<td>0.1</td>
<td>(&lt;0.0001)</td>
<td></td>
</tr>
<tr>
<td>Cervical interospirous bursae</td>
<td>6 (9)</td>
<td>2 (20)</td>
<td>1 (17)</td>
<td>0.55</td>
<td>0.05</td>
<td>(&lt;0.0008)</td>
<td></td>
</tr>
<tr>
<td>Lumbar interospirous bursae</td>
<td>28 (44)</td>
<td>5 (50)</td>
<td>2 (33)</td>
<td>0</td>
<td>0.8</td>
<td>(&lt;0.0001)</td>
<td></td>
</tr>
<tr>
<td>Carotic arteries</td>
<td>4 (6)</td>
<td>2 (20)</td>
<td>4 (67)</td>
<td>1 (1)</td>
<td>0.001**</td>
<td>(&lt;0.0001)</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** With the limitation of the small number of GCA patients included and of the absence of histological data on the temporal arteries of PMR patients, our study suggests that in PMR and GCA similarities exceed differences. These conditions could be different forms of the same disease. PET/CT, a minimally invasive technique, is an effective and objective method to evaluate inflammation in PMR/GCA, optimally discriminating patients with PMR/GCA complex from controls.

Disclosure: D. Camellino, None; S. Morbelli, None; F. Paparo, None; M. Massolò, None; G. Sambuceti, None; M. A. Cimmino, None.

### 2351

**Correlation Between Hypoechoic Halo of the Temporal Arteries and Clinical, Laboratory, and Temporal Artery Biopsy Findings in Patients with Giant Cell Arteritis.** Luigi Botardì1, Giulia Pazzola1, Albiero Cavaizza2, Francesco Muratore1, Giovanna Restuccia1, Alberto Nicolini1, Giuseppe Genaro2, Nicolet Piptone1, Pierluigi Macchioni1, Niccolò Possemato1, Gianluigi Bajocchi3, Ilaria Padovano1, Olga Addimanda1, Alberto Lo Gullo1, Maria Grazia Catanoso1 and Carlo Salvarani3. 1Arcispedale S Maria Nuova, IRCCS, Reggio Emilia, Italy, 2Arcispedale S Maria Nuova, Reggio Emilia, Italy, 3Arcispedale S Maria Nuova, Reggio Emilia, Italy, 4Arcispedale S Maria Nuova.

**Background/Purpose:** The presence of a hypoechoic halo of the temporal arteries on Color-Doppler sonography (CDS) has high specificity and acceptable sensitivity for the diagnosis of giant cell arteritis (GCA). However, it is unclear whether patients with a positive halo sign differ from those without such a sign. The aim of our study was to evaluate the correlations between the presence of a hypoechoic halo, on the one hand, and, clinical, laboratory, and histological parameters, on the other, in patients with biopsy-proven GCA.

**Methods:** We analyzed the clinical records of 105 consecutive patients with biopsy-proven GCA (including those with transmural cell infiltration, small-vessel vasculitis and vasa vasorum vasculitis of the temporal arteries) who underwent CDS of the temporal arteries before temporal artery. Mean age was 74±8 years, while females were 72.4%. A hypoechoic halo larger than 0.4 mm around the temporal artery lumen on CDS was considered positive. Correlations were sought by chi-square test or Fisher’s exact test as appropriate using SPSS version 18.0.

**Results:** The presence of a hypoechoic halo significantly correlated with jaw claudication (35.8% vs 23.9%; \(p=0.001\), odds ratio [OR] 4.1, 95% confidence interval [CI] 1.8–9.3), abnormalities of temporal artery on clinical examination (67.3% vs 46.9; \(p=0.041\), OR 2.3 [CI 1.0–5.3]), elevated erythrocyte sedimentation rate ([91.5% vs 59.2%; \(p=0.001\), OR 7.4 [CI 2.3–23.94]), and the presence of giant cells on temporal artery biopsy [66.7% vs 29.4%; \(p=0.001\), OR 2.3 [CI 2.0–11.4]]. In addition, patients with a hypoechoic halo had higher levels of blood platelets (396755 ±116274 vs 327954 ±103181; \(p=0.005\), unpaired two-tailed t-test). However, no correlation was found between the presence of a ultrasonographic halo and visual loss.

**Conclusion:** These provide evidence for a close correlation between the presence of a hypoechoic halo on CDS of the temporal arteries and jaw claudication, giant cells on temporal artery biopsies, and elevated levels of erythrocyte sedimentation rate in patients with GCA. In contrast, a positive halo sign did not predict visual loss.

Disclosure: L. Boiardi, None; M. Pazzola, None; A. Cavaizza, None; F. Muratore, None; G. Restuccia, None; A. Nicolini, None; G. Genaro, None; N. Piptone, None; F. Botardì, None; N. Macchioni, None; N. Possemato, None; G. Bajocchi, None; I. Padovano, None; O. Addimanda, None; A. Lo Gullo, None; M. G. Catanoso, None; C. Salvarani, None.
Temporal Artery Biopsy Culture in Tridimensional Matrix. *in Vitro* Model for Functional Studies in Giant-Cell Arteritis. Martiñez Corbera Bellalta1, Esther Planas Rigol1, Ester Lozano1, Marco A. Alba1, Izzar Tavera-Bahillo1, Sergio Prieto-González1, Sergio Gispil Vrigolé1, Montserrat Buños1, Jose Hernández-Rodriguez1, Ana García-Martínez2 and Maria C. Cid2. Hospital Clinic University Barcelona, Barcelona, Spain, 2Vasculitis Research Unit. Hospital Clinic. University of Barcelona. IDI-BAPS, Barcelona, Spain

Background/Purpose: GCA is the most frequent systemic vasculitis in Europe and North America. In spite of the initial response to glucocorticoid treatment more than 60% of patients relapse when glucocorticoids are tapered indicating the need for more effective therapies. Search for therapeutic targets in GCA is hampered by the lack of an animal model to assess the consequences of therapeutic intervention. Subcutaneous engraftment of temporal artery fragments into the SCID mouse is the only existing functional system (Brack et al. J Clin Invest 1997) to assess the effects of intervention. However it is costly, complex and only a limited number of conditions can be evaluated. We previously described a temporal artery culture model (Arthritis Rheum 2008 (suppl) S89; S929-S929), and the effects of the same cytokine blockade on cultured GCA arteries. Our purpose is to explore changes induced by corticosteroids on the expression of inflammatory mediators between control arteries, treatment naïve GCA arteries and GCA arteries treated with dexamethasone.

Methods: Fresh temporal artery sections surgically removed for diagnoses were embedded in the reconstituted basement membrane Matrigel™ and cultured for 10 days as described (Arthritis Rheum 2008 (suppl) S89; S929-S929). Cultured sections were treated with medium alone or with medium supplemented with 0.5mg/ml of dexamethasone. IFNg, TNFα, IL-1β, IL-6, CD3, CD20 and CD68 mRNA were measured in harvested sections by quantitative real-time PCR (Applied Biosystems). Proinflammatory cytokine secretion was also measured in the supernatant fluid by immunoassay (R&D Systems).

Results: As expected, cultured inflamed arteries produced remarkable amounts of proinflammatory cytokine mRNAs (IFNg, TNFα, IL-1β, and IL-6) compared with control biopsies. Moreover, mRNA expression of CD3, CD20 and CD68 cell markers was significantly increased in biopsies from patients compared with controls. Glucocorticoid treatment of the GCA biopsies for 10 days markedly reduced mRNA expression of all cytokines and cell markers. At the protein level we found a significant decrease in IL-1β, TNFα and IL-6 which was less marked for IFNg. Our model reproduces previous results obtained in other functional systems or in cross-sectional or serial comparison of biopsies obtained from patient naïve versus treated patients (Visvanathan S, Rheumatology 2011)

Conclusion: Our temporal artery culture system in tridimensional matrix is viable and is a suitable model to evaluate functional changes in biomarker expression and secretion after intervention. This model has several advantages compared to 2D tissue culture. It is simpler and cheaper, it allows continuous assessment of viability, the analysis of more conditions per specimen and the assessment of proteins in the supernatant fluid. Unfortunately, as in the SCID mouse, disease outcomes cannot be assessed in our model.

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Disclosure: M. Corbera Bellalta, None; E. Planas Rigol, None; E. Lozano, None; M. A. Alba, None; I. Tavera-Bahillo, None; S. Prieto-González, None; G. Espigol Vrigolé, None; M. Butjosa, None; J. Hernández-Rodriguez, None; A. García-Martínez, None; M. C. Cid, None.

2354


Background/Purpose: Giant cell arteritis (GCA) is a common form of vasculitis mainly affecting individuals older than 50 years with a mean onset age of 69 years. The prevalence of osteoporosis in postmenopausal women is high and increases with age. The recommended standard treatment for GCA is high doses of glucocorticosteroids which over weeks are reduced to lower maintenance doses. The aim of this study was to examine the prevalence of reduced bone mineral density (BMD) in patients with a new onset GCA and to examine if these patients were treated adequately according to the American College of Rheumatology (ACR) 2010 recommendations for the prevention and treatment of glucocorticoid-induced osteoporosis.

Methods: Patients diagnosed at our outpatient clinic with GCA from January 2010 to May 2012 were retrospectively assessed. The majority of patients were examined by dual energy X-ray absorptiometry (DXA) in spine and hips. The WHO definition was applied to define osteoporosis (T-score ≤−2.5 SD at femoral neck and/or lumbar spine L1–4) and osteopenia (T-score <−1 and ≥−2.5 SD). Treatment data were also recorded.

Results: A total of 36 patients were diagnosed with GCA (27 females, 9 males). Two patients were excluded due to known osteoporosis. From the 34 remaining patients (25 females and 9 males) DXA measurement was performed in 27 (23 females and 4 males) patients at the time of the by disregulated angiogenesis and inflammatory infiltration, however the causative mechanisms involved in regulating these processes have yet to be elucidated. This study examines the role of acute serum amyloid A (A-SAA), TLR2 activation and the downstream Notch signalling pathway in mediating the pro-inflammatory response in GCA.

Methods: A-SAA expression in Temporal artery (TA) sections from GCA patients was assessed by immunohistology. *Ex vivo* TA explant cultures were established from GCA patients, and the effect of pro-inflammatory stimuli A-SAA (10μg/ml) and a TLR2 agonist Pam3CSK4 (1μg/ml) on mRNA expression of all cytokines and IL-6) compared with control biopsies. Moreover, mRNA expression of CD3, TNFα, IL-1β, IL-6, CD3, CD20 and CD68 mRNA were measured in harvested sections by quantitative real-time PCR (Applied Biosystems). Proinflammatory cytokine secretion was also measured in the supernatant fluid by immunoassay (R&D Systems).

Results: A-SAA expression was demonstrated in the adventitial and intimal regions, particularly localised to endothelial cells. High A-SAA levels (386 +/- 191 pg/ml) were spontaneously released from TA explants cultures. *Ex vivo* TA explant cultures spontaneously released pro-inflammatory mediators, maintained cell viability and histological morphology, reflecting the *in vivo* microenvironment. A-SAA and Pam3CSK4 induced expression of instability growth factor Ang2 (p<0.05), IL-8 (p<0.05), IL-6 (p<0.05) and MMP9. A-SAA and Pam3CSK4 induced myofibroblast outgrowths from TA explants embedded in matrigel over a time course of 1–15 days. In parallel, Ang2, MMP9 and pro-inflammatory chemokine IL-8 were induced in myofibroblast outgrowths in response to A-SAA, and to a lesser extent Pam3CSK4. A-SAA induced Ang2, IL-8, IL-6 were significantly decreased in the presence of Notch inhibitor DAPT. Furthermore anti-TLR2 inhibited the effects of A-SAA on endothelial cell function. Finally conditioned media from TA explants significantly induced TLR2 activation through induction of NFκB activation, suggesting the presence of a TLR2 ligand in the inflamed microenvironment.

Conclusion: A-SAA-induced pro-inflammatory events in GAC are mediated through Notch signaling and the TLR2 activation. A better understanding of A-SAA/TLR2-mediated inflammatory pathways may lead to novel treatment strategies for RA.

Disclosure: P. Rooney, None; D. Molloy, None; J. McCormick, None; M. Connolly, None; S. M. Maggin, None; A. Maratha, None; D. J. Veale, Abbott Immunology Pharmaceuticals, 2, Ophorsa, 2, Pfizer Inc, 2, Roche Pharmaceuticals, 2, MSD, 2; C. Murphy, None; E. S. Molloy, None; U. Fearon, None.
initial evaluation. A total of 21 patients (78%) had reduced BMD (osteoporosis in 13 females and osteopenia in 3 males and 5 females). Treatment with bisphosphonates was initiated in 14 out the 21 patients (67%) with reduced BMD (11 patients with osteoporosis and 3 patients with osteopenia) who according to the ACR guidelines were recommended treatment. All patients with osteoporosis and osteopenia received calcium and vitamin D supplementation.

Conclusion: More than 75% of the DXA examined patients had reduced BMD and thus were in need for osteoporosis treatment with bisphosphonates according to the ACR 2010 recommendations for glucocorticoid-induced osteoporosis. Despite the clear guidelines 1 out of 3 GCA patients were in our patient cohort not treated properly. Our data emphasizes the need for increased awareness of osteoporosis and osteopenia in these patients which are at high risk for future fractures.

Disclosure: A. P. Diamantopoulos, None; G. Haugeberg, None.

2355
Increase in Duration and Cumulative Dose of Glucocorticoid Therapy in Recent Decades: Observations From a Population-Based Cohort of Patients with Giant Cell Arteritis. P. Deepak Udayakumar, Tanaz A. Kermani, Kenneth J. Warrington, Cynthia S. Crowson and Eric L. Matteson. Mayo Clinic, Rochester, MN

Background/Purpose: Systemic glucocorticoid (GC) therapy is the first line treatment for giant cell arteritis (GCA). Patients with GCA are often counseled that therapy will be needed for 1 to 2 years, but in recent years it has been recognized that GCA is a chronic disease requiring long-term therapy and monitoring. We sought to evaluate the duration and cumulative dose of GC therapy in a population based cohort of patients with GCA diagnosed 1980–2004 compared with 1950–1979.

Methods: We retrospectively reviewed a population-based incidence cohort of GCA patients diagnosed between 1950 and 2004. All subjects were longitudinally followed through all available community medical records until death, migration or December 31, 2009. Data was collected regarding duration and dosage of GC use. Kaplan-Meier methods were used to estimate the time to discontinuation of GC and log rank tests were used for comparisons between time periods.

Results: The study population included 204 patients. Mean age was 76 years and 163 (80%) were female. Median follow-up was 8.8 years with 1,996 total person-years. Mean erythrocyte sedimentation rate at diagnosis was 79.2 mm/hr. Temporal artery biopsy was positive in 176 (86%) patients. The mean starting dose of prednisone was 53.2mg/day in 1980–2004 and 54.8 mg/day in 1950–1979 (p=0.79). Prednisone dose of <10 mg/day for 6 months was reached in 34%, 81% and 98% patients by 1, 2, and 5 years from GCA incidence date in patients diagnosed between 1980–2004 compared to 52%, 80% and 100% respectively among patients in the 1950–1979 cohort (p=0.003). In the 1980–2004 cohort, only 14% permanently discontinued GC use by 1 year from GCA incidence date, 41% by 2 years and 75% by 5 years compared to 40%, 64% and 76% respectively in the 1950–1979 cohort (p=0.032). The median time to reach a prednisone dose of <10mg/day was about 6.5 months in 1980–2004 versus 3.2 months in 1950–1979 (p <0.001). The mean cumulative dose of prednisone by 1 year after incidence of GCA was 6.1 gm in 1980–2004 versus 4.1 gm in 1950–1979 (p <0.001). Mean cumulative dose by 5 years was 10.3 gm in 1980–2004 versus 7.8 gm in 1950–1979 (p=0.007).

Conclusion: Patients diagnosed with GCA in recent decades were on GC for a longer duration and received higher cumulative doses. As well, a significantly higher proportion of patients remain on GC therapy even beyond 5 years following diagnosis. The reasons for the secular trend in longer duration and higher doses of GC for treating GCA are unclear, but may relate to recognition that GCA a more chronic disease with late sequelae such as large vessel disease than previously recognized, increasing the concern for GC associated adverse effects in these patients.

Disclosure: P. D. Udayakumar, None; T. A. Kermani, None; K. J. Warrington, None; C. S. Crowson, None; E. L. Matteson, Centocor, Inc./Johnson and Johnson, 2, Genentech and Biogen IDEC Inc., 2, Hoffmann-La Roche, Inc., 2, Human Genome Sciences, Inc., 2, Pfizer, Inc., 2, Novartis Pharmaceutical Corporation, 2, Roche Pharmaceuticals, 2, UCB Group, 2, Centocor, Inc., 5, Horizon Pharma, 5, Novartis Pharmaceutical Corporation, 5.

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Visual Manifestations in Giant Cell Arteritis: Trend Over Five Decades. Abha G. Singh1, Cynthia S. Crowson1, Tanaz A. Kermani2, Cornelia M. Weyand3, Eric L. Matteson1 and Kenneth J. Warrington1. Mayo Clinic, Rochester, MN, 2University of California Los Angeles, Los Angeles, 3Stanford University School of Medicine, Stanford, CA

Background/Purpose: Cranial ischemic complications, particularly permanent visual loss, are catastrophic complications of giant cell arteritis (GCA). Corticosteroids have been used to decrease the risk of vision loss but it is unclear if the rate of visual complications has changed in recent decades. We examined trends in visual manifestations in GCA over the last 5 decades.

Methods: We reviewed the medical records of a population-based cohort of patients with GCA meeting ACR classification criteria, diagnosed between 1950 and 2004. We characterized the clinical, ophthalmological and laboratory features of patients with visual manifestations and compared them with patients who did not develop visual complications. Trends of visual manifestations in GCA over time were examined using logistic regression model adjusted for age and sex.

Results: 204 cases of GCA were identified (mean age 76.0 ± 8.2 years, 80% female) of which 47 had visual manifestations attributable to GCA at presentation. Blurred vision (15%) and diplopia (5%) were the most common visual symptoms. Ischemic optic neuropathy (ION) was the predominant ophthalmologic diagnosis (17/204, 8%). Nine patients (4.4%) suffered complete loss of vision. As compared to patients with GCA without visual manifestations at presentation, patients with visual manifestations were more likely to have associated jaw claudication (59/157 vs 26/47, p =0.04), but were similar with regard to other clinical (age, smoking status, headache, scalp tenderness, constitutional symptoms, frequency of polymyalgia rheumatica) and laboratory features.

Recovery from visual symptoms was less likely in patients with complete vision loss as compared to those with blurred vision alone [Hazard ratio, 95% Confidence Interval (HR, 95% CI): 0.20 (0.06–0.63), p<0.001], and in patients with ION or central retinal artery occlusion as compared to other diagnoses [HR (95% CI): 0.22(0.10–0.49), p<0.001].

Over a period of 55 years, there has been a significant decline in the incidence of visual symptoms (figure) and ION (1950–1979 vs 1980–2004: 9/61 (15%) vs 8/143 (6%), p=0.03) with time. Additionally, patients diagnosed more recently were more likely to have recovery from visual symptoms than patients diagnosed in earlier years [HR (95% CI): 1.34 (1.06–1.71) per 10 year increase in calendar year, p=0.016].

Figure. Incidence of visual manifestations (adjusted for age and sex) among 204 patients with giant cell arteritis declined over time (p=0.02). Point estimate and 95% confidence interval for each 5 year time period are displayed.

Conclusion: In this population-based cohort study of patients with GCA, we found that the incidence of visual symptoms and ION has declined over the past 5 decades, and chances of recovery from visual symptoms have improved. Reasons for this improvement are unclear but may relate to increased disease awareness, earlier diagnosis and timely initiation of treatment.

Disclosure: A. G. Singh, None; C. S. Crowson, None; T. A. Kermani, None; C. M. Weyand, None; E. L. Matteson, Centocor, Inc./Johnson and Johnson, 2, Genentech and Biogen IDEC Inc., 2, Hoffmann-La Roche, Inc., 2, Human Genome Sciences, Inc., 2, Pfizer Inc., 2, Novartis Pharmaceutical Corporation, 2, Roche Pharmaceuticals, 2, UCB Group, 2, Centocor, Inc., 5, Horizon Pharma, 5, Novartis Pharmaceutical Corporation, 5, K. J. Warrington, None.
Relapses in Patients with Giant-Cell Arteritis: Prevalence, Characteristics and Associated Clinical Findings in a Prospectively Followed Cohort of 106 Patients. Marco A. Alba1, Ana García-Martínez2, Izziar Tavera-Bahillo1, Sergio Prieto-González1, Montserrat Butxosa3, Georgina Espígol3, Marc Corbera3, Ester Planas3, Jose Hernandez-Rodriguez4 and Maria C. Cid5.
1Vasculitis Research Unit. Hospital Clinic. University of Barcelona. IDIBAPS, Barcelona, Spain, 2Hospital Clinic University Barcelona. Barcelona, Spain, 3Vasculitis research unit. Hospital Clinic. University of Barcelona. IDIBAPS, Barcelona, Spain, 4Hospital Clinic. University of Barcelona. IDIBAPS, Barcelona, Spain

**Background/Purpose:** In spite of the satisfactory initial response to glucocorticoid treatment, patients with giant cell arteritis (GCA) frequently experience relapses during follow-up. The objectives of this study were 1) To investigate the prevalence and characteristics of relapses in a prospectively followed cohort of patients with GCA. 2) To determine whether clinical or analytical findings at presentation may predict relapses and 3) To analyze whether a relapsing course is associated with higher cumulated GC doses and more prolonged treatment periods.

**Methods:** Between 1995 and 2007, 187 patients were diagnosed with biopsy-proven GCA at our institution. Among them, 106 patients fulfilled the following inclusion criteria: prospective treatment by the authors according to uniform criteria and prospective follow-up for at least 4 years. GCA features and blood tests at diagnosis (acute phase reactants, blood cell counts and liver function tests), ischemic complications, relapses, and prednisone doses for at least 4 years. Relapses were defined as reappearance of disease related symptoms accompanied by elevation of acute-phase reactants that required treatment adjustment. Type of relapse was defined as PMR, cranial symptoms, severe cranial ischemic complications or systemic disease (anemia, fever, and/or weight loss). Chi-square test, student T test and Kaplan-Meyer survival analysis/log-rank test were used for statistical comparison.

**Results:** During the follow-up period (mean 7.6 ± 3.3 years), 66 (62%) patients experienced at least 1 relapse and 38 (36%) 2 or more. Relapses consisted of PMR in 33 (50%), cranial symptoms in 19 (29%), systemic complaints in 13 (19%) and cranial ischemic complications in 1 (1.5%). Mean time (in weeks) to first relapse was 72 ± 71 (11-339). There were no differences in clinical findings or blood test results at presentation between patients who relapsed and those who achieved sustained remission. However, 23 (60.5%) of patients with ≥ 2 relapses had a strong systemic inflammatory response at presentation (defined as at least 3 of the following fever >38°C, weight loss > 5 kg, hemoglobin < 11 gr/L or ESR > 85 mm/hour) which was present in only 5 (18%) of the remaining patients (p = 0.001). Patients with ≥ 2 relapses presented significantly higher levels of ESR and C-reactive protein at 6 months and lower concentrations of hemoglobin at baseline, at 6 months (all p<0.01) and at 24 months (p=0.045). Patients with relapses required longer periods of time to reach a stable maintenance dose of prednisone (<10mg/day (67±58 weeks vs 31±21, p<0.001), <5mg/day (159±106 vs 89±42, p=0.001) and to completely discontinue GC treatment (237±124 vs 157±99 p=0.005). In addition, cumulative prednisone dose at one year was significantly different between both groups (6.2±1.7 gr vs 5.4±0.7, p=0.01).

**Concluci:** More than 60% of patients with GCA experience at least one relapse and 36% have multiple relapses. Relapses usually consist of PMR. Those with multiple relapses have stronger systemic inflammatory response at presentation. A relapsing course is associated with higher and prolonged GC requirements underlining the need for more effective treatments for GCA.

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and vessel diameter at the aforementioned four aortic segments were evaluated. Aortitis was defined as circumferential aortic wall thickness ≥2 mm with or without contrast enhancement of the vessel wall observed in zones without adjacent atheroma.

**Results:** Five out of the 40 patients were lost to follow-up or declined a new CTA, so follow-up CTA has been completed in the remaining 35 patients. CTA findings of aortitis were still present in 16 (72% of the patients who initially had aortitis). Nevertheless, a significant reduction in mean wall thickening was detected in all of the aortic segments: ascending aorta (1.51 ± 0.81 vs 1.22 ± 0.59 mm, p = 0.018), aortic arch (2.31 ± 1.02 vs 1.77 ± 0.87 mm; p = 0.002), descending thoracic aorta (2.74 ± 1.06 vs 2.02 ± 0.95 mm; p = 0.001), and abdominal aorta (1.68 ± 0.8 vs 1.31 ± 0.6 mm; p = 0.012). None of the 35 patients evaluated developed new lesions in previously unaffected areas and no patients lacking aortitis in the first CTA developed new aortic involvement. Similar to the first evaluation, aortic arch and descending thoracic aorta were the most affected segments, followed by the abdominal aorta and ascending aorta, respectively. Interestingly, aortic diameters remained stable, and no patients developed new aortic dilatation or increase in previous dilatations.

**Conclusion:** CTA signs of aortitis persisted in 72% of the patients who presented initial aortic inflammation after one year of steroid treatment. Nevertheless, aortic thickening significantly decreased and there were no changes in aortic diameters during this period of time. In order to rule out clinical significance of these inflammatory findings and their possible relationship with dilatation longer follow-up is mandatory.

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**Disclosure:** S. Prieto-González, None; P. Arguis, None; A. García-Martínez, None; L. Tortajada, None; M. Corbera-Balalta, None; M. A. Alba, None; G. Espigol-Frigoli, None; E. Planas-Rigol, None; J. Hernández-Rodríguez, None; M. C. Cid, None.

### 2360

**Vasculitis in Difficult to Treat PMR and GCA Patients. Prevalence, Management and Outcomes of PET Positive Large Vessel Vasculitis in Difficult to Treat PMR and GCA Patients. Pravin Patil1, Shifali Jain2, Katerina Achilleos3, Totchukwu Adizie4, Mark Williams3, Matthew Tam1 and Bhaskar Dasgupta1. 1Southend University Hospital, Westcliff on sea, United Kingdom, 2Southend University Hospital, Westcliff-on-Sea, United Kingdom**

**Background/Purpose:** Management of PMR and GCA can be challenging in patients with persistently elevated inflammatory markers, prominent constitutional symptoms and inadequate steroid response. We undertook an audit in such difficult to treat cases of the utility of FDG-PET CT scanning and outcomes of therapeutic decisions subsequently made.

**Methods:** We report a retrospective case notes review of 52 rheumatology patients with active PMR, GCA despite optimal steroid/ methotrexate therapy or patients with an unexplained systemic illness who had PET-CT. PET alterations reported were characterized by a (18)FDG uptake of the aortic wall. PET-CT scan results are in-fluenced by dose of steroid intake and we suggest prednisolone no higher than 7.5 –10mg daily a priori to the scan. Patients on higher doses may have false negative scans. FDG PET can also reveal occult malignancies or confirm the PMR diagnosis. Novel agents like leflunomide and tocilizumab provide targeted and effective therapy in refractory patients with reversal of FDG avidity on and re-vascularisation on repeat scans.

**Disclosure:** P. Patil, None; S. Jain, None; K. Achilleos, None; T. Adizie, None; M. Williams, None; M. Tam, None; B. Dasgupta, Merck Pharmaceuticals, 5.

### 2361

**Misdiagnosis of Giant Cell Arteritis Presenting As Fever of Unknown Origin. Chiara Stagnaro, Rosaria Talarico, Claudia Ferrari, Anna d’Ascanio and Stefano Bombardieri. Rheumatology Unit, University of Pisa, Pisa, Italy**

**Background/Purpose:** Giant cell arteritis (GCA) represents the most common primary vasculitis of the elderly, that usually involves large and medium sized arteries. The wide spectrum of clinical manifestations can extensively vary, from cranial symptoms, such as headache, jaw claudication or visual alterations, to constitutional symptoms, like fever, weight loss or anaemia. Fever of unknown origin (FUO) may sometimes represent the initial symptom of GCA and when it is not associated with other typical GCA features, unfortunately the diagnosis can be delayed. The primary aim of this study was to evaluate the prevalence of GCA presenting as FUO. The secondary aims were: to identify delays in recognizing patients with GCA presenting as FUO and to explore any potential differences between the subset of GCA patients characterised by the presence of FUO at the onset, and the other patients of the cohort.

**Methods:** Epidemiological and clinical data of 180 GCA patients followed in the last 15 years in our Unit were analysed. We quantified the latency period between the onset of signs and symptoms and the final diagnosis of GCA in terms of months.

**Results:** One hundred and thirty-five patients (13 males and 122 females, mean ± SD age at the onset 75.2 ± 6 years, mean follow-up 8 years) had shown at the onset signs and symptoms suggestive of GCA (new onset headache and scalp pain 78%, jaw claudication 36%, vision loss 33%, abnormal temporal artery on examination 32%, dizziness 29%) while 45 patients (9 males and 36 females, mean age at the onset 67 ± 2 years, mean follow-up 6 years) were sent to our attention because of FUO onset and an increase of erythrocyte sedimentation rate and C-reactive protein not otherwise justified. After an extensive work-up aimed at excluding any kind of infection, malignancy or hematological disorder, we performed temporal artery biopsy (TAB) in all patients presenting as FUO, that resulted positive in 29% of cases. Moreover, (18)F-fluorodeoxyglucose positron emission tomography (18F-FDG PET) was performed in 29 cases and was positive in 27. The main PET alterations reported were characterized by a (18)FDG uptake of the aortic arch and its major branches, including the carotid, subclavian, thoracic aorta and, less frequently, the abdominal aorta. The mean latency period between the onset of FUO and the diagnosis of GCA was 7 ± 2 months, which was significantly higher compared with the mean latency period between the onset of signs and symptoms suggestive of GCA and the definitive diagnosis (3 ± 1 months) in the other patients of the cohort. No difference was noted between the 2 groups, except for the mean age at the onset, which seems to be earlier in GCA patients presenting with FUO.

**Conclusion:** GCA patients presenting with constitutional symptoms may sometimes represents a diagnostic challenge and our results confirm that FUO must to be carefully investigated in elderly patients. In fact, there are major delays in the recognition of GCA patients presenting with FUO, and it partially seems to be due to the long diagnostic work-up before performing a rheumatologic evaluation.

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Evaluation of Disease Activity Using FDG PET-CT in Patients with Large Vessel Vasculitis. Giulia Pazzola1, Luca Magnani1, Luigi Boiard1, Nicolò Pipitone1, Annibale Versari1, Debora Formisano1, Olga Addimanda1, Riccardo Ferrari1, Lia Pulsatelli1, Gianluigi Bajocchi1, Pirri Giacomi1, Maria Grazia Catanosono1, Nicolò Possemato1, Ilaria Pavodano1, Alberto Lo Gullo1 and Carlo Salvarani1. 1Arcispedale S Maria Nuova, IRCCS, Reggio Emilia, Italy, 2Istituto Ortopedico Rizzoli, University of Bologna, Bologna, Italy, 3Istituto Ortopedico Rizzoli, Bologna, Italy

Background/Purpose: 18F-Fluorodeoxyglucose (FDG) positron emission tomography (PET)/computerized tomography (CT) [PET/CT] has been proposed as a useful tool to diagnose and monitor activity of large vessel vasculitis (LVV), but its precise role remains debated. The objective of this study was to determine the value of PET-CT in the assessment of disease activity in LVV. To this end, PET/CT findings were correlated with clinical indices including ITAS (Indian Takayasu activity score) and Kerr/National Institute of Health, serum acute-phase reactants (ESR, CRP) levels as well as interleukin-6 (IL-6) and the soluble IL-6 receptor (sIL-6R).

Methods: 78 patients with LVV (giant cell arteritis, Takayasu arteritis or idiopathic aortitis) underwent a total of 204 PET/CT scans. PET/CT scans were reviewed by a nuclear medicine physician without knowledge of clinical information. Vascular uptake was graded using a 4-point semiquantitative scale where grade 0=no uptake, grade 1=less than liver uptake, grade 2=similar to liver uptake, grade 3=higher than liver uptake. Visual analysis was performed on 14 vessel segments. PET/CT scans were considered negative if vascular FDG uptake was grade 0–1, moderately positive if vascular uptake was grade 2, and markedly positive if vascular uptake was grade 3 in at least one vessel. ITAS, Kerr/NIH scores, ESR, CRP, IL-6 and sIL-6R values were obtained within 20 days of PET/CT scans.

Results: 43% of 204 PET-CT were negative, 31% were moderately positive, and 26% were markedly positive. We found a significant association between the intensity of the uptake and both ESR and CRP levels. Significantly higher ESR values were observed in the patients with markedly positive PET/CT (49.4 ± 36.5 mm/1st h) compared with those with moderately positive (27.0 ± 21.1 mm/1st h, p = 0.0001) and inactive scans (22.7 ± 15.9 mm/1st h, p = 0.0001), respectively. CRP levels were 0.8 ± 1.0 mg/dL in patients with inactive scans, 1.3 ± 2.2 mg/dL in patients with moderately positive (p=0.001) and 3.0 ± 3.6 in patients with markedly positive scans (p = 0.0001). Significantly higher levels of IL-6 were measured in patients with markedly positive scans (10.0 ± 8.9 pg/ml) compared to those with inactive scans (8.1 ± 18.5 pg/ml, p=0.013). No association was found between sIL-6R levels and intensity of vascular FDG uptake. However, there was a significant association between the intensity of vascular FDG uptake and both ITAS and Kerr/NIH scores.

Patients with markedly positive scans had more frequently (50%) active vasculitis according to the ITAS compared with those with moderately active (31.7%) and inactive scans (28.1%) (p=0.0001). Likewise, vasculitis was judged to be active according to the Kerr/NIH index in 50% of patients with markedly positive scans, 22% of those with moderately positive scans, and 14.6% with inactive scans (p=0.0001).

Conclusion: Our findings show a strong association between vascular FDG uptake and clinical activity and traditional inflammatory markers. A weak association was found between vascular FDG uptake and IL-6 levels. These data suggest that PET/CT may be a useful tool for evaluating disease activity in patients with LVV.

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Assessment of Disease Activity in Large Vessel Vasculitis: Initial Results of an International Delphi Exercise. Sibel S. Aydin1, Haner Direskeneli1, Ercan Boz1, Alinee E. Matteson1, Eric Matteson1 and Peter A. Merkel1. 1Medeniyet University, Gazipepe Training and Research Hospital, Istanbul, Turkey, 2Marmara University, School of Medicine, Istanbul, Turkey, 3Mayo Clinic, Rochester, MN, 4University of Pennsylvania, Philadelphia, PA.

Background/Purpose: Assessment of disease activity in large vessel vasculitis (LVV) is challenging. The lack of specific, validated outcome measurements for both Takayasu’s (TAK) and giant cell arteritis (GCA) affects clinical care and research in these diseases.

Methods: The Delphi survey was sent out to >300 experts by e-mail. Experts were chosen from different specialties based on their interest in LVV and previous involvement in vasculitis clinical research. Experts from countries with high prevalence of either TAK or GCA were especially recruited. The first round included 99 items on a 5-point scale aiming to cover all potential disease manifestations. Items accepted or rejected by >70% of the voters are not advanced to subsequent rounds.

Results: 116 experts completed the survey and included physicians from 23 countries in Asia, Australia, Europe and North and South America. Most of the vascular/cardiovascular items (e.g. bruises, new loss of pulse, claudication) were accepted by >70% of experts for TAK; ocular findings (e.g. visual loss, blurred vision, retinal vasculitis) were considered high-priority outcomes for GCA. Vascular imaging (CT, MRI, PET, or ultrasound) was accepted for both TAK and GCA. SF-36 and patient global assessment were widely accepted as tools for patient-reported outcomes in both diseases. Disease Extent Index-Tak (DEI-Tak) was the only composite index accepted by the majority for TAK. Only ESR and CRP were suggested as biomarkers in TAK, whereas hemoglobin level was also supported in GCA. Findings rejected by >70% of the experts were erythema nodosum for TAK and pulmonary assessments for GCA. Many items were endorsed by a majority of experts but did not reach the 70% threshold for final acceptance; it is expected that additional items will reach the 70% threshold in subsequent Delphi rounds. Several new items were proposed by participants (e.g. IL-6 levels and novel patient reported outcome measures) that will be considered in subsequent rounds.

A majority of experts (63%) voted for aiming to have a common tool for both TAK and GCA but also develop additional tools specific for each disease. 25% felt the two diseases were unsuitable for common outcome measures.

Conclusion: This exercise points out the similarities and differences from experts’ perspective for assessing clinical activity in TAK and GCA. The completion of the Delphi will produce a consensus-driven set of outcomes to study prospectively with the long-term goal of developing a core set of validated outcomes for LVV. Based on these data it is anticipated that such a set of outcomes will include many data elements common to both diseases, supplemented by disease-specific items for TAK and GCA. Continued international collaborative work will be required to advance this research for these diseases.

Disclosure: S. Z. Aydin, None; H. Direskeneli, None; E. L. Matteson, None; P. A. Merkel, Actelion Pharmaceuticals US, 5, Genzyme Corporation, 5, Celgene, 2, Genentech and Biogen IDEC Inc., 2, Bristol-Myers Squibb, 2, Human Genome Sciences, Inc., 2, Proton Therapeutics, 2.
Conclusion: Our results demonstrate a high incidence of myocardial involvement in TA patients mainly related to microcirculation impairment. This clearly demonstrate that this large vessel vasculitis, also affect vessels of small size. Systematic cardiac evaluation including dipyridamole thallium-201 stress myocardial scintigraphy is required to properly identify TA patients with asymptomatic myocardial involvement. Further studies are needed to determine whether myocardial findings using dipyridamole thallium-201 stress myocardial scintigraphy have an impact on the prognosis and treatment strategy.

Disclosure: C. Comarmond, None; O. Dessault, None; J. Y. Devaux, None; N. Costedoat-Chalumeau, None; M. Resche Rigon, None; R. Isnard, None; F. Koskas, None; P. Cacoub Sr, None; D. Saadoun, None.

2366

Aortic and Coronary Calcifications in Takayasu Arteritis. Emire Seyahi1, Ayca Ucgun2, Serdal Ugrulu1, Canan Akman1, Deniz Cebi Olgun1, Sebahattin Yurdakul1 and Hasan Yazici1, 1Istanbul University, Cerrahpasa Medical Faculty, Istanbul, Turkey, 2University of Istanbul, Cerrahpasa Medical Faculty, Istanbul, Turkey, 3Istanbul University, Cerrahpasa Medical School, Istanbul, Turkey

Background/Purpose: We had previously shown, similar to patients with systemic lupus erythematosus (SLE), patients with Takayasu arteritis (TAK) had significantly more atherosclerotic plaques in the carotid arteries compared to the healthy controls (1). Moreover, we had observed that atherosclerotic plaques were more common in areas where arteritis was more prominent, implying that atherosclerosis in TAK might be mainly due to local inflammation.

In this study, we aimed to investigate the presence of coronary artery (CAC) and thoracic aorta calcifications (ToAC) using multi-detector computed tomography (MDCT) in a larger cohort of TAK patients and controls. We again investigated the frequency of atherosclerotic plaques in the carotid arteries. These investigations enabled us to compare atherosclerotic lesions in different vessel beds in patients with TAK and controls and thus to test the hypothesis that atherosclerosis observed in TAK is primarily due to local factors.

Methods: We studied 47 female with TAK (mean age: 37.4 ± 8.0 SD years), 43 patients with SLE (mean age: 39.3 ± 8.1 years) and 70 healthy controls (mean age: 40.2 ± 5.2 years). Calcification in the coronary arteries and thoracic aorta was measured using MDCT. Carotid artery plaques (CAP) were assessed using B-Mode ultrasonography.

Results: Table 1 demonstrates the odds ratios for the surrogate markers of atherosclerosis among the study groups with healthy controls being the reference group. The OR for having atherosclerotic plaques was considerably higher (9 vs 4) among the SLE patients as compared to the TAK patients while the frequency of CAC was significantly increased only among patients with SLE compared to the healthy controls. However, ToAC and CAP were significantly more common among both TAK and SLE patients compared to the healthy controls. Calcification in the thoracic aorta was present in 45 % of TAK patients and its morphology was different than that observed in SLE. It was mostly circumferential in TAK, whereas punctuate or linear in SLE. As reported previously, similar to SLE patients, TAK patients were found to have increased risk for CAP. Moreover, among TAK patients CAC, ToAC and CAP were more likely to be seen in places where primary vasculitic lesions were frequent (coronary artery involvement: 67% vs 7 %, CAC (+) vs CAC (−), respectively, p = 0.027; thoracic aorta involvement: 52% vs 19 %, ToAC (+) vs ToAC (−), respectively, P = 0.029, and carotid artery involvement: 92% vs 69 %, CAP (+) vs CAP (−), respectively, P=0.146).

Table. Prevalence and the odds ratios of CAC, ToAC and CAP

<table>
<thead>
<tr>
<th>Study groups</th>
<th>Patients with, n (%)</th>
<th>OR (95 % CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAK, n =47</td>
<td>5 (11)</td>
<td>4.0 (0.8–21.8)</td>
<td>0.104</td>
</tr>
<tr>
<td>SLE, n =43</td>
<td>9 (21)</td>
<td>9.0 (1.8–44.0)</td>
<td>0.007</td>
</tr>
<tr>
<td>HC, n =70</td>
<td>2 (3)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>ToAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAK, n =47</td>
<td>21 (45)</td>
<td>27.5 (6.0–125.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SLE, n =43</td>
<td>10 (23)</td>
<td>10.3 (2.1–49.7)</td>
<td>0.004</td>
</tr>
<tr>
<td>HC, n =70</td>
<td>2 (3)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>CAP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAK, n =47</td>
<td>12 (23)</td>
<td>3.1 (1.1–8.6)</td>
<td>0.030</td>
</tr>
<tr>
<td>SLE, n =43</td>
<td>12 (28)</td>
<td>3.5 (1.2–9.7)</td>
<td>0.017</td>
</tr>
<tr>
<td>HC, n =70</td>
<td>7 (10)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
2367
Presence of Fibromyalgia and Fatigue Is Not Increased in Patients with Takayasu’s Arteritis. Fatma Albaz-Onen, Meryem Can, Birkan Ilhan, Ozge Polat and Haner Direskeneli. Marmara University, School of Medicine, Istanbul, Turkey

Background/Purpose: Takayasu’s arteritis (TAK) is a large-vessel vasculitis of the aorta and its major branches. To our knowledge, no data is reported about the frequency of Fibromyalgia Syndrome (FM), in TAK. We aimed to investigate the frequency of FM in TAK, defined according to the new 2010 ACR Preliminary Diagnostic Criteria for Fibromyalgia. The correlation between ACR-1990 and 2010 FM criteria and the effect of patient-reported outcomes (PROs) such as Health Assessment Questionnaire (HAQ). Multidimensional Assessment of Fatigue Scale (MAF), Short-Form 36-item survey (SF-36) and hospital anxiety and depression scales (HADS) on FM were analyzed.

Methods: We studied 51 patients with TAK (f/M: 47/4, mean age: 42.3 years), 50 (F/M: 35/15, mean age: 40.89 years) healthy controls (HC). All patients were examined for FM tender points by two observers (kappa: 0.648) and asked to complete new ACR 2010 FM questionnaire for FM (ref1). SF-36, MAF and HADS were used to assess quality of life together with HAQ. Seventeen patients were re-evaluated 6 months later.

Results: Six (11.7%) patients with TAK and 5 HC (10%) met the ACR-2010 FM criteria, whereas only 3(5.8%) TAK patients and no controls (0%) met the 1990 Criteria. No significant differences regarding the FM frequency were present according to both ACR-2010 and 1990 FM criteria between TAK and HC. No differences were also observed for the 2 subscales of 2010 criteria, the Widespread Pain Index(WPI) and the Symptom Severity scale (SSS) scale among the groups. Fourteen patients (33.3%) were clinically active. FM presence was also similar between active and inactive patients (p=0.188). The results of PROs were showed in Table 1. WPI correlate significantly with tender points (r=0.477, p<0.001), MAF (r=0.623, p<0.001), HAQ (r=0.477, p<0.001), anxiety (r=0.458, p<0.001), depression (r=0.378, p<0.001), PCS (r=-0.586, p<0.001) and MCS (r=-0.335, p<0.001). SSS correlate significantly with tender points (r=0.477, p<0.001), MAF (r=0.775, p<0.001), HAQ (r=0.437, p<0.001), anxiety (r=0.557, p<0.001), depression (r=0.438, p<0.001), PCS (r=-0.593, p<0.001) and MCS (r=-0.531, p<0.001). During follow-up, no significant differences between baseline and 6-month were observed in terms of frequency of FM, MAF, HAQ, HADS, PCS and MCS.

Table 1. Results of the patient-reported outcomes in TAK and controls

<table>
<thead>
<tr>
<th>Takayasu’s arteritis \n(n=51)</th>
<th>Healthy controls \n(n=50)</th>
<th>P values</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAF 18.5 (4–97.4)</td>
<td>17.5 (0–38.6)</td>
<td>0.282</td>
</tr>
<tr>
<td>Anxiety scale score 5 (0–21)</td>
<td>5 (0–18)</td>
<td>0.533</td>
</tr>
<tr>
<td>Depression scale score 3 (0–21)</td>
<td>3 (0–14)</td>
<td>0.529</td>
</tr>
<tr>
<td>HAQ 0.15 (0–2.35)</td>
<td>0 (0–8.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PCS 46.9 (17.5–61.7)</td>
<td>53.4 (30.4–100)</td>
<td>0.003</td>
</tr>
<tr>
<td>MCS 46.2 (22.4–65.4)</td>
<td>49.9 (20.8–100)</td>
<td>0.350</td>
</tr>
</tbody>
</table>

Conclusion: The frequency of FM is similar to general population in patients with Takayasu arteritis. However, although other MAFs also does not differ from HC, the new FM criteria subscales WPI and SSS significantly correlated with scales such as SF-36, MAF, anxiety and depression scale and HAQ in TAK, suggesting that in a minority of patients with FM and TA, PROs are affected with FM presence.


Disclosures: F. Albaz-Onen, None; M. Can, None; B. Ilhan, None; O. Polat, None; H. Direskeneli, None.

2368
Tocilizumab in Refractory Takayasu’s Arteritis: 7 Patients Followed At a Single Italian Centre. Enrico Tombetti, Elena Baldissera, Stefano Franchini, Patrizia Aiello, Francesca Motta, Barbara Guliciemi and Maria Grazia Sabadini. Vita-Salute San Raffaele University, Milan, Italy

Background/Purpose: Takayasu arteritis (TA) is a rare chronic-relapsing vasculitis involving primarily the aorta and its major branches. TA is associated with considerable morbidity and mortality. Therapy is based on corticosteroids (CS) but steroid-sparing immunosuppressive drugs are required in most patients to minimize CS adverse events and to control progressive vascular disease. However, about 25% of patients relapse when CS are tapered. In this setting, previous works showed that tocilizumab (TCZ), an humanized anti-IL6 receptor antibody may be useful.

Objectives: To evaluate the safety and efficacy of TCZ in the treatment of refractory TA.

Methods: We retrospectively studied 7 TA patients (pts) treated with TCZ (8 mg/kg monthly) between 2010 and 2012 at a single academic Italian center. All pts satisfied ACR criteria for TA classification and had active refractory TA. Treatment efficacy was evaluated as: i) reduction of signs and symptoms of active disease, ii) steroid sparing activity (assessed as reduction in the average daily dose measured within the 12 month period preceding each medical evaluation, iii) angio-MRI assessment of vascular lesions evolution, iv) decrease in CRP and ESR.

Results: All 7 pts were female, with a median age at the beginning of TCZ therapy of 35 years (range 32–46), median duration of disease 66 months (range 17–101). Before TCZ therapy, they were taking a median of 4 (range 1–8) immunosuppressive agents. Four pts had been previously treated with anti-TNF agents. Median FU on TCZ therapy was 14 months (range 9–24). Mean duration of CS therapy before TCZ was 37 months. Two pts did not show signs or symptoms of active disease during FU while 3 pts satisfied NIH criteria of active disease. During FU, average prednisone daily dose decreased from a median value of 8.3 mg (range 5.9–29) to 8.0 mg (range 5.0–16): however, the dose could be reduced more than 3 mg/day in 4 patients. The median number of vascular lesions was unchanged (8, range 4–12) at baseline and at the end of FU. In one pt vascular lesions improved during FU and in another did not progress, while in the other 5 pts there was worsening of at least one vascular lesion. Median values of ESR and CRP decreased from 34 (range 8.0–76) to 4.0 (range 2.0–4.5) mm/h and from 13 (range 10–35) to 2.0 (range 1.0–4.4) mg/l, respectively. TCZ was stopped in 4 pts because of suboptimal disease control. During FU one pt had severe pneumonia, requiring TCZ interruption, another had relapsing upper respiratory infections and a third developed pyrithisiasis rosea, that subsided after TCZ interruption.

Conclusion: In this study of refractory TA, TCZ showed efficacy only in a minority of pts. Our data do not confirm the positive results of TCZ therapy reported in previous studies. However, our pts may have had more severe disease, as suggested by the higher number of immunosuppressive agents at baseline compared to previous reports. Finally, it should be noted that ESR and CRP do not appear to correlate reliably with disease activity during TCZ therapy. Further studies are necessary to better define the role of TCZ in TA therapy.

Disclosures: E. Tombetti, None; E. Baldissera, None; S. Franchini, None; P. Aiello, None; F. Motta, None; B. Guliciemi, None; M. G. Sabadini, None.

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Aspects of Innate Immunity in Behc¸et’s Disease: A Model of Auto-inflammatory Disease? Sandro F. Perazzio1, Paulo Vitor Soeiro Pereira2, Alexandre Wagner S. de Souza3, Antonio Condino-Neto4 and Luis Eduardo C. Andrade5. 1Federal University of Sao Paulo, Sao Paulo, Brazil; 2USP, Sao Paulo, Brazil; 3University Medical Center Groningen, University of Groningen, Groningen, Netherlands; 4Universidade Federal de Sao Paulo, Sao Paulo, Brazil

Background/Purpose: Behc¸et’s disease (BD) is a systemic vasculitis of unknown etiopathogenesis. Increased neutrophil activation has previously shown in BD patients and it is unclear whether neutrophil activation occurs constitutively or if it is secondary to a yet unknown stimulus or some other cause or a cell specific soluble factor. The hypersensitivity to Streptococcus sangui-nis antigens suggests that infectious agents may play a role in BD pathogenesis. Recently, it has been postulated that BD may be a form of auto-inflammatory disease. The present study investigated several aspects of
cellular activation in neutrophils and peripheral blood mononuclear cells (PBMC) of patients with active and inactive BD.

**Methods:** four study groups were analyzed: active BD (aBD; n=17), inactive BD (iBD; n=26); septic patients (SP; n=10); healthy controls (HC; n=10). BD activity was established as Behçet’s Disease Current Activity Form simplified (BDCAFs) score >2. Flow cytometry analysis evaluated phagocytes (zymosan particles, Streptococcus pneumoniae and Candida albicans) and the oxidative metabolism before and after stimulation with phorbol myristate acetate (PMA). The shedding of CD62L was determined under PMA, LPS or microbial stimuli were used for determination of IL-1β, TNFα, IFNγ, IL-12p70, Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) reduction and Streptococcus pneumoniae after stimulation of TLR-2, -3, -4, -5, -7. Microbicidal activity against Staphylococcus aureus was determined and the oxidative metabolism before and after stimulation with phorbol myristate acetate (PMA). The shedding of CD62L was determined after stimulation of TLR-2, -3, -4,-5,-7. Microbial activity against Streptococcus pneumoniae and Candida albicans was determined by means of 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) reduction and absorbance read by ELISA. The supernatant of PBMC cultures under TLR or microbial stimuli was used for determination of TNFα, IFNγ, IL-12p70, IL-23, IL-6 and IL-10 by ELISA. The supernatant of neutrophil cultures under PMA, LPS or microbial stimuli were used for determination of IL-1β and IL-8.

**Results:** There was no difference in medication use between aBD and iBD. Phagocytosis, microbial killing activity and oxidative burst assays in PMN and monocytes showed no difference among the four groups. The activated monocyte index of shedding assay showed higher activation by TLR3 in iBD (31.2±8.6%) than in HC (31.2±4.3%). In contrast, the activation by TLR7 was lower in iBD (27.3±6.2%) than in SP (30.5±8.8%) (p=0.022). The shedding of CD62L was not different in HC monocytes regarding activation via TLR stimuli. Neutrophils from aBD produced less IL-1β after stimulus with S. pneumoniae (68±61 pg/ml) than HC (71±174 pg/ml) (p=0.05) and showed a trend for lower values comparing to iBD (175±93 pg/ml, p=0.07). There was no difference in the production rate of other cytokines.

**Conclusion:** These results showed that phagocytes in BD are not constitutively activated. This negative evidence suggests that the marked involvement of neutrophils in BD pathophysiology may be caused by some kind of stimuli produced by other cells at or close to the target tissues. Thereby, further studies should address proteomic analyses of the serum and samples from target tissues in BD in an attempt to identify possible metabolic pathways involved in neutrophil activation in BD.

**Disclosure:** S. F. Perazzio, None; P. S. Coit, None; A. W. S. de Souza, None; A. Condino-Neto, None; L. E. C. Andrade, Fleyr Medicine and Health Laboratories, 5.

**2370**

**A Genome-Wide DNA Methylation Study Identifies Significant Epigenetic Changes Across the Genome and in Multiple HLA Loci in Behcet’s Disease**

**Background/Purpose:** To identify DNA methylation changes in BD patients and controls, consistent in the two cell subsets, was also observed in HLA-DPB1, HLA-DPB2, HLA-DQA1, HLA-DQA2, HLA-DRB1, HLA-DRB6, and HLA-G. Other hypomethylated loci in BD include NOP10 (monocytes, 3.2-fold; CD4+ T cells, 4.2-fold), and SPDEF (monocytes, 2.3-fold; CD4+ T cells, 2.2-fold). Hypomethylated loci include IL17RA (monocytes, 4.0-fold; CD4+ T cells, 2.2-fold), MMP27 (monocytes, 3.8-fold; CD4+ T cells, 2.0-fold), MRLP1 (monocytes, 2.1-fold; CD4+ T cells, 1.0-fold), SLC37A4 (monocytes, 2.0-fold; CD4+ T cells, 1.9-fold). Canonical pathway analysis of differentially methylated genes highlighted the antigen-presentation pathway (monocytes, P=1.1×10^-6; CD4+ T cells, P=4.02×10^-5). Indeed, transcription factor binding site analysis demonstrated enrichment of CITTA binding sites in differentially methylated genes (monocytes, P=1.2×10^-7; CD4+ T cells, P=4.52×10^-10). Cytotoxic T cell-mediated apoptosis, allograft rejection signaling, graft-versus-host disease signaling, and OX40 signaling, are also enriched pathways. Network analysis also highlights type-I interferon and NFκB signaling.

**Conclusion:** We performed a genome-wide DNA methylation study in BD using two distinct cell populations. Our data demonstrate significant genome-wide epigenetic differences between BD patients and healthy age-, sex-, and race-matched controls. We identified differential DNA methylation in the HLA locus in BD, and hypothesize that BD-associated risk alleles in the HLA might induce disease susceptibility, at least in part, by tagging a DNA methylation change.

**Disclosure:** H. Direskeneli, None; P. S. Coit, None; F. Ture-Ozdemir, None; F. Alibaz-Oner, None; G. Saruhan-Direskeneli, None; M. A. Jeffries, None; A. H. Sawalha, None.

**2371**

**The Unmet Need in Behcet’s Disease: Most Patients Are Not in Complete Remission in the Long-Term Follow-up**

**Background/Purpose:** The nature of Behcet’s disease (BD) as a multi-systemic disorder with a remitting-relapsing course is unsufficiently explored. Complete remission should be aimed in all inflammatory diseases; we investigated the frequency of complete remission in routine practice in BD.

**Methods:** In this retrospective study, 130 patients with BD (FM: 67/63, mean age: 43.23±11.7 years) classified according to ISG criteria were included. The demographic and clinical data for active organ manifestations and treatment protocols were evaluated, both for the current visit and in the last month. Patients having at least one of any disease manifestations were categorized as active.

**Results:** A total of 857 visits of 130 patients were reviewed. Mean visit number was 6.5±2.7 (range:1–10) and mean follow-up duration was 53.54±41.79 months (3–162). Sixty-one patients (46.9%) were of mucocutaneous type, whereas 69 patients (53.1%) had major organ involvement. When all visits combined, 16–49% of the patients were using immunosuppressives (IS), whereas 30–62.3% was under non-IS therapies such as colchicine or NSAIDs. There was also a group of noncompliant patients (6–53.8%) without any treatment. Patients were clinically active in 67% (n=575) of the total visits (n=857). Mean frequency of clinical activity was 61.9% (53.7–87.7), which increased to 77.2% (64.2–90) when the month before the visit was also included. The major cause of the activity was aphthous ulcers (41.1–74.6%) with other mucocutaneous manifestations also common present (Genital ulcer: 4.5–33.8%, erythema nodosum: 7.5–30%, papulopustular lesions: 16.3–39.2%, arthritis: 19.9–33.3%, uveitis: 0–7.7% and vascular involvement: 2.3–12.3%). No difference was observed between the frequency of activity of patients having ISs or non-IS therapies.

**Conclusion:** Although complete remission is the current, primary target in inflammatory rheumatological diseases such as rheumatoid arthritis or vasculitides, it is fairly difficult to achieve complete remission in BD with current therapeutic regimens. The reluctance of the clinician to be aggressive for some manifestations with low morbidity, such as mucocutaneous lesions, might be influencing the continuous, low-disease activity state in BD patients.

**Disclosure:** F. Alibaz-Oner, None; G. Mumcu, None; G. Ozen, None; Z. Kubilay, None; M. Can, None; S. Yılmaz Oner, None; T. Ergun, None; H. Direskeneli, None.
Efficacy of Quantitative Analysis of Brainstem Atrophy On Magnetic Resonance Imaging for Diagnosis of Chronic Progressive Neuro-Behçet’s Disease. Hiroshi Kikuchi,1 Maki Takayama,2 Yoshinaka Kimura,3 Kurumi Asako,3 Hajime Kono,4 Yasuo Ono1 and Shinsei Hirota.1 1Teikyo University School of Medicine, Tokyo, Japan, 2Teikyo University School of Medicine, Tokyo, Japan, 3Kitasato University School of Medicine, Sagamihara, Japan

Background/Purpose: CNS involvement in Behc¸et’s disease, usually called neuro-Behc¸et’s disease (NB), can be classified into acute NB (ANB) and chronic progressive NB (CPNB) based upon the differences in clinical courses and responses to corticosteroid treatment. Previous studies demonstrated that brainstem atrophy was significantly more frequently observed in CPNB than in ANB or non-NB. Since the presence of brainstem atrophy depends on the anatodal judgment by expert radiologists, more objective definition of brainstem atrophy is required. The present study was designed to examine whether quantitative analysis of the brainstem areas on magnetic resonance imaging (MRI) scans might be useful for early diagnosis as well as for evaluation of the disease activity of CPNB.

Methods: MRI scans recorded at the diagnosis and at various periods thereafter were evaluated in patients with ANB (n=10), CPNB (n=10), non-NB (n=8), and NPSLE (n=8). MRI scans of age- and sex-matched control patients for CPNB (non-inflammatory CNS diseases [NID]) (n=10) were also studied. The areas of midbrain tegmentum and pons were measured on mid-sagittal sections of T1-weighted images of brain MRI using image analysis software Image J (ver.1.45, National Institutes of Health: NIH, U.S. [http://image.nih.gov/ij/download.html]).

Results: The areas of midbrain tegmentum (ANB: 145.9 ± 20.1 mm² [mean ± SD], CPNB: 125.6 ± 18.0 mm², non-NB: 133.0 ± 16.4 mm², NPSLE: 133.4 ± 19.7 mm², NID: 151.1 ± 11.8 mm²) as well as those of pons (ANB: 540.1 ± 87.5 mm², CPNB: 482.0 ± 91.3 mm², non-NB: 540.3 ± 40.2 mm², NPSLE: 517.3 ± 47.1 mm², NID: 574.1 ± 43.4 mm²) were found to be lower in CPNB than those in the other 4 groups. On receiver operating characteristic (ROC) analysis, the sensitivity / specificity of the areas of midbrain tegmentum, pons and brainstem (midbrain tegmentum + pons) for diagnosis of CPNB against non-CPNB (ANB + non-NB) were 80.6%/66.7% at cut-off value of 134.0 mm², 70.0%/77.8% at cut-off value of 483.7 mm² and 70.0%/94.4% at cut-off value of 614.9 mm² respectively (figure). The time kinetics analysis demonstrated that brainstem atrophy progressed most markedly during the first 2 years from the initial diagnosis of CPNB. Finally, brainstem atrophy progressed at significantly greater degree in CPNB patients with continuous elevation of cerebrospinal fluid (CSF) IL-6 (>20 pg/ml) compared with those in whom CSF IL-6 levels were kept bellow 20 pg/ml.

Conclusion: These results confirm that brainstem atrophy is one of the characteristic features of CPNB. Moreover, the data suggest that quantitative analysis of the brainstem areas on MRI scans might be effective for early diagnosis as well as for evaluation of the disease activity of CPNB. Finally, it is also suggested that brainstem atrophy might progress due to CNS inflammation mediated by IL-6 during the early phase of CPNB.

The Clinical Course of the Acute Deep Vein Thrombosis of the Legs in Behçet’s Syndrome. Yesim Ozguler,1 Melike Melikoglu2, Firat Cetinkaya1, Serdal Ugurlu1, Emir Seyahi3, Koray Tascilar1, and Hasan Yazici1. 1Istanbul University, Cerrahpasa Medical School, Rheumatology, Istanbul, Turkey, 2Rheumatology, Istanbul, Turkey, 3Istanbul, Turkey, 4Istanbul University Cerrahpasa Medical Faculty, Istanbul, Turkey, 5Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey

Background/Purpose: 15-50% of patients with Behcet’s syndrome have vascular involvement (BS). Deep vein thrombosis is the most common form with lower extremity deep vein thrombolysis (LEDTV) making up 70% of all vascular involvement. The aim of this study was to determine the clinical course of LEDTV about which there has been little data.

Methods: Consecutive BS patients attending our multidisciplinary BS outpatient clinic were included after an acute or subacute first episode of LEDTV in one leg. They might have had a previous episode of LEDTV in the contralateral extremity. The same radiologist performed a structured and detailed lower extremity Doppler ultrasonography (US). All deep veins, VCI and major superficial veins were examined at 1, 3, 6, 18 and 24 months after the index event. Nodular lesions that evolved during the follow-up were also examined for their US structure to differentiate between the presence of superficial vein thrombosis and erythema nodosum.

Results: Within a course of 20 months 31 patients (4F, 27M) with LEDTV in a previously uninvolved leg were seen and included in the study. 10 patients had had a previous episode of LEDTV in the opposite leg. Mean age was 29.5 ± 7, mean disease duration since disease onset was 49.5 ± 34.6, and the mean follow-up duration during the study was 13.4 ± 6.2 months. Veins involved in order of frequency were popliteal vein (42%), superficial femoral vein (31%), cranial veins (29%) and common femoral vein (27%). VCI was involved in 3 (5%) patients. 14 patients (45%) relapsed during follow-up. 11 patients relapsed with a superficial thrombolphelbitis and 5 patients relapsed with a new deep vein thrombosis. Mean time to relapse was 2.83 ± 1.99 months when the relapse was a superficial thrombolphelbitis and 6.0 ± 2.3 months when the relapse was a LEDTV (P=0.001). Only 3 out of 19 patients who had a recanellization (>50%) at month 3 follow-up had a relapse. On the other hand, a relapse was observed in 11 of the 12 patients with poor recanellization(<50%) (P=0.001). All 3 patients with VCI involvement had venous skin ulcers in the lower extremity and these 3 patients were the only patients with skin ulcers in the whole group. 17/31 (55%) patients developed nodular lesions during the study. 15/31 (48%) had had previous episodes of nodular lesions while in 4 patients these appeared for the first time. Doppler ultrasonographic examination of these nodules revealed superficial thrombolphelbitis in 12 (70%) and like lesions in 5 patients (29%).

Conclusion: The more common vascular relapse after an episode of LEDTV is superficial thrombolphelbitis. Relapses of a superficial thrombolphelbitis occur earlier than relapses with a LEDTV. Poor recanalization of the index LEDTV at 3 months is associated with relapses. The presence of skin ulcers seems to go along with inferior vena caval thrombosis. As expected, LEDTV in BS is associated more with superficial thrombolphelbitis than with erythema nodosum lesions.

Disclosure: Y. Ozguler, None; M. Melikoglu, None; F. Cetinkaya, None; S. Ugurlu, None; E. Seyahi, None; K. Tascilar, None; H. Yazici, None.

Characteristics, Treatment and Outcome of Gastrointestinal Involvement in Behçet’s Syndrome: Experience in A Dedicated Center. Ibrahim Hatemi1, Gulen Hatemi2, Yusuf Erzin1, Aykut Ferhat Celik1 and Hasan Yazici1. 1Istanbul University, Cerrahpasa Medical School, Gastroenterology, Istanbul, Turkey, 2Istanbul University, Cerrahpasa Medical Faculty, Rheumatology, Istanbul, Turkey, 3Istanbul University, Cerrahpasa Medical School, Rheumatology, Istanbul, Turkey

Background/Purpose: Gastrointestinal involvement can be a severe complication resulting in perforation and massive bleeding. Controlled data regarding treatment is lacking and long term prognosis is not well known.

Methods: We retrospectively reviewed the charts of all BS patients evaluated with a suspicion of gastrointestinal involvement. We identified BS patients with gastrointestinal ultrasonography, endoscopic and histologic findings, and treatment modalities. Patients were evaluated either in the outpatient clinic or if not possible by phone calls to assess their outcome.

Results: Within a course of 20 months 31 patients (4F, 27M) with LEDTV in a previously uninvolved leg were seen and included in the study. 10 patients had had a previous episode of LEDTV in the opposite leg. Mean age was 29.5 ± 7, mean disease duration since disease onset was 49.5 ± 34.6, and the mean follow-up duration during the study was 13.4 ± 6.2 months. Veins involved in order of frequency were popliteal vein (42%), superficial femoral vein (31%), cranial veins (29%) and common femoral vein (27%). VCI was involved in 3 (5%) patients. 14 patients (45%) relapsed during follow-up. 11 patients relapsed with a superficial thrombolphelbitis and 5 patients relapsed with a new deep vein thrombosis. Mean time to relapse was 2.83 ± 1.99 months when the relapse was a superficial thrombolphelbitis and 6.0 ± 2.3 months when the relapse was a LEDTV (P=0.001). Only 3 out of 19 patients who had a recanellization (>50%) at month 3 follow-up had a relapse. On the other hand, a relapse was observed in 11 of the 12 patients with poor recanellization(<50%) (P=0.001). All 3 patients with VCI involvement had venous skin ulcers in the lower extremity and these 3 patients were the only patients with skin ulcers in the whole group. 17/31 (55%) patients developed nodular lesions during the study. 15/31 (48%) had had previous episodes of nodular lesions while in 4 patients these appeared for the first time. Doppler ultrasonographic examination of these nodules revealed superficial thrombolphelbitis in 12 (70%) and like lesions in 5 patients (29%).

Conclusion: The more common vascular relapse after an episode of LEDTV is superficial thrombolphelbitis. Relapses of a superficial thrombolphelbitis occur earlier than relapses with a LEDTV. Poor recanalization of the index LEDTV at 3 months is associated with relapses. The presence of skin ulcers seems to go along with inferior vena caval thrombosis. As expected, LEDTV in BS is associated more with superficial thrombolphelbitis than with erythema nodosum lesions.

Disclosure: Y. Ozguler, None; M. Melikoglu, None; F. Cetinkaya, None; S. Ugurlu, None; E. Seyahi, None; K. Tascilar, None; H. Yazici, None.
Results: Among the 8058 recorded BS patients in our multidisciplinary outpatient clinic, 69 had symptoms suggesting gastrointestinal involvement and lesions on endoscopy. Among these, 18 patients had other reasons for their gastrointestinal symptoms and endoscopic lesions. The remaining 51 patients had GIBS (Table). The presenting symptoms were acute abdomen caused by perforations in 4/51 patients, massive bleeding in 8/51 patients and abdominal pain or diarrhea in 39/51 patients. Surgery had to be performed in 20/51 patients, and 4 of them had to be re-operated for development of stricture, progressive disease, relapse, and corrective surgery, 1 patient each. The most commonly used drugs for initial management were azathioprine 2–2.5 mg/kg/day (n=33) and 5 ASA compounds 3–4 g/day (n=13). Remission was observed and there were no relapses during a mean follow-up of 44.3±46.9 months in 22/33 (67%) patients who had initially been prescribed azathioprine (2.5 mg/kg) and during 45.0±50.1 months in 9/13 (68%) patients who had been prescribed 5 ASA compounds. Other than the 33 patients who used azathioprine as their initial treatment, remission was also obtained with azathioprine in 3/4 patients who were resistant to 5 ASA compounds. Among the 10 patients who had relatively severe symptoms and persistent large ulcers despite at least 6 months of azathioprine treatment, endoscopic and symptomatic remission could be obtained with thalidomide in 4 patients, infliximab in 4 patients and adalimumab in 2 patients. After a mean follow-up of 7.1±4.8 years (range 0.25–17 years), 42 (84%) patients were in remission and 14 (28%) of these were off treatment. Four (8%) patients were still active, 3 (6%) patients had died due to non-GI related reasons and 2 (4%) were lost to follow-up. The reasons for death were pulmonary artery thrombosis, infection and acute renal failure due to amyloidosis in 1 patient each.

Patients with GI involvement of BS (n) 51

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men women</td>
<td>27 (29.9%)</td>
</tr>
<tr>
<td>Mean age ± SD (years)</td>
<td>38.5 ± 9.3</td>
</tr>
<tr>
<td>Mean age at diagnosis of GIBS ± SD (years)</td>
<td>31.2 ± 7.1</td>
</tr>
<tr>
<td>Oral ulcers</td>
<td>51/51</td>
</tr>
<tr>
<td>Genital ulcers</td>
<td>43/51 (86%)</td>
</tr>
<tr>
<td>Positive pathergy reaction</td>
<td>27/51 (54%)</td>
</tr>
<tr>
<td>Papulopustular lesions</td>
<td>34/51 (68%)</td>
</tr>
<tr>
<td>Erythema nodosum</td>
<td>24/51 (48%)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>17/51 (33%)</td>
</tr>
<tr>
<td>Uveitis</td>
<td>10/51 (20%)</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>4/51 (8%)</td>
</tr>
<tr>
<td>Superficial thrombophlebitis</td>
<td>4/51 (8%)</td>
</tr>
<tr>
<td>Pulmonary artery thrombosis</td>
<td>1/51 (2%)</td>
</tr>
<tr>
<td>Neurologic parenchymal involvement</td>
<td>3/51 (6%)</td>
</tr>
<tr>
<td>Dural sinus thrombosis</td>
<td>3/51 (6%)</td>
</tr>
<tr>
<td>Ileocecal region involvement</td>
<td>20/51 (40%)</td>
</tr>
<tr>
<td>Colonic involvement</td>
<td>14/51 (28%)</td>
</tr>
<tr>
<td>Terminal ileum involvement</td>
<td>12/51 (24%)</td>
</tr>
<tr>
<td>Iliocolonic involvement</td>
<td>4/51 (8%)</td>
</tr>
<tr>
<td>Duodenal bulbus involvement</td>
<td>1/51 (2%)</td>
</tr>
</tbody>
</table>

Conclusion: 84% of patients with GIBS were in remission after a mean of 7 years of follow-up. Surgery was required in 40% of patients with GIBS. 5 ASA compounds or azathioprine provided remission and prevented relapses in two thirds of the patients. The latter was also beneficial in some patients resistant to 5 ASA compounds. Resistant and relapsing cases could be managed with thalidomide or TNF-alpha antagonists.

Disclosure: I. Hatemi, None; G. Hatemi, None; Y. Erzin, None; A. F. Celik, None; H. Yaziçi, None.

2376

Behcet’s Disease: Combination of Pulse Cyclophosphamide, Azathioprine, and Prednisolone for the Treatment of Retinal Vasculitis; Longitudinal Study On 10 Years. Feredyon Davatchi, Farhad Shahram, Bahar Sadeghi Abdollahi, Hormoz Shams, Abdolhadi Nadji, Massoomeh Akhlaghi, Tahereh Faezi and Farimah Ashehft. Shirati Hospital-Tehran Univ, Tehran, Iran

Background/Purpose: Ocular lesions of Behcet’s Disease (BD), need aggressive treatment to prevent severe loss of vision or blindness. Cytotoxic drugs are the main therapeutic agents and the first line treatment for it. Retinal vasculitis is the most aggressive lesion of ocular manifestations. It has the worse outcome. We present here the outcome with a combination of pulse cyclophosphamide, azathioprine, and prednisolone, on long-term usage up to 10 years on 291 patients (17286 eyes-months of follow-up).

Methods: Cyclophosphamide was used as one gram as monthly pulse for 6 months and then every 2 to 3 months as necessary. Azathioprine was used as 2 to 3 mg/kg weight/day. Prednisolone was associated as 0.5 mg/kg/day. Upon the suppression of the inflammatory reaction, prednisolone was tapered gradually. Inclusion Criteria: 1- Fulfilling the International criteria, the ICBD. 2- Having active posterior uveitis (PU) and/or retinal vasculitis (RV). Visual acuity (VA): was calculated by the Snellen chart on a scale of 10 (best vision 10/10). An activity index was calculated for PU and RV. A Total Active Disease Activity Index (TADA) was calculated for both eyes taking in account all parameters. Results were assessed at 3, 6, 9 months, then at 1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 9, and 10 years.

Results: The mean improvement for Visual Acuity (p value) was: 0.9 (<0.001), 0.9 (<0.001), 0.9 (<0.001), 1.0 (<0.001), 0.8 (<0.001), 0.9 (<0.001), 0.9 (<0.001), 0.9 (<0.001), 1.1 (0.005), 0.1 (0.9), -0.5 (0.3), -0.5 (0.3), -0.5 (0.2), -0.2 (-0.01), +0.3 (0.9). The mean improvement for Posterior Uveitis was: 1.0 (<0.001), 1.2 (<0.001), 1.5 (<0.001), 1.4 (<0.001), 1.4 (<0.001), 1.6 (<0.001), 1.6 (<0.001), 1.7 (<0.001), 1.9 (<0.001), 1.9 (<0.001), 1.9 (<0.001), 2.0 (<0.001), 2.0 (0.01), 2.8 (0.08), 1.0 (0.9). The mean improvement for Retinal Vasculitis was: 1.1 (<0.001), 1.7 (<0.001), 1.6 (<0.001), 1.6 (<0.001), 1.6 (<0.001), 1.8 (<0.001), 1.7 (<0.001), 1.9 (<0.001), 1.9 (<0.001), 2.1 (<0.001), 2.2 (<0.001), 2.2 (<0.001), 1.8 (0.004), 6.0 (0.11), 4.0 (0.2), 2.0 (0.01). The mean improvement for TADA was: 9.1 (<0.001), 11.7 (<0.001), 12.7 (<0.001), 11.9 (<0.001), 13 (<0.001), 13.8 (<0.001), 14.2 (<0.001), 14.6 (<0.001), 13.5 (<0.001), 16.3 (<0.001), 19.6 (<0.001), 17.1 (<0.001), 16.2 (0.6), 5.4 (0.2), 4.0 (0.0). Overall results (from baseline to the last evaluation): The mean VA improvement was 0.8 (<0.001), PU 1.4 (<0.001), RV 1.6 (<0.001), and TADA 11 (<0.001). VA improved in 45.4% of eyes, PU in 75.6% of eyes, RV in 71.5% of eyes, and TADA in 74.9% of patients. VA aggravated in 33% of eyes, PU in 14% of eyes, RV in 16.9% of eyes, and TADA in 18.9% of patients. The remaining kept their baseline values.

Conclusion: All parameters improved significantly. The improvement in VA was the least. It was mainly due to cataract. The non-significance of p values in the last years of follow-up was due to the low number of patients.
Combination of pulse cyclophosphamide and azathioprine is the best treatment choice for retinal vasculitis before opting for biologic agents.

Disclosure: F. Davatchi, None; F. Shahram, None; B. Sadeghi Abdullahi, None; H. Shams, None; A. Nadjji, None; M. Akhlaghi, None; T. Faeki, None; F. Ashofteh, None.

2377
Impaired Endothelial Function in Patients with Takayasu’s Arteritis.
Fatma Alibaz-Oner1, Selen Yurdakul2, Yelda Tayyareci2, Saide Aytekin2 and Haner Direskeneli1. 1Marmara University, School of Medicine, Istanbul, Turkey, 2ISTANBUL FLORENCE NIGHTINGALE HOSPITAL, Istanbul, Turkey

Background/Purpose: Takayasu’s arteritis (TAK) is a chronic, inflammatory, large-vessel vasculitis. In the present study, we aimed to evaluate vascular endothelial function in patients with TAK compared to systemic lupus erythematosus (SLE), another inflammatory, autoimmune disorder.

Methods: We studied 33 patients with TAK, 18 patients with SLE and 20, and age and sex-matched healthy controls. Brachial artery Doppler ultrasonography (USG) and bilateral carotid artery intima-media thickness (CIMT) measurements were performed.

Results: Basal diameter and nitrate-induced dilatation (NID) values of the brachial artery were similar between the three groups. However, flow-mediated dilation (FMD) was markedly reduced in patients with TAK (Table 1). Carotid artery intima-media thickness (CIMT) was also significantly increased in TAK group compared to the controls (0.11±0.03 vs to 0.07±0.009 cm, respectively, p=0.0001). Presence of hypertension had no association with FMD and CIMT measurements. In the SLE group, a marked impairment in FMD % was obtained (8.85±2.8, p=0.0001). % NID and CIMT measurements were observed to be similar between the patients with SLE and the healthy controls (p=0.60 and p=0.05, respectively).

Table 1. Brachial artery Doppler ultrasonography measurements in patients with Takayasu’s Arteritis and SLE as compared controls

<table>
<thead>
<tr>
<th>Basal diameter (cm)</th>
<th>FMD (%)</th>
<th>NID (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAK patients (N=33)</td>
<td>0.28 ± 0.06</td>
<td>6.96 ± 4.5*</td>
</tr>
<tr>
<td>SLE patients (N=18)</td>
<td>0.29 ± 0.04</td>
<td>8.85 ± 2.8**</td>
</tr>
<tr>
<td>Controls (N=20)</td>
<td>0.29 ± 0.02</td>
<td>15.6 ± 2.2</td>
</tr>
</tbody>
</table>

#P:0.0001, **P:0.0001

Conclusion: In the present study, we detected significantly decreased FMD and increased CIMT in TAK patients, suggesting a marked endothelial dysfunction. Chronic inflammation and vascular fibrosis might lead to increased atherosclerosis in TAK.

Disclosure: F. Alibaz-Oner, None; S. Yurdakul, None; Y. Tayyareci, None; S. Aytekin, None; H. Direskeneli, None.

2378
Evaluation of the EULAR/ACR 2012 Classification Criteria for Polymyalgia Rheumatica: Comparison of the New Algorithms with and without Ultrasound to the Formerly Used Criteria. Sandra Balser1, Emmanuelle LeBras2, Boris P. Ehrenstein2, Martina Müller1 and Martin Fleck1. 1Asklepios Klinikum Bad Abbach, Bad Abbach, Germany, 2University Clinic Regensburg, Regensburg

Background/Purpose: The purpose of this study was to compare the sensitivity of the algorithms with and without ultrasound of the EULAR/ACR 2012 Classification Criteria for Polymyalgia rheumatica (PMR) to the former criteria in a retrospective single center study.

Methods: All patients newly diagnosed with PMR at our tertiary rheumatology center between 01/2011 to 06/2012 were included in this retrospective study and analyzed whether the EULAR/ACR 2012 Classification Criteria for PMR with and without ultrasound as well as the formerly used PMR criteria (Bird & Wood’s, Chuang & Hunder’s, Healey’s, Jones & Hazelman’s) were fulfilled. All patients with suspected PMR underwent physical examination, questionnaires, laboratory analysis, ultrasound examination of joints and an organ staging to exclude other conditions mimicking PMR (mostly laboratory analysis, chest X-ray and abdominal ultrasound examination).

Results: PMR was established as a new diagnosis by a rheumatologist of our center in 35 patients between 01/2011 to 06/2012. The average age was 66.4 +/– 8.8 (mean +/– standard-deviation) years. 60.0% of those 35 patients were female. The average ESR before treatment was 43.0 +/– 24.6 mm/1h, the average CRP 43.8 +/– 31.6 mg/l, the average duration of morning stiffness 88.7 +/– 59.0 min. 82.9% had hip pain or limited range of motion, 91.4% had normal values for RF and ACPA and 34.3% had no other joint involvement. We found that the sensitivity of the EULAR/ACR 2012 classification criteria for PMR without ultrasound was 88.6%, the sensitivity of the algorithm with ultrasound was 82.9%. We did not detect any patient fulfilling the classification criteria with ultrasound but not the criteria without ultrasound. The sensitivity of the formerly used criteria was 82.9% for Bird & Wood’s, 40.0% for Chuang & Hunder’s, 77.1% for Healey’s and 82.9% for Jones & Hazelman’s criteria.

Conclusion: The results demonstrate a higher sensitivity of the novel EULAR/ACR criteria compared to the previous PMR classification criteria. However, ultrasound findings did not contribute to the higher sensitivity observed in our cohort of recent onset PMR patients.

Disclosure: S. Bailer, None; W. Haring, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5; E. LeBras, None; B. P. Ehrenstein, Abbott Immunology Pharmaceuticals, 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5; M. Müller, None; M. Fleck, Abbott Immunology Pharmaceuticals, 5, Roche Pharmaceuticals, 5, Pfizer Inc, 5.

2379
Successful Treatment of Churg-Strauss Syndrome with Rituximab. Christin Druabri, Fabian Arndt, Wolfgang L. Gross and Frank Moosig. 1University Hospital Schleswig-Holstein, Campus Luebeck and Klinikum Bad Bramstedt, Bad Bramstedt, Germany, 2University Hospital Schleswig Holstein and Klinikum Bad Bramstedt, Bad Bramstedt, Germany

Background/Purpose: Rituximab has recently been shown to be equipotent to cyclophosphamide for induction of remission in generalized ANCA-associated vasculitis. A substantial number of observational pro- and retrospective studies also investigate the efficacy of RTX in refractory ANCA-associated vasculitis. However, there are only few data regarding the effectiveness of rituximab in Churg-Strauss syndrome.

Objective: To investigate the overall efficacy and safety of rituximab in Churg-Strauss syndrome at a tertiary vasculitis referral center.

Methods: This study represents a retrospective, standardized data collection from all Churg-Strauss syndrome patients treated with rituximab from 06/2007 to 06/2012. Patients were assessed in a standardized diagnostic procedure (ANCA, CRP, B cell levels, immunoglobulin levels, Eosinophil count, Birmingham Vasculitis Activity Score, glucocorticoid demand etc.) before and after receiving rituximab. After achieving complete remission or a response under rituximab, patients were switched on maintenance therapy with methotrexate or azathioprine or leflunomide.

Results: 11 patients were included in the study. Five were ANCA positive. Five were refractory to standard cyclophosphamide treatment. There were three relapsers and three patients could not be treated with cyclophosphamide in order to preserve fertility (2) or because of hemorrhagic cystitis (1). Manifestations prior to rituximab were sinusitis (7), alveolitis (7), polyneuropathy/mononeuritis (4), myositis (2), glomerulonephritis (1), cardiac involvement (1), skleritis (1), gastrointestinal involvement (1), purpura (2) and arthritis (2). Eight patients had more than one manifestation before the start of RTX. The median BVAS was range (1–27).

Regarding overall efficacy eight patients had a response (1 remission, 7 response), one patient was refractory. In two patients follow-up was pending. Birmingham Vasculitis Activity Score version 3 (BVAS 3), glucocorticoid demand, Eosinophil count, CRP and immunoglobulin levels decreased in all patients (table 1). ANCA and peripheral blood lymphocyte counts became undetectable after rituximab treatment. After a median follow-up of eight months (1–54) there was no increase in disease activity. Three infections occurred during follow-up: one pneumonia, two broncho-pulmonary infection.

Table 1.

<table>
<thead>
<tr>
<th>Before rituximab</th>
<th>After rituximab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median (range)</td>
<td>(Median (range)</td>
</tr>
<tr>
<td>BVAS 3</td>
<td>7 (1–27)</td>
</tr>
<tr>
<td>glucocorticoid demand (mg)</td>
<td>30 (5–80)</td>
</tr>
<tr>
<td>Eosinophil count (Eosinophils/μl)</td>
<td>300 (0–3300)</td>
</tr>
<tr>
<td>CRP (mg/dl)</td>
<td>0.6 (0.1–5.5)</td>
</tr>
<tr>
<td>immunoglobulin G (g/l)</td>
<td>7.4 (0.3–11)</td>
</tr>
</tbody>
</table>

*P:0.0001, **P:0.0001

Disclosures: A. Nadji, None; A. Shams, None; H. Cicek, None; F. Alibaz-Oner, None; S. Yurdakul, None; Y. Tayyareci, None; S. Aytekin, None; H. Direskeneli, None.
Conclusion: The overall response rate of Churg-Strauss syndrome to RTX was high (1 remission, 7 respond). There was no increase in disease activity in all patients until the end of follow-up.

Disclosure: C. Dubrau, None; F. Arndt, None; W. L. Gross, None; F. Moosig, None.

2380

High Frequency of Ferritin Autoantibodies in Takayasu Arteritis. Niklas T. Baerlecken1, Katherina Große2, Frank Moosig2, Wolfgang L. Gross2, Reinhold E. Schmidt2 and Torsten Witte3. 1MD, Hannover, Germany, 2Student, Hannover, Germany, 3Stormarnzing 156, Bad Bramstedt, Germany. 1Medical University at Lubeck, Lubeck, Germany, 2Hannover Medical School, Hannover, Germany, 3Hannover Medical School, Hanover, Germany

Background/Purpose: Takayasu arteritis (TA) may be difficult to diagnose since diagnostic biomarkers have not been established so far. In a previous study, we could show the presence of autoantibodies against the human ferritin heavy chain protein (HFC) in sera of patients with giant cell arteritis (GCA) and/or polymyalgia rheumatica (PMR). Therefore, we studied the presence of autoantibodies against HFC in TA.

Methods: We established 7 ELISAs for the detection of autoantibodies against HFC. As autoantigen we used the full recombinant HFC expressed by E. coli or one of six different peptides of the HFC; 1–18Aa (purity 98.8%), 19–45Aa (purity 98.8%), 55–78Aa purity 98.3%, 79–104Aa (purity 98.8%), 105–143Aa (purity 98.4%), 145–183Aa (purity 98.5%). We collected sera of 43 patients with TA, 36 patients with systemic lupus erythematosus (SLE), 77 patients age >65yrs, 35 patients with arteriosclerosis, 118 sera of fever patients with underlying chronic infectious and malignant diseases, which are known for having unspecific autoantibodies, and 50 blood donors' sera served as controls.

Results: The best results were obtained by using ferritin peptides as antigens. By combining different ELISAs detecting autoantibodies against HFC peptide 19–44Aa, 79–104Aa and 105–144Aa, we were able to detect ferritin peptide antibodies in 27/43 (63%) TA patients. For early TA, the frequency was lower than in early GCA and PMR (previous study up to 92%). In the controls, 0/100 (0%) of the blood donors, 10/36 (28%) of the patients with SLE, 7/77 (9%) of the patients with age >65yrs, 4/35 (11%) of the patients with arteriosclerosis and 24/118 (20%) of the fever patients were positive.

Conclusion: Considering the lack of biomarkers for TA, autoantibodies against peptides of HFC could be helpful as a marker for TA.

Disclosure: N. T. Baerlecken, None; K. Große, None; F. Moosig, None; W. L. Gross, None; R. E. Schmidt, None; T. Witte, None.

2381

Serum Level of IL-33 and Soluble ST2 and Their Association with Disease Activity in Patients with Behcet’s Disease. Dae-Jun Kim1, Jae-Ho Lee2, Ji Hyeon Ju3, Sung-Hwan Park4, Hae-Youn Kim5 and Seung-Ki Kwok6. 1The Catholic University of Korea, Seoul St. Mary’s Hospital, Seoul, South Korea, 2Catholic University of Korea, Seoul St. Mary’s Hospital, Seoul, South Korea, 3Catholic University of Korea, Seoul St. Mary’s Hospital, Seoul, South Korea, 4Hannover Medical School, Hannover, Germany, 5Hannover Medical School, Hanover, Germany, 6Hannover Medical School, Hanover, Germany

Background/Purpose: Interleukin-33 (IL-33) is a new member of the IL-1 family of cytokines which signals via receptor, ST2L/IL-33R, and has an important role in Neutrophil migrations, Th2 responses and mast cell responses. This study aims to measure the serum levels of IL-33 and soluble ST2 in patients with Behçet’s disease (BD) and to examine their association with disease activity.

Methods: Fifty three BD patients were evaluated for disease activity, determined by BDCAF, IBDDAM, ESR/CRP levels. IL-33 and sST2 were measured by sandwich ELISA in the 53 BD serum samples and compared with 31 age- and sex-matched healthy controls. The cutaneous expressions of IL-33 and sST2 in BD patients with erythema nodosum(EN) or EN-like lesion was compared with normal control skin tissues by immunohistochemical stains.

Results: Serum IL-33 level was significantly higher in active BD patients [594.48 pg/ml] compared with normals [224.23 pg/ml] (P<0.05), and soluble ST2(sST2) level was also significantly higher in active BD patients [99.01 pg/ml] compared with normals [23.56 pg/ml]. The tissue expression of IL-33 and sST2, shown by immunohistochemistry, were higher in BD compared with the controls. Serum sST2 level correlated significantly with BDCAF, IBDDAM, ESR and CRP. Multiple linear regression showed that both serum CRP and serum sST2 were independent predictive factor for IBDDAM (regression coefficient: 0.519; P = 0.000, regression coefficient: 0.300; P = 0.016, respectively).

Conclusion: These results suggest that IL-33 and sST2 area increased in Behçet’s disease and The level of sST2 are correlated with Behçet’s disease activity index (IBDDAM) and acute phase reactant (ESR, CRP) and also a independent predictive factor of IBDDAM, suggesting a potential role of sST2 as a surrogate marker of disease activity of BD.

Disclosure: D. J. Kim, None; J. H. Lee, None; J. H. Ju, None; S. H. Park, None; H. Y. Kim, None; S. K. Kwok, None.

2382

Plasma Fibrinogen is an Accurate Marker of Disease Activity in Patients with Polymyalgia Rheumatica. E.M. McCarthy1, Paul A. MacMullan1, S. Al-Mudhaffer2, Anne M. Madigan3, S. Donnelly4, C. J. McCarthy5, Dermot Kenny5, Eamonn S. Molloy6 and G M. McCarthy7. 1Mater Misericordiae University Hospital, Dublin 7, Ireland, 2RCGI, Dublin 2, Ireland, 3Dublin Academic Medical Centre, St. Vincent’s University Hospital, Dublin, Ireland

Background/Purpose: Accurate determination of disease activity in polymyalgia rheumatica(PMR) is challenging due to the subjective nature of symptoms and concurrent musculoskeletal complaints in an elderly population. Any biomarker that assists physicians in more accurately determining patients disease state, thereby enabling safe adjustment of steroid dose would be welcomed. Previously we have demonstrated the enhanced specificity of plasma fibrinogen over both ESR and CRP for the detection of response to treatment in patients with active PMR. We sought to prospectively evaluate the utility of the biomarkers ESR, CRP and Fibrinogen for identifying different disease states in patients with known PMR.

Methods: Patients with PMR were divided into high/moderate disease activity (Group 1) or low disease activity (Group 2) according to the Polymyalgia Rheumatica Activity score(PMRS-AS) as per Bird and Leeb. PMR-AS >CRP(mg/dl)+ VAS pain(0–10 scale)+ VASphysician (0–10scale)+ Moming stiffness[min](x.1)+ Upper Limb Elevation(0–3 scale). A PMR-AS > 7 indicates medium/high disease activity with a PMR-AS < 7 indicating low disease activity. Plasma fibrinogen, CRP and ESR were also assayed. An ESR value of 30mm/hr(lab normal<20mm/hr) and CRP of 6mg/L (lab normal<5mg/l) were considered the upper limit for detection of low disease activity. The upper limit of the lab normal for Fibrinogen(4g/L) was used. Sensitivity, specificity, positive predictive values and likelihood ratios were calculated for all biomarkers.

Results: Data was available from 120 patient visits. Demographic data was similar in both groups. Mean age was 71.8 years. All patients were receiving glucocorticoids with a median steroid dose of 10mg in Group 1 and 5mg in Group 2. There were significant differences in steroid dose between the two groups(p<0.001). 70 patients were defined as having low disease activity as per the PMR-AS. Of these 64/70 had a normal plasma fibrinogen with 56/70 having an ESR <30mg/L and 45/70 a CRP <6mg/L. Table 1 shows the specificity, sensitivity, positive predictive values and likelihood ratios for the biomarkers as calculated for all 120 patient visits.

<table>
<thead>
<tr>
<th></th>
<th>Specificity</th>
<th>Sensitivity</th>
<th>PPV</th>
<th>Likelihood Ratio</th>
<th>Fischers Exact Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrinogen</td>
<td>91%</td>
<td>52%</td>
<td>.81</td>
<td>6.06</td>
<td>P&lt;.001</td>
</tr>
<tr>
<td>CRP</td>
<td>80%</td>
<td>90%</td>
<td>.66</td>
<td>2.68</td>
<td>P&lt;.001</td>
</tr>
<tr>
<td>ESR</td>
<td>64%</td>
<td>50%</td>
<td>.64</td>
<td>2.5</td>
<td>P&lt;.001</td>
</tr>
</tbody>
</table>

Overall plasma fibrinogen was more specific than either ESR or CRP for differentiating between low disease activity and moderate/high disease activity in PMR. It also demonstrated a better positive predictive value and likelihood ratio than the standard biomarkers ESR and CRP for identifying patients with moderate/high disease activity.

Conclusion: Plasma fibrinogen can aid treating physicians in determining disease activity in PMR. An elevated plasma fibrinogen level more accurately indicates that patients are in a moderate or highly active disease state than either the ESR or CRP alone. Measurement of fibrinogen as an adjunct to ESR and CRP in patients with PMR can help treating physicians more accurately identify patients’ disease status and guide decisions with regards glucocorticoid dosage.

Disclosure: E. M. McCarthy, None; P. A. MacMullan, None; S. Al-Mudhaffer, None; A. M. Madigan, None; S. Donnelly, None; C. J. McCarthy, None; D. Kenny, None; E. S. Molloy, None; G. M. McCarthy, None.
Rituximab As Induction and Maintenance Therapies for ANCA-Associated Vasculitis: A Multicenter Retrospective Study On 80 Patients.

Pierre Charles,1 Antoine Neéd,2 Nathalie Texié,2 Arnaud Hot Sr,2, Gregory Pugnet2, Olivier Decaux3, Isabelle Marie2, Mehdi Khellafi5, Jean-Emmanuel Kahn2, Alexandre Karras10, Jean-Marc Ziza11, Christophe Deligny12, Colas Tcherkian13 and Loïc Guévelin1. 1Department of Internal Medicine, Refer-ral Center for Rare Autoimmune and Systemic Diseases, Hôpital Cochin, AP-HP, Université Paris Descartes, Paris, France, Paris, France, 2Internal Medicine, Nantes University Hospital, Nantes, France, 3Service de Médecine interne, CHU Nîmes, Nice, France, 4Lyon hospital, Lyon, France, 5Toulouse University Hospital, University of Toulouse, INSERM UMR 1027, Toulouse, France, 6Hôpital Sud, Rennes, France, 7Service de médecine interne, Université Paris Est Créteil, AP-HP, Hôpital Mondor Créteil, France, 8Internal Medicine, Foch Hospital, Suresnes, France, 9Hôpital Européen Georges Pompidou, APHP, Paris, France, 10Hôpital Croix Saint Simon, Paris, France, 11Centre hospitalier universitaire de Fort de France, Fort de France, Martinique, 12Service de pneumologie, hôpital Foch, Suresnes, France.

Background/Purpose: Rituximab has been shown to induce remission of ANCA-associated vasculitis (AAV). Our study was undertaken to 1) describe the clinical response of AAV to rituximab used for remission-induction and/or maintenance therapy, 2) assess rituximab’s safety profile, and 3) evaluate French clinical practices (choice of rituximab, modalities of its use and monitoring).

Methods: This retrospective cohort study concerned AAV patients who had received at least 1 rituximab infusion, between 2002 and January 2011, and all patients had at least 12 months of follow-up.

Results: Eighty patients were included, most had refractory or relapsing AAV: 70 (88%) had granulomatosis with polyangiitis (GPA), 9 (11%) had microscopic polyangiitis (MPA), 1 (1%) had eosinophilic granulomatosis with polyangiitis (EGPA). Rituximab was first prescribed to induce remission in 73 patients. The 2 most commonly administered regimens were: 1) infusion of 375 mg/m2/week for 4 weeks (55 patients) and 1 infusion of 1 g every 2 weeks for a month (17 patients). Rituximab was first prescribed to maintain remission in 7 patients, usually at a dose of 500 mg every 6 months. Relapse-free survival rates at 1, 2 and 3 years after the first rituximab infusion were, respectively, 80% (95% CI 72–89), 63% (95% CI 51–77) and 52% (95% CI 39–70). A trend towards rituximab superiority as maintenance therapy was observed: 9/45 (20%) patients given rituximab relapsed vs 7/14 (50%) prescribed various other therapies (p = 0.13). Twenty-two (27.5%) rituximab-treated patients experienced a severe adverse event. Among them, 12 (15%) had infectious complications leading to 4 (5%) deaths. Only 15 (19%) patients had received anti-pneumococcal vaccine before the first rituximab infusion.

Conclusion: Rituximab was able to induce AAV remission in already immunosuppressed patients and seems to be superior to other therapies at maintaining remission. However, caution is needed concerning its safety, especially bacterial infections, in this immunosuppressant-treated population.

Disclosure: G. Pugnet, None; L. Sailer, None; R. Bourrel, None; J. L. Montastruc, None; M. Lapeyre-Mestre, None.

Giant Cell Arteritis and Cardiovascular Events in the French Apogee Cohort. A Population-Based Study Using the French Health Insurance System Database.

Prognostic Impact of HLA-B*51 and HLA-A*26:01 On Ocular Behcet’s Disease. Jun Won Park1, Eun Ha Kang2, Hye Won Kim3, Chaerin Park4, Hyeong Gon Yu5, Eun Young Lee6, Yun Jong Lee7, Eun Bong Lee1 and J. E. Kahn8. 1Seoul National University Bundang Hospital, Seongnam-si, South Korea, 2Seoul National University Hospital, Seoul, South Korea, 3Seoul National University Bundang Hospital, Seoul, South Korea.

Background/Purpose: To investigate the prognostic implication of HLA-B*51 and HLA-A*26:01 on visual outcome in Korean Behcet’s disease (BD) patients with uveitis.

Methods: Seventy-seven Korean BD patients with uveitis (F:M = 29:48) who met the classification criteria by the International Study Group were enrolled. The presence of HLA-B*51 was determined by polymerease chain reaction (PCR) using sequence specific primers. Genotyping for HLA-A locus was performed with PCR-Luminex typing method. Patient visual acuity (VA) was measured using Snellen chart at every visit to ophthalmology clinic. Loss of useful vision (LUV) was defined as VA worse than 20/200 for more than 6 months and near blindness (NB) was defined as VA of light perception or worse.

Results: The onset of uveitis was 36.6 ± 10.8 (mean ± standard deviation) years of age and the duration of uveitis was 10.8 ± 7.2 years. Posterior uveitis was found in 64.9% (50/77) of patients. Forty-seven (61.0%) patients were treated with one or more systemic immunosuppressants other than steroids; azathoprine (n = 38), cyclosporine (n = 24), methotrexate (n = 7), mycophenolate mofetil (n = 7), cyclophosphamide (n = 6), tacrolimus (n = 2), or anti-TNF-a agents (n = 2). HLA-B*51 was positive in 44.2% (34/77) while HLA-A*26:01 in 18.2% (14/77) of patients. In multivariate analyses, LUV was associated with male gender (p = 0.032), duration of uveitis (p = 0.016), and posterior uveitis (p = 0.010). HLA-A*26:01 was not directly associated with LUV but with posterior involvement (p < 0.001). HLA-B*51 did not show any significant associations with LUV or posterior involvement. NB was associated with duration of uveitis (p = 0.022) and glaucoma (p = 0.026) in multivariable analysis. When patients with posterior uveitis were analyzed, the single most important factor for LUV was duration of uveitis.
Disability and Mortality Related to Cerebrovascular Disease in Systemic Vasculitis. Jamal Mikdashi and Marcia Wozniak. University of Maryland School of Medicine, Baltimore, MD

Background/Purpose: Despite improved therapeutic strategies, patients with systemic vasculitis (SV) continue to experience serious morbidity and mortality from persistent low grade disease activity and permanent damage, particularly cardiovascular diseases. Nonetheless, the outcome of cerebrovascular disease (CVD) in patients with SV during the first-ever stroke remains unclear when compared to patient with other causes for their first-ever stroke. Purpose: To examine the clinical outcome related to CVD in SV, and determine whether disability and mortality are related to the disease itself, or associated comorbidities.

Methods: Disability and mortality were examined in 24 SV patients (large vessel vasculitis n = 8, medium vessel vasculitis n = 10, and small vessel vasculitis n = 6; with mean age of 55.7 years, 55% men) admitted to a tertiary care stroke center with validated first-ever stroke between January 2000 and January 2012. Disability rated according with modified Rankin Scale (mRS> 3), and mortality defined as all-cause fatal event were measured the day of first-ever stroke and at 90 days of follow up. Demographics and clinical manifestations were compared between those with SV and age- and gender –matched non SV controls with their first-ever stroke (n = 24) from the same tertiary stroke center. Significant variables in these analyses and the National Institute of Health Stroke Severity Scale (NIHSS) were entered into the multivariate analyses and Cox proportional hazards analyses to determine their contribution to disability and mortality related to CVD.

Results: Patients from the SV and non SV groups had comparable ethnic distribution, socioeconomic features, smoking, and their stroke type (ischemic, hemorrhagic) and Charlson comorbidity scores were similar. Disability was more frequent among SV patients as compared to controls (odds ratio = 4.2, 95% Confidence interval: 1.2–14.4, p value = 0.04). Within the SV patients 18 were disabled (mRS > 3), and 6 were not. Intractable disease activity and cumulative damage involving the pulmonary and renal organs were higher in disabled than the non disabled SV patients, although the difference was not statistically significant. Four patients died among SV group as compared to one patient among the non SV controls. Death due to infection was more frequent among SV patients, although the difference was not statistically significant. Four pulmonary and renal organs were higher in disabled than the non disabled group. According to the angiographic findings, the distribution of all patients was as follows, 45.4% Type I, 14.4% Type IIa, 5.1% Type IIb, 2.3% Type III, 6.5% Type IV, and 26.4% Type V arteritis. Most patients (61.1%) were treated with pharmacotherapy, while the others received interventional therapy (26.4%) or surgical operation (12.5%).

Conclusion: Disability and mortality were examined in 24 SV patients and age- and gender –matched non SV controls with their first-ever stroke (n = 24) from the same tertiary stroke center. Significant variables in these analyses and the National Institute of Health Stroke Severity Scale (NIHSS) were entered into the multivariate analyses and Cox proportional hazards analyses to determine their contribution to disability and mortality related to CVD. Intractable disease activity, cumulative damage and long-term prednisone use are independently associated with disability related to CVD after adjustment for stroke severity. Death due to infection is frequent.
Table 2. Selection of treatment strategies on diagnosis of different lesion types

<table>
<thead>
<tr>
<th>Lesion type</th>
<th>No. (%)</th>
<th>Medicine no. (%)</th>
<th>Interventional therapy no. (%)</th>
<th>Operation no. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>98/216 (45.4)</td>
<td>59/98 (60.2)</td>
<td>23/98 (23.5)</td>
<td>16/98 (16.3)</td>
</tr>
<tr>
<td>Type II a</td>
<td>31/216 (14.4)</td>
<td>14/31 (45.2)</td>
<td>13/31 (41.9)</td>
<td>4/31 (12.9)</td>
</tr>
<tr>
<td>Type II b</td>
<td>11/216 (5.1)</td>
<td>7/11 (63.6)</td>
<td>3/11 (27.3)</td>
<td>1/11 (9.1)</td>
</tr>
<tr>
<td>Type III</td>
<td>5/216 (2.3)</td>
<td>4/5 (80.0)</td>
<td>1/5 (20.0)</td>
<td>0/5 (0)</td>
</tr>
<tr>
<td>Type IV</td>
<td>14/216 (6.5)</td>
<td>12/14 (85.7)</td>
<td>2/14 (14.3)</td>
<td>0/14 (0)</td>
</tr>
<tr>
<td>Type V</td>
<td>57/216 (26.4)</td>
<td>36/57 (63.2)</td>
<td>15/57 (26.3)</td>
<td>6/57 (10.5)</td>
</tr>
<tr>
<td>Total</td>
<td>216/216 (100)</td>
<td>132/216 (61.1)</td>
<td>57/216 (26.4)</td>
<td>27/216 (12.5)</td>
</tr>
</tbody>
</table>

Table 3. Features of corticosteroid and immunosuppressive therapy

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Number</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pred</td>
<td>27/132 (20.5)</td>
<td>16/27 (59.3)</td>
</tr>
<tr>
<td>CTX</td>
<td>3/132 (2.3)</td>
<td>1/3 (33.3)</td>
</tr>
<tr>
<td>Pred+CTX</td>
<td>65/132 (49.2)</td>
<td>58/65 (89.2)</td>
</tr>
<tr>
<td>Pred+MTX</td>
<td>13/132 (9.8)</td>
<td>11/13 (84.6)</td>
</tr>
<tr>
<td>Pred+CTX+MTX</td>
<td>8/132 (6.1)</td>
<td>5/8 (62.5)</td>
</tr>
<tr>
<td>Pred+HQC</td>
<td>3/132 (2.3)</td>
<td>2/3 (66.7)</td>
</tr>
<tr>
<td>Pred+AZA</td>
<td>2/132 (1.5)</td>
<td>2/2 (100)</td>
</tr>
<tr>
<td>Pred+CysA</td>
<td>2/132 (1.5)</td>
<td>1/2 (50.0)</td>
</tr>
<tr>
<td>Pred+TGV</td>
<td>2/132 (1.5)</td>
<td>1/2 (50.0)</td>
</tr>
<tr>
<td>Anti-TNFα+MTX</td>
<td>1/132 (0.8)</td>
<td>1/1 (100)</td>
</tr>
<tr>
<td>Others</td>
<td>6/132 (4.5)</td>
<td>3/6 (50.0)</td>
</tr>
<tr>
<td>Total</td>
<td>132/132 (100)</td>
<td>101/132 (76.5)</td>
</tr>
</tbody>
</table>


Conclusion: Our study indicated that TA could non-accidentally happen in people over 40 years old. It also revealed that, in all expressions, vascular symptoms occurred more frequently than systemic symptoms. Moreover, fever, claudication, hypertension, and retinopathy were more typical in active TA patients. When monitoring disease activity, erythrocyte sedimentation rate and C-reactive protein were useful. Most of our patients received medicine treatments after definite diagnosis. And the outcome revealed that glucocorticoids and immunosuppressive agents were notably effective.

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2389

Cutaneous Leukocytoclastic Angiitis: Study of 137 Patients, Javier Loricerac, Vanessa Calvo-Rioc, Francisco Ortiz-Sanjuan, Marcos Antonio Gonzalez-Lopeza, Hector Fernandez-Llacab, Javier Rueda-Gotor, Carmen Gonzalez-Vela, Miguel A. Gonzalez-Gay and Ricardo Blanco, Hospital Universitario Marques de Valdecilla, IFIMAV, Santander, Spain

Background/Purpose: Cutaneous leukocytoclastic angiitis (CLA) was defined by the International Consensus Conference for the Nomenclature of the Vasculitis (Chapel Hill, A&R 1994) as an isolated cutaneous vasculitis without systemic vasculitis or glomerulonephritis. Our objective was to evaluate the clinical features, treatment and outcome of patients with CLA.

Methods: From a large series of patients with cutaneous vasculitis those diagnosed as having cutaneous vasculitis in the setting of connective tissue diseases, malignancies, infections, primary systemic necrotizing vasculitis and other entities such as Henoch-Schönlein Purpura and Essential Mixed Cryoglobulinemia were excluded from this analysis. Patients with systemic involvement including gastrointestinal or renal involvement (glomerulonephritis) were also excluded. The remaining patients were classified as having CLA.

Results: According to the above mentioned methodology, 173 patients (91 men and 82 women), with a mean age of 46.29±24.37 years (range, 1 to 95 years) were diagnosed as having CLA. The presenting events were found in 146 (84.39%) patients. A history of drug intake before the onset of the vasculitis was found in 82 (47.40%) patients and a previous history of upper respiratory tract infection in 48 (27.74%) patients. The most frequent drugs taken shortly before the onset of the cutaneous vasculitides were Beta-lactam antibiotics (38 cases), NSAIDS (20 cases) and diuretics (8 cases). The most frequent clinical manifestations were cutaneous (100%), joint manifestations (41.51%) and fever (17.92%). The main laboratory data were elevated ESR (46.82%), leukocytosis (28.90%), anemia (10.98%), positive Rheumatoid Factor (13.87%), positive ANA (16.18%), hypocomplementemia (C3 and/or C4) (2.89%), cryoglobulins (2.31%) and positive ANCA (0.58%).

Treatment included NSAIDS (17.34%), Corticosteroids (16.18%), Colchicine (2.89%) and Azathioprine (1.73%). After a mean follow-up of 12.42±30.31 months (median, 3 months), relapses were observed in 19.65% of patients.

Conclusion: CLA is usually a benign syndrome, often secondary to drugs or infections, or both. Its main clinical features are skin and joint manifestations. Its prognosis is very good.

Disclosure: J. Loricerac, None; V. Calvo-Rioc, None; F. Ortiz-Sanjuan, None; M. A. Gonzalez-Lopez, None; H. Fernandez-Llaca, None; J. Rueda-Gotor, None; C. Gonzalez-Vela, None; C. Mata-Arnaiz, None; J. L. Peña-Sagredo, None; M. A. Gonzalez-Gay, None; R. Blanco, None.
Color Doppler Ultrasoundography an Alternative to CT/MR Angiography for Identifying Large Vessel Involvement in Giant Cell Arteritis? Andreas P. Diamantopoulos,1 Glenn Haugeberg1 and Geirmund Myklebust2.1Hospital of Southern Norway HF, Kristiansand, Norway, 2Hospital of Southern Norway, Kristiansand, Norway

Background/Purpose: Large vessel involvement has been reported to be present in 20–50% of patients with giant cell arteritis (GCA). Computed tomography (CT) and magnetic resonance (MR) angiography are used for assessment of large-vessel involvement in patients with GCA. Our aim was to compare color Doppler ultrasonography (CDUS) to CT/MR angiography for identifying large vessel involvement in patients with GCA at the time of initial evaluation.

Methods: Consecutive GCA patients with large vessel involvement assessed by CDUS underwent CT/MR angiography between January 2010 and May 2012. The aorta and supraaortic vessels were assessed by CT/MR angiography, while the carotid and axillary arteries were assessed by CDUS. The patients were diagnosed by CDUS with large vessel vasculitis (LVV) when intima-media complex thickness was homogenous and more than 1.5 mm in the carotid artery and more than 1 mm in the axillary artery.

Results: A total of 13 GCA patients (7 females, 6 males, mean age 70 years) were identified with LVV using CDUS. In these 13 patients aortic involvement was observed in 5 patients (38%) by CT/MR angiography. In all of these 5 patients, involvement of axillary arteries (4 patients) or carotid arteries (3 patients) were found by CDUS. In the other 8 patients axillary arteritis was visible on CDUS whereas only 2 of these patients revealed large vessel vasculitis on CT/MR. Interestingly, inflammation in large vessels was retrospectively identified by CT/MR angiography in 6 of 13 patients and this after reevaluating the images after the positive CDUS examination.

Conclusion: CDUS seems to be a valuable tool for assessment of large vessel vasculitis. The data from our pilot study suggest that CDUS is comparable and even better than CT/MR angiography to detect large vessel involvement in GCA. In the future CDUS may become the gold standard for first line evaluation of large vessel involvement. However further validation of the method is warranted.

Disclosure: A. P. Diamantopoulos, None; G. Haugeberg, None; G. Myklebust, None.

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New Disease Manifestations After Diagnosis in Six Types of Vasculitis. Peter C. Grayson1, David Cuthbertson2, Simon Carette3, Gary S. Hoffman4, Nader A. Khalidi5, Curry L. Koening6, Carol A. Langford7, Kathleen Maksimowicz-Mckinnon8, Paul A. Monach9, Philip Seo9, Ulrich Specks10, Steven R. Ytterberg11 and Peter A. Merkel11.1Boston University Medical Center, Boston, MA, 2University of South Florida, Tampa, FL, 3UHN/MSH, Toronto, ON, 4Cleveland Clinic, Cleveland, OH, 5McMaster University, Hamilton, ON, 6Salt Lake City Veterans Administration, Salt Lake City, UT, 7University of Pittsburgh, Pittsburgh, PA, 8Boston University, Boston, MA, 9Johns Hopkins Vasculitis Center, Baltimore, MD, 10Mayo Clinic, Rochester, MN, 11University of Pennsylvania, Philadelphia, PA

Background/Purpose: The proportion of patients who experience new manifestations of vasculitis after diagnosis is unknown. Our objectives were to quantify the occurrence of new features of vasculitis after diagnosis in 6 types of vasculitis and to compare patterns of disease activity over time.

Methods: Standardized data collection on 98 disease manifestations in 6 vasculitides, including granulomatosis with polyangiitis (Wegener’s GPA), microscopic polyangiitis (MPA), Churg-Strauss syndrome (CSS), polyarteritis nodosa (PAN), giant cell arteritis (GCA), and Takayasu’s arteritis (TAK), was performed within a set of multicenter, longitudinal cohorts. For each form of vasculitis, the frequency of disease-specific manifestations at diagnosis was compared to the cumulative frequency of each manifestation. The percentage of patients who developed new “severe” manifestations after diagnosis, defined as organ-threatening or life-threatening in the small and medium vessel vasculitides and as ischemic/vascular in the large vessel vasculitides, was described.

Results: The number of patients and median length of follow-up (years) (Figure) for the vasculitides was: GPA 341, 7.2; MPA 26, 3.7; CSS 117, 5.1; PAN 55, 4.3; GCA 19, 3.0; TAK 28, 4.8. Invasions with vasculitis experienced 1.3 new disease manifestations after diagnosis (GPA - 1.9, MPA - 1.2, CSS - 1.5, PAN - 1.2, GCA - 0.7, TAK - 1.0). Depending on the type of vasculitis, at least 1 new disease manifestation occurred after diagnosis in 44%–69% of patients (Figure), most notably in GPA and CSS. A subset of patients (7–28%) with each type of vasculitis experienced ≥ 3 new manifestations after diagnosis. The 3 most frequent new manifestations after diagnosis for each type of vasculitis are listed in the Table. New severe manifestations occurred after diagnosis in GPA - 30%, MPA - 27%, CSS - 23%, PAN - 29%, GCA - 26%, and TAK - 45%. Mean time from diagnosis to initial flare in disease activity did not significantly differ among those who experienced a new manifestation versus a recurrence of prior disease (1.15 vs 1.18 years, p=0.8).

Conclusion: A majority of patients with vasculitis develop new features of disease after diagnosis, including a substantial number of new, severe manifestations. New manifestations after diagnosis, although more frequent among the small-vessel vasculitides, are also common in patients with medium- or large-vessel vasculitis. Patterns of disease recurrence after diagnosis are not related to disease duration. Ongoing clinical assessment of patients with all types of established vasculitis should remain broad in scope.

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Blood Vessel Instability and Oxidative Damage in Giant Cell Arteritis. Danielle Molloy1, Jennifer McCormick1, Mary Connolly1, Muhammad Haroon1, Douglas J. Veale1, Conor Murphy1, Ursula Fearon1 and Eamonn S. Molloy1,2.1Dublin Academic Medical Center, St. Vincents’s University Hospital, Dublin, Ireland, 2Royal Victoria Eye and Ear Hospital, Dublin, Ireland

Background/Purpose: Giant cell arteritis (GCA) is the most common form of primary vasculitis. The pathogenesis is incompletely understood, but involves neangiogenesis and inflammatory infiltration of the arterial wall. The aim of the present study was to assess blood vessel stability and oxidative damage in patients with the condition and correlate with disease activity.
Methods: 20 patients with a clinical diagnosis of GCA were included, of whom 16 had a positive temporal artery biopsy. Temporal artery (TA) sections were assessed for blood vessel maturity (%BV) by dual-immunofluorescent staining for Factor VIII αSMA. Oxidative DNA damage (8-oxo-7,8-dihydro-2'-deoxyguanosine; 8-oxo-dG), lipid peroxidation (4-hydroxy-2'-nonenal; 4-HNE), angiogenic growth factor Angiopoietin 2 (Ang2) and its receptor Tie-2 were assessed by immunohistochemistry. Ex vivo TA explant cultures were established directly from fresh biopsy specimens (n = 4) and spontaneous release of pro-angiogenic factors were examined by ELISA and gelatine zymography. Patients were categorised into low disease (CRP > 50) vs high disease activity (CRP > 50).

Results: Strong expression of 8-oxo-dG, 4-HNE, Ang2 and Tie-2 were demonstrated in all GCA patients, with a lower number of factors were examined by ELISA and gelatine zymography. Patients were fresh biopsy specimens (n/H11005

Conclusion: This is the first study directly demonstrating that vessels in the inflamed temporal arteries from patients with GCA are unstable and are associated with incomplete EC/pericyte interactions, expression of Ang2 and oxidative damage markers.

Disclosure: D. Molloy, None; J. McCormick, None; M. Connolly, None; M. Haroon, None; D. J. Veale, Roche Pharmaceuticals, 5, Pfizer Inc, MSD, Bayer, 5, Pfizer Inc, MSD, 8; C. Murphy, None; U. Fearon, None; E. S. Molloy, Roche Pharmaceuticals, 2.

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Fibromyalgia in Behçet’s Disease Is Associated with Disease Activity. Meryem Can1, Fatma Alibaz-Oner2, Sibel Yilmaz-Oner2, Birkan Ilhan1, Tuğrul Ergun 1, Gonca Mumcu1 and Haner Direskeneli1. 1Marmara University School of Medicine, Istanbul, Turkey, 2Marmara University, Faculty of Health Sciences, Department of Health Informatics and Technologies, Istanbul, Turkey.

Background/Purpose: Studies on the relationship between Fibromyalgia (FM), a generalized pain disorder with up to 2% prevalence and Behc¸et’s Disease (BD), a systemic, inflammatory vasculitis, is limited. We conducted the present study to assess the prevalence of FM in BD diagnosed according to 2010 American College of Rheumatology (ACR) criteria and to evaluate the association of FM with disease activity, disability, depression, anxiety and quality of life (QoL) in BD patients.

Methods: One hundred-two patients followed as BD (FM:56.46, mean age: 40.4 years) fulfilling the International Study Group Criteria (ISG,1990), 85 patients with systemic lupus erythematosus (SLE) (FM:81.4, mean age: 41.4 years) and 51 healthy controls (HC) (FM: 30/21, mean age: 40.9 years) were enrolled to the study. All patients were examined for FM tender points (according to ACR 1990 criteria for the classification of FM) by two observers (kappa=0.8) and asked to complete new ACR 2010 FM questionnaire for FM (ref1). The clinical activity score in BD was determined by Behçet’s Syndrome Activity Scale (BSAS) and SLE by SLEDAI. SF-36 and hospital anxiety and depression scales were also used to assess QoL together with health assessment questionnaire (HAQ).

Results: Twenty-four (23.5%) BD patients met the ACR 2010 criteria for FM, compared to 18 (21.2%) in SLE and 5 (9.8%) in HC (p=0.1). When we analysed according to 1990 ACR FM criteria, 13(12.7%) in BD group, 7.1% in SLE and one (2.7%) in HC were classified as FM.

BSAS score correlated with FM (r=0.5, p=0.002), whereas FM and SLEDAI had no correlation (r=0.2, p=0.1). While mean anxiety scores were similar between groups (7.1±4.3, 7.01±4.3 and 5.8±4.6 in BD, SLE and HC, respectively)(p>0.05), mean depression scores were significantly different (5.8±3.4, 6.4±4.8 and 3.9±3.5 in BD, SLE and HC respectively) between the groups. When anxiety and depression scores were analyzed as possible contributing factors for FM presence, correlation was observed between anxiety and depression scores with FM (r=0.3, p=0.002 vs r=0.3, p=0.002, respectively) in BD.

SF-36 SF-36 component scores (PCS) were observed significantly lower in BD and SLE patients [41.7(11.3), 41.6(12.2) and 49.8(5.8) in BD, SLE and HC, respectively] (p<0.01). Also, SF-36-mental component scores (MCS) were different between BD and HC groups [42.3(9.8), 46.6(10.3) in BD and 52.3(8.4), 54.6(11.4) in HC, respectively] (p<0.01).
Background/Purpose: Loss of muscle and strength typically occur with advanced age. Chronic inflammatory diseases, such as rheumatoid arthritis, have reported similar deficits. Giant cell arteritis (GCA) is an inflammatory systemic vasculitis that occurs almost exclusively in the elderly. We sought to determine the body composition, strength, and functional disability in a cross-sectional sample of GCA patients (pts) and compare these parameters to age-matched community dwelling non-GCA controls.

Methods: Pts were recruited from a tertiary academic center. Body composition was evaluated by dual energy x-ray absorptiometry (DEXA, GE Lunar Prodigy Software V13); strength was assessed by hand grip dynamometry and lower extremity isokinetic testing (Biodex System 3 dynamometer); and functional disability by the short physical performance battery (SPPB). The SPPB includes: chair stands, semi-tandem, tandem, one-leg stand, and gait speed (6 meter walk). GCA pts were matched (1:2 ratio) by age (within 1 year), gender, and race to eligible controls randomly selected from the Baltimore Longitudinal Study of Aging (BLSA). The BLSA prospectively follows a cohort of healthy volunteers who undergo comprehensive evaluation every 1–2 years. Continuous and categorical variables were compared using student’s t-test and chi-square analyses respectively.

Results: GCA pts (N=18) had a mean ± SD age of 74 ± 7 yrs (range 59–86). They were mostly female (83%), white (83%) and had a positive temporal artery biopsy (89%). Mean disease duration was 2.7 ± 4.1 yrs (range 0.1–16); 7 (39%) were diagnosed >2 yrs prior to their study visit. Most (78%) were on daily prednisone (11 ± 13 mg/d) with a mean duration of steroid exposure at the study visit of 11 ± 13 months. GCA pts were significantly weaker on all measures of strength compared to BLSA controls (Table 1). GCA pts also had marked slowness as indicated by longer time to complete chair stands and slower gait speed. Body composition was similar between the two groups without a corresponding decrease in lean mass among the GCA group despite their decreased strength.

Table 1.

<table>
<thead>
<tr>
<th></th>
<th>GCA N=18</th>
<th>BLSA N=36</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD (years)</td>
<td>75 ± 7</td>
<td>74 ± 7</td>
<td>0.672</td>
</tr>
<tr>
<td>Gender (% women)</td>
<td>83</td>
<td>78</td>
<td>0.633</td>
</tr>
<tr>
<td>Race (% Caucasian)</td>
<td>83</td>
<td>83</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Strength Measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grip strength (kg)</td>
<td>21 ± 6</td>
<td>27 ± 9</td>
<td>0.015</td>
</tr>
<tr>
<td>Leg extension 180°/s peak torque (Nm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left quadriceps</td>
<td>46 ± 17</td>
<td>89 ± 2 (n=23)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Right quadriceps</td>
<td>49 ± 20</td>
<td>69 ± 16 (n=31)</td>
<td>0.001</td>
</tr>
<tr>
<td>Leg flexion 180°/s peak torque (Nm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left hamstrings</td>
<td>21 ± 10</td>
<td>66 ± 22 (n=23)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Right hamstrings</td>
<td>23 ± 10</td>
<td>49 ± 15 (n=31)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion: GCA pts in this small cross-sectional study were significantly weaker and slower than age-matched controls in the absence of significant differences in body composition. Slow gait speed (<0.8 m/s) is associated with disability, morbidity, and mortality among elderly adults. The preservation of lean mass in elderly GCA pts, in the presence of clinically significant weakness, suggests that impairment/dysfunction in muscle quality rather than muscle quantity may be the culprit. Prednisone use may be a significant contributor to weakness and slowness in elderly GCA pts. However, prednisone is unavoidable in the treatment of this potentially catastrophic illness and future investigation should focus on methods to improve strength and function in GCA pts regardless of their need for steroid therapy.

Disclosure: R. L. Manno, None; A. C. Gelber, None; P. Sea, None; S. M. Levine, CE Outcomes, 5, Up to Date, 7; S. R. Hacharian, None; P. H. Chen, None; K. J. Stewart, None; J. Metter, None; L. Ferrucci, None; K. R. Fontaine, None.
Tuesday, November 13

Correlation was found between plasma homocysteine and PON1 activity (ischemic events (411.4 U/mL; P = 0.022) and 1 μmol/L increase in homocysteine plasma levels (OR: 1.31; 95% CI: 1.01–1.25; P = 0.022) and 1 μmol/L increase in homocysteine plasma levels (OR: 1.31; 95% CI: 1.01–1.25; P = 0.041) were independently associated with ischemic events in TA. Mean homocysteine levels were similar in TA patients on methotrexate and in those being treated with other immunosuppressive agents (12.8 ± 5.3 vs. 12.1 ± 3.2 μmol/L; P = 0.662) and regarding the extension of arterial involvement, no differences in homocysteine levels were found in TA patients with angiographic type V in comparison to other angiographic types (12.7 ± 4.2 vs. 11.0 ± 2.6 μmol/L; P = 0.342). No differences in PON1 activity were found in TA patients with active disease in than those in remission (386.7 ± 251.2 vs. 323.7 ± 264.1 U/mL; P = 0.552) and between TA patients with and without previous ischemic events (411.4 ± 232.3 vs. 307.4 ± 268.6 U/mL; P = 0.310). No correlation was found between plasma homocysteine and PON1 activity (P = 0.214; P = 0.265).

Conclusion: Patients with TA presented higher homocysteine levels than control subjects and homocysteine levels were independently associated with acute arterial ischemic events in TA. Higher homocysteine levels were not observed in TA patients with active disease or with extensive vascular involvement and folate use associated to methotrexate seemed to prevent higher homocysteine levels in TA. No associations were found between PON1 activity with homocysteine levels, active disease or ischemic events.

Disclosure: A. W. S. Souza, None; C. S. Lima, None; A. C. D. Oliveira, None; L. S. G. Machado, None; F. A. G. Pinheiro, None; S. Hix, None; V. D’Almeida, None.

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Urinary Biomarkers in Vasculitis Associated with Anti-Neutrophil Cytoplasmic Antibodies. Jason G. Lieberthal1, David Cuthbertson2, Simon Carette3, Gary S. Hoffman4, Nader A. Khalidi5, Curry L. Koening6, Carol A. Hopkins8, Rebecca L. Manno1, Duvuru Geetha1, Stuart M. Levine1, Philip Seo1, Simon Carette, None; G. S. Hoffman, None; N. A. Khalidi, None; C. L. Koening, None; A. C. Langford, None; K. Maksimowicz-McKinnon, None; P. Sea, None; U. Specks, None; S. R. Ytterberg, None; P. A. Merkel, None; P. A. Monach, None.

Background/Purpose: Glomerulonephritis is common in ANCA-associated vasculitis (AAV), but non-invasive tools for early detection of renal involvement suffer from low sensitivity (red blood cell casts) or low specificity (hematuria). We investigated four urinary proteins as potential markers of active renal AAV: alpha-1 acid glycoprotein (AGP), kidney injury molecule-1 (KIM-1), monocyte chemoattractant protein-1 (MCP-1), and neutrophil gelatinase-associated lipocalin (NGAL).

Methods: Patients with active renal AAV (n=20), active non-renal AAV (n=16), and AAV in long-term remission (n=14) were identified within a longitudinal cohort, in which detailed clinical assessment and urinalysis results had been recorded at every visit. Biomarker concentrations were measured by ELISA and normalized for urine creatinine. Marker levels during active AAV were compared to baseline remission levels determined from 1-4 remission visits for each patient. Areas under receiver-operating characteristic curves (AUC), sensitivities, specificities, and likelihood ratios (LR) comparing disease states were calculated. Generalized linear models were used to assess the effects of proteinuria, treatment, and other variables on marker levels.

Results: Baseline biomarker levels varied among patients. All four markers increased during renal flares (P<0.05). MCP-1 discriminated best between active renal disease and remission: a 1.3-fold increase in MCP-1 per mg creatinine had 94% sensitivity and 89% specificity for active renal disease (AUC=0.93, positive LR 8.5, negative LR 0.07; see Figure 1). However, increased MCP-1 also characterized 50% of apparently non-renal flares. Changes in non-specific proteinuria did not account for the association of MCP-1 with active renal disease, nor did changes in treatment. Change in AGP, KIM-1, or NGAL showed more modest ability to distinguish active renal disease from remission (AUC 0.71–0.75). Hematuria was noted during 63% of active renal episodes, but also during 38% of non-renal flares and 25% of remission visits.

Conclusion: An increase in urinary MCP-1 may signal renal involvement in AAV. In contrast to a previous report, MCP-1 was imperfect in distinguishing active renal AAV from remission and was also elevated in cases in which renal involvement was thought to be absent. Either MCP-1 showed poor specificity for renal disease, or it improved sensitivity for detecting it, and urinalyses indicated that non-invasive assessment of active renal disease might be challenging in this cohort. AGP, KIM-1, and NGAL, despite being among the most promising markers in other kidney diseases, have lower prospects for clinical use in AAV.

Disclosure: J. G. Lieberthal, None; D. Cuthbertson, None; S. Carette, None; G. S. Hoffman, None; N. A. Khalidi, None; C. L. Koening, None; A. C. Langford, None; K. Maksimowicz-McKinnon, None; P. Sea, None; U. Specks, None; S. R. Ytterberg, None; P. A. Merkel, None; P. A. Monach, None.

2398

Pauic-Immune Glomerulonephritis in the Elderly: Disease Severity and Outcomes. Rebecca L. Manno1, Duvuru Geetha1, Stuart M. Levine1, Philip Seo2 and Allan C. Gelber3. Johns Hopkins University, Baltimore, MD; Johns Hopkins Vascularitis Center, Baltimore, MA; Johns Hopkins Vasculitis Center, Baltimore, MD.

Background/Purpose: Incident cases of pauci-immune glomerulonephritis affect adults at the older end of the age spectrum though relevant published data are limited. We sought to determine whether the clinical expression of disease differed in adults older than 70 years of age.

Methods: Between January 1, 1995 and June 22, 2012, a total of 55 patients (pts) ≥ age 60 years with histologic evidence of pauci-immune glomerulonephritis were evaluated at a single university center. The association of demographic and clinical parameters with age category was assessed using student’s t and chi-square tests for continuous and categorical variables, respectively. The association of age category (vasculitis onset age 60–69 vs ≥70 yrs) with several outcome measures was examined using logistic regression in univariate analyses.

Results: 33 pts were age 60–69 yrs at presentation; 22 were ≥70 yrs. This cohort was 87% Caucasian, 44% female, and 89% ANCA-positive; the proportion pANCA and cANCA positive did not differ by age group. There were no differences in mean BVAS/WG scores at diagnosis between the 2 groups (8.2 ± 4.4 vs 9.5 ± 3.4, p=0.25). Peak serum creatinine at the time of renal biopsy was 4.6 mg/dl ± 2.4 among the older vs 3.4 ± 2.3 (p=0.085) among the younger age group with a mean GFR 15.9 ± 8.4 vs 26.8 ± 21.6 (p=0.035), respectively. Combination therapy with steroids and cyclophosphamide was the most frequently employed first vasculitis treatment regardless of age group (n=15; 68% older vs. n=26; 79% younger; p=0.53). There were 4 total deaths in the cohort, 2 in each age group. Ultimately, 5 renal transplants were performed among the younger vs. none in the older patient group (p=0.056). Further associations of key clinical features of disease differed between the two age groups, as follows:
Conclusion: There is relatively little information on the clinical features and outcomes regarding pauci-immune glomerulonephritis in the elderly. This single-center experience, limited by retrospective design and small sample size, suggests that patients ≥70 years of age have worse renal outcomes associated with a higher serum creatinine and lower GFR at time of diagnosis, and an increased risk of progression to hemodialysis (borderline statistically significant) despite similar BVAS/WG scores. Elderly patients may be diagnosed later in their disease course, which may reflect a delay in initiating effective therapy. Our experience also suggests that elderly patients are more likely to experience treatment complications such as severe infection; although this did not correlate with an increased rate of leukopenia. These data imply that older pates may require a different treatment paradigm with more aggressive surveillance for both inpatient renal disease and treatment complications.

Disclosure: R. L. Manno, None; D. Geetha, Genentech and Biogen IDEC Inc.; S. M. Levine, CE Outcomes, 5, Up to Date, 7. P. Seo, None; A. C. Geber, None.

ACR/ARHP Poster Session C
Education/Community Programs

Tuesday, November 13, 2012, 9:00 AM–6:00 PM

2399
Exercise On Prescription: Barriers to Participation in Community Based Exercise Programmes, Dr Nicola E. Walsh1 and Professor Mike Hurley2.
1University of the West of England, Bristol, United Kingdom, 2St George’s University of London, London, United Kingdom

Background/Purpose: Osteoarthritis (OA) is highly prevalent, disabling and associated with high costs. Costs of pain and functional impairment can be ameliorated through participation in regular exercise, and this is recognised as a long-term self-management strategy. Community based, instructor-led ‘exercise on referral’ schemes are common but infrequently assessed to determine their effectiveness; furthermore, participant and instructor views on these services are rarely reported. The aim of this study was to audit a 12-week local authority subsidised exercise programme and to report on participant and instructor views of this scheme.

Methods: Pre-existing databases were analysed to determine participation and health outcomes, an online survey and semi-structured interviews recorded instructor beliefs, whilst focus groups were used to collect data regarding participant views of community-based exercise. Ethical approval references IRAS 11/SW/0064 and UREC HSC/11/02/27.

Results: In a 2-year period 2101 people, age 45 and over, with chronic joint pain/OA were referred for exercise. 36% of individuals completed the 12-week scheme; 22% of individuals did not start the programme; the remainder started but did not finish. Improvements were seen in BMI, blood pressure and self-reported activity levels for those that did complete all 12 sessions. Qualitative interviews (n = 14) suggested people with OA were sceptical regarding the ability of gym instructors to manage their condition and incurs considerable healthcare costs. Symptoms of pain and functional impairment can be ameliorated through participation in regular exercise, and incurs considerable healthcare costs. Symptoms of pain and functional impairment can be ameliorated through participation in regular exercise, and gains that estimate the effectiveness of OA treatment are rarely reported. The aims of this study are to audit a 12-week local authority subsidised exercise programme and to ascertain whether reports of pain, balance ratings and physical activity are associated with positive changes in pain, fitness and QOL, suggesting these exercise programs may play an important role in alleviating and/or minimizing symptoms of OA.

Disclosure: S. Goldsmith, None; D. Friedman, None; L. Roberts, None; D. Sperber, None; L. Robbins, None.

2400
Hospital for Special Surgery Osteoarthritis Wellness Initiative: the Impact of a Hospital-Based Exercise Program On Osteoarthritis, Sandra Goldsmith, Dana Friedman, Linda Roberts, Dana Sperber and Laura Robbins. Hospital for Special Surgery, New York, NY

Background/Purpose: The Centers for Disease Control and Prevention (CDC) reports that about 27 million adults were affected by osteoarthritis (OA) in 2005. OA is characterized by degeneration of cartilage and bone within a joint, leading to pain and joint stiffness. Its effects are not just physical; lifestyle also declines (NIAMS). Research has shown that physical activity reduces pain, improves physical function, and delays disability in people with OA. Among older adults with knee OA, engaging in moderate physical activity at least 3 times per week can reduce the risk of arthritis related disability by 47%. However, almost 44% of adults with doctor-diagnosed arthritis report no leisure time physical activity compared with 36% of adults without arthritis (CDC). This specialty orthopedic hospital developed its Osteoarthritis Wellness Initiative, comprised of educational and exercise programs, to raise awareness, educate and reduce the impact of OA. This study attempts to support the efficacy of hospital-based exercise programs in increasing physical activity and improving quality of life (QOL) through pain reduction in the older adult community.

Methods: This prospective cohort study assesses the impact of participation in exercise classes on self-reported pain, balance, falls and level of physical activity, based on responses to a pre/post-test survey of 120 participants conducted in the Fall of 2011. The 11-point Numeric Pain Intensity Scale was used to quantify the intensity of muscle or joint pain. Pain interference scores were found on aspects of QOL (general activity, mood, walking ability, sleep, enjoyment of life etc.) was measured using items from the 10-point Brief Pain Inventory. Participants were asked to rate their balance on a 6-point rating scale, while self-reported number of falls and fall severity was assessed on a 5-point scale. Independent sample t-tests were performed to measure changes in mean pain intensity, pain interference scores, physical activity and fall severity scores from pre- to post test. Chi square tests were conducted to ascertain whether reports of pain, balance ratings and physical activity were significantly changed from pre to post test. Demographics such as age, gender and race/ethnicity were also collected.

Results: Most respondents were female (88.6%) with the majority ages 65+ (77.3%). The proportion of respondents who reported pain decreased from pre- to post test (73.4% to 56.5%). Statistically significant differences (p < 0.001) were found in mean pain intensity ratings between pre- and post test (pre-test = 5.1; post-test = 2.8). Significant differences in pain interference scores were found with regard to mood, walking ability and enjoyment of life (p < 0.05). Balance ratings improved, number and severity of falls diminished and vigorous physical activity increased.

Conclusion: Preliminary results indicate that providing low cost exercise programs to the community can play an important role in fighting OA with minimal resources. Data indicate that hospital-based exercise classes are associated with positive changes in pain, fitness and QOL, suggesting these exercise programs may play an important role in alleviating and/or minimizing symptoms of OA.

Disclosure: D. N. E. Walsh, None; P. M. Hurley, None.

2401
1Centers for Disease Control and Prevention, Atlanta, GA, 2University of British Columbia, Vancouver, BC, 3Alberta Health Services, Calgary, AB, 4BC Women’s Hospital & Health Centre, Vancouver, BC

Background/Purpose: Self-management support (SMS)—a grouping of policies, programs, services, and structures that extend across health care, social sector and community to support and improve the way individuals manage their chronic conditions—is important in both health care delivery and population-based public health approaches, in the United States and internationally. However, SMS initiatives have evolved differently in differ-
ent professional disciplines, service systems and countries, with very limited cross-fertilization among them. The purpose of this project was to establish a framework of SMS (definitions, guiding principles, and strategic directions) to guide the development of self-management support initiatives locally, regionally, nationally and internationally. The purpose of this paper is to report on the international framework that emerged from an international electronic consultation process.

Methods: The British Columbia Center of Excellence for Women’s Health hosted a three day roundtable discussion among twenty-three opinion-leaders from five English-speaking countries to explore SMS from a broad system perspective encompassing health care delivery, public health, and the social services sectors; a wide variety of funding sources supported the initiative. Roundtable participants were selected to represent a balance of policy, practice, and research perspectives across the US, Canada, Australia, the UK, and New Zealand. A preliminary draft framework was developed using a thematic analysis of the roundtable proceeding; the draft framework was refined through two rounds of a modified Delphi process among roundtable participants.

International electronic consultation was conducted using an online survey tool. A snowball sampling technique was used to gather international responses to the key elements of the draft framework. Data was collected using an on-line survey tool.

Results: A total of 204 reviewers from 16 countries responded to the electronic consultation. Representation by country ranged from 31% (Canada) to 1% (New Zealand including Austria, Brazil, Denmark, Germany). 24% of respondents were researchers, 18% health care providers, 7% policy-makers, 6% consumers or patient advocates. 96% of respondents agreed or strongly agreed with the definitions of self-management and self management support. The final draft framework contained eight guiding principles and seven strategic directions, with international agreement ranging from 94–96% and 98–99% respectively.

Conclusion: The international electronic consultation demonstrated strong international agreement with the definitions, guiding principles, and strategic directions that emerged from the modified Delphi process. While the original draft framework was developed by opinion-leaders in 5 English-speaking countries, the framework also resonated with respondents from 11 other countries where English is not the national language. While SMS developments need to reflect local, regional, and national needs, this international framework provides an emerging consensus on strategies to move the field forward across multiple perspectives and countries.

Disclosure: T. J. Brady, None; S. Mills, None; P. Sargious, None; S. Ziaakhsh, None.

2402
Clinical Utility of the Hospital Anxiety and Depression Scale for an Outpatient Fibromyalgia Education Program. Diane Tin1, Lorna J. Bain2, J. Carter Thorne1, Seungree Nam2 and Liane Ginsburg2. 1Southlake Regional Health Centre has offered an inter-professional, patient centered Outpatient Fibromyalgia Education Program. Outpatient FM education program.

Background/Purpose: A retrospective chart review was performed on 232 outpatient cases with complete pre and post program data. Results for the ASE and HADS depression and anxiety scales were analyzed to guide the development of self-management support initiatives locally, regionally, nationally and internationally. The purpose of this paper is to report on the international framework that emerged from an international electronic consultation process.

Methods: The British Columbia Center of Excellence for Women’s Health hosted a three day roundtable discussion among twenty-three opinion-leaders from five English-speaking countries to explore SMS from a broad system perspective encompassing health care delivery, public health, and the social services sectors; a wide variety of funding sources supported the initiative. Roundtable participants were selected to represent a balance of policy, practice, and research perspectives across the US, Canada, Australia, the UK, and New Zealand. A preliminary draft framework was developed using a thematic analysis of the roundtable proceeding; the draft framework was refined through two rounds of a modified Delphi process among roundtable participants.

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Disclosure: T. J. Brady, None; S. Mills, None; P. Sargious, None; S. Ziaakhsh, None.

2403
The Effect of a Rheumatoid Arthritis Peer Support Program On Clinical Outcomes. Rebecca Throyer1, Christine K. Iannacci1, Hsun Tsao2, Michael Weinblatt1, Jing Cui4 and Nancy A. Shadick5. 1Brigham and Women’s Hospital, Boston, MA. 2Brigham and Women’s Hospital, Harvard Medical School, Boston, MA. 3Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA. 4Department of Medicine, Division of Rheumatology, Immunology and Allergy, Brigham and Women’s Hospital, Boston, MA. 5Department of Medicine, Division of Rheumatology, Immunology and Allergy, Brigham and Women’s Hospital, Boston, MA.

Background/Purpose: RA patients enrolled at a tertiary hospital arthritis center were recommended for peer support (mentees) by their rheumatologist. Peer support mentors received a three hour training to learn how to help other patients with concerns, coping strategies and medical decision-making. Mentors contacted mentees by phone once a week for 6 months, with optional email. Mentees were compared with controls who were not receiving peer support. They were matched on disease duration (years), age (years), and gender. Both groups filled out questionnaires at baseline and six month follow-up, assessing VAS fatigue and pain, arthritis self-efficacy, functional status (SF-12 PCS), emotional health (SF-12 MCS) and medication adherence (ASK-20).

Methods: RA patients enrolled at a tertiary hospital arthritis center were recommended for peer support (mentees) by their rheumatologist. Peer support mentors received a three hour training to learn how to help other patients with concerns, coping strategies and medical decision-making. Mentors contacted mentees by phone once a week for 6 months, with optional email. Mentees were compared with controls who were not receiving peer support. They were matched on disease duration (years), age (years), and gender. Both groups filled out questionnaires at baseline and six month follow-up, assessing VAS fatigue and pain, arthritis self-efficacy, functional status (SF-12 PCS), emotional health (SF-12 MCS) and medication adherence (ASK-20).

Results: 20 mentees and 22 controls completed the baseline and 6 month questionnaires. Only 2 participants dropped out of the program. There were no differences in baseline demographics or disease duration between groups. The mean age was 49.7 years (SD, 12.3), 88.1% were female, and the mean disease duration was 8.5 years (SD, 10.2). Mentees entered the study with worse pain, fatigue, health status, and self-efficacy, but with similar medication adherence scores compared to controls. In linear regression analyses, the mentees had a significant improvement in self-efficacy (p=0.01) and physical function (p=0.007) compared to controls (see Table 1) and physical function improvement persisted after adjusting for baseline clinical outcome differences (p=0.02).

<table>
<thead>
<tr>
<th>Mentees (N=19)</th>
<th>Controls (N=22)</th>
<th>Change (SD)</th>
<th>Change (SD)</th>
<th>P-Value</th>
<th>P-Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS Pain (0–100)</td>
<td>−9.7 (3.3)</td>
<td>1.4 (3.6)</td>
<td>0.31</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>VAS Fatigue (0–100)</td>
<td>−9.2 (3.4)</td>
<td>4.3 (2.7)</td>
<td>0.17</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Arthritis Self-Efficacy</td>
<td>13.1 (21.0)</td>
<td>−3.6 (10.6)</td>
<td>0.01</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>SF-12 (MCS)</td>
<td>3.4 (9.2)</td>
<td>1.7 (8.8)</td>
<td>0.61</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>SF-12 (PCS)</td>
<td>5.8 (7.7)</td>
<td>−2.0 (8.2)</td>
<td>0.007</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>ASK-20 Scale (20–100)</td>
<td>−3.6 (11.5)</td>
<td>−0.5 (7.0)</td>
<td>0.33</td>
<td>0.69</td>
<td></td>
</tr>
</tbody>
</table>

*Outlier removed; †Adjusted for baseline outcome differences.
Conclusion: This pilot study suggests that RA patients who have active disease and receive peer support show improvement in self-efficacy and physical function. Peer support programs may be effective in enhancing patients’ coping skills. Further analyses on a larger number of participants are needed to demonstrate the impact of the program on patient self-reported outcomes of fatigue, pain and medical adherence.

Disclosure: R. Thrower, None; C. K. Iannaccone, None; H. Tsao, None; M. Weinblatt, Angen, 5; J. Cui, None; A. A. Shadick, Angen, 2, Abbott Immunology Pharmaceuticals, 2, Genentech and Biogen IDEC Inc., 2, Crescendo Bioscience, 2, Medimmune, 2.

Background/Purpose: SLE patients have high rate of cardiovascular events due to increased prevalence of traditional cardiovascular disease (CVD)- and other lupus-related thrombosis risk factors. In addition, antiphospholipid antibody (aPL)- positive patients are at increased risk for thrombosis.

We have developed a free-of-charge CVD prevention counseling program (PCP) for SLE and/or aPL-positive patients that provides a basic assessment of education about the CVD and thrombosis risk factors (Arthritis Rheum. 2009;60:S743). We report two-year patient reported outcomes in our ongoing CVD-PCP.

Methods: The CVD PCP consists of two phases: “assessment” (blood pressure, blood glucose, cholesterol profile, waist circumference, body mass index, family history of CVD, smoking status, Framingham 10-year CVD risk calculation, aPL-profile, and medications) and “education” (counseling about the above mentioned risk factors). Patients are followed every 3–6 months for a maximum of 3 years; they are questioned about their diet and exercise habits during each visit. In addition, patients are offered to fill out baseline and follow-up surveys during each visit. We analyzed diet and exercise habits in a descriptive fashion (Likert Scale; 1–5, 5 is best). Repeated measures analysis was utilized to assess the change of the need for counseling on dietary and exercise habits over time. Our hypothesis was that over time there will be less need for counseling as a result of the program.

Results: Between 3/2009 and 12/2011, 115 SLE and/or aPL-positive patients received baseline counseling and 102/115 (89%) completed the baseline surveys. The mean (+ SD) scores for the baseline surveys were: a) improvement in patient’s knowledge about CVD risk factors: 4.3±0.9; b) likelihood of the counseling program improving patients’ diet: 4.1 ± 1.1; and c) likelihood of the counseling program improving patients’ exercise pattern: 4.0 ± 1.1. Patients completed surveys during 268/429 (63%) of follow-up visits (range: 3–33 months); some-to-significant improvement in the diet and exercise habits were reported during 251 (94%) and 225 (84%) of the visits, respectively. Repeated measures analysis showed that there was a significant decrease over time of the need for counseling on all dietary habits (fruits, vegetables, whole-grain, fiber, fish) and 30+ day exercise habits mostly starting at 9–12 months, continuing up to 2 years (Table).

<table>
<thead>
<tr>
<th>Variable</th>
<th>3 or 6m Visit</th>
<th>9 or 12m Visit</th>
<th>15 or 18m Visit</th>
<th>21 or 24m Visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for counseling on Fruits &amp; Vegetables</td>
<td>0.63 (0.32–1.26)</td>
<td>0.44 (0.22–0.88)*</td>
<td>0.24 (0.1–0.54)*</td>
<td>0.20 (0.08–0.51)*</td>
</tr>
<tr>
<td>Need for counseling on Whole-Grain &amp; High-fiber</td>
<td>0.62 (0.31–1.22)</td>
<td>0.4 (0.3–0.8)*</td>
<td>0.48 (0.23–0.99)*</td>
<td>0.22 (0.09–0.52)*</td>
</tr>
<tr>
<td>Need for counseling on Fisk</td>
<td>0.51 (0.3–1.02)</td>
<td>0.4 (0.54–0.93)*</td>
<td>0.41 (0.2–0.86)*</td>
<td>0.33 (0.15–0.73)*</td>
</tr>
<tr>
<td>Need for counseling on Cholesterol Free Diet</td>
<td>0.50 (0.21–1.15)</td>
<td>0.70 (0.29–1.66)</td>
<td>0.95 (0.27–1.09)</td>
<td>0.72 (0.27–1.93)</td>
</tr>
<tr>
<td>Need for counseling on exercise at least 30 min/day</td>
<td>0.33 (0.15–0.71)*</td>
<td>0.23 (0.11–0.5)*</td>
<td>0.28 (0.13–0.63)*</td>
<td>0.19 (0.08–0.44)*</td>
</tr>
</tbody>
</table>

Conclusion: Two-year preliminary analysis of our ongoing CVD prevention counseling program demonstrates our patients’ belief that the program is helping them make healthful lifestyle choices in terms of diet and physical exercise. These findings are supported by the significant reported improvement in their diet and exercise. The three-year longitudinal analysis of clinical outcomes will determine the true effectiveness of the program with respect to decreasing the prevalence of cardiovascular disease risk factors.

Disclosure: V. Haiduc, None; M. C. Richey, None; S. Everett, None; A. Dwivedi, None; L. Konstantellis, None; H. Gomhrawi, None; D. Erkan, None.


Background/Purpose: Patient decision aids are designed to present the potential benefits and harm of treatment options, clarify individuals’ preferences, and guide discussion at a clinic visit. The majority of decision aids on arthritis treatments are in printed formats. Although informative, they tend to be less engaging for users. We applied the concept of edutainment (i.e., education that engages through entertainment) to develop a web-based decision aid called ANSWER. Designed for patients with rheumatoid arthritis (RA), ANSWER presents information on methotrexate (MTX) in print, voice recording, and animated stories created using Adobe Photoshop. The current study aims to assess the extent to which ANSWER reduces patient’s decisional conflict, and improves their medication knowledge and skills of being ‘effective healthcare consumers’.

Methods: We used a pre-post study design. Participants were recruited from rheumatologists’ clinics, patient groups and social networking sites (Facebook, Twitter, Craiglist, Kijiji). Eligible participants were those who: 1) had a physician diagnosis of RA, 2) had been prescribed MTX but were unsure about starting it, 3) had access to the internet. Password access to the ANSWER was provided immediately after enrollment. Participants completed a questionnaire before and within 48 hours after using the ANSWER. Outcome measures included: 1) Decisional Conflict Scale (DCS, primary outcome; 0–100, scores <25 are associated with follow-through with decisions), 2) MTX in RA Knowledge Test (MiRAK; 0–60, higher = better), and 3) Effective Consumer Scale (EC-17; 0–100, higher = better). Paired t-test was used to assess differences before and after the intervention.

Results: 30 participants were recruited between November 2010 and April 2012. The majority were women (n=23, 76.7%) with a mean age of 54.90 years (SD=14.91); 73.3% (n=22) attended/graduated from university. The median disease duration was 1 year (IQ=3.5; 5.0), and the mean Health Assessment Questionnaire score was 1.16 (SD=0.68). The mean DCS was 23.17 (SD=24.10) pre-intervention (change=−27.67, 95% CI=−15.44,−39.89; p<0.001). Before using the ANSWER, 13.3% of participants scored <25, compared to 70% after the intervention. Similar results were observed in MiRAK (pre: 30.62, SD=9.26; post: 41.67, SD=6.81; change: 11.03, 95% CI=6.73,15.34; p<0.001), but not in EC-17 (pre: 68.24, SD=12.46; post: 72.94, SD=12.74; change: 4.71; 95% CI=−1.81,11.22; p=0.15). After using the ANSWER, 20 participants (66.6%) were able to make a decision (14 would take MTX, 6 would decline MTX and talk to their doctor about other treatment options). 10 participants (33.3%) remained unsure about their preferred choice.

Conclusion: Patients’ decisional conflict and MTX knowledge improved after using the ANSWER. Our results show similar changes to other studies evaluating decision aids in chronic diseases. The lack of a statistically significant change in the EC-17 might reflect the fact that it takes time to develop effective healthcare consumer skills. ANSWER provides patients with an easy-to-use, game-like tool that helps patients to find resources. Further research into the application of edutainment in developing patient decision aids and education programs is warranted.

Disclosure: L. C. Li, None; P. M. Adam, None; C. L. Backman, None; S. Brooks, None; G. A. Ellert, None; A. Jones, None; O. Kameneck, None; C. Koehn, None; D. Lacaille, None; C. Maloney, None; A. F. Townsend, None; E. Yacyshyn, None; C. Yousei, None; D. Stacey, None.
Implementation of a Pilot Nutrition Education Intervention for Culturally Diverse Teens with Lupus and Their Families in Hospital for Special Surgery’s Charla De Lupus/Lupus Chat® Teen and Parent Support Group

Tuesday, November 13

Jillian A. Rose1, Roberta Horton1, Dariana M. Pichardo2, Dana Friedman1, Robyn Wiesel1, Sandra Goldsmith1, Sotiria Everett1 and Lisa F. Imundo1. 1Hospital for Special Surgery, New York, NY, 2Hospital For Special Surgery, New York, NY, 3Morgan Stanley Children’s Hospital of New York-Presbyterian, Columbia University Medical Center, New York, NY

Background/Purpose: Based on results of our previously reported needs assessment, the hospital’s national lupus support and education program worked with our Public and Patient Education Department to adapt their existing culturally sensitive nutrition program to the needs of predominantly Hispanic teens with lupus and their families. This community service plan initiative was affiliated with an urban medical center’s pediatric rheumatology department. The 5 session curriculum focused on whole grains/fiber, calcium/vit D, fruits/vegetables, protein foods, and snacks/fast foods. Portion control, food labels, sodium and culturally appropriate recipe examples were included throughout. “Lupus Links” were provided by a Registered Dietitian to address bone and cardiac health, hypertension, renal disease, and obesity. The program’s goal was to provide practical strategies to initiate/sustain healthy nutrition practices in this community.

Methods: A bilingual (English/Spanish) 68 item pre-test was administered at the 1st session and a 78 item post-test at the 5th session to assess the program’s impact on knowledge and behavior. True/false, multiple choice, Likert-type, and open ended questions were included. Program satisfaction was also assessed. A 3 month follow-up was conducted.

Results: Pre/post tests were completed by all 19 participants (8 teens, 11 parents), a total of 7 households. 80% of participants were female; ages ranged from 12-50; >70% were Hispanic; 66% indicated household incomes of 10,000–29,999 per year. 94% reported the program led them to include more nutritious foods in their diet. Results indicated a statistically significant increase (p<0.05) cooking with canola oil (41% to 76%); weekly frequency of reported consumption of fish, chicken and/or cereals increased, as did consumption of whole or rye bread (p<0.05). Positive behavioral changes occurred in most households as well as in every nutritional item. Although mean knowledge scores > from pre to post-test (64% to 70%), this was not statistically significant. The most knowledge gained (11%) related to whole grains/fiber. Overall, teens and their parents didn’t always agree on how often they cooked or ate healthy at pre-test, but more congruent behavioral responses were reported from most households at post-test.

The program was well-received by participants: 94% rated overall content as excellent; 88% rated the program excellent in terms of organization, clarity, and level of presentation; 93% rated the instructor’s knowledge of the subject, and ability to keep the group engaged as excellent. Seven participants completed the 3-month follow-up survey (3 teens, 4 parents); all reported eating healthier. The use of canola oil for cooking < to 66.7% at follow-up, though still higher than baseline. There were slight reductions in several knowledge items.

Conclusion: Overall, this program, limited by our small sample size, helped families implement healthy dietary changes. A consideration for future planning is building in follow-up communications (nutritional tips, facts and strategies) using texting/social media to reinforce knowledge and engage participants in sustaining healthy nutritional choices.

Disclosure: J. A. Rose, None; R. Horton, None; D. M. Pichardo, None; D. Friedman, None; R. Wiesel, None; S. Goldsmith, None; S. Everett, None; L. F. Imundo, None.

2408

Effects of Ground and Joint Reaction Force Exercise On Bone Mineral Density in Postmenopausal Women: A Meta-Analysis of Randomized Controlled Trials

Tuesday, November 13, 2012, 9:00 AM–6:00 PM

George A. Kelley1, Kristi S. Kelley1, Wendy M. Kohrt2. 1West Virginia University, Morgantown, WV, 2University of Colorado @ Denver, Aurora, CO

Background/Purpose: Previous randomized controlled trials have led to conflicting findings regarding the effects of ground and/or joint reaction force exercise on femoral neck (FN) and lumbar spine (LS) bone mineral density (BMD) in postmenopausal women. The purpose of this study was to use the aggregate data meta-analytic approach to resolve these discrepancies.

Methods: The a priori inclusion criteria were: (1) randomized controlled trials, (2) ground and/or joint reaction force exercise > 24 weeks, (3) comparative control group, (4) postmenopausal women, (5) participants not regularly active, (6) published and unpublished studies in any language since January 1, 1989, (7) BMD data available at the FN and/or LS. Studies were located by searching six electronic databases, cross-referencing, hand searching and expert review. Dual selection of studies and data abstraction were performed. Hedge’s standardized effect size (g)
was calculated for each FN and LS BMD result and pooled using random-effects models. Z-score alpha values, 95% confidence intervals (CI) and number-needed-to-treat (NNT) were calculated for pooled results. Heterogeneity was examined using Q and I². Mixed-effects ANOVA and simple meta-regression were used to examine changes in FN and LS BMD according to selected categorical and continuous variables. Statistical significance was set at an alpha value ≤ 0.05 and a trend at >0.05 to ≤ 0.10.

Results: Statistically significant exercise minus control group improvements were found for both FN (28 g’s, 2’632 participants, p = 0.288, 95% CI = 0.102, 0.474, p = 0.002, Q = 90.5, p<0.0001, I² = 70.1%, NNT = 6) and LS (28 g’s, 1’504 participants, p = 0.179, 95% CI = -0.003, 0.361, p = 0.05, Q = 77.7, p<0.0001, I² = 65.3%, NNT = 6) BMD. None of the mixed-effects ANOVA analyses were statistically significant for either FN or LS BMD. None of the observed associations were found for age, years postmenopausal and changes in lean body mass while inverse associations were significant and positive associations were found for aerobic fitness.

Conclusion: Quality of life, disease activity and physical function all affect work presenteeism in patients with SpA, regardless of age, gender and disease subtype. The results indicate that work presenteeism is affected in patients with all types of SpA and more affected in women. We also find that presenteeism and register based sick leave (absenteeism) may be related to different dimensions of the individuals and their disease.

Disclosure: E. Haglund, None; A. B. I. Bremander, None; S. Bergman, Swedish Rheumatism Association, 6, Pfizer Inc, 8; L. T. Jacobsson, Abbott, UCB, MSD, 8; B. Strömbeck, None; I. F. Peterson, Abbott, Pfizer, 2, U.S Pharma, Pfizer, Abbott, 8.

2410

The Impact of Severe Hip and Knee Joint Disease On Paid and Unpaid Work Participation in Australia. Ilana N. Ackerman1, Zanfina Ademi1, Richard H. Osborne1 and Danny Liew1. 1The University of Melbourne, Melbourne, Australia, 2Deakin University, Melbourne, Australia

Background/Purpose: Severe hip and knee joint disease are common and disabling conditions which represent a growing public health problem internationally. Although people of working age are commonly affected, the impact of severe hip and knee joint disease on work participation is not well understood. Using a national approach, this study aimed to evaluate participation in paid and unpaid work according to the severity of hip and knee joint disease.

Methods: A sample of 5000 people was randomly selected from the Australian electoral roll and invited to complete a questionnaire to screen for doctor-diagnosed hip arthritis, hip osteoarthritis (OA), knee arthritis and knee OA, and evaluate the severity and burden of these conditions. Joint disease severity was classified using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores (range 0–100): <7 = asymptomatic, 7–38 = mild to moderate and ≥39 = severe. Self-reported data were collected on paid and unpaid work status, premature exit from the workforce, and changes to work due to hip or knee arthritis or OA.

Results: Data were available for 1157 participants, with 237 (20%) reporting hip or knee joint disease. Of these, 16% (n=187) were classified as asymptomatic, 51% (n=120) as mild-moderate and 27% (n=64) as severe. None of the participants was more than 64 years old and 5% were female. None of the severity grades were classified as severe. Either age nor gender was associated with severity (p>0.05). Only 29% of the severe group was in paid employment, compared with 46% of the mild to moderate group and 54% of the asymptomatic group (p<0.01). Nine percent of the severe group had stopped work due to their hip or knee, while no participant from the asymptomatic or mild to moderate groups had stopped work for this reason. After adjustment for age and gender, the severe group was over 3 times less likely to be in paid employment (adjusted odds ratio (AOR) 0.28, 95%CI 0.09–0.88), and over 4 times less likely to undertake unpaid work (AOR 0.24, 95%CI 0.10–0.62), compared with the asymptomatic group. Mild to moderate joint disease was not associated with a reduced likelihood of either being in paid employment or of undertaking unpaid work (p>0.05). Increasing severity was associated with greater difficulty in undertaking work; the proportion of participants who reported having to change the way they worked due to arthritis or OA rose with increasing disease severity (5% for asymptomatic group, 20% for mild to moderate group, and 59% for severe group; p<0.01). The proportion who reported having to change the number of hours worked due to arthritis or OA also increased with greater disease severity (3% for asymptomatic group, 15% for mild to moderate group, and 33% for severe group; p<0.01).

Conclusion: This study has generated new information on the relationship between severity of joint disease and work. Compared with those who had milder disease, individuals with severe joint disease reported markedly reduced paid and unpaid work participation, and greater difficulty in undertaking work. These data provide further evidence of the personal burden of severe joint disease and highlight the need for timely access to care.

Disclosure: I. N. Ackerman, None; Z. Ademi, None; R. H. Osborne, None; D. Liew, None.
Obesity Is Associated with Higher Levels of Fatigue in RA. Patricia P. Katz,1 Vladimir Chernitskiy2 and Mary Margareten2. 1University of California San Francisco, San Francisco, CA, 2University of California San Francisco, San Francisco, CA, UCFS, San Francisco, CA

Background/Purpose: Fatigue is recognized as a major problem for individuals with rheumatoid arthritis (RA), yet the causes of fatigue are not well defined. Obesity appears to be common in RA, and studies outside RA have linked obesity with fatigue. This analysis examined the association of obesity with fatigue in RA.

Methods: Subjects are participants in an on-going study of RA fatigue (current n=136). Home visits are made to individuals with documented RA to assess a number of factors, including the following variables used to estimate body composition: height, weight, waist circumference, and bioelectrical impedance analysis (BIA). Height and weight were used to calculate body mass index (BMI). Obesity was defined by standard definitions of BMI (≥30 kg/m²) and waist circumference (women: ≥88 cm; men: ≥102 cm). Revised definitions of obesity from BMI (≥26 kg/m²) and waist circumference (women: ≥83 cm; men: ≥96 cm) were also examined. Total percent body fat was calculated from BIA. Fatigue was measured with the Fatigue Severity Index, and used the rating of average fatigue severity over the past week (range 0–10, no fatigue to severe fatigue). Subjects also completed questionnaires to measure RA disease activity (RA Disease Activity Index [RADAI]), sleep quality (Pittsburgh Sleep Quality Index [PSQI]), depression (PHQ), and functioning (HAQ). Multiple linear regression analyses were used to identify the association of each measure of obesity with fatigue severity. Covariates included RADAI, PHQ, HAQ, sleep quality, age, sex, and RA duration.

Results: Mean (±SD) age was 59 (±12) years, 87% were female, and 77% were white. Mean fatigue severity rating was 3.8 (±2.1; range 0–10). Proportion defined as obese ranged from 27% (BMI≥30) to 61% (waist circumference, revised), and mean percent fat was 35.6% (±9.0%). In unadjusted analyses, all measure of obesity and body fatness were significantly associated with fatigue (Table). Adjustment for covariates attenuated the relationship of body composition measures with fatigue, but the association persisted.

Table. Associations of body composition measures with fatigue severity

<table>
<thead>
<tr>
<th>% (n) obese</th>
<th>Unadjusted</th>
<th>Adjusted</th>
<th>p</th>
<th>Beta (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI obese (30 kg/m²)</td>
<td>27% (17)</td>
<td>1.2 (0.4, 1.9)</td>
<td>.003</td>
<td>0.5 (-0.2, 1.1)</td>
<td>.18</td>
</tr>
<tr>
<td>BMI obese (revised; 26 kg/m²)</td>
<td>51% (70)</td>
<td>1.6 (1.0, 2.4)</td>
<td>&lt;.0001</td>
<td>0.7 (0.1, 1.3)</td>
<td>.02</td>
</tr>
<tr>
<td>Waist obese (women ≥ 88 cm; men ≥ 102 cm)</td>
<td>47% (63)</td>
<td>1.3 (0.6, 2.2)</td>
<td>.0002</td>
<td>0.5 (-0.1, 1.1)</td>
<td>.11</td>
</tr>
<tr>
<td>Waist obese (revised; Women ≥ 84 cm; Men ≥ 96 cm)</td>
<td>61% (82)</td>
<td>1.3 (0.6, 2.3)</td>
<td>.0004</td>
<td>0.6 (-0.02, 1.2)</td>
<td>.06</td>
</tr>
<tr>
<td>Total % fat (per 10%) increase</td>
<td>1.4 (0.7, 2.1)</td>
<td>.0002</td>
<td>0.3 (0.06, 0.7)</td>
<td>.10</td>
<td></td>
</tr>
</tbody>
</table>

1Adjusted for RADAI, PHQ, HAQ, self-reported sleep quality, age, sex, RA duration.

Conclusion: Obesity appears to play a role in RA fatigue, even after controlling for important covariates such as disease activity, sleep, and depression. Associations found using the revised obesity definitions, which increased the number of individuals classified as obese by 89% (BMI) and 30% (waist circumference), were not substantially different from those found with the standard definitions. Addressing obesity in RA may be part of effective interventions for RA fatigue.

Disclosure: P. P. Katz, None; V. Chernitskiy, None; M. Margareten, None.

2412 Validation of a Diagnosis of Gout in the EpicCare Electronic Medical Records. Neera Narang1 and Eswar Krishnan2. 1Stanford Univ Medical Center, Stanford, CA, 2Stanford University, Stanford, CA

Background/Purpose: Electronic Medical Records (EMR) offer great opportunities for pharmacoepidemiologic, health outcome and health services research. However, the critical limiting factor in the widespread use of these data is the accuracy, precision and validity of diagnoses. EpicCare is a large and growing proprietary EMR software system that has been adopted by several large tertiary care facilities. The goal of this FDA funded project was to assess the validity of an ICD code of 274.* to identify patients meeting a clinical diagnosis of gout from among those who have ever been prescribed colchicine.

Methods: We identified 143 patients in the Stanford EpicCare system in the past 6 years that met our case definition for gout - at least one prescription of colchicine and one instance of ICD-9 code of 274.*. The records of these patients were individually reviewed and data on the following aspects were abstracted: physician diagnosis (notes), performance of arthrocentesis, use of urate lowering therapy, and documentation of each of the American College of Rheumatology (ACR) criteria for diagnosis/classification of gout. Data were analyzed quantitatively and qualitatively.

Results: Overall 143 case records were reviewed, of which 3 did not have any physician authored clinical documents. A physician diagnosis of gout was documented in 114 (80%). Three charts revealed a diagnosis of pseudogout and 31 did not have any physician documentation of gout. Among those records with a physician diagnosis of gout, 35 records documented intra-articular urate crystals, 36 records had documentation that met the ACR criteria, and 19 records had documentation of ACR criteria and urate crystals. The median number of ACR criteria met in the 114 charts was 4, with an interquartile range of 2 to 6. Among those records with a positive crystal identification, only 48% had documentation that met the ACR criteria. Among those records where arthrocentesis was performed and found to be negative for crystals, physician diagnosis was documented in 90%, and ACR criteria were met in 40%. In the case records that did not show documentation of arthrocentesis or any relevant laboratory evaluation, 75% had physician documentation and about 13% met the American College of Rheumatology criteria.

Conclusion: This study showed that in the setting of a tertiary medical center, Electronic Medical Records are an excellent resource for gout research. Documentation of the individual ACR criteria and performance of arthrocentesis is infrequent and hence these may not be useful gold standards for validation studies of gout in the EMR. From our qualitative review, documentation of physician diagnosis may be considered a useful benchmark for assessing the utility of case definitions for gout.

Disclosure: N. Narang, None; E. Krishnan, savient, 1, URL, takeda, meborex, ARDEA, 2, METABOLEX TAKEDA, 5.

2413 The Impact of Asymptomatic Vertebral Fractures On Quality of Life in Community-Dwelling Older Women: The Sao Paulo Ageing & Health Study (SPAHi). Jaqueline B. Lopes1, Leandro Fung1, Carolina C. Cha2, Camille P. Figueiredo3, Liliam Takayama1, Valeria Caparbo1 and Rosa M.R. Pereira. 1Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 2Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil

Background/Purpose: Health-related Quality of life (HRQL) has been used as a complementary measure of bone mineral density to evaluate the burden of osteoporosis on a patient’s daily life. There are few epidemiological studies to estimate HRQL and vertebral fractures in non-ambulatory or non-institutionalized elderly individuals. The aim of this study was to investigate the impact of asymptomatic vertebral fractures on quality of life in community-dwelling older women.

Methods: This cross-sectional study is nested within the larger epidemiological project of prevalence vertebral fractures in older living in Sao Paulo, Brazil. A random sample of 180 women with 65 years of age or over was evaluated. The Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO) was applied to all subjects. The QUALEFFO is a specific questionnaire designed to be used by patients with vertebral fractures attributed to osteoporosis. A low domain score indicates worse quality of life. Anthropometric data was obtained by physical examination and body mass index (BMI) was calculated. A lateral thoracic and lumbar spine X-ray was performed to identify asymptomatic vertebral fractures using Genant semi-quantitative method. A generalized linear model (GLM) with gamma distribution and logarithmic link function was used in the final statistical analysis.

Results: Women with asymptomatic vertebral fractures had lower QUALEFFO total score [61.4 (15.3) vs. 67.1 (14.2), p = 0.03] and worse QUALEFFO-physical-function domain [69.5 (20.1) vs. 77.3 (17.1), p = 0.02] compared to those without fractures. QUALEFFO total score was also worse in women classified as obese, compare those classified as overweight and normal, and it was related with better QUALEFFO-physical function score (p = 0.01). Likewise, lower QUALEFFO-physical-function score was observed in women with higher BMI (p = 0.05) and lower physical activity (p < 0.05). GLM with gamma distribution and logarithmic link function,
adjusted to age, showed that impair QALEFFO-total score and QALEFFO-physical-function domain was related with BMI, lower physical activity and vertebral fractures (p<0.05).

Conclusion: Vertebral fractures are associated to decrease QOL in community-dwelling older women regardless of age, BMI, and physical activity. Therefore, our results highlight the importance of preventing and controlling asymptomatic vertebral fractures in order to reduce their impact on QOL among older women.

Disclosure: J. B. Lopes, None; L. Fung, None; C. C. Cha, None; C. P. Figueiredo, None; L. Takayama, None; V. Carapito, None; R. M. R. Pereira, None.

2414 Multisite Joint Pain and Fatigue: the Role of Pain Severity and Sleep Problems in Adults with Arthritis. Maylee Canizares1 and E.M. Badley1, 2. 1Division of Health Care and Outcomes Research, Toronto Western Research Institute, Toronto, ON, 2Division of Health Care and Outcomes Research, Toronto Western Research Institute; Dalla Lana School of Public Health, University of Toronto, Toronto, ON

Background/Purpose: Little is known about the severity and determinants of fatigue in adults with arthritis. We hypothesize that the number of joint sites affected is associated with fatigue through pain severity and sleep problems.

Methods: Data source: a representative sample of people reporting arthritis, the 2009 Survey on Living with Chronic Diseases in Canada—Arthritis Component (age ≥ 20; n=4,365). Variables: frequency and severity of fatigue and of pain, sleep difficulties (a lot, a little, not at all), sites of joint pain (up to 18 joint sites), other chronic conditions, arthritis type (more frequently unknown type or osteoarthritis), and personal characteristics (age, sex, education, income, obesity). The number of joint sites affected were frequently unknown type or osteoarthritis), and personal characteristics (age, sex, education, income, obesity). The number of joint sites affected were grouped: no pain, single site, 2–3 sites, 4–7 sites, and 8+ sites (widespread). Over 80% reported multisite joint pain (24.3% 2–3 sites, 25.2% 4–7 sites, 30.4% 8+ sites). There was a significant gradient of higher pain severity and more sleep problems with increasing joint site count. Women, obese individuals and those with comorbidities had higher levels of fatigue. No differences were seen by arthritis type. In the model adjusting only for personal and health characteristics having 2–3 sites or more was significantly associated with higher levels of fatigue. When pain severity was added to the model the coefficients for 2–3 sites by 15.8% (range, pg/mL) N Median IL-6 (pg/mL) LS Mean BMD (SE) Model 1* Model 1 + IL-6 Estradiol quartile Estradiol quartile

Men

<table>
<thead>
<tr>
<th>Quartile</th>
<th>N</th>
<th>Median BMD (g/cm^2)</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1.1, 19.6)</td>
<td>307</td>
<td>2.53 0.960 (0.007)</td>
<td>0.960 (0.007)</td>
</tr>
<tr>
<td>2 (19.7, 24.9)</td>
<td>310</td>
<td>2.68 0.972 (0.007)</td>
<td>0.972 (0.007)</td>
</tr>
<tr>
<td>3 (25.0, 31.4)</td>
<td>304</td>
<td>3.13 0.979 (0.007)</td>
<td>0.979 (0.007)</td>
</tr>
<tr>
<td>4 (31.5, 118)</td>
<td>309</td>
<td>3.19 0.985 (0.007)</td>
<td>0.985 (0.007)</td>
</tr>
</tbody>
</table>

P for trend 0.01

Women

<table>
<thead>
<tr>
<th>Quartile</th>
<th>N</th>
<th>Median BMD (g/cm^2)</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (3.0, 4.0)</td>
<td>53</td>
<td>1.87 0.942 (0.016)</td>
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</tr>
<tr>
<td>2 (4.0, 5.0)</td>
<td>54</td>
<td>2.39 0.979 (0.016)</td>
<td>0.981 (0.016)</td>
</tr>
<tr>
<td>3 (6.0, 8.0)</td>
<td>54</td>
<td>1.64 0.994 (0.016)</td>
<td>0.992 (0.016)</td>
</tr>
<tr>
<td>4 (137, 678)</td>
<td>54</td>
<td>2.10 0.948 (0.016)</td>
<td>0.948 (0.016)</td>
</tr>
</tbody>
</table>

P for trend 0.73

Conclusion: The results underscore the high frequency of multisite joint involvement among people with arthritis, as well as the importance of joint site count for pain severity, sleep problems, and fatigue. The findings confirm that the effect of number of joint sites on fatigue is mediated through pain severity and sleep problems, and indicate at least some direct effect of widespread joint involvement on fatigue. These findings together with the similarities for the different types of arthritis point to the need to pay attention to the number of joint sites affected for all types of arthritis in strategies aiming to reduce the impact of fatigue.

Disclosure: M. Canizares, None; E. M. Badley, None.

2415 Does Interleukin-6 Mediate the Relation Between Estrogen and Bone? an Epidemiologic Approach in the Framingham Osteoporosis Study. Robert R. McLean1, Xiaochun Zhang2, Andrea D. Covello2, Joao D.T. Fontes1, L. Adrienne Cupples1, Douglas P. Kiel1 and Marian T. Hannan1. 1Hebrew SeniorLife & Harvard Medical School, Boston, MA, 2Hebrew Senior Life, Boston, MA, 3Boston University School of Medicine, Boston, MA, 4Framingham Heart Study and Boston University, Framingham, MA, 5Boston University School of Public Health, Boston, MA

Background/Purpose: Laboratory and animal studies suggest that lower sex hormone levels promote production and activity of pro-inflammatory cytokines that trigger bone resorption. This paradigm is a hypothesized mechanism for accelerated bone loss following menopause, and may influence bone loss in men and premenopausal women as cytokine levels may vary across the range of endogenous hormones within these groups. Confirmation of these hypotheses in epidemiologic studies could inform the development of interventions to prevent bone loss. We examined whether interleukin-6 (IL-6) concentrations is a mediator of the cross-sectional relation between total estradiol concentration and hip bone mineral density (BMD), separately among men, premenopausal women and postmenopausal women in the Framingham Osteoporosis Study. We hypothesized that a direct association between total estradiol and BMD would be attenuated after adjusting for IL-6, suggesting IL-6 as a potential mediator.

Methods: Fasting blood samples and BMD measures were obtained (1996–2001) from 1,220 men, 215 premenopausal and 1,300 women. Serum total estradiol (pg/mL) and IL-6 (pg/mL) concentrations were measured via LC-MS/MS and ELISA, respectively. Femoral neck BMD (g/cm²) was measured with a Lunar DPX-i. Separately for men, premenopausal and postmenopausal women, total estradiol was categorized into quartiles and analysis of covariance was used to calculate least squares-adjusted mean BMD for each quartile and test for a linear trend, adjusting for age, BMI, height, physical activity, current smoking and in postmenopausal women, use of hormone replacement therapy (HRT). To examine potential effect modification by HRT in postmenopausal women analyses were also stratified by HRT use. Models were additionally adjusted for IL-6 and if an association between total estradiol and BMD was consequently attenuated, IL-6 was considered a mediator.

Results: Mean age was 61 y (range 29–86 y). There was a statistically significant positive association between total estradiol and BMD among men and a similar, though not statistically significant, relation in postmenopausal women (Table). There was no association in premenopausal women. In postmenopausal women the relation was similar for HRT users and non-users (data not shown). Associations were nearly identical after adjusting for IL-6, suggesting no mediation by IL-6.

Least squares-adjusted mean femoral neck BMD (g/cm²) for quartiles of serum total estradiol, with and without adjustment for IL-6, among men and women in the Framingham Osteoporosis Study.

<table>
<thead>
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<td>309</td>
<td>3.19 0.985 (0.007)</td>
<td>0.985 (0.007)</td>
</tr>
</tbody>
</table>

P for trend 0.01

*Adjusted for age, BMI, height, physical activity, current smoking, and, in postmenopausal women, current HRT use.

Conclusion: These cross-sectional findings suggest that while lower estrogen status was associated with lower hip BMD in men and postmenopausal women, these relations are not influenced by IL-6. Subsequent analyses should examine additional markers of estrogen status (free estradiol, estrone, sex hormone-binding globulin) and pro-inflammatory cytokines (CRP, TNF-α), the role of hormonal contraceptive use and phase of menstrual cycle in premenopausal women, and prospective changes in BMD.

Disclosure: R. R. McLean, None; X. Zhang, None; A. D. Covello, None; J. D. T. Fontes, None; L. A. Cupples, None; D. P. Kiel, Eli Lilly and Company, 2, Merck Pharmaceuticals, 2, Eli Lilly and Company, 5, Merck Pharmaceuticals, 5, Novartis Pharmaceutical Corporation, 5, Amgen, 5; M. T. Hannan, None.
Arthritis-Attributable Interference in Routine Life Activities. Kristina A. Theis1, Teresa J. Brady1, Charles G. Helmick2, Louise Murphy3 and Kamil E. Barbour1. 1Centers for Disease Control and Prevention, Atlanta, GA, 2CDC, Atlanta, GA

Background/Purpose: Arthritis-attributable interference (AAI) in routine life activities is indicators of quality-of-life (QOL) that have not often been studied in a population-based sample of U.S. adults with arthritis. The purpose of this study is to estimate, among people with arthritis, the proportion and number with AAI in four routine life activity domains (1. recreation, leisure, and hobbies; 2. household chores; 3. errands and shopping; and 4. normal social activities), as well as the proportion affected among those with select characteristics.

Methods: Data were from ACHES, a cross-sectional, random digit dialed national telephone survey of non-institutionalized U.S. adults ≥45 years with self-reported doctor-diagnosed arthritis conducted in 2005–06. All respondents (n=1793) confirmed a diagnosis of arthritis from a health professional. AAI for the first 3 life activity domains was asked by: “During the past 7 days, how much did your arthritis or joint symptoms interfere with the following activities?” AAI in the fourth domain used a 30-day recall; responses for all 4 questions were: a lot, a little, or not at all. For analysis across the 4 activity domains, a composite measure of AAI was created with three mutually exclusive subgroups: substantial (‘a lot’ in ≥1 domain), modest (‘a little’ in ≥1 domain), and none (no interference in any domain). The proportion of adults in each of these subgroups was examined overall and by demographics, clinical measures, and psychological factors. Weighted proportions and 95% confidence intervals (CI) were calculated accounting for the complex sample design (SAS 9.2).

Results: AAI (a lot, a little) was reported by more than half of respondents in each of the 4 life activity domains and was highest for household chores (68%) and recreation/leisure/hobbies (65%). The proportion of U.S. adults ≥45 years with arthritis who reported any degree of composite AAI in routine life activities was 79% (29.9 million) (substantial AAI = 38% (14.3 million); modest AAI = 41% (15.6 million)). Only 21% (7.8 million) reported no AAI. Substantial AAI was significantly higher in women compared with men (42% vs. 31%) but similar by age and race/ethnicity. Substantial AAI was significantly lower among those with high confidence in ability to manage arthritis symptoms. The proportion with substantial AAI by select characteristics was >50% for those with: severe fatigue (74%), severe joint stiffness (69%), severe joint pain (68%), anxiety (61%), depression (68%), low confidence in managing arthritis symptoms (65%), and those currently seeing a doctor or healthcare provider (51%).

Conclusion: Severe arthritis symptoms identify patients with substantial interference in routine life activities, but other characteristics (above) may identify additional patients who can benefit from interventions to preserve QOL. Controlling arthritis symptoms medically, in combination with referrals for evidence-based self-management education and physical activity programs, may reduce AAI in these important life activity domains and help address the large and growing public health problem of arthritis and its related QOL impacts.

Disclosure: K. A. Theis, None; T. J. Brady, None; C. G. Helmick, None; L. Murphy, None; K. E. Barbour, None.

2418 The Everyday Challenge of Living with Lupus. Brenda L. Frie. St. Catherine University, St. Paul, MN

Background/Purpose: A considerable body of evidence highlights the negative impact of rheumatic disease on employment. However, most research examines middle- and older-aged adults. We lack information on the employment experiences of young adults with rheumatic diseases who are transitioning to adulthood.

Objectives: To describe the working experiences of young adults (ages 18 to 30 years) with systemic lupus erythematosus (SLE) and juvenile arthritis (JA) in terms of: 1) employment status 2) disease-related job absenteeism and disruptions and 3) demographic, health, psychological and work factors associated with job disruptions.

Methods: 143 participants (mean age = 23.3 years, SD = 3.5, 80% female) with SLE (n = 78) and JA (n = 65) were recruited from rheumatology clinics in four Canadian provinces (Ontario, Saskatchewan, British Columbia and Alberta). All completed an online questionnaire asking about demographic (age, gender, education), health (diagnosis, pain, fatigue, disease activity), work context (job sector, hours worked), absenteeism, job stress, and psychosocial factors (perceived independence, disclosure of disease). The number of disease-related job disruptions (work interruptions, arriving late/leaving early, missed meetings) were also asked (1 = yes; 0 = no). A multivariate linear regression analysis examining the association of demographic, health, work context, and psychological factors with disease-related job disruptions was conducted.

Results: 61% of the sample were employed, 26% were students and 13% were not working. Participants mostly reported a well controlled disease with low pain (mean = 3.5, SD = 3.0), fatigue (mean = 4.2, SD = 3.1) and disease activity (mean = 3.1, SD = 3.0); 56% had attended post-secondary school. Among those employed, half worked full-time (54%) and about a third of participants worked in sales and service jobs (36%). Over half of employed participants (53%) reported at least one disease-related job disruption (mean = 1.5, SD = 2.3; range: 0–7) and 56.5% reported a job absence because of their disease in the previous 6 months. The most common disease-related job disruptions in the past 6 months were work interruptions of 20 minutes or more (33%), lost time because of arriving late/leaving early (22%) and being unable to work requested schedules (20%). Greater job disruptions were significantly associated with older age, greater job stress, workplace activity limitations, and having disclosed arthritis to one’s manager. Increased fatigue and perceiving that one would be able to remain employed were significantly associated with fewer job disruptions.

Conclusion: Similar to their healthy peers, the majority of young adults with SLE and JA in this sample were employed or pursuing an education. However, many experienced disease-related absenteeism or job disruptions that were associated with having discussed their disease with an employer, higher work stress and workplace limitations, signaling the need for intervention. Flextime or workplace self-management are examples of interventions, in this age group, that may improve long-term success in employment.

Disclosure: A. Jetha, None; E. M. Badley, None; D. Beaton, None; P. R. Fortin, None; N. J. Shift, None; A. M. Rosenberg, None; L. B. Tucker, None; D. P. Mosher, None; M. A. Gignac, None.
on the Systemic Lupus Erythematosus Needs Questionnaire (SLE-NQ) (Moses, Wiggers, Nicholas, & Cockburn, 2007) and 25 items from categories listed on the World Health Organization Quality of Life Assessment (1995) and the Healthcare Assessment Questionnaire developed by Fries, Spitz, Klauser, & Holman (1980). Survey items were ranked on a 5-point rating scale based on level of difficulty participating in daily life tasks, managing physical symptoms and emotional concerns. Demographic information, access to services, and interest in community based programming was assessed through open ended and multiple choice questions. The data was analyzed descriptively.

Results: Ninety six participants completed the survey. The majority of the study participants were women (95%), with an average age of 49 years old. Over half of the respondents (52%) reported that they were not working at the time of the survey. Three percent of those surveyed received occu-

ional therapy services within the past year. Most participants were

Caucasian (82%). Fifty percent of participants reported moderate or higher level difficulty doing the daily tasks of sports, climbing, outdoor work, and managing the physical symptoms of pain and fatigue. Thirty percent of those surveyed reported difficulty coping with emotional concerns of depression, stress and anxiety. Management of fatigue was the most prevalent area of concern. Eighty seven percent of participants reported that they may be interested in attending a community based educational program addressing the areas of fatigue, pain, stress, strength and conditioning, coping skills and life balance.

Conclusion: This study is important in that it identifies there is a need for and interest in community based educational programming for those living with lupus. Community based services can play a key role in improving the quality of life of those with SLE through providing services to help adapt or modify their environments and manage the disease symptoms.

Disclosure: B. L. Frie, None.


1 University of North Carolina, Chapel Hill, NC, 2 University of North Carolina, Thurston Arthritis Research Center, Chapel Hill, NC

Background/Purpose: Structural foot disorders, such as hallux valgus, deformities of the lesser toes (toes 2–5) and plantar soft-tissue atrophy, commonly affect 60% of older adults at the population level and are often linked with foot pain, chronic mobility limitations, and disabil-

ity. Although, body weight and other environmental factors are considered possible causes of these foot conditions, the importance of genetics is commonly suspected in clinical observations of family aggregation. Previously, we reported strong heritability (h2 for lesser-toe deformity (61% in men; 85% in women) and moderate h2 for hallux valgus (35%) and plantar soft-tissue atrophy (20%) in older men and women, suggesting potential genetic predisposition to structural foot disorders. To identify their genetic determinants, we have undertaken a GWAS using 2.5M imputed SNPs (HapMapII CEU reference panel) to localize susceptible genes in the population-based Framingham Foot Study.

Methods: Structural foot disorders were indicated as present or absent and were assessed based on an atlas of pictorial depictions. Plantar soft-tissue atrophy was determined by palpating the plantar fat pad at the forefront and heel during a validated foot examination. Among 2,446 Framingham participants (mean age 66 yrs; 57% women; Caucasian), we identified 753 (31%), 764 (31%), 1,065 (27%) participants with deformities of the lesser-toes, hallux valgus and plantar soft-tissue atrophy, respectively. A mixed-effect regression model was performed and adjusted for age, sex, weight and principal components of ancestral genetic background. A kinship covariance matrix was used to take into account within-family correlations among siblings. We filtered out SNPs with low imputation quality (O/E variance matrix was used to take into account within-family correlations among siblings. We filtered out SNPs with low imputation quality (O/E variance ratio of allele frequency < 0.3) and SNPs with MAF < 1%. In addition, p-values were also adjusted for AGC.

Results: We found several associations achieved genome-wide signifi-

The most significant SNP (p=4.9x10^-10) was in GATAD2B gene. For plantar soft-tissue atrophy, the most significant SNP (p=4.76x10^-10) is located near ADAMTS16 gene. Pathway and gene-set analyses for the genome-wide significant and suggestive genes suggested significant clustering of genes involved in connective tissue disorders (such as olioarthritis, osteoarthritis and osteosclerosis). Of note, a few SNPs were reported to associate with longevity. These results are undergoing replication in independent sam-


1 University of North Carolina at Chapel Hill, Chapel Hill, NC, 2 Children’s Mercy Hospitals and Clinics, Kansas City, MO, 3 Duke University Medical Center, Durham, NC

Background: Previous research has demonstrated that children with Juvenile Idiopathic Arthritis (JIA) experience frequent pain intensity and interferes with performing tasks at home and at school. However, it is unclear whether pain and associated functional limitations persist despite recent advances in the understanding and medical treatment of the disease. The present study used electronic (e-) diaries to determine whether pain, stiffness, and fatigue continue to be common, disabling symptoms in children with JIA despite aggressive contemporary medical management.

Methods: Fifty-nine children with JIA (44 girls, 73% Caucasian, mean age 13.3 years) were recruited during routine pediatric rheumatology clinic visits. Most had mild (42%) or moderate (43%) physician-rated disease activity (minimal 1%, severe 4%). Participants provided current ratings of pain, stiffness, and fatigue intensity; number of painful locations; and functional limitations using a Smartphone e-diary three times each day for one month. Medication information was collected via parent report and checked for accuracy by chart review. Descriptive analyses were conducted to describe typical symptoms, and were assessed based on an atlas of pictorial depictions. Plantar soft tissue atrophy was determined by palpating the plantar fat pad at the forefront and heel during a validated foot examination. Among 2,446 Framingham participants (mean age 66 yrs; 57% women; Caucasian), we identified 753 (31%), 764 (31%), 1,065 (27%) participants with deformities of the lesser-toes, hallux valgus and plantar soft-tissue atrophy, respectively. A mixed-effect regression model was performed and adjusted for age, sex, weight and principal components of ancestral genetic background. A kinship covariance matrix was used to take into account within-family correlations among siblings. We filtered out SNPs with low imputation quality (O/E variance ratio of allele frequency < 0.3) and SNPs with MAF < 1%. In addition, p-values were also adjusted for AGC.

Results: Across 3258 completed e-diary entries, the average pain inten-

sity rating was 26.3/100 (SD = 27.5), average stiffness intensity 24.4/100 (SD = 25.2), and average fatigue intensity 42.7/100 (SD = 28.19). Children reported pain (31% of all e-diaries with 86% reporting high pain at least once in study period. The majority of children in this sample were prescribed DMARDS on 31% of all e-diaries with 86% reporting high pain at least once in study period. The majority of children in this sample were prescribed DMARDS (chart review 79%, caregiver report 54%). Biologics were the next most commonly prescribed medication (chart review 47%, caregiver report 32%). Few children were taking opioids (chart review 1%, caregiver report 3%). Medication type did not reliably predict differences in symptom intensity. The findings are surprisingly consistent with previous results from paper daily diary research in the pre-biologic era. There remains a pressing ongoing need to optimize pain and symptom management in JIA.

Disclosure: M. H. Bromberg, None; M. Connelly, None; K. K. Anthony, None; K. M. Gill, None; L. E. Schanberg, None.
Background/Purpose: The Pediatric Rheumatology Nursing (PRN) Network is an electronic listserv linking 190 pediatric rheumatology nurses in 8 countries. Pediatric rheumatology nurses often have a sense of isolation because the closest nurse in this specialty could be 1000 miles away. However, this communication system makes consultation with another pediatric rheumatology nurse as close as one click away.

The purpose of the PRN Network is to promote communication, networking and to enhance practice knowledge, thereby improving patient care in pediatric rheumatology. The listserv goals are to exchange best pediatric rheumatology nursing practices; discuss difficult treatment issues such as patient adherence; share family educational and support products, activities, and materials; and exchange disease information, resources, school forms, treatment protocols, and procedures.

Methods: The PRN Network began in 1988 with a quarterly newsletter disseminated to pediatric rheumatology nurses in the United States (US). The nurses who initially received the newsletter were part of 11 multidisciplinary pediatric rheumatology teams from SPRANS Grant Programs (Special Programs of Regional and National Significance) through the US Division of Maternal & Child Health. The newsletter was published from 1988 to 1996. Grants totaling $3,000 were obtained from Astra USA to underwrite the newsletter. By 1997, the newsletter reached pediatric rheumatology nurses throughout the United States and Canada. The number of nurses on the mailing list increased from 20 to 60 nurses, primarily through word of mouth.

In 1998, the PRN Network listserv was initiated. Some nurses were participating on the well-established pediatric rheumatology (physician) listserv run by Peter Dent, MD, through McMaster Children’s Hospital in Ontario, Canada. However, the pediatric rheumatology nurses felt that a nurse-only listserv would enable them to discuss issues relevant to their profession. This listserv was launched on a trial basis with 7 nurses. By 2002 there were 31 nurses on the listserv. By 2004 subscribers had grown to 82. In 2010, there were 146 nurses.

Lack of funding required startup from a home computer. Eventually the listserv transitioned to the server at All Children’s Hospital in St. Petersburg, Florida. The listserv coordination is done from a home laptop and the database is maintained on gmail. Twice a year listserv members receive a copy of the updated member list.

Results: There are currently 190 nurses on the listserv—from the United States, Canada, United Kingdom, Germany, Spain, Australia, New Zealand, and Singapore. Benefits of the listserv include increased knowledge of timely issues, management of medication shortages, sharing of difficult cases, promotion of patient adherence, conference planning, and sharing of educational materials.

Conclusion: There is no cost to participate on the PRN Network listserv. Once a year, an email is sent to the physicians’ pediatric rheumatology listserv to recruit nurses for the PRN Network. All pediatric rheumatology nurses are welcome to join. For more information, contact Norma Liburd at norma.liburd@allkids.org.

Disclosure: N. L. Liburd, None;
Results: Participant characteristics are displayed in Table 1. The total prevalence of CVD risk factors among this population was 86%, 50% accounting for family history of CVD before age 55. Significant themes (Table 2) included lack of education and awareness along with ineffective patient-clinician communication. Barriers included physical and psychosocial limitations in adopting healthier behaviors.

Table 1. Patient demographics and disease characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number of participants</th>
<th>% (female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>8</td>
<td>100%</td>
</tr>
<tr>
<td>Mean age in years</td>
<td>45</td>
<td>19-65</td>
</tr>
<tr>
<td>Highest Education (&gt;12 years)</td>
<td>8</td>
<td>100%</td>
</tr>
<tr>
<td>Yearly Income (under 10,000)</td>
<td>4</td>
<td>50%</td>
</tr>
<tr>
<td>Family history of CVD before age 55</td>
<td>4</td>
<td>50%</td>
</tr>
<tr>
<td>Personal History of CVD with SLE</td>
<td>3</td>
<td>37.5%</td>
</tr>
<tr>
<td>Disease duration of SLE in years</td>
<td>20.6</td>
<td>12-39</td>
</tr>
<tr>
<td>Median Disease Severity (SLICC scores)</td>
<td>2</td>
<td>0-4</td>
</tr>
</tbody>
</table>

Table 2. Five key themes identified with examples

<table>
<thead>
<tr>
<th>THEMES</th>
<th>QUOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A need for more information and awareness about CVD risk</td>
<td>Yes. I think it would be real beneficial. You would have the awareness and the knowledge to know what to look for.</td>
</tr>
<tr>
<td>A desire for healthcare providers time, attention and communication regarding CVD risk factors</td>
<td>Because when you get a diagnosis like lupus, you already think your life is over and I just think that they have to know how to present the information in order for the patient to really understand yes are you at risk but I mean you can do things to prevent this and as it stands right now, in my experience and I don’t know what kind of experience you guys have had but like my doctor basically told me my life was over.</td>
</tr>
<tr>
<td>Physical and psychosocial limitations related to the impact of lupus</td>
<td>Doing things that I used to do is limited now, very, very limited</td>
</tr>
<tr>
<td>The need for effective prevention and disease management approaches</td>
<td>Well I’ve never been offered screening so if it was offered to me, [crosstalk], then I would go through the process but I mean it’s never been offered to me.</td>
</tr>
<tr>
<td>Adoption of healthier living habits (activity and diet)</td>
<td>I can add to what she’s saying. You eat more whole food. If you can pick it off a tree or pull it out of the ground eat that. &quot; Aquatic therapy. I’ve been doing that for about maybe four or five years. Aquatic therapy seems to help. &quot;</td>
</tr>
</tbody>
</table>

Conclusion: This study provides additional data illustrating the importance of patient-clinician communication and the obstacles of effective management in reducing CVD risk. These findings suggest the need for further exploration of interventions used to eliminate barriers and foster facilitation in reducing CVD risk factors in the presence of SLE.

Disclosure: B. Mia, None; L. Nemeth, None; D. L. Kamen, None; Y. C. Gibbs, None.

2425
A Qualitative Study of Self-Image and Body Image in Individuals with Systemic Lupus Erythematosus, Afton L. Hassett1, Diane C. Radvanski2, and Elizabeth Hale3. 1University of Michigan, Ann Arbor, MI, 2Robert Wood Johnson Medical School, NJ, 3Dudley Group NHS Foundation Trust, Dudley, United Kingdom

Background/ Purpose: Symptoms and treatment related to SLE are often outwardly evident. Patients with SLE cope with such external manifestations as joint swelling, rashes, scarring, loss of skin pigmentation, alopecia, facial changes (Cushingoid appearance) and overall weight gain. Despite findings that side effects affecting appearance are associated with poor medication adherence, body-image and self-image in general have received very little attention in the SLE scientific literature. The primary objective of this qualitative study was to learn more about the role of self-image and body image in SLE.

Methods: 15 patients with SLE underwent semi-structured interviews that were approximately one hour long. Interviews were audio recorded, transcribed verbatim and analyzed using Interpretive Phenomenological Analysis (IPA). IPA is a qualitative method that takes an idiographic approach, trying to understand the experience from an individual account, then building up to commonalities and differences when looking across cases. Themes for these interviews were identified and collected under major thematic headings.

Results: Our participants included 14 females and 1 male all between the ages of 22 and 57. Patients were ethnically and racially diverse (e.g., 53.3% African American, 13.3% Caucasian) and just over half were married (53.3%). Running throughout the interviews were the themes of the changed self, the battle for normality and being attacked by an unwanted physical enemy. It also became clear that is the outward “cosmetic” effects of SLE that can cause the most distress for participants, quite apart from the internal effects with which they were coping. We found that the concepts of body-image and self-image were inextricably linked; body-image impacts self-image and when feeling negative about one, it’s hard to feel positive about the other. This was the daily challenge our participants faced. Often highlighted was how much they felt they had changed when talking about their body image, particularly in outward appearance. This was a topic that caused great distress as individuals remembered how they used to be. Sometimes this was expressed as...
looking in the mirror and not recognizing the person looking back, which suggests that not only did individuals experience a distancing from other people and valued social roles, they experienced a disembodiment from their own selves as well.

Conclusion: Patients reported that self-image and body image are adversely affected by SLE and these changes in perception can impact quality of life. Weight gain, Cushingoid appearance, hair loss and rashes were the most troubling manifestations.

Disclosure: A. L. Hassett, Bristol-Myers Squibb, 2, Bristol-Myers Squibb, 5, Pfizer Inc, 5, Pfizer Inc, 2; D. C. Radavanski, None; E. Haile, None.

2427

Health-Related Quality of Life in Adolescents with Rheumatoid Disease. Sandra J. Watcher, Maggi Sepkowitz, Suhas M. Radhakrishna, Anusha Ramanathan, Elizabeth Morasso, Jennifer Chang and Jeffrey I. Gold.

Background/Purpose: Adolescents with chronic health disease face a variety of physical and psychological challenges. Adolescents with rheumatologic conditions vary with regard to their physical, emotional, and functional health outcomes, such as quality of life. The purpose of this project was to evaluate health-related quality of life (HRQOL) in adolescents with rheumatic disease. In addition, an examination of agreement between adolescent and parent-report of HRQOL was completed.

Methods: Adolescents and their parents participated in concurrent rheumatology support groups focused on psychoeducation, medical management, and quality of life. The sample consists of 38 adolescent (11–20 years)/parent pairs. Prior to attending the support/education group one parent and their adolescent completed self-reports of HRQOL. Measures of interest included a demographic questionnaire and the Simple Measure of Impact of Illness or Lupus Erythematosus in Youngsters® (SMI-IYLC - SMILEY®) for parents and adolescents. The tool evaluates perception of overall quality of life, current illness and four individual domains: effect on self, burden of illness, social impact, and limitations of illness. Scores are calculated into a percentile score for each domain, with a higher score indicating greater HRQOL.

Results: 65.8% were Latino/Hispanic and 34.3% reported other (Asian, Asian/pacific, Asian pacific-islander black or white/non-Latino). Mothers represented 69.4%, fathers 22.2% and other 8.3%. Gender of the adolescent was 82.4% female.

Adolescents reported functioning above average quality of life in the domains of effect on self (61.26%) and social impact (73.02%). Two domains demonstrated a moderate impact on HRQOL in the domains of burden of illness (51.73%) and limitations (54.27%). Parent-report reflected similar responses being slightly lower in all domains reflecting the effect on self (58%), social impact (66.97%), burden of illness (47.59%) and limitations (52.76%).

The Wilks' Lambda distribution was used and no significant differences were found between adolescent and parent ratings. Additionally, there was no significant correlation between the parent and adolescent-reports on all domains and total score of the SMI-IYLC/SMILEY®.

Conclusion: Adolescents and their parents enrolled in a support/education program reported moderate to moderately high levels of self and social support. Of interest is the consistent burden of illness and limitations reported by adolescent with rheumatic disease and their parents. The findings are consistent with other literature supporting the effects of pediatric chronic health disease on HRQOL. While similar trends were reported across all domains of HRQOL, measures of agreement were not statistically significant. Information regarding the effects of rheumatic disease on the four domains lend further support for interventions focused on the direct burden of illness and limitations caused by the particular disease. Future investigations should focus on the impact of rheumatic disease on self and social support and focus on interventions for specific aspects of burden of illness and disease specific limitations.

Disclosure: S. J. Watcher, None; M. Sepkowitz, None; S. M. Radhakrishna, None; A. Ramanathan, None; E. Morasso, None; J. Chang, None; J. I. Gold, None.

2428

Causal Beliefs of Disease Among Patients with Systemic Vasculitis. Peter C. Grayson1, Naomi Armadali1, Carol McAlear2, Renee Leduc3, Denise Sherreff4, Rachel Richesson5, Liana Frenken1 and Peter A. Merkel6.

Background/Purpose: To describe patient beliefs related to the cause of systemic vasculitis and to examine whether causal beliefs are associated with psychological impact of disease and functional impairment.

Methods: Participants were recruited online from a patient contact registry in vasculitis. Causal beliefs were measured using two approaches. Using an open-ended question, participants were asked to list the three most

Table. Median of means and ranges of reported values for survey and polysomnograph measures among RA patients and controls

<table>
<thead>
<tr>
<th>Clinical Characteristics</th>
<th>Median of Means (Range of Values)</th>
<th>Number of Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pittsburgh Sleep Quality Index</td>
<td>8.5 (7.6–9.5)</td>
<td>2.6 (2.4–2.8)</td>
</tr>
<tr>
<td>Polysomnograph Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Hours of Sleep (hrs)</td>
<td>6.3 (5–7.2)</td>
<td>6.9 (6–7.6)</td>
</tr>
<tr>
<td>Sleep Efficiency (%)</td>
<td>80.9 (61–93.6)</td>
<td>90.8 (85–94)</td>
</tr>
<tr>
<td>Number of Wakeups</td>
<td>67.6 (31.3–194)</td>
<td>7.4 (2.6–112)</td>
</tr>
<tr>
<td>Sleep Latency (min)</td>
<td>25.1 (21–38.5)</td>
<td>13.7 (12.1–25.2)</td>
</tr>
</tbody>
</table>

1Range = 0–21, PSQI score < 5 = “good sleeper”, PSQI > 5 = “poor sleeper”

Conclusion: Sleep disturbances, notably increased awakenings, were reported by the majority of RA patients, while sleep duration was similar among RA patients compared to controls. These results suggest that widespread sleep problems among RA patients may be a result of disturbed sleep rather than an overall lack of sleep. Future studies are needed using uniform sleep measures in large cohorts of well-characterized RA patients with appropriately selected controls.

Disclosure: C. Coleman, None; Y. C. Lee, Forest Laboratories, 2, Merck Pharmaceuticals, 1, Novartis Pharmaceutical Corporation, 1, Elian Corporation, 1.
important causal beliefs about disease-onset. Responses were categorized and
weighted by rank to determine the relative frequency of beliefs. Participants
each rated 18 specified causal beliefs (obtained from the well-validated revised
Illness Perception Questionnaire, IPO-R) on a 5-point scale, with higher
scores indicating stronger agreement. Response scores to the specified items
were summed into a belief score which defined strength of causal beliefs.
Psychological impact was measured using a scale from the IPO-R assessing
the negative emotional impact of vasculitis. The Medical Outcomes Study
General Health Survey was used to assess functional impairment (physical,
role, and social). Pearson correlation coefficients were calculated between
belief scores, psychological, and functional impairment.

Results: 692 participants with 9 forms of vasculitis were included. There
was considerable variability of causal beliefs among participants and beliefs
differed by type of vasculitis (Table). The most common beliefs listed by
participants using the open-ended approach were environmental exposures
(16%), stress (15%), hereditary factors (15%), and infection (15%). For the
18 specified items (scored 1-5), altered immunity (3.6 ±1.1) and stress
(3.2 ±1.3) were the most agreed upon causal items for each type of vasculitis.
Negative emotional impact of illness, role, and social function were signifi-
cantly correlated with belief score (r = 0.26, 0.12, 0.12; p<0.01). Physical
function was not significantly associated with belief score (r=0.07, p<0.09).

Table. Frequency (%) of Disease-Onset Causal Beliefs in Systemic Vasculitis

<table>
<thead>
<tr>
<th>Causal Belief</th>
<th>Total N=692</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental exposure</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Stress</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Hereditary</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Infections</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Altered immunity</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Other Risk Factors</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Medications and Vaccines</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Psychological Factors</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Chance</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Past Medical Problems</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11</td>
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<td>1</td>
<td>11</td>
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<td>0</td>
<td>11</td>
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</tbody>
</table>

The most common beliefs per column are highlighted in bold. *Other Risk Factors = diet or
gating habits, poor medical care, my own behavior, ageing, alcohol, smoking, accident or injury.
Psychological Factors = my mental attitude, family problems, my emotional state, overwork,
my personality. BD= Behcet's disease; CNS = central nervous system vasculitis; CSS= Churg-
Strauss syndrome; GCA= giant cell arteritis; HSP= Henoch-Schlein purpura; GPA= microscopic polyangiitis; PAN= polyarteritis nodosa; TAK= Takayasu’s arteritis; GPA= granulomatosis with polyangiitis ( Wegener’s).

Conclusion: Patient beliefs related to the cause of systemic vasculitis are
highly variable. Patients with strongly-held causal beliefs report that their
illness has greater negative impact on their psychological well-being and their
ability to perform role and social functions. Clinicians who care for patients
with vasculitis should be mindful of these associations and consider asking
patients about their causal beliefs.

Disclosure: P. C. Grayson, None; N. Amudala, None; C. McAlear, None; R. Leduc,
None; D. Shereff, None; R. Richesson, None; L. Frankei, None; P. A. Merkel, None.

2429

Balancing Work and Health: Do Younger Workers Experience More Work-Health Conflict Than Middle- and Older-Aged Workers with Rheumatic Diseases? Afri Jetha, Xingshan Cao and Monique A. Gignac. 1Health Care and Outcomes Research, Toronto Western Research Institute; 2Dalhia Lana School of Public Health, University of Toronto, Toronto, ON, 3Arthritis Research Centre, Vancouver, BC, 4Arthritis Research Centre, Vancouver, BC, 5University of British Columbia, Vancouver, BC.

Background/Purpose: Research on work-life balance with healthy adults
finds that difficulties balancing roles is related to negative employment
outcomes. Yet, little is known about work-health balance among those with
rheumatic diseases, especially in different age groups or career stages.

Objective: To compare perceptions of work-health balance/conflict in
younger (18 to 30 years of age) and older (greater than 30 years of age)
workers, as well as demographic, health, and job context factors associated
with work-health balance/conflict.

Methods: Data from two separate studies were combined: an online
survey of 143 young adults (mean age=23.3, SD=3.5, range: 18-30 years)
with juvenile arthritis and systemic lupus erythematosus; and a telephone
survey of 350 workers (mean age =54.2, SD = 8.9; range: 26–69 years)
with inflammatory arthritis and osteoarthritis. Respondents completed the
Arthritis-Work Spillover Scale (AWS), a 6-item measure of perceived
rheumatic disease-related work-health conflict (1 = “strongly disagree”; 5 =
“strongly agree”). Participants also completed information on demographics,
health (e.g. diagnosis, pain), and work context factors (e.g. work hours, work
activity limitations). Descriptive analyses and separate multivariate linear
regression analyses by age group (18 to 30 years of age; greater than 30 years)
examined factors associated with AWS.

Results: Younger workers reported working significantly fewer hours
(30.7 vs. 34.8) and were more likely to work in sales and service jobs (36% vs.
21%) than workers aged 30 years or older (p<.05). AWS was significantly
lower among younger workers (mean=2.5, SD= 1.1 versus mean=2.9,
SD=1.0; p<.05). Although health and work context factors were associated
with AWS for all workers, R-squared values indicated that health factors
explained more of the variance in younger workers and work context factors
were more important for older workers. Specifically, pain was related to more
AWS in younger adults and work hours, job disruptions (e.g., missed
meetings), and disclosing one’s disease to an employer were associated with
higher AWS in workers older than 30 years of age. Workplace activity
limitations was related to increased AWS for all workers.

Conclusion: Younger workers with rheumatic diseases reported less
work-health conflict which can be related to differences in the type and hours
of their work. In reducing work-health conflict, pain management may be
particularly important for younger workers and workplace accommodations
may be important for older workers. Future research needs to examine age
differences in greater detail, as well as how care management and work
context factors.

Disclosure: A. Jetha, None; X. Cao, None; M. A. Gignac, None.

2430

Using the Internet in Help-Seeking As Illness Develops in Early Rheumatoid Arthritis, Anne F. Townsend, Jenny Leese, Catherine L. Backman, Paul M. Adam and Linda C. Li. 1Arthritis Research Centre of Canada, Vancouver, BC, 2Arthritis Research Centre, Vancouver, BC, 3University of British Columbia, Vancouver, BC, 4Mary Pack Arthritis Centre, Vancouver, BC, 5Arthritis Centre of Canada and Department of Physical Therapy, University of British Columbia, Vancouver, BC.

Background/Purpose: Patients’ Internet use for health purposes is
regarded as potentially transformational. Using on-line resources is
associated with the emergence of the e-patient; broadly defined as someone
who is an involved and empowered partner in care and is engaged in informed
decision-making. We know little however, about how Internet use influences
help seeking, the patient-physician consultation and informed decision-making
in early rheumatoid arthritis (RA). This qualitative study examines patient
accounts of their Internet use during the 12 months following their diagnosis
of RA to describe how it impacted patient help seeking and how Internet use
took over.

Methods: Twenty-two participants (17 women, 5 men), age range
30s–70s were recruited, within 12 months of an RA diagnosis, from
rheumatologist and family physician offices and online patient advocacy
groups. A series of 3–4 in-depth interviews were conducted over twelve
months to track illness experiences and behaviors over time. The interview
guide is based on 3 areas: 1) Pre-diagnosis symptoms, impact and manage-
ment; 2) Experiences with health professionals leading to the diagnosis; 
3) Post-diagnosis experience of symptoms, management and the health care
system. Analysis is informed by grounded theory. Early analysis was
conducted concurrently with data collection enabling new and salient questions to be
introduced to the interview schedule. Internet use as impacting illness
behaviors emerged as an early theme and was subsequently included as a
topic for inquiry in all interviews.

Results: Preliminary analysis identified that online patients’ experi-
ences affected help seeking in a range of ways. Three early themes emerged:
1) Information seeking: participants compared different sites to validate
information and favored institutional sites offering factual information over
personal blogs, which could heighten their anxieties; 2) Help-seeking sup-
port: the Internet provided participants with information which some discussed
with their family doctor e.g. to gain a specialist referral, while others used it
as a “second opinion” to compare with their doctor’s advice; 3) Evolving
strategies: Over time participants changed the way they used the Internet; e.g.
some used it less as they secured knowledge and support from their doctors,
and others used it in a more targeted or selective way.
Conclusion: Our findings show how our participants used the Internet in a range of ways, which impacted their help seeking, and had the potential for both positive and negative impacts. As Internet use becomes a key feature of help seeking, it influences patients’ experiences. This has implications for both the patient’s and clinician’s role in managing RA. More research is needed to identify the ways in which health professionals can best support patient Internet use for optimum outcome, and encourage patients to become more informed partners in care.

Disclosure: A. F. Townsend, None; J. Leese, None; C. L. Backman, None; P. M. Adam, None; L. C. Li, None.

ARHP Concurrent Abstract Session
Physical/Occupational Therapy and Exercise in Patients with Rheumatoid Disease

Tuesday, November 13, 2012, 9:00 AM–10:30 PM

2431
Are Occupational Therapy Interventions Included in the Most Commonly Used European Clinical-Practice Guidelines for the Management of Osteoarthritis? Michaela Stofer1, Doris Taurk2, Birgit Prodinger1, Jelent S. Stamm3, Anthony D. Woolf4 and Tanja A. Stamm4. 1Medical University of Vienna, Austria; 2Orthopaedic Hospital Vienna Speising, Austria; 3University of Western Ontario, Canada; 4Medi- cinal University of Vienna, Austria

Background/Purpose: The EUMUSC.net project facilitates cooperation between EU Member States and promotes a comprehensive European strategy to optimise musculoskeletal health.

Part of the EUMUSC.net project was devoted to retrieving clinical practice guidelines (CPG) for Osteoarthritis (OA) and to appraise them critically. The purpose of this study was to identify the relevance given to occupational therapy interventions.

Methods: National rheumatological scientific societies, social leagues and health professional associations were contacted and asked to provide relevant documents. Furthermore, a systematic review of the respective literature was conducted in Medline, CINAHL and the Internet. Documents fulfilling pre-defined inclusion and exclusion criteria have been critically appraised by two independent assessors using the AGREE II Instrument. All six CPGs obtained the highest scores in the domain “Scope and Purpose” followed by remark- able improvements seen after completing the Arthritis Foundation’s 8-week Tai Chi course.

Conclusion: The EUMUSC.net project facilitates cooperation between EU Member States and promotes a comprehensive European strategy to optimise musculoskeletal health.

Disclosure: M. Stofer, None; D. Taurk, None; B. Prodinger, None; J. S. Stamm, None; A. D. Woolf, None; T. A. Stamm, None.

2432
Arthritis Foundation’s Tai Chi Program for People with Arthritis: One Year Follow-up. My-Linh Luong5, Rebecca J. Cleveland2, Betsy Hackney3 and Leigh F. Callahan5. 1University of North Carolina at Chapel Hill, Chapel Hill, NC; 2University of North Carolina, Chapel Hill, NC

Background/Purpose: To evaluate program adherence and whether the improvements seen after completing the Arthritis Foundation’s S-week Tai Chi course remained for reduction of symptoms, increased function, and improved psychosocial status in participants with arthritis one year after program completion.

Methods: At one year after the end of the intervention, individuals who completed the S-week follow-up (n=144) were mailed a self-report questionnaire designed to assess continuation of the Tai Chi program as well as evaluate pain, fatigue and stiffness visual analog scales (VAS), Health Assessment Questionnaire (HAQ), general health, Rheumatology Attitudes Index (RAI, helplessness), and Arthritis self-efficacy (ASE) for pain and symptoms. Participants also completed the PROMIS™ (PRP) Short Form instruments for sleep disturbance and satisfaction with social roles. Regression analyses evaluated the change in scores from baseline assessment to 1-year follow-up, with adjustment for baseline score, age, gender, and BMI.

Results: The follow-up rate for the 1-year evaluation was 78% (n=113) and 31% reported that they continued participation in the Tai Chi Program (n=35) after completion of the S-week follow up. Overall, those who participated in the Tai Chi program at baseline reported improvements in several self-reported health status measures one year after completion of the program. Modest improvements were seen for pain and stiffness VAS (effect size [ES] = 0.30 and 0.25, respectively). Participants also reported statistically significant improvements for helplessness, pain impact and pain behavior (ES = 0.23, 0.21, and 0.32, respectively). However, when comparing those who continued to practice Tai Chi at one year with those who did not, there were no statistically significant differences in improvements from baseline in self-reported measures for those who continued with the Tai Chi program except for helplessness (RAI, ES = 0.49 vs. ES = 1.1, p = 0.03). The most frequently cited reasons for not continuing the Tai Chi program were that participants did not feel comfortable doing Tai Chi outside of a class setting (41%) and that there were no classes convenient to them (37%). 95% of participants said they would recommend the program to others.

Conclusion: Participants in the AF Tai Chi program showed continued modest improvements in pain, and stiffness. The HAQ measure of physical function did not indicate significant change; however those who continued practicing Tai Chi saw improvements in feelings of helplessness. While we did not observe sustained effects of the Tai Chi program, those who participated enjoyed the program and many did not continue with the program due to lack of availability in their area.

Disclosure: M. L. Luong, None; R. J. Cleveland, None; B. Hackney, None; L. F. Callahan, None.

2433
Integration of a Healthy Aging Program Into the Arthritis Foundation Exercise Program: Six-Month Results. Elizabeth A. Schlenk1, Joni Vander Bilt2, Wee-Hian Lo-Cugnic3, Sarah E. Woody3, Janice C. Zgibor3, Molly B. Conroy4, C. Kent Kwoh5 and Anne B. Newman5. 1University of Pittsburgh, Pittsburgh, PA; 2University of Pittsburgh, Pittsburg, PA; 3University of Pittsburgh and VA Healthcare System, Pittsburgh, PA

Background/Purpose: In 2001, the University of Pittsburgh Prevention Research Center (PRC) developed the “10 Keys”™ to Healthy Aging program in response to the need to promote healthy aging. The “10 Keys”™ focus on systolic blood pressure (BP), smoking cessation, cancer screenings (breast, cervical, prostate, and colon), immunizations (influenza and pneumo- nia), blood glucose, LDL cholesterol, physical activity, musculoskeletal health (bone density test and BMI), social contact, and combat of depression. Primary objectives of the program were collaboration and dissemination. In 2010, the PRC partnered with the Arthritis Foundation (AF) of Western Pennsylvania and targeted older adults with arthritis or joint pain for a
community-based, group-delivered intervention. We hypothesized that the integrated program would improve preventive behaviors and outcomes targeting both arthritis and clinical assessments of preventive health goals.

**Methods:** A quasi-experimental design was used for this pilot study ($N=51$). A 10-week curriculum that integrated the “10 Keys™” program into the AF Exercise Program was developed, instructors were recruited and trained, and host sites and participants were recruited. Classes were held twice weekly in three sites and once weekly in one site. Data were collected at baseline, post-intervention, and six months post-intervention and included BP, BMI, cholesterol and glucose levels, questionnaires [preventive behaviors; WOMAC scales: pain (range 0–20), stiffness, and function (range 0–68); Loneliness subscale of the Perceived Isolation scale (range 0–12); and Stanford Arthritis self-efficacy scale (range 0–30)], and Short Physical Performance Battery (SPPB, range 0–12).

**Results:** Participants were on average 75.5 (SD=9.3) years of age and primarily white (92%, n=47) women (88%, n=44) who reported an arthritis diagnosis (73%, n=37). Thirty-eight (75%) participants attended >50% of the classes. At six months, 50% (n=18) performed the AF Exercise Program exercises 1–2 days/week, and 28% (n=10) did so 3–7 days/week. Baseline to six-month results demonstrated significant improvements in WOMAC function in worst knee/hip (Ms 23.0 to 17.7, p<0.01), loneliness (Ms 4.3 to 3.6, p=0.002), self-efficacy for communication with a physician (Mds 28.5 to 30.0, p<0.006), and SPPB (Mds 10.0 to 11.0, p=0.02). Trends in improvements from baseline to six months were seen in diastolic BP (Ms 72.4 to 69.3 mm Hg, p<0.05), influenza vaccinations (Ms 54% to 99%, p=0.06), and WOMAC pain in worst knee (Ms 7.4 to 6.2, p=0.09). Participants (29%, n=34) rated the program overall as excellent or very good.

**Conclusion:** Our results indicate that this pilot program was feasible, was successful in engaging community partners, and improved participant behaviors and outcomes six months post-intervention. A clustered randomized trial comparing the integrated community program to the AF Exercise Program is underway.

**Disclosure:** E. A. Schlenk, None; J. Vander Bilt, None; W. H. Lo-Ciganic, None; S. E. Woody, None; J. C. Zgibor, None; M. B. Conroy, None; C. K. Kwok, None; A. B. Newman, None.

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**2434**

**Effects of Interventions That Aim to Increase Exercise Adherence in People with Arthritis: A Best Evidence Synthesis**

Katie, E. MacPherson1, Allison M. Ezzat2, Jenny Leese3 and Linda C. Li4. 1University of Pittsburgh, Pittsburgh, PA, 2Pittsburgh, PA, 3University of Pittsburgh, Pittsburgh, 4Allegheny General Hospital, Pittsburgh, PA

**Background/Purpose:** Carpal tunnel syndrome (CTS) is a prevalent peripheral upper extremity neuropathy. Splinting and exercise is often recommended for those with mild to moderate symptoms. Lumbroal muscles of the hand appear to affect carpal tunnel canal pressure and CTS symptoms. We hypothesized that a lumbral intensive treatment of nocturnal splinting and stretching exercises would provide greater improvements in impairments than less lumbral intensive treatments.

**Methods:** A randomized controlled 2×2 factorial design study was conducted with four groups: Lumbral splint/Lumbral stretch (Lsp/Lst); General splint/Lumbral stretch (Gsp/Lst); Lumbral splint/General stretch (Lsp/Gst); General splint/General stretch (Gsp/Gst). Appropriate patients with mild/moderate CTS were recruited by 2 hand surgeons.

**Assessments** were obtained at baseline and 4 weeks after completion of an at-home regimen of splinting and exercise. Grip strength and lateral and palmar pinch were measured using standardized assessment tools. Fine motor dexterity was evaluated using the Purdue Pegboard.

**Results:** The average age of this cohort (N=93) was 53.3±11.8 years. The majority were female (71.8%), with chronic carpal tunnel symptoms ≥3 months (85.7%). As CTS was most prevalent for the right (43.7%) or bilateral hand (38.8%) and the majority were right handed (91.3%), only right-sided results are provided for strength measurements (Table 1). There were no significant differences in demographics between groups.

**Table 1. Results of 2-way ANOVA between Baseline and 4 week follow-up**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>Group</th>
<th>LsplLst</th>
<th>GspLst</th>
<th>LsplGst</th>
<th>GspGst</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Right Group (kg)</em></td>
<td>Base</td>
<td>22.8±12.3</td>
<td>25.2±11.1</td>
<td>24.0±11.3</td>
<td>24.9±12.7</td>
<td>24.9±12.7</td>
</tr>
<tr>
<td></td>
<td>4 wk</td>
<td>23.8±13.0 (0.24)</td>
<td>27.4±10.4 (0.22)</td>
<td>27.6±12.5 (0.32)</td>
<td>20.2±12.4 (0.26)</td>
<td>20.2±12.4 (0.26)</td>
</tr>
<tr>
<td><em>Right Palmar (kg)</em></td>
<td>Base</td>
<td>6.0±2.4</td>
<td>7.3±1.4</td>
<td>6.5±2.5</td>
<td>6.5±2.5</td>
<td>6.5±2.5</td>
</tr>
<tr>
<td></td>
<td>4 wk</td>
<td>6.5±2.4 (0.21)</td>
<td>7.4±1.7 (0.07)</td>
<td>6.7±2.5 (0.08)</td>
<td>7.5±3.0 (0.23)</td>
<td>7.5±3.0 (0.23)</td>
</tr>
<tr>
<td><em>Right Lateral (kg)</em></td>
<td>Base</td>
<td>7.3±2.3</td>
<td>8.4±2.0</td>
<td>7.5±2.2</td>
<td>7.5±2.2</td>
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</tr>
<tr>
<td></td>
<td>4 wk</td>
<td>7.5±2.5 (0.09)</td>
<td>8.5±2.1 (0.05)</td>
<td>7.3±2.2 (0.14)</td>
<td>7.3±2.2 (0.14)</td>
<td>7.3±2.2 (0.14)</td>
</tr>
<tr>
<td><em>Parade Right (m)</em></td>
<td>Base</td>
<td>11.6±3.1</td>
<td>12.3±2.1</td>
<td>11.6±2.5</td>
<td>12.5±2.1</td>
<td>12.5±2.1</td>
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<tr>
<td></td>
<td>4 wk</td>
<td>12.6±3.2 (0.12)</td>
<td>13.5±2.4 (0.07)</td>
<td>12.3±2.4 (0.28)</td>
<td>13.2±2.4 (0.33)</td>
<td>13.2±2.4 (0.33)</td>
</tr>
<tr>
<td><em>Parade Left (m)</em></td>
<td>Base</td>
<td>11.3±2.5</td>
<td>12.2±2.6</td>
<td>12.0±2.9</td>
<td>12.3±1.8</td>
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<td>4 wk</td>
<td>12.6±2.5 (0.08)</td>
<td>12.6±2.5 (0.15)</td>
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<td>13.3±2.0 (0.56)</td>
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<tr>
<td><em>Parade Both (m)</em></td>
<td>Base</td>
<td>18.5±5.4</td>
<td>19.5±4.4</td>
<td>18.2±5.2</td>
<td>20.3±3.4</td>
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</tr>
<tr>
<td></td>
<td>4 wk</td>
<td>19.5±5.4 (0.10)</td>
<td>19.9±4.4 (0.09)</td>
<td>19.5±5.1 (0.18)</td>
<td>19.7±2.8 (0.18)</td>
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</tr>
</tbody>
</table>

* (lumbral splint, lumbral stretch), † (general splint, lumbral stretch), ‡ (lumbral splint, general stretch), § (general splint, general stretch)

© effect of time main effect; †represented by group main effect

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2-way ANOVAs were performed using SPSS 18 with group as the between-subjects factor and time as the within-subjects factor. Post hoc analyses used pairwise comparisons on difference scores for significant between-group outcomes with alpha set at 0.05. We calculated a Cohen’s D to identify the clinical effect of the intervention.

The main effect of time was significant for all but Purdue - both hands. When analyzing group by time interactions the only outcomes with significant change were Right Lateral pinch (p=0.03) with greatest improvement in the GspGst group, and Purdue - left hand only (p=0.03) with greatest improvement in the LspLst group. Overall the group using the GspGst demonstrated the greatest clinical improvements (small to moderate D).
Conclusion: All groups showed significant improvements over time regardless of treatment. Intensive lumbral treatment was significantly better only for Purdue left hand, however, dexterity tasks such as Purdue both hands and Purdue assembly also showed greater improvement for this group (D scores were small to moderate). It appears that a more intensive lumbral treatment may affect dexterity more than strength at 4 weeks follow-up. Future CTS research should examine the effects of more intensive lumbral treatments on impairments over a longer follow-up period.

Disclosure: N. A. Baker, None; K. Moehling, None; E. Rubinstein, None; N. Gustafson, None; M. Baratz, None.

2436

Clinical Effectiveness and Costs of an Integrated Rehabilitation Programme Compared with Outpatient Physiotherapy for Chronic Knee Pain. Mike Hurley1, Dr Nicola E. Walsh2 and Sally Jessop3. 1St George's University of London, London, United Kingdom, 2University of the West of England Bristol, Bristol, United Kingdom, 3Kent, United Kingdom

Background/Purpose: Chronic knee pain is a major cause of disability. Management guidelines recommend exercise and self-management interventions. We previously described a rehabilitation programme that integrates exercise and self-management (Enabling Self-Management and Coping with Arthritic Knee Pain through Exercise, ESCAPE-knee pain) that produced short term improvements in pain and physical function. Sustaining these improvements is problematic. In addition, the programme is untried in the short term improvements in pain and physical function. Sustaining these improvements is problematic. In addition, the programme is untried in the community where it is most likely to be delivered. This study evaluated the feasibility of delivering ESCAPE-knee pain in a community setting, and compared its clinical effectiveness and costs with Out-Patient Physiotherapy.

Methods: This was a pragmatic, randomised controlled trial. 64 people with chronic knee pain were randomised to receive Out-Patient Physiotherapy or the ESCAPE-knee pain programme in a Local Adult Education Community Centre. Primary outcome was physical function assessed using the Western Ontario and McMaster Universities Osteoarthritis Index. Secondary outcomes included pain, objective functional performance, anxiety, depression, exercise-related health beliefs, exercise self-efficacy and healthcare utilisation. All outcomes were assessed at baseline and 12 months after completing the interventions (primary endpoint). ANCOVA investigated between-group differences.

Results: Both groups demonstrated similar improvements in clinical outcomes, except health beliefs and self-efficacy where improvements were greater in ESCAPE-knee pain participants. Out-Patient Physiotherapy cost £130 per person and its participants had healthcare utilisation costs over one year of £583, the ESCAPE-knee pain programme cost £64 per person and participant’s healthcare utilisation was £320.

Conclusion: ESCAPE-knee pain and Out-Patient Physiotherapy produced sustained physical and psychosocial benefits, but ESCAPE-knee pain cost less and was more cost-effective. Greater improvements in beliefs about the role of exercise in the management of knee pain, and their confidence in their ability to perform exercise that will help their knee pain (exercise self-efficacy), may make ESCAPE-knee pain participants more self-reliant and utilise less healthcare resources, thereby accounting for the better cost-effectiveness of ESCAPE-knee pain.

Disclosure: M. Hurley, None; D. N. E. Walsh, None; S. Jessop, None.

2437

Initiating an Innovative Training Programme to Improve Access to Musculoskeletal Health Care in Kenya. Anthony D. Woolf1, Jo Erwin2, Omondi G. Oyoo3, Lillian Mwaniki4, Ingrid Cederlund5, Paul Etau6 and Katie Edwards7. 1Royal Cornwall Hospital, Truro Cornwall, United Kingdom, 2Royal Cornwall Hospital, Teliske, United Kingdom, 3University of Nairobi, Nairobi, Kenya, 4Association for Arthritis & Rheumatic Diseases of Kenya, Nairobi, Kenya, 5Reumatikverkordet, Stockholm, Sweden, 6University of Nairobi, Nairobi, Kuwait, 7Royal Cornwall Hospital, Truro, United Kingdom

Background/Purpose: Musculoskeletal conditions (MSC) are common in Kenya yet the training of primary care physicians in MSC is minimal and there are only 2 full time rheumatologists for a population of 41 million. The aim of this project, supported by ILAR, is to enable early access to appropriate health care for MSC in Kenyan communities. In a collaboration between colleagues in Kenya, UK and Sweden an innovative sustainable training programme has been developed to raise the knowledge and skills of health professionals working in the community in the early detection, diagnosis and management of MSC.

Methods: A programme was developed to train a cohort of mid-grade physicians and patients as trainers in musculoskeletal health. These trainers teach health providers that are the first point of contact for patients in the community eg. clinical officers. The training emphasises history and examination to identify the musculoskeletal syndrome; the use of basic investigations, diagnosis, management and referral. The trainers work as a physician/patient team with the patients playing a key role in teaching history taking and examination skills and in making health providers aware of the impact of MSC on patient’s lives.

Results: A train the trainer session was held in March 2012. 10 physicians and 9 patients were trained to become trainers in a 2.5 day session followed by a one-day demonstration training session which was videoed as a resource for the trainers. The trainers have gone on to deliver training to 150 first contact providers in 4 regions across Kenya. The content and delivery of the trainer and health provider courses were rated by participants as very good or excellent. After the first round of health provider training 75% of participants felt they were well prepared to use the skills in MSC diagnosis and 68% felt they were well prepared to use the skills in MSC management in their daily work. A 6 month post training evaluation was completed.

Training patients to be educators has started empowering them in advocacy and self-management. The project recognises the need to work with patients to develop an appropriate self management programme for Kenya and plans to address this in the future.

Conclusion: This sustainable programme has developed a system and resources for delivering effective and appropriate musculoskeletal health care training to first contact health providers across Kenya. It has also raised the level of knowledge and competency of mid-grade physicians so they can fill the gap between first contact providers and hospital specialists.

Disclosure: M. Hurley, None; D. N. E. Walsh, None; S. Jessop, None.

2438


Background/Purpose: Musculoskeletal symptoms (MSS), such as pain, numbness or cold, are common and distressing occurrences during computer use. One commonly used method to reduce MSS is workstation redesign which aims to “fit the workstation to the worker” and thereby reduce awkward postures. However, recent systematic reviews have reported that this method may not be effective [1]. This pilot study tested if a systematic method of workstation redesign which focused on 19 areas where mismatch could occur may reduce MSS.

Methods: This was a single group pretest/posttest study that examined 26 computer operators with self-reported computer related MSS of at least 2 in one body area (neck/shoulder, arm/wrist, hand) on a scale of 0 to 10 (with 0 being no pain and 10 the worst possible). Workers completed an MSS survey, and a self-assessment of their workstation set-up, the Computer Ergonomic Survey (CES), and were photographed in their computer workstations. An expert in workstation redesign used the results of the CES and photographs to identify in which of the 19 areas mismatch could occur combined with active involvement of the worker in the development of the workstation redesign intervention plan (personalized ergonomics) would reduce or eliminate MSS one month after intervention.

Results: The 26 computer operators mean age was 46.4 (±10.5). They were primarily female (92%) and used a computer, on average, 6.0 (±1.2) hours daily. The 19 areas of MSS were primarily neck/shoulder, arm/wrist, hand, and elbow. Both arms were affected for 13 operators, only one arm was affected for 11, and only hands were affected for 2. The CES results showed that the participants did not like their workstation set-up at baseline (mean score of 67) and that most MSS increased at baseline (mean score 65). The redesign resulted in a significant reduction of MSS in the posttest period.

Disclosure: A. D. Woolf, None; J. Erwin, None; O. G. Oyoo, None; L. Mwaniki, None; I. Cederlund, None; P. Etau, None; K. Edwards, None.
hours per day. There were significant reductions in MSS for all body areas on both the left and right sides. Reductions in MSS achieved clinically important levels of at least 1 point for the neck/shoulder (left -1.23; right - 1.08), and right hand (1.01). Many subjects reported complete elimination of MSS at follow-up; neck/shoulder – left 35%, right 31%; arm/wrist – left 27%, right 46%; hand – left 27%, right 35%. This change was significant for the left arm/wrist and both hands. The changes reported to have the greatest effect on MSS were: adjusting the chair height to ensure that the feet were well supported (29%), adjusting the monitor height to reduce head tilt (18%), and adjusting the arm support height to support the arm during computer use (18%). Ninety-five percent of subjects reported that they were satisfied with the recommended changes, and 100% reported that they found the process to be helpful and they felt empowered to be able to continue to adjust their workstation to continue reducing MSS.

Conclusion: This study suggests that a systematic method of computer workstation redesign combined with worker involvement lead to significant improvements in computer-related MSS.

Reference

Disclosure: N. A. Baker, None; K. Moehling, None.

2439

A Brief Exercise and Self Management Programme Improves Upper Limb Disability in People with Early Rheumatoid Arthritis. Lindsay M. Beare1, Victoria L. Manning1, David L. Scott2, Ernest Choy3 and Michael V. Hurley4. 1Kings College London, London, United Kingdom, 2King’s College London, London, United Kingdom, 3Cardiff University School of Medicine, Cardiff, United Kingdom, 4St George’s University of London, London, United Kingdom

Background/Purpose: Upper limb dysfunction occurs early in people with rheumatoid arthritis (RA) and deteriorates as the disease progresses, impacting on independence and work capacity. Exercise is a important component in the management of upper limb disability, however, studies focus on the hand in isolation and do not address potential proximal motor deficits. Individually tailored, home exercise regimens are required to address global upper limb dysfunction which, if completed in the long term, could encourage self management. This study evaluated the efficacy of a global, upper limb home exercise programme supplemented with a brief supervised exercise, education and self management (Education and eXercise Training in early Rheumatoid Arthritis (EXTRA)) programme.

Methods: 108 adults with RA of less than 5 years duration (26 males, age mean (SD) 55 (15) years, disease duration 20 (19) months) were randomized to receive either Usual Care (n=52) or the EXTRA programme (n=56). This programme is a tailored home exercise regimen, focused on improving upper limb function, which is supplemented with 4 group supervised exercise, education and self management sessions, aimed at improving self efficacy and disease self management (2 sessions per week for the first 2 weeks, each session lasting approximately 1 hour, with 4–6 participants per group). Upper limb disability (Disability of Arm, Shoulder, Hand questionnaire (DASH)), grip strength, function (Grip Ability Test (GAT)), self efficacy (Arthritis Self Efficacy Scale - pain subscale (PSE)) and disease activity (Disease Activity Score (DAS 28)) were assessed at baseline, 3 months (primary end point) and 9 months. Intention to treat analysis using full factorial mixed Analysis of Variance (ANOVA) (treatment, time and treatment × time interaction) adjusted for baseline disease duration, disease activity and disability, and corrected for multiple comparisons, were used to determine between group differences. Significance was accepted at P<0.05.

Results: Compared to a usual care control group, participants who completed the EXTRA programme demonstrated improved disability, function, non dominant grip strength and self efficacy with no adverse effects on disease activity (Table). More details can be seen in the table.

Table

<table>
<thead>
<tr>
<th>Disease Activity Score (DAS 28)</th>
<th>Baseline</th>
<th>change at 3 months</th>
<th>change at 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Dominant Grip Strength</td>
<td>Baseline</td>
<td>57.5 (50.7, 64.2)</td>
<td>59.2 (52.9, 65.6)</td>
</tr>
<tr>
<td>change at 3 months</td>
<td>1.8 (-5.1, 1.5)</td>
<td>3.3 (-0.0, 6.6)</td>
<td>2.1 (-4.4, 8.6)</td>
</tr>
<tr>
<td>change at 6 months</td>
<td>-0.8 (-4.7, 3.0)</td>
<td>0.0 (-4.3, 4.7)</td>
<td>0.9 (0.0, 1.8)</td>
</tr>
</tbody>
</table>

Conclusion: The EXTRA programme improves upper limb disability, grip strength, self efficacy and function in people with early RA, with no detrimental effects on disease activity. This brief intervention may be easily implemented into clinical practice.

Disclosure: L. M. Beare, Physiotherapy Research Foundation, 2; V. L. Manning, Physiotherapy Research Foundation, 2; D. L. Scott, None; E. Choy, None; M. V. Hurley, None.

2440

Decisional Conflict Among Vulnerable Patient Populations with Rheumatoid Arthritis Is Associated with Limited Health Literacy and Non-English Language. Laura Trupin, Jennifer Barton, Gina Evans-Young, John B. Imboden, Andrew J. Gross, Dean Schillinger and Edward H. Yelin, UCSF, San Francisco, CA

Background/Purpose: Suboptimal communication in shared decision-making among vulnerable populations has been reported in rheumatoid arthritis (RA). National and international recommendations for quality health care highlight the importance of patient-centered care and involvement of patients in decision-making. The concept of decisional conflict captures the extent to which patients lack adequate information and support to make an informed health care decision. The objective of this study was to identify patient-level factors associated with high decisional conflict in RA treatment decisions among vulnerable populations who are at highest risk for poor health outcomes.

Methods: Data derive from a subset of participants in the RA Cohort Study, which enrolls adult RA patients from university-affiliated rheumatology clinics at an urban county hospital and a tertiary care facility. Enrollment for the present study occurred from September 2011 to May 2012; eligibility included having moderate to high disease activity, defined as a RAPID-3 score >6, and being a member of a vulnerable population based on the following criteria: immigrant, ethnic/racial minority, non-English speaker, age >65, or limited health literacy. Eligible patients completed a questionnaire in English, Spanish, or Chinese immediately after their clinic appointment. The questionnaire included a screening measure of health literacy, a series of true-false questions about RA and its treatments, and a low-literacy version of the 10-item Decisional Conflict Scale (DCS), given to patients who reported discussing a medication change with their doctor. DCS scores were compared by gender, race/ethnicity, age, and language using non-parametric ANOVA (Kruskal-Wallis) tests. Correlations among DCS, RA knowledge, and health literacy were assessed with Spearman correlation coefficients.

Results: Of 163 cohort members screened, 97 had active disease according to their RAPID-3 score and were enrolled in the study; 48 of those patients reported receiving a new prescription or discussing a medication change and were included in this analysis. Mean age was 59 (±12), 75% were women, 58% immigrants, 82% ethnic minorities, 35% Spanish or Chinese speakers, 61% had limited health literacy. DCS scores ranged from 0 to 80 (higher scores indicate more decisional conflict). Scores were significantly higher (p<0.01) among Chinese (45±7) and Spanish speakers (23±6) as compared with African Americans (14±7) and Whites (12±8), but did not...
differ by age or gender. Higher decisional conflict was associated with lower levels of health literacy (Spearman’s r = 0.35, p = 0.01) and poorer RA knowledge (Spearman’s r = -0.36, p = 0.01).

Conclusion: Limited health literacy and non-English language were associated with greater levels of decisional conflict about a real-time RA treatment decision. Providing low literacy decision aid tools to reduce decisional conflict and promote shared decision-making may lead to more patient-centered care, treatment decisions that align with patient preferences, and ultimately, improved health outcomes among vulnerable populations with RA.

Disclosure: L. Trupin, None; J. Barton, None; G. Evans-Young, None; J. B. Imboden, None; A. J. Gross, None; D. Schillinger, None; E. H. Yelin, None.

2441

Readability and Suitability Assessment of Patient Education Materials in Rheumatic Diseases

Rennie L. Rhee1, Joan Marie Von Feldt2, H. Ralph Schumacher3 and Peter A. Merkel1. 1University of Pennsylvania, Philadelphia, PA, 2Univ of Pennsylvania/Philadelphia VAMC, Philadelphia, PA, 3University of Pennsylvania and VA Medical Center, Philadelphia, PA

Background/Purpose: Comprehension of health resources may be challenging for patients particularly those with limited health literacy. The objective of this study was to examine the readability and suitability of commonly used patient education materials for systemic lupus erythematosus (SLE), vasculitis, rheumatoid arthritis (RA), and osteoarthritis (OA) and to determine whether readability and suitability vary among diseases of different complexities.

Methods: Several highly popular web-based patient resources were chosen for evaluation: American College of Rheumatology (ACR), Arthritis Foundation (AF), Mayo Clinic Health Information, National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), UpToDate Basics, UpToDate Beyond the Basics, Vasculitis Clinical Research Consortium (VCRC), and Vasculitis Foundation. Readability was measured using the Flesh-Kincaid Reading Ease and Grade Level and computed after the removal of illustrations, tables, captions, disease and medication names, all forms of “rheumatology,” and defined terms. Suitability was determined by the Suitability Assessment of Materials (SAM), a score that considers characteristics such as content, graphics, layout/topography, and cultural appropriateness. Three different reviewers rated the SAM score and means were used in the analysis. Scores were then converted into a percentage by dividing the given score by the total possible score. A score of 0–39% was considered not suitable, 40–69% adequate, 70–100% superior.

Results: The education material for all four diseases studied had readability above the 8th grade level and readability did not differ among the diseases. The mean grade level for each resource ranged from 4.8 to 12.5 with a median grade level of 9.6. Only 5 of the 23 resources received superior suitability scores (ACR for SLE, ACR for OA, AF for RA, AF for OA, UpToDate Basics for OA). Suitability scores among the four diseases were similar and again did not differ based on disease complexity.

Readability by Grade Level

<table>
<thead>
<tr>
<th>Resource</th>
<th>SLE</th>
<th>Vasculitis</th>
<th>RA</th>
<th>OA</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR</td>
<td>10.0</td>
<td>10.5</td>
<td>7.3</td>
<td>8.8</td>
<td>9.2</td>
</tr>
<tr>
<td>AF</td>
<td>9.0</td>
<td>—</td>
<td>9.7</td>
<td>8.4</td>
<td>9.0</td>
</tr>
<tr>
<td>Mayo Clinic</td>
<td>8.0</td>
<td>7.8</td>
<td>7.6</td>
<td>7.0</td>
<td>7.6</td>
</tr>
<tr>
<td>NIAMS</td>
<td>11.4</td>
<td>—</td>
<td>11.6</td>
<td>9.8</td>
<td>10.9</td>
</tr>
<tr>
<td>UpToDate Basics</td>
<td>5.1</td>
<td>—</td>
<td>4.5</td>
<td>4.8</td>
<td>4.8</td>
</tr>
<tr>
<td>UpToDate Beyond</td>
<td>9.9</td>
<td>8.5</td>
<td>11.1</td>
<td>10.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Basics</td>
<td>—</td>
<td>10.6</td>
<td>—</td>
<td>—</td>
<td>10.6</td>
</tr>
<tr>
<td>Vasculitis</td>
<td>—</td>
<td>12.5</td>
<td>—</td>
<td>—</td>
<td>12.5</td>
</tr>
<tr>
<td>Foundation</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Suitability by mean SAM score (in percentage)

| ACR             | 76%*     | 48%       | 56%     | 79%*    | 65%   |
| AF              | 67%      | —         | 71%*    | 78%*    | 72%   |
| Mayo Clinic     | 61%      | —         | 61%     | 63%     | 69%   |
| NIAMS           | 36%      | 46%       | 40%     | 47%     | 38%   |
| UpToDate Basics | 58%*     | —         | 60%     | 76%*    | 65%   |
| UpToDate Beyond | 52%      | 52%       | 46%     | 57%     | 52%   |
| VCRC            | —        | 32%       | —       | —       | 32%   |
| Vasculitis      | —        | 33%       | —       | —       | 33%   |
| Foundation      | 57%      | 45%       | 56%     | 68%     | —     |

*SAM score considered superior

Conclusion: Patient education materials for rheumatic diseases other than UpToDate Basics are written at readability levels above the recommended sixth-grade reading level for the general public. Most resources were considered to have only adequate suitability. Scores were similar among the four diseases which suggest that disease complexity does not explain poor readability and suitability indices. Most educational resources for patients with rheumatic diseases should be revised to more appropriately communicate information about these diseases.

Disclosure: R. L. Rhee, None; J. M. Von Feldt, None; H. R. Schumacher, None; P. A. Merkel, None.

2442

Screening of Osteoporosis in Men Age 70 and Older: A Need for Increased Awareness

Sian Yik Lim, Kenneth Nugent, Joon Hee Lim, Hoda Mojazi Amiri, Rie Okamura and Dan Nguyen. Texas Tech University Health Sciences Center, Lubbock, TX

Background/Purpose: The National Osteoporosis Foundation (NOF) currently recommends osteoporosis screening with bone mineral density (BMD) testing in men age 70 and older, regardless of clinical risk factors. Despite these recommendations being published initially in 2008, data regarding BMD testing rates in men age 70 and older in a primary care setting in the United States are lacking. We hypothesize that BMD testing rates using Dual-energy X-ray absorptiometry (DEXA) scan in men age 70 and older remains low despite recommendations by the NOF.

Methods: We performed a retrospective chart review of male patients age 70 and older who were seen at the Internal Medicine Clinic at Texas Tech University Health Science Center, a major primary care setting in West Texas. We reviewed charts of patients seen between January 1st, 2011 and January 1st, 2012. We identified patients who had established the Internal Medicine Clinic as their primary care provider. We included patients who had been seen at least twice over a 3 year period. We excluded patients who were one time hospital discharge follow-ups and those who visited the internal medicine clinic for preop-eative evaluations. Demographic information and BMD testing status were determined from electronic medical records. 10-year osteoporotic and hip fracture probabilities of individual patients were calculated using the World Health Organization Fracture Risk Assessment Tool. Analysis of the effect of increasing age on BMD testing was performed using chi square test for trend with patients divided into age groups of 70–74, 75–79, 80–84, 85–89, 90–94 and 95–99. The Pearson’s correlation was used to analyze correlation of age with 10-year osteoporotic and hip fracture probabilities.

Results: The median age of our patients was 76 years (range 70–98 years). There were 341 male patients age 70 and older who were seen at the clinic during the study period. 310 patients were included in the study. 35 patients, which is 11.4% (95%CI [7.9–15.7]) of the study population received BMD testing using DEXA scans. BMD testing indicated that 8 patients (22.9%) were osteoporotic, 22 patients (62.9%) were osteopenic, and 5 patients, which is 11.4% (95%CI [7.9–15.7]) of the study population received BMD testing rates using Dual-energy X-ray absorptiometry (DEXA) scan in men age 70 and older remains low despite recommendations by the NOF.

Conclusion: Osteoporosis in men age 70 and older is still under-screened and underrecognized. Despite recommendations by the NOF for BMD testing using DEXA scan in men age 70 and older since 2008, BMD testing rates remain low. Although there was an increase in both the 10-year osteoporotic and hip fracture probabilities with age, no association was found between increased age and BMD testing. In view of the aging society in the United States, more has to be done to increase awareness of this major public health problem.

Disclosure: S. Y. Lim, None; K. Nugent, None; J. H. Lim, None; H. Mojazi Amiri, None; R. Okamura, None; D. Nguyen, None.

S1028
Background/Purpose: There is little information on Systemic Lupus Erythematosus (SLE) patients undergoing total joint arthroplasty (TJA). The purposes of this study were to determine the patterns of TJA in a contemporary SLE cohort and to determine if SLE is a risk factor for worse outcomes compared with similar osteoarthritic (OA) patients.

Methods: Patients with SLE who underwent hip or knee arthroplasty between May 2007 and June 2011 and enrolled in our institution’s arthroplasty registry were eligible for this study. SLE cases were identified by ICD-9 code T70 and confirmed if they met 3/14 ACR criteria, were on immunosuppressant therapy, or had the diagnosis confirmed by a rheumatologist. Validated SLE cases were matched to two OA controls by age (+/- 2.5 years), gender, procedure, and presence of osteonecrosis (ON). ON was confirmed in cases and controls by pathology or radiology review. Pain and function were measured by WOMAC and the validated Lower Extremity Activity Scale (LEAS). Administrative and self-report data were collected at baseline and 2 years. Standard univariate comparisons were performed to compare SLE with matched OA cases at baseline and at two years post-op. Multivariate regressions were performed to analyze the relationship between diagnosis, presence of ON, and WOMAC pain and function at 2 years. TKA patients’ pre-operative expectations were measured with the validated TKR Expectations Survey.

Results: 101 SLE cases were identified, 56 hip (THR) and 45 knee (TKR). 5 cases could only be matched to 1 control. Pre-operatively, SLE THR cases had statistically and clinically significantly worse WOMAC pain, stiffness, and function than matched OA hips, (see Table). Renal failure, hypertension, pulmonary, and valvular disease were also more common in SLE THR patients. Both SLE-THA and TKA has statistically significantly worse SF-36 PCS compared with OA controls post-operatively. Two-years post-operatively, there were no differences in pain and function scores between SLE and OA controls. In controls post-operatively. Two-years post-operatively, there were no differences in pain and function scores between SLE and OA controls.

Table.

<table>
<thead>
<tr>
<th></th>
<th>SLE THA</th>
<th>OA THA</th>
<th>p-value</th>
<th>SLE TKA</th>
<th>OA TKA</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>54.4±14.3</td>
<td>54.3±14.2</td>
<td>0.89</td>
<td>62.4±9.1</td>
<td>62.6±9.4</td>
<td>0.9</td>
</tr>
<tr>
<td>Female</td>
<td>59.3±13.5</td>
<td>51.9±9.8</td>
<td>0.05</td>
<td>49.0±9.3</td>
<td>43.5±10.2</td>
<td>0.06</td>
</tr>
<tr>
<td>ONa</td>
<td>18.32(15.2)</td>
<td>29.28(29.6)</td>
<td>0.01</td>
<td>9.0(0.0)</td>
<td>2.22(0.0)</td>
<td>0.35</td>
</tr>
<tr>
<td>WOMAC Baseline</td>
<td>4.29±0.197</td>
<td>5.5±15.7</td>
<td>0.01</td>
<td>4.26±1.73</td>
<td>4.49±1.50</td>
<td>0.073</td>
</tr>
<tr>
<td>WOMAC total yr</td>
<td>9.0±0.132</td>
<td>9.2±13.8</td>
<td>0.5</td>
<td>8.1±1.59</td>
<td>10.7±3.04</td>
<td>0.06</td>
</tr>
<tr>
<td>WOMAC function</td>
<td>3.91±0.207</td>
<td>4.85±20.2</td>
<td>0.04</td>
<td>4.21±1.75</td>
<td>47.5±17.3</td>
<td>0.21</td>
</tr>
<tr>
<td>WOMAC pain</td>
<td>87.1±0.17</td>
<td>91.5±15.1</td>
<td>0.33</td>
<td>79.7±1.77</td>
<td>87.0±16.0</td>
<td>0.2</td>
</tr>
<tr>
<td>ED-50 scale</td>
<td>59.8±17.6</td>
<td>76.9±20.6</td>
<td>0.06</td>
<td>69.7±18.8</td>
<td>73.7±15.0</td>
<td>0.5</td>
</tr>
<tr>
<td>ED-50 yrs</td>
<td>69.9±16.8</td>
<td>84.0±12.9</td>
<td>0.02</td>
<td>82.2±9.7</td>
<td>81.5±17.0</td>
<td>0.88</td>
</tr>
<tr>
<td>SF-36 PCS Baseline</td>
<td>24.5±6.5</td>
<td>31.9±8.8</td>
<td>0.0001</td>
<td>27.3±6.7</td>
<td>33.7±8.1</td>
<td>0.0006</td>
</tr>
<tr>
<td>SF-36 PCS yrs</td>
<td>39.0±12.4</td>
<td>40.1±10.6</td>
<td>0.001</td>
<td>16.9±5.5</td>
<td>48.4±6.8</td>
<td>0.0007</td>
</tr>
<tr>
<td>LEAS Baseline</td>
<td>8.1±3.1</td>
<td>9.4±3.1</td>
<td>0.04</td>
<td>8.4±2.3</td>
<td>9.6±3.1</td>
<td>0.09</td>
</tr>
<tr>
<td>LEAS yrs</td>
<td>10.4±3.9</td>
<td>12.2±2.9</td>
<td>0.06</td>
<td>9.9±2.5</td>
<td>11.6±2.9</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Discussion: Both SLE and TKA patients have similar pain and functional outcomes at 2 years compared with matched OA controls. Although PCS scores improved after arthroplasty, they remained lower in SLE patients than OA controls. To our knowledge, this is the first study to demonstrate that neither SLE nor ON should be considered risk factors for poor post-operative outcomes.

Disclosure: U. Shah, None; L. A. Mandl, None; M. P. Figge, None; M. Alexiades, None; S. M. Goodman, None.

2444

Restricting Back Pain Is Associated with Disability in Community-Living Older Persons. Una E. Makris¹, Liana Fraenkel², Ling Han¹, Linda Leo-Summers¹ and Thomas M. Gill³. ¹UT Southwestern Medical Center, Dallas, TX, ²Yale University School of Medicine, Veterans Affairs Connecticut Healthcare System, New Haven, CT, ³Department of Medicine, New Haven, CT, Yale University, New Haven

Background/Purpose: Although back pain is common and costly, few longitudinal studies have evaluated the association between back pain, severe enough to restrict activity (hereafter referred to as restricting back pain), and the development of disability in mobility. Older persons who lose independence have higher rates of morbidity and mortality, and experience a poorer quality of life. We hypothesized that restricting back pain would be strongly associated with mobility disability over the 13+ years of follow-up.

Methods: We evaluated the 555 participants (mean age 77.5 years, 56% women) of the Precipitating Events Project, a prospective study of community-living persons aged 70+ years. We performed non-disabled at baseline, who completed monthly telephone assessments of restricting back pain and who were at risk for developing mobility disability for up to 159 months. Restricting back pain was defined as staying in bed for at least half a day and/or cutting down on one’s usual activities due to back pain. Mobility disability (hereafter referred to as disability) was defined as needing help with or inability to complete any of the following four tasks in any given month: walking a 1/4 mile, climbing a flight of stairs, lifting or carrying 10 pounds, or driving a car. The event rate for disability was estimated using a Generalized Estimation Equation Poisson model. A recurrent events Cox model was used to evaluate the associations between the occurrence of restricting back pain (yes/no) and subsequent (within one month) disability. The model was adjusted for fixed-in-time (sex, education, ethnicity) and time-varying covariates (age, chronic conditions, BMI, depressive symptoms, cognitive impairment, and physical frailty defined by slow gait speed) that were updated every 18 months. We tested potential interactions of restricting back pain with sex, BMI, depressive symptoms, and physical frailty.

Results: The event rate for disability was 8.47 per 100-person months (95% CI 8.08,8.88) with a median duration of 2 (interquartile range: 1–5) months. The frequency of each of the four disability items at baseline was 13.2% for walking a 1/4 mile, 3.6% for climbing stairs, 10.5% for lifting/carrying 10 pounds, and 11.2% for driving a car. After adjusting for covariates, restricting back pain was strongly associated with subsequent disability, with a hazard ratio (95% CI, p-value) of 3.35 (2.91,3.86, <0.001). Only the interaction with physical frailty was statistically significant (p = <0.001). Subgroup analyses suggest that restricting back pain is associated with disability among participants with and without physical frailty at baseline assessment 2.10 (1.67,2.63) and 4.06 (3.42,4.81), respectively.

Conclusion: In this longitudinal study, restricting back pain was independently associated with disability among older persons. It is possible that individuals who are not physically frail may be more active and therefore at higher risk for developing subsequent disability. Calculating absolute risk differences may help to clarify the results of our subgroup analysis. Interventions implemented to decrease or prevent restricting back pain are likely to decrease disability.

Disclosure: U. E. Makris, None; L. Fraenkel, None; L. Han, None; L. Leo-Summers, None; T. M. Gill, None.

2445

Ipsilateral Lower Extremity Joint Involvement Increases the Risk of Poor Pain and Function Outcomes After Hip or Knee Arthroplasty. Jasvinder A. Singh¹ and David Lewallen². ¹University of Alabama at Birmingham, Birmingham, AL, ²Mayo Clinic College of Medicine, Rochester

Background/Purpose: Persistent pain and functional limitation are unfavorable outcomes after knee and hip replacement, which are getting increasing attention due to a dramatic increase in rates of knee and hip replacements. Our objective was to assess the association of ipsilateral knee/hip pain on short- and midterm pain and function outcomes after total hip or knee arthroplasty (THA/TKA).

Methods: We used the prospectively collected data from the Mayo Clinic Total Joint Registry to assess the association of ipsilateral knee or hip joint pain with THR/TKA outcomes. We evaluated the association between pain in the ipsilateral knee or hip and poor pain and function outcomes at 2 years, controlling for demographic, medical, and surgical factors.

Results: A total of 24,806 patients with THR/TKA were included in the study. Of these, 11,827 patients had pain in the ipsilateral knee or hip. The risk of poor pain and function outcomes (measured by SF-36 PCS and WOMAC) was significantly higher in patients with ipsilateral knee or hip pain compared to those without pain in the ipsilateral knee or hip. The risk of poor pain and function outcomes was highest in patients with pain in both the ipsilateral knee and hip.

Conclusion: Ipsilateral knee or hip pain is associated with poor pain and function outcomes after THR/TKA, and the risk of poor outcomes is highest in patients with concomitant pain in both the ipsilateral knee and hip.
involvement with moderate-severe pain and moderate-severe functional limitation at 2- and 5-year follow-up after primary and revision THA and TKA using multivariable-adjusted logistic regression analyses. Analyses were adjusted for patient characteristics (unmodifiable—age and gender; and modifiable—BMI, comorbidity, depression and anxiety), implant fixation (cemented/hybrid versus not cemented) and health care access as assessed by the distance from medical center.

**Results:** At 2-year, 3.823 primary THA, 4.701 primary TKA, 1.218 revision THA and 725 revision TKA were studied. After adjusting for multiple covariates, ipsilateral knee pain was significantly associated with outcomes after primary THA (all p-values <0.001): (1) moderate-severe pain: at 2-years, odds ratio (OR), 2.3 [95% CI: 1.5, 3.6]; at 5-years, OR 1.8 [95% CI: 1.1, 2.7]; (2) moderate-severe functional limitation: at 2-years, OR 3.1 [95% CI:2.3, 4.3]; at 5-years, OR 3.6 [95% CI:2.6, 5.0]. Ipsilateral hip pain was significantly associated with outcomes after primary TKA (all p-values <0.01): (1) moderate-severe pain: at 2-years, OR 3.3 [95% CI:2.3, 4.7]; at 5-years, OR 1.8 [95% CI:1.1, 2.7]; (2) moderate-severe functional limitation: at 2-years, OR 3.6 [95% CI:2.6, 4.9]; at 5-years, OR 2.2 [95% CI:1.6, 3.2]. Similar associations were noted for revision THA and TKA patients.

**Conclusion:** Presence of ipsilateral joint involvement after primary and revision THA and TKA is a poor prognostic factor for pain and function outcomes. A potential way to improve outcomes may be to address ipsilateral lower extremity joint involvement.

**Disclosure:** J. A. Singh, Research and travel grants from Takeda, Savient, Wyeth and Amgen, 2; Honoraria from Abbott, Consultant fees from URL, Pharma, Savient, Takeda, Ardea Biosciences, Allergen and Novartis, 5; D. Lewallen, Zimmer, 5; Zimmer, 7; DePuy, Stryker and Zimmer, 2.

### 2446

**Activity Limitations Experienced by People with Rheumatoid Arthritis On Biologic Medications and Their Use of Ergonomic Methods.** Alison Hammond1 and Sarah Tyson2. 1University of Salford, Salford, United Kingdom, 2University of Salford, Manchester, United Kingdom

**Background/Purpose:** People with rheumatoid arthritis (RA) commonly have daily activity difficulties. Whilst biologies significantly improve ability, ergonomic methods (e.g. altered working methods, ergonomic equipment, activity and environment modification) may still improve ability further. The aim of this study was to investigate activity limitations of people with RA on biologics and their use of ergonomic methods.

**Methods:** Participants on biologics completed the Evaluation of Daily Activity Questionnaire (EDAQ): measuring ability performing 138 activities (grouped in 14 domains: Table 1). Activities are scored as 0 (no difficulty) to 3 (unable to do). Each is scored twice: Section A = ability without ergonomic methods or help; Section B (completed if difficulty) = ability with ergonomic methods (if used). Percentages of participants experiencing difficulties per activity section A were calculated. Score differences between sections A and B were analysed using paired t-tests.

**Results:** Participants were recruited from 14 Rheumatology units (n=198; 156 women; 42 men). Mean age = 59.16 (SD 10.46) years; RA duration 13.83 (SD 9.24) years. Biologics prescribed were: etanercept (n=75); adalimumab (57); rituximab (44), infliximab (16), golimumab (3), certolizumab (1) and abatacept (1). Average pain was 4.69 (SD2.57) and fatigue 5.47 (SD2.47). Average HAQ score was 1.21 (SD 0.83). Participants rated their health as: very good (9%); good (29%); fair (42%); poor (16%) and very poor (4%). Average EDAQ scores without ergonomic methods were at least 1.6 METs) based on the SW proprietary MET data. Each interval was categorized as sedentary or non-sedentary (labelled) (**rest with music, **read book, **knee ROM exercise in lying). According to the 2011 Compendium of Physical Activities (CPA), 5 activities were defined as *sedentary (<1.6 METs) and 4 were defined as **non-sedentary/light (1.6 to 3 METs). The middle 3-minute interval from each 5-minute time period was analyzed. Each SW activity was categorized as sedentary (<1.6 METs) or non-sedentary (≥1.6 METs) based on the SW proprietary MET data. Each AG activity was categorized as sedentary or non-sedentary, based on 2 different sedentary cut-points (<100 and < 589 activity counts/minute) for the AG vertical axis data.

**Percentage of activities correctly identified as sedentary (sensitivity) and non-sedentary (specificity), proportion of all activities identified as sedentary or non-sedentary that were in fact sedentary (positive predictive value – PPV) or non-sedentary (negative predictive value – NPV), as well as, the positive (LR+) and negative (LR-) likelihood ratios were calculated for both accelerometers.

**Results:** Compared against derived values from the 2011 Compendium of Physical Activities, SW performed notably better than AG in differentiating between sedentary and non-sedentary/light physical activities under controlled laboratory settings (Table 1). Accuracy of AG was not affected by the cut-point chosen.

**Table 1.** Summary of measurement accuracy of SenseWear Mini and Actigraph GT3X compared with the Compendium of Physical Activities

<table>
<thead>
<tr>
<th></th>
<th>SenseWear Mini</th>
<th>Actigraph GT3X (&lt;100 activity counts/minute)</th>
<th>Actigraph GT3X (&lt;589 activity counts/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (Sedentary)</td>
<td>0.98</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Specificity (Non-Sedentary)</td>
<td>0.70</td>
<td>0.63</td>
<td>0.59</td>
</tr>
<tr>
<td>PPV (Sedentary)</td>
<td>0.81</td>
<td>0.57</td>
<td>0.59</td>
</tr>
<tr>
<td>NPV (Non-Sedentary)</td>
<td>0.97</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>LR+ (Sedentary)</td>
<td>1.32</td>
<td>1.13</td>
<td>1.13</td>
</tr>
<tr>
<td>LR- (Non-Sedentary)</td>
<td>0.03</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Conclusion:** Our results suggest that SenseWear Mini may be a better accelerometer for objective measurements of low physical activity in people.
with inflammatory arthritis. Further studies are needed to examine the accuracy of SenseWear Mini for measuring physical activity under free-living conditions.

Disclosure: A. Y. F. Leung, None; L. M. Feehan, None; C. Macdonald, None; J. Leese, None; E. Carruthers, None; L. C. Li, None.

2448

Sustained Improved Physical Function Following an Integrated Rehabilitation Programme for Chronic Knee Pain, Mike Hurley1 and Dr Nicola E. Walsh2. 1St George’s University of London, London, United Kingdom, 2University of the West of England Bristol, Bristol, United Kingdom

Background/Purpose: Chronic knee pain causes personal suffering and impairs physical function and quality of life. Usual primary care involves prolonged drug therapy in spite of growing concerns about effectiveness and side-effects. Exercise and self-management interventions can have good short-medium term (up to 6 months) benefits, but whether short term benefits are sustained is largely unknown. Since chronic knee pain is a long term problem establishing long term outcome is important. We devised a rehabilitation programme that integrates exercise and self-management (Enabling Self-management and Coping with Arthritic knee Pain through Exercise, ESCAPE-knee pain), that produced short-medium term (6-months) improvements in physical functioning. To measure long term effects of the programme we continued to follow participants for 30 months after completing the programme.

Methods: 418 people from 54 primary care surgeries were randomised to receive i) usual care, or ESCAPE-knee pain delivered to ii) individual or iii) groups of 8 participants. As there no differences in the baseline or post-rehabilitation data between participants who received the programme individually or in groups these data were combined. Subjective physical function was measured by the Western Ontario and McMaster University Osteoarthritis Index function sub-scale (WOMAC-func) was assessed at baseline, immediately post-rehabilitation, 6-months, 18-months and 30-months after completing the ESCAPE-knee pain programme. Multilevel Modelling was performed to adjust for clustering, baseline WOMAC-func and missing data.

Results: At baseline physical function in both groups were similar. Immediately after the intervention, participants who undertook ESCAPE-knee pain reported better physical function than participants who remained on usual primary care. In the following 30 months, physical function of participants who remained on usual care remained unchanged. Physical function of participants who undertook the ESCAPE-knee pain programme improved at each assessment compared to baseline value, i.e. mean WOMAC-func decreased, (post-rehabilitation WOMAC-func -5.49 (95%CI -7.78, -3.19; p<0.0001); 6-month WOMAC-func -4.44 (-6.54, -2.33; p<0.0001); 18-month WOMAC-func -3.10 (-5.44, -0.76; p<0.0095) 30-month WOMAC-func -2.78 (-5.32, -0.23; p<0.0323), but declined over time becoming more similar to the usual care values.

Conclusions: ESCAPE-knee pain is an exercise-based rehabilitation programme for chronic knee pain that has sustained improvement in physical function for up to 2½ years after completing the programme. Models of care should be developed that will sustain for longer the initial improvement in physical functioning.

Disclosure: M. Hurley, None; D. N. E. Walsh, None.

ACR Plenary Session III: Discovery 2012
Tuesday, November 13, 2012, 11:00 AM—12:30 PM

2449

Head to Head Comparison of Subcutaneous Abatacept Versus Adalimumab in the Treatment of Rheumatoid Arthritis: Key Efficacy and Safety Results From the Ample (Abatacept Versus Adalimumab Comparison in Biologic-Naive RA Subjects with Background Methotrexate) Trial. Michael E. Weinblatt1, Michael H. Schiff2, Roy Fleischmann3, Robert Valente4, Desiree van der Heijde5, Gustavo Citera6, Cathy Zhao7 and Michael A. Maldonado8. 1Rheumatology & Immunology, Brigham & Women’s Hospital, Boston, MA, 2University of Colorado, Denver, CO, 3University of Texas Southwestern Medical Center, Dallas, TX, 4Arthritis Center of Nebraska, Lincoln, NE, 5Leiden University Medical Center, Leiden, Netherlands, 6Instituto de Rehabilitación Psicosocial, Buenos Aires, Argentina, 7Bristol-Myers Squibb, Princeton, NJ

Background/Purpose: The availability of multiple biologic agents to treat rheumatoid arthritis (RA) has created a need for comparative assessment. AMPLEx (Abatacept Versus Adalimumab Comparison in Biologic-Naive RA Subjects with Background Methotrexate) is the first head-to-head study powered to compare SC abatacept (ABA) and adalimumab (ADA) on a background of methotrexate (MTX). Here, we report key 1 year data from AMPLEx including ACR core component data.

Methods: AMPLEx is an ongoing, phase IIIb, randomized, investigator-blind study of 24 months duration with a 12 month primary efficacy endpoint. Biologic-naive RA patients with an inadequate response to MTX were randomized to 125 mg ABA weekly or 40 mg ADA bi-weekly, in combination with MTX. The primary end point was non-inferiority (NI) of ABA to ADA based on ACR 20 at 12 months; key secondary endpoints were rates of radiographic non-progression, safety, injection site reactions and retention. ACR core component data were also analyzed.

Results: A total of 646 patients were randomized and treated; 86.2% of ABA patients and 82.0% of ADA patients completed 12 months. Baseline characteristics were balanced across both arms (mean DAS28-CRP of 5.5 and disease duration 1.8 yrs). At 1 year, 64.8% of ABA patients and 63.4% of ADA patients achieved an ACR 20 response, with an estimated difference between the two arms (95% CI) of 1.8 (-5.6, 9.2) supporting NI of ABA to ADA. The kinetics of response across ACR scores were comparable overall, with an ACR50 of 46.2% and 46% and ACR70 of 29.2% and 26.2% for ABA and ADA, respectively, at 1 year. Similar responses over time were seen in some ACR core components (Figure). At 1 year, the rates of radiographic non-progression were comparable, as were mean changes in van der Heijde-modified total Sharp scores (0.58 vs. 0.38, for ABA vs. ADA respectively). The rates of AEs, SAEs, serious infections and malignancies were comparable. There were more patients with autoimmune AEs (3.1% vs. 0.9%) in the ABA arm; however, none were serious. One patient discontinued in each arm due to an autoimmune event. There were fewer discontinuations with ABA due to AEs (3.5% vs. 6.1%) and due to serious infections (0% vs. 1.5%). Injection site reactions occurred in significantly fewer ABA-treated patients (3.8% vs. 9.1% [p=0.006]).

Conclusion: This first head-to-head study in RA patients comparing biologic agents on background MTX demonstrated that subcutaneous abatacept is comparable to adalimumab by most efficacy measures, including radiographic progression. Safety was generally similar with fewer discontinuations and injection site reactions observed with abatacept.

Disclosure: M. E. Weinblatt, Bristol-Myers Squibb, Abbott, 2, Bristol-Myers Squibb, 5, M. H. Schiff, Bristol-Myers Squibb, 3, Abbott Laboratories, 8, R. Fleischmann, Genentech Inc., Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicomp, MSD, Novartis, BiogenIdec, Astellas, Astra-Zeneca, Jansen, 2, Roche, Abbott, Amgen, UCB, Pfizer, BMS, Lilly, Sanofi Aventis, Lexicomp, Novartis, Astellas, Astra-Zeneca, Jansen, HGS, 5, R. Valente, UCB, Pfizer, Novartis,Eli Lilly,Takeda, Centocor, 2, D. van der Heijde, Abbott, Amgen, AstraZeneca, BMS, Centocor, Chugai, Eli-Lilly, GSK, Merck, Novartis, Ono, Pfizer, Roche, Sanofi-Aventis, Schering-Plough, UCB, Wyeth, 5, Owner of Imaging Rheumatology bv, 4, G. Citron, Pfizer Inc, 2, Pfizer, Bristol-Myers Squibb, Astra Zeneca, 5, C. Zhao, Bristol-Myers Squibb, 1, Bristol-Myers Squibb, 3, M. A. Maldonado, Bristol-Myers Squibb, 3, Bristol-Myers Squibb, 1.
Evoked Pain Brain Response Is Associated with Reduced μ-Opioid Receptor Binding in Fibromyalgia. Heng Wang1, Daniel J. Clauw2, Jon-Kar Zubieta1 and Richard E. Harris1. 1University of Michigan, Ann Arbor, MI

Background/Purpose: Previous studies indicate that fibromyalgia (FM) patients have augmented clinical and brain responses to painful stimuli (i.e., hyperalgesia/allodynia), as well as increased production of endogenous opioids, and reduced μ-opioid receptor (MOR) binding. However, it is not known if these factors co-occur within the same individual or if these factors act independently. We performed a longitudinal investigation using functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) in chronic pain patients diagnosed with FM to address this question. If these factors operate in the same individual, we expected an inverse correlation between changes in fMRI evoked pain activity and MOR binding potential (BP).

Methods: fMRI and PET imaging sessions were performed on 18 female opioid-naïve FM patients (age 45.4 ± 13.0). Each participant underwent 4 weeks of non-pharmacological treatment. Before and after treatment, each patient underwent an fMRI scan with varying levels of pressure pain applied to the thumb as well as a 90-minute [11C]carfentanil PET scan under resting conditions. After quantification of the PET data with Logan plots, fMRI images and preprocessing of PET data were performed with statistical parametric mapping (SPM5). fMRI and PET scans were normalized to the same template. Difference images before and after treatment were calculated for both the fMRI contrast and PET images. A whole-brain voxel-by-voxel correlation analysis between the fMRI and PET difference images were carried out using the Biological Parametric Mapping toolbox. Activation clusters were defined based on a correlation coefficient, with R²>0.6 uncorrected. Clinical pain was assessed with Short Form McGill Pain Questionnaire (SFMPQ).

Results: Negative correlations between the change in the fMRI brain oxygenation level dependent (BOLD) signal and MOR BP were observed in multiple regions involved in pain processing and modulation: right posterior insula R = −0.82, P = 0.0004; left medial insula R = −0.82, P = 0.0003; left orbital frontal cortex R = −0.75, P = 0.0004; right amygdala R = −0.68, P = 0.002; brainsstem R = −0.71, P = 0.0009. Positive correlations were observed in right DLPCF R = 0.66, P = 0.003; posterior cingulate R = 0.62, P = 0.006; right putamen R = 0.72, P = 0.0008. Changes in both functional imaging outcomes were negatively associated with changes in clinical pain: BOLD in right DLPFC and clinical SFMPQ; R = −0.52, P = 0.003; MOR BP in left medial insula and SFMPQ present pain R = −0.51, P = 0.03.

Conclusion: We find strong longitudinal associations between evoked pain activations suggestive of hyperalgesia, and μ-opioid receptor availability (binding potential, BP) within the same brain regions, in individual FM patients. Positive associations were also observed between BOLD responses, and μ-opioid receptor BP (in opposite directions) with respect to clinical pain. These data suggest that the μ-opioid system is somehow involved in the pathogenesis of FM, and may even help explain why these patients are generally not felt to respond to narcotic analgesics, and may even be made worse when these drugs are used therapeutically.

Disclosure: H. Wang, None; D. J. Clauw, Pfizer Inc, Forest Laboratories, Merck, Novo, 2, Pfizer, Forest, Lilly, Merck, Novo, J and J, 5; J. K. Zubieta, None; R. E. Harris, Pfizer Inc, 2, Pfizer Inc, 5.

2451

Laquinquimod (LAQ) Is Equivalent to Mycophenolate Mofetil (MMF) in Preventing and Suppressing Murine Lupus Nephritis and Has Greater Effects On Myeloid/Monoocyte/Macrophage Cells. Bevra H. Hahn, Maida Wong, Elaine Lourenco and Brian Skaggs. UCLA David Geffen School of Medicine, Los Angeles, CA

Background/Purpose: Lupus nephritis (LN) depends on autoAb deposition and activation of multiple cell types that infiltrate kidneys and promote inflammation—monocytes/macrophages (MM), DCs, T and B cells. Laquinimid (LAQ) administered to humans downregulates Ag presentation, decreases chernkine production, decreases MHC expression on MM, and induces apoptotic pathways in PBMC (Gurevich M et al 2010). LAQ reduces progression of relapsing remitting multiple sclerosis (Corin G et al NEJM 2012); it is currently in clinical trial for SLE. MMF targets primarily lymphocytes; it is effective in many LN patients.

Methods: We compared clinical and immune cell changes in groups of 10–12 BWF1 female mice treated orally 3 times a week for 24 weeks with a) water; b) LAQ 1 mg/kg; c) LAQ 25 mg/kg; d) MMF 30 mg/kg; e) MMF100 mg/kg.

Results: Survival was better in both LAQ groups and the MMF100 group vs controls (p = 0.028). LAQ at both doses was equivalent to MMF100 in preventing proteinuria in mice treated before disease appeared. At 32 wks of age 50% of mice on water had proteinuria vs zero in LAQ and MMF100 groups (p < 0.0001) Renal histology mirrored proteinuria: mean total histological scores were 7.8 on water, 1.0 on LAQ and 0.1 on MMF100 (p < 0.01; both treatment groups compared to controls). Glomerular deposition of Ig and C3 were in the normal range in LAQ and MMF, and significantly increased in the water group (p < 0.001).

Mice treated after clinical nephritis appeared (≥3+ proteinuria) improved on LAQ after 3 wks of treatment proteinuria was present in 100% on water vs 25% on LAQ (p < 0.001). Survival was also better in mice treated with LAQ (p < 0.0001).

Effects on splenic PBMC differed between LAQ and MMF. Neither treatment changed total numbers of B cells. MMF decreased CD4+ and CD8+ T cell percent; LAQ did not. LAQ compared to MMF increased numbers of two putative regulatory cells, CD4+CD25+Foxp3+ Treg and CD11b+Ly6c−GR-1+ myeloid MM. Most interesting was the observation that LAQ, but not MMF, significantly reduced numbers of MM.

Conclusion: LAQ was highly effective in preventing and suppressing proteinuria and glomerular immune disease in BWF1 mice. Responses to MMF in high dose were similarly good. However, LAQ reduced numbers of MM, and MMF did not. In addition, LAQ induced different types of regulatory cells, distinguishing it from MMF. Since suppression of MM is likely to reduce renal inflammation and damage, future development of LAQ as a therapeutic for lupus nephritis is especially promising.

Disclosure: B. H. Hahn, Teva Pharmaceuticals, 2, Aspree Pharmaceutical, 2, Anthera, 5, Abbott, 5, Eli Lilly, 5; M. Wong, None; E. Lourenco, None; B. Skaggs, None.

2452

Rheumatoid Arthritis-Associated PTPN22 Modulates Toll-Like Receptor-Mediated, Type 1 Interferon-Dependent Innate Immunoregulation. Yaya Wang1, Stephanie Stanford1, Wenbo Zhou2, Jennifer L. Auger2, Genhong Cheng3, Amanda Campbell1, Fernando M. Shoyama2, Henry H. Balfour Jr4, Andrew C. Chan5, Bryce A. Binstadt5, Nunzio Bottini2 and Erik J. Peterson1. 1University of Minnesota, Minneapolis, MN, 2La Jolla Institute for Allergy and Immunology, La Jolla, CA, 3University of California, Los Angeles, Los Angeles, CA, 4University of Minnesota, Minneapolis, Genentech Inc, South San Francisco, CA

Background/Purpose: A coding polymorphism (C1858T) in PTPN22 is strongly associated with risk of Rheumatoid Arthritis (RA) and other autoimmune diseases. PTPN22 encodes Lymphoid Phosphatase (Lyp); the Lyp disease variant bears an R620W substitution (‘LypW’). The mechanism by which LypW impairs immune surveillance, PTPN22 deficient mice develop severe inflammatory arthritis in susceptible backgrounds in the absence of other genetic predispositions. These are driven by TLR-induced type 1 IFN production, impaired dendritic cell activation, and diminished T cell responses. The role of LypW in RA-associated type 1 IFN-dependent immunity is unknown.

Methods: We found markedly decreased induction of type 1 IFN after TLR4/3/7/9 activation in Ptpn22−/− macrophages, DC, and plasmacytid DC. Interestingly, Ptpn22 was dispensable for induction of proinflammatory cytokines, including TNFα, IL-6, and IL-1β, after TLR3/2/3/4/7/9 stimulation. The selective TLR signalling defect in Ptpn22−/− cells was associated with impaired type 1 IFN-dependent immunity, manifested by reduced serum type IFN and proinflammatory cytokines in response to Toll-like receptor (TLR) engagement. We hypothesized that PTPN22 might modulate TLR signaling and attenuate innate immune responses.

Results: We found markedly decreased induction of type 1 IFN after TLR3/4/7/9 activation in Ptpn22−/− macrophages, DC, and plasmacytid DC. Interestingly, Ptpn22 was dispensable for induction of proinflammatory cytokines, including TNFα, IL-6, and IL-1β, after TLR3/2/3/4/7/9 stimulation. The selective TLR signalling defect in Ptpn22−/− cells was associated with impaired type 1 IFN-dependent immunity, manifested by reduced serum type IFN and proinflammatory cytokines in response to Toll-like receptor (TLR) engagement. We hypothesized that PTPN22 might modulate TLR signaling and attenuate innate immune responses.

Methods: We studied TLR signaling and type 1 IFN-mediated antiviral responses and immunoregulation in Ptpn22−/− deficient myeloid cells and mice, in transgenic mice harboring human LypW or Lyrp (major allele protein product), and in human LypW carrier peripheral blood mononuclear cells (PBMC).

Results: We found markedly decreased induction of type 1 IFN after TLR3/4/7/9 activation in Ptpn22−/− macrophages, DC, and plasmacytid DC. Interestingly, Ptpn22 was dispensable for induction of proinflammatory cytokines, including TNFα, IL-6, and IL-1β, after TLR3/2/3/4/7/9 stimulation. The selective TLR signalling defect in Ptpn22−/− cells was associated with impaired type 1 IFN-dependent immunity, manifested by reduced serum type IFN and impaired dendritic cell activation, and diminished T cell responses after lymphopohic chorionarthritis virus (LCMV) infection of Ptpn22−/− mice. In the K/BxN serum transfer model of rheumatoid arthritis, treatment with type 1 IFN-inducing TLR ligands suppresses disease. However, we observed significantly decreased TLR ligand-mediated suppression of inflammatory arthritis in Ptpn22−/− mice. RA-associated LypW carrier human PBMC and myeloid cells derived from LypW transgenic mice displayed defective induction of type 1 IFN after TLR stimulation. Lyrp directly associated with TNF receptor-associated factor 3 (TRAF3), a key TLR signaling mediator upstream of type 1 IFN induction. LyrpR, but not LypW promoted TRAF3 K63-linked polyubiquitylation, which is required for TLR-induced type 1 IFN production.
Conclusion: PTPN22 is a key positive regulator of TLR-driven upregulation of type 1 IFN. LypW, product of the RA-associated PTPN22 allele, exhibits "loss of function" in type 1 IFN dependent processes, including antiviral host defense and amelioration of inflammatory arthritis. Our findings strongly suggest that PTPN22 could regulate severity of joint inflammation in RA through modulation of TLR signaling in innate immune cells.

Disclosure: Y. Wang, None; S. Stanford, None; W. Zhou, None; J. L. Auger, None; G. Cheng, None; A. Campbell, None; F. M. Shoyama, None; H. H. Balfour Jr., None; A. C. Chan, None; B. A. Bistadt, None; N. Bottini, None; E. J. Peterson, None.

2453
The Role of Bob1 in Rheumatoid Arthritis: Potential Implications for Autoimmunity, Nataliya Yerenenko1, Tinke Canaert1, Melissa N. van Tok1, Ioana Gofita1, Juan D. Canete2, Paul P. Tak2, Hergen Spits3 and Dominique L. Baeten1. 1Division of Clinical Immunology and Rheumatology and Department of Experimental Immunology, Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands, 2Rheumatology Department, Hospital Clinic Barcelona, Spain, 3Tytgat Institute for Liver and Intestinal Research, Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands.

Background/Purpose: Rheumatoid arthritis (RA) is a prototypic autoimmune disease characterized by a prominent humoral autoimmunity. Of particular relevance is the local production of autoantibodies such as rheumatoid factor and anti-citrullinated protein antibodies in the inflamed synovial tissue. The mechanisms underlying break of B cell tolerance and local autoantibody production remains poorly understood. This study was conducted in order to identify cellular and molecular pathways implicated in RA-specific humoral autoimmunity.

Methods: Synovial tissue samples were obtained by arthroscopy from untreated individuals with RA (n=33) and inflammation matched SpA controls (n=58). Gene expression profiling was performed on tissue samples of patients with established arthritis using 44K Whole Genome Human microarrays (Agilent). Top differentially expressed genes were validated on three independent cohorts by Taqman based RT-qPCR and immunohistochemistry. Collagen-induced arthritis (CIA) and Experimental autoimmune encephalomyelitis (EAE) experiments were conducted using Bob1 knockout mice and their littermate controls.

Results: Microarray screening for genes differentially expressed in the inflamed synovium, the key target of the disease process in RA, revealed a prominent and disease-specific B cell/plasma cell signature with the B cell-specific transcriptional co-activator Bob1 and its transcriptional target BCMA among the most upregulated genes. Validation by RT-qPCR on two independent cohorts representing early and established arthritis confirmed microarray data and demonstrated elevated expression of Bob1 and BCMA not only in established RA, but also at the early phase of the disease. Quantitative evaluation of immunohistochemical stainings of synovial tissue with monoclonal antibody for Bob1 revealed significant increase in Bob1 positive cells in RA synovium (p<0.01). Next we determined whether lack of functional Bob1 modifies disease onset or severity in CIA. Interestingly, the results showed that Bob1-/- mice were fully resistant to CIA induction compared to their wild-type littermates. This remarkable protection from CIA was achieved by failure to produce pathogenic anti-collagen autoantibodies in the absence of Bob1. In contrast, Bob1-/- mice were susceptible to MOG protein induced EAE and incidence and severity of clinical disease were not altered in these mice compared to wild-type littermates, suggesting that absence of Bob1 does not impact on antigen-presentation/ costimulatory capacity of B cells.

Conclusion: The specific increase in Bob1 expressing cells in RA synovitis and the resistance of Bob1-deficient mice to development of CIA indicate that Bob1/BCMA axis may contribute to humoral autoimmunity in RA. The relationship between an aberrant Bob1 expression and the break of peripheral tolerance in RA is currently under investigation.

Disclosure: N. D. Chamberlain, None; M. Volin, None; G. M. Vila, None; S. Arami, None; S. Volkov, None; S. Shahrara, None.

2454
Expression of TLR5 Strongly Correlates With Levels of TNF-a and DAS28 in RA Monocytes and Ligation of TLR5 Induces Angiogenesis in RA. Nathan D Chamberlain1, Michael Volin2, Olga M. Vila3, Shiva Arami4, Suncica Volkov5 and Shiva Shahrara1. 1University of Illinois at Chicago, Chicago, Chicago, IL, 2Chicago College of Osteopathic Medicine Midwestern University, Downers Grove, IL.

Background/Purpose: This study was performed to determine whether expression of TLR5 is associated with Rheumatoid Arthritis (RA) disease activity as well as to examine the role of TLR5 ligation in the pathogenesis of RA.

Methods: Expression of TLR5 was determined in RA and normal (NL) PB monocytes and in vitro differentiated macrophages by real-time RT-PCR and/or flow cytometry. Next, linear regression analysis was employed to correlate expression of TLR5 with levels of TNF-a and DAS28 score in RA monocytes from 43-48 patients. Finally, the mechanism by which TLR5 ligation mediates RA pathogenesis was determined by endothelial chemotaxis and tube formation.

Results: We performed microarray studies to identify differentially regulated genes in RA synovial fluid macrophages from active patients and identified Toll like receptor (TLR5) as one of the most highly upregulated genes in RA synovial fluid macrophages compared to normal macrophages. Using real-time RT-PCR and FACS analysis we confirmed that expression of TLR5 is significantly elevated in RA synovial fluid macrophages (35 fold) and RA monocytes (7 fold) compared to normal counterparts. Interestingly, we found that blockade of TLR5 on RA peripheral blood (PB) monocytes greatly reduces RA synovial fluid mediated TNF-a transcription by 80% suggesting that there are endogenous TLR5 ligands expressed in the RA synovial fluid that are crucial for joint TNF-a modulation. Since TNF-a stimulation is also capable of upregulating TLR5 levels there is a positive feedback modulation in RA monocytes between TNF-a and TLR5 ligation and expression. We found that patients with higher expression of TNF-a expressed elevated levels of TLR5 (R2=0.79, p=3.6x10-7) in RA monocytes and the concentrations of TLR5 and TNF-a strongly correlated with increased disease activity as determined by examination of 28 defined joints (DAS28) (correlation of TLR5 with DAS28; R2=-0.75) (correlation of TNF-a with DAS28; R2=-0.58). Since our previous studies demonstrated that TLR5 expression is elevated on RA synovial tissue endothelial cells compared to control tissue we asked whether ligation of this receptor induces angiogenesis and if TLR5 endogenous ligands present in RA synovial fluid play a role in this process. We found that when endothelial cells were exposed to a dose response of flagellin, a TLR5 agonist, migration of endothelial cells was induced at concentrations ranging from 0.1 to 100 ng/ml (p<0.05). Further, incubation of endothelial cells with neutralizing antibody to TLR5 significantly suppressed RA synovial fluid endothelial migration and tube formation suggesting that the RA synovial fluid contains TLR5 endogenous ligands that are chemoattractant for TLR5+ endothelial cells.

Conclusion: Our observations highlight that there is a strong correlation between TNF-a and TLR5 expression with disease activity in RA monocytes suggesting that TLR5 may be a TNF-a responsive gene that is linked to RA progression through induction of angiogenesis.

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ACR Concurrent Abstract Session
Antiphospholipid Syndrome

Tuesday, November 13, 2012, 2:30 PM–4:00 PM

2455
Establishment of Standardized International Units for IgG Anti-β2Glycoprotein Antibody Measurement. Rohan Willis1, Claudia Grossi2, Gabriella Lakos3, Pier Luigi Meroni4, Maria Borgh5, Luis R. Lopez6, Corina Dim7, Marius C. Teodeorescu8, Nicholas Ozarka9, Matthias Kast10, Nina Olschowka11, Alfredo Villarreal12, Maria Crisostomo13, Mike Watkins9, Wendy Vandani14, Tony Prestigiacomo10, Josep Puig12, Kerrie Jaskal13, Roger Walker10, Sarah Paul9, T. Buckner14, Fernando S. Cavalcanti12 and Silvia S. Pierangeli1. 1University of Texas Medical Branch, Galveston, TX, 2Lab of immunology, IRCCS Istituto Auxologico Italiano, Milano, Italy, 3INOVA Diagnostics, Inc., San Diego, CA, 4Division of Rheumatology - Istituto G. Pini, University of Milano, Milano, Italy, 5Corgenix Inc, Broomfield, CO, 6TheraTest Laboratories Inc, Lombard, IL, 7TheraTest Laboratories Inc, Lombard, IL, 8Phadia Thermofisher, Milano, Milano, Italy, 9Bio-Rad Laboratories Inc, Lombard, IL, 10Bio-Rad Laborato- ries, Hercules, CA, 11Bio-Rad Laboratories, Hercules, CA, 12Bio-Rad Laboratories, Barcelona, Spain, 13Instrumentation Laboratories, Bedford, MA, 14Corgenix, Broomfield, CO

Background/Purpose: Despite numerous efforts aimed at the standardization of assays for detection of anti-β2-Glycoprotein I (α2GPI) antibodies, there are still inconsistencies including the lack of universal units of measurement and reference material and the lack of universal units of measurement. Based on recommendations of an international task force at the 13th Congress on Antiphospholipid Antibodies, a project was started with the goals of establishing a
reference preparation (RP) and international consensus units (IU) for the measurement for IgG anti-2GPI antibodies.

Methods: Whole IgG fractions were affinity-purified (AP) from sera of 2 primary Antiphospholipid syndrome patients with high IgG anti-2GPI levels using a Protein G Sepharose column. Pooled IgG fractions were further AP using an affinity column coupled to βGPI and the protein concentration of the AP material was determined using two methods, and a value based on the definition that 1 IU equates to 1 µg/ml of AP IgG anti-2GPI was assigned. A reference preparation (RP) serum created from sera taken from the original PAPS patients was then assigned an IU value based on repeated testing using original AP material as a calibrator. RP was sent to six commercial companies for testing in their respective kits (eight total) according to an approved protocol to enable evaluation of linearity and unit equivalence, along with a set of 30 samples (APS samples and healthy controls) to allow for commutability studies to be done. Companies (and kits) included: INOVA Diagnostics, 2; Bio-Rad Laboratories, 3; Phadia (EliA 2-Glycoprotein I IgG on Phadia® 250) and Instrumentation Laboratory (HemosIL®), AcuStar anti-βGPI, IgG-14.

Results: The pooled AP material had a protein concentration of 103.1 µg/ml (OD280nm) and 108.5 µg/ml (Bradford) and was assigned a value of 100 IgG anti-2GPI IU/ml. RP had a value of 270 IgG anti-2GPI IU/ml. The 1/2 values of the regression lines of the RP for all kits were >0.9. The value of the RP in the various kit units ranged from 115 to 19931. Results of correlations of commutability samples with commutability units are shown in Table 1 (kit units and international units).

Table 1. Correlation of commutability sample values among various ab2GPI assays

<table>
<thead>
<tr>
<th>Biomarkers</th>
<th>Controls</th>
<th>Combined</th>
<th>Primary APS</th>
<th>SLE/APS</th>
<th>Primary aPL</th>
<th>SLE/Pla n</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL-6 (pg/ml)</td>
<td>0.7</td>
<td>38.0*</td>
<td>31.2*</td>
<td>12.2*</td>
<td>0.4</td>
<td>2.7*</td>
</tr>
<tr>
<td>IL-1b (pg/ml)</td>
<td>0.3</td>
<td>4.7</td>
<td>3.0</td>
<td>11.4*</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>IL-8 (pg/ml)</td>
<td>27.4</td>
<td>42.6</td>
<td>24.5</td>
<td>27.4</td>
<td>7.2</td>
<td>21.6</td>
</tr>
<tr>
<td>VEGF (pg/ml)</td>
<td>88.3</td>
<td>225.1*</td>
<td>242.2</td>
<td>109.1</td>
<td>74.6</td>
<td>67.2</td>
</tr>
<tr>
<td>TNF-α (pg/ml)</td>
<td>0.5</td>
<td>28.0</td>
<td>21.5*</td>
<td>11.6*</td>
<td>8.9*</td>
<td>53.9</td>
</tr>
<tr>
<td>IFN-γ (pg/ml)</td>
<td>0.1</td>
<td>12.9*</td>
<td>10.1</td>
<td>0.3</td>
<td>0.3</td>
<td>13.2</td>
</tr>
<tr>
<td>IL-10 (pg/ml)</td>
<td>96.2</td>
<td>544.4*</td>
<td>427.2*</td>
<td>656.2*</td>
<td>249.7</td>
<td>472.5*</td>
</tr>
<tr>
<td>sCD40L (pg/ml)</td>
<td>16.4</td>
<td>230.1*</td>
<td>276.5*</td>
<td>145.6*</td>
<td>149.7*</td>
<td>76.0*</td>
</tr>
<tr>
<td>sTF pM</td>
<td>13.0</td>
<td>134*</td>
<td>153.6*</td>
<td>329.2*</td>
<td>190.4*</td>
<td>102.1*</td>
</tr>
<tr>
<td>sICAM-1 (pg/ml)</td>
<td>9.5</td>
<td>151.3*</td>
<td>281.6*</td>
<td>55.1*</td>
<td>163.5</td>
<td>2.8</td>
</tr>
<tr>
<td>sVCAM-1 (pg/ml)</td>
<td>33.7</td>
<td>41.9</td>
<td>1128.4*</td>
<td>156.4</td>
<td>321.3</td>
<td>41.1</td>
</tr>
<tr>
<td>s-II (mg/dl)</td>
<td>10.1</td>
<td>14.1</td>
<td>27.7*</td>
<td>14.7</td>
<td>10.9</td>
<td>4.1</td>
</tr>
<tr>
<td># of BMR elevated</td>
<td>9/12</td>
<td>9/12</td>
<td>7/12</td>
<td>3/12</td>
<td>4/12</td>
<td></td>
</tr>
</tbody>
</table>

* significantly different from the median of controls (p<0.05)

Conclusion: Establishment of equivalency between kit units and IU value of RP was successful. The RP demonstrated excellent linearity and was commutable in the various ab2GPI IgG assays and is therefore adequate to be used as a reference material. Expressing results in the new IU instead of arbitrary kit units illustrated the comparability of the results obtained in the different kits. These studies contribute significantly to the much-needed standardization of ab2GPI immunoassays.

Disclosure: R. Willis, None; C. Grossi, None; G. Lakos, Inova Diagnostics, Inc.; 3; P. L. Meroni, None; M. Borghi, None; L. R. Lopez, Congerix, 1; C. Dinna, Thera test laboratories, 3; M. C. Teodorescu, Thera Test Laboratories, 1; N. Ozarka, Thera Test Laboratories, 3; M. Kast, Phadia Therufisher, 3; N. Olshchowka, Phadia Thermedisorfer, 3; A. Villareal, BioRad Laboratories, 3; M. Crisostomo, BioRad Laboratories, 3; M. Watkins, Bio-Rad Laboratories, 3; W. Vandam, BioRad Laboratories, 3; T. Prestigiacomo, Bio-Rad Laboratories, 3; J. Vega, None; E. B. Gonzalez, None; S. S. Pierangeli, None.

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Pro-Inflammatory and Pro-Thrombotic Markers in Persistently Antiphospholipid Antibody-Positive Patients. Doruk Erkan1, Rohan Willis2, JoAnn Vega3, Vijaya L. Murthy3, Ana Laura Carrera Marin3, Gurjot Basra2, Patricia Ruiz Limon2, Emilio Gonzalez3, Silvia S. Pierangeli1. 1Hospital for Special Surgery, New York, NY, 2University of Texas Medical Branch, Galveston, TX.

Background/Purpose: Antiphospholipid antibodies (aPL) induce a pro-inflammatory and pro-thrombotic state by upregulating various cytokines, chemokines, and tissue factor (TF). Fluvasatin reduces TF expression and decreases thrombogenic effects of aPL in vitro and in mice. The purpose of this prospective pilot study was to examine the effects of fluvasatin on pro-inflammatory and pro-thrombotic biomarkers (BMR) in persistently aPL-positive patients.

Methods: Persistently aPL-positive patients (IgG/M aCLâ©40 GPL/MPL, IgM aβGPIâ©20U, and/or positive lupus anticoagulant (LA) test on 2 occasions at least 12w apart) received fluvasatin 40 mg daily for at least 3 months. At 3 months, patients were instructed to stop fluvasatin and they were followed for another 3 months. Serum samples were collected at baseline and monthly thereafter for 6 months. Selected exclusion criteria were pregnancy, statin use, prednisone >10 mg/day, and immunosuppressive use (except hydroxychloroquine). Control samples (age/mo sex matched) were identified from our database of healthy people. Interferon (IFN)-α, Interleukin (IL)1b, IL6, IL8, insubilic protein (IP)10, tumor necrosis factor (TNF)-α, vascular endothelial growth factor (VEGF), and soluble CD40 ligand (sCD40L) levels were determined by the MILLIPLEXMAP human cytokine/chemokine assay (Millipore, Billerica, MA) in the serum of patients and controls. Plasma samples were used to detect sTF using a chromogenic assay, aCL (IgG, IgM and IgA), aβGPI (IgG, IgM and IgA), soluble intercellular cell adhesion molecule (ICAM)-1, vascular cell adhesion molecule (VCAM)-1, and E-selectin (E-select) were evaluated by ELISA. Mann-Whitney Rank Sum test was used to analyze the data for differences between patient subgroups and controls; Kruskal-Wallis One Way Analysis of Variance was used to compare medians of BMR among groups.

Results: 41 persistently aPL-positive patients (mean age: 44.6±13.6 y; female: 70%; primary APS: 18; SLE/APS: 7; Primary aPL [no history of thrombosis or pregnancy morbidity]: 9; and SLE/aPL: 7) and 30 healthy controls were included in this analysis. All APS patients had history of thrombosis except two SLE/APS patients who had only obstetric APS. Mean levels of: a) all BMR except IL-8, VCAM-1, and s-Sele was significantly higher in all groups combined when compared to the controls; b) IL-8, TNF-α, and IP-10, were significantly higher in Primary APS, SLE/APS and SLE/aPL when compared to primary aPL; c) VEGF, sCAM-1, and sVCAM-1 were significantly higher in Primary APS when compared to the other groups; and d) sTF was elevated in all subgroups (Table). There was no difference in aCL/aβGPI titers among the groups.

Conclusion: Our study suggests that the pro-inflammatory and prothrombotic biomarkers are differentially upregulated in persistently aPL-positive patients with or without vascular events and/or SLE. These findings have implications in the pathophysiology of APS and the risk-stratification of aPL-positive patients.

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IL6, IL8, inducible protein (IP)10, tumor necrosis factor (TNF)-α, vascular endothelial growth factor (VEGF), and soluble CD40 ligand (sCD40L) levels were determined by the MILLIPLEXMAP human cytokine/chemokine assay (Millipore, Billerica, MA) in serum of patients and controls. Plasma samples were used to detect STF using a chromogenic assay. aCL IgG/M/A, IgG/M/A, vascular intercellular cell adhesion molecule (ICAM)-1, vascular cell adhesion molecule (VCAM)-1, and E-selectin (E-sel) were evaluated by ELISA. We used Spearman test to analyze the significance of monthly changes in BMR levels.

Results: Of 41 patients recruited, 24 completed the study (mean age: 44.6 ± 13.6y; female: 70%; Primary APS: 8, SLE/APS: 7, Primary aPL: 5; SLE/aPL: 4; HCV: 61%; and Anticoagulation: 43%). The early withdrawal reasons for 15/41 patients were: 6 lost to follow-up or refused further treatment without adverse events; 4 stopped treatment due to myalgia (normal reason for 15/41 patients were: 6 lost to follow-up or refused further 4, 4 stopped treatment due to myalgia (normal reason for 15/41 patients were: 6 lost to follow-up or refused further 1); 5 stopped due to miscellaneous (reasons for 15/41 patients were: 1 patient refused to continue treatment, 1 patient developed new-onset diabetes, 1 patient developed new-onset hypertension, 1 patient developed new-onset anxiety, and 1 patient developed new-onset depression).

The table shows the number of patients with elevated BMR (above the assay cut-off) at baseline as well follow-up BMR levels during and after fluvastatin. The levels of sTF, IL-6, IL-1β, VEGF, TNF-α, IP-10, sCD40L, sE-sel, and sVCAM-1 significantly decreased with fluvastatin, followed by significant increases after stopping the treatment. Of note, aCL/β2GPI and LA tests remained unchanged throughout the study.

Conclusion: Our pilot study demonstrating that fluvastatin can reverse the pro-inflammatory and prothrombotic biomarkers in persistently aPL-positive patients with or without SLE provide the basis for future larger randomized-control trials to examine the effects of the statins on the aPL-induced biomarkers as well as on the aPL-related clinical manifestations.

Disclosure: D. Erkan, None; R. Willis, None; J. Vega, None; V. L. Murthy, None; A. L. Carrera Marin, None; G. Basra, None; P. Ruiz Limon, None; E. B. Gonzalez, None; S. S. Pierangeli, None.

2458

The Estimated Prevalence of Antiphospholipid Antibodies in General Population Patients with Pregnancy Loss, Stroke, Myocardial Infarction, and Deep Vein Thrombosis. Laura Andreoli1, Alessandra Banzato, Cecilia B. Chighizola1, Guillermo J. Pons-Estel4, Guilherme Ramires de Jesus5, Michael D. Lockshin3, Doruk Erkan4, and On Behalf of APS Action1. 1Rheumatology and Clinical Immunology, University of Brescia, Brescia, Italy; 2Department of Cardiac Thoracic and Vascular Sciences, University of Padua, Padua, Italy; 3Istituto Auxologico Italiano, University of Milan, Milan, Italy; 4Department of Autoimmune Diseases, Instituto Clinic de Medicina i Dermatologia, Hospital Clinic, Barcelona, Spain; 5Department of Obstetrics, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil; 6Hospital for Special Surgery, New York, NY.

Background/Purpose: AntiPhospholipid Syndrome Alliance For Clinical Trials and International Networking (APS ACTION) is an international research network that has been created specifically to design and conduct well-designed, large-scale, multi-center clinical trials in persistently antiphospholipid antibody (aPL)-positive patients. One of the first needs of APS ACTION was to know the true prevalence of aPL in the general population with pregnancy loss (PL), stroke (ST), myocardial infarction (MI) and deep venous thrombosis (DVT).

Methods: The search for "aPL" and multiple keywords regarding the outcomes of interest was completed in PubMed; additionally, review articles were searched. A total of 108 full-text papers were collected and analyzed for the type of outcome, the aPL tests used (criteria tests vs. non-criteria), the definition of "positive aPL" (low, medium, high, other), the confirmation of aPL (at least 6–12w apart), and the prevalence of positive aPL in the study population (defined by sex and age range). The mean, median, and range of the aPL prevalence were calculated separately for papers with and without aPL confirmation. The incidence of PL, ST, MI and DVT in the general US population was retrieved from official sources.

Results: Of 108 papers, the outcome of interest was early/late PL in 32, ST in 31, MI in 24, and DVT in 21. Despite the limitations of the literature, the table demonstrates the estimated prevalence and incidence of aPL-related events. These limitations were: a) approximately 60% of the papers were published between 1984 and 2000; b) the number of aPL criteria tests used was single test in 43 (36.6%), two tests in 65 (52.8%), and 3 tests in 13 (10.6%); c) anticoagulindipin and/or b2-glycoprotein-I ELISA cut-off was not available in 10% of the papers and "low titer" (<20U) was used in 36% of the papers; d) the method of reporting the cut-off for anti-b2-glycoprotein-I was quite heterogeneous, reflecting the lack of international reference units; e) the confirmation of aPL was performed only in 24 papers (19.5%); and f) half of the studies were not designed to answer our research question (case-control:30%, retrospective cohort/case series:20%).

Conclusion: It is difficult to determine the prevalence of a "clinically significant aPL profile" in the general population patients with pregnancy loss with the lack of robust data. Pending more rigorous data collection, our best estimates of the incidence of aPL-associated events should be confirmed with appropriately sampled and designed population studies. One of the goals of APS ACTION is to improve upon existing aPL prevalence studies.

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Efficacy of Aspirin for the Prevention of the First Thrombo-Emolic Events in Patients with Antiphospholipid Antibodies: A Meta-analysis of Literature Data. Laurent Arnaud1, Alexis Mathian1, Amelia Ruffatti2, Maria Tecktonidou3, Ricard Cervera4, Ricardo Forastiero5, Vittorio Pengo6, Marc Lambert7, Stéphane Zulian8, Denis Wahl9 and Zahir Amoura1. 1Hôpital Pitié-Salpêtrière, AP-HP, UPMC Univ Paris 06 & French National Reference Center For Systemic Lupus and Antiphospholipid Syndrome, Paris, France; 2Rheumatology Unit, Department of Clinical and Experimental Medicine, University of Padua, Padua, Italy; 3First Department of Internal Medicine, School of Medicine, National University of Athens, Athens, Greece; 4Hospital Clinic of Barcelona, Barcelona, Spain; 5Favaloro University, Argentina; 6Clinical Cardiology, Department of Cardiac Thoracic and Vascular Sciences, University of Padova, Padova, Italy; 7Internal Medicine Department, University Hospital, Lille, France; 8Nancy University Hospital, Université de Lorraine & INSERM U961, Vandoeuvre-Les-Nancy, France.

Background/Purpose: Whether aspirin is needed in patients with antiphospholipid antibodies (aPL+) for prevention of a first thrombotic event is controversial. The aim of this metaanalysis was to determine whether aspirin had a protective effect in aPL+ patients with no history of thrombosis.

Methods: Both observational (either prospective or retrospective) and interventional studies were selected if they assessed the incidence of the
first thrombosis in patients with aPL, either treated with aspirin or not, were included. Data sources were MEDLINE, Embase, Cochrane Library, hand search, contact with investigators, and reference lists of studies, without language restrictions. Data on study and patient characteristics, risk estimates, and study quality were independently extracted by 2 investigators. Pooled effect estimates were obtained by using random-effect models according to the DerSimonian and Laird method.

Results: Of 3142 identified abstracts, 9 primary studies (8 observational and 1 interventional) met inclusion criteria, including 1136 aPL patients and 133 thrombotic events. Compared with aPL+ patients without aspirin (n = 556), the overall pooled odds ratio for the risk of first thrombosis in aPL+ patients treated with aspirin (n = 580) was 0.48 (95% CI: 0.24 to 0.93), with significant heterogeneity across studies (I² = 53%, p = 0.03).

Subgroup analysis according to the type of study suggested a protective effect of aspirin when considering only retrospective (OR: 0.25 [0.15–0.43]) but not prospective (OR: 0.84 [0.46–1.54]) studies. Subgroup analysis according to the type of thrombotic event suggested a protective effect of aspirin when considering only arterial (OR: 0.48 [0.28–0.83]) but not venous (OR: 0.52 [0.24–1.14]) thrombosis.

Conclusion: This metaanalysis suggests that aspirin has a protective effect for the risk of first thrombosis among aPL+ patients. Significant heterogeneity was found across included studies, with subgroup analyses showing a protective effect in retrospective but not in prospective studies, as well as for arterial but not venous first thrombotic events. A collaborative metaanalysis of individual patient data is currently underway to clarify these findings at patient level by taking into account the various pathogenic backgrounds as well as potential confounding factors.

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2460
Dual Antiplatelet Therapy As Prophylaxis of Recurrent Arterial Thrombosis in Patients with Antiphospholipid Syndrome. Yuichiro Fujieda, Olga Amengual, Toshiyuki Watanabe, Michihito Kono, Yusaku Kanetsuka, Takashi Kurita, Toshio Odani, Kotaro Otomo, Toshiyuki Bohgaki, Tetsuya Horita, Shinsuke Yasuda and Tatsuya Atsumi. Hokkaido University, Sapporo, Japan

Background/Purpose: Arterial thrombosis (AT) is a major clinical manifestation of the antiphospholipid syndrome (APS). A number of studies have evaluated the rate of recurrent thromboembolism, including arterial and venous thrombosis, after an initial event in patients with APS. Regardless of the presence of warfarin therapy, recurrent events were seen in >11% of APS patients-year. Therefore, the optimal treatment for recurrent AT in patients with APS remains unclear. The purpose of this study is to clarify the efficacy of dual antiplatelet therapy for recurrent AT in patients with APS.

Methods: This study comprised 82 unsellected consecutive APS patients with AT recruited at one single center. Patients were included in this observation study at the initial arterial thrombotic event and followed up. We retrospectively assessed the efficacy and safety of several therapies for the secondary prevention of AT in those patients. The recurrence rate of AT was analyzed as the efficacy outcome and the occurrence of major bleeding event and overall mortality as the safety outcome. The evaluated therapies include warfarin therapy (Group 1), antiplatelet monotherapy (Group 2), combination therapy with warfarin and antiplatelet agent (Group 3), and dual antiplatelet therapy (Group 4).

Results: Among all the patients, 67 (76%) were females, the mean age was 44 years (range 15–74 years) and 51 (62%) were diagnosed as systemic lupus erythematosus. The mean follow up period was 8.5 years (range 2–22 years). Thirteen (16%) patients were in Group 1, 35 (43%) in Group 2, 21 (26%) in Group 3, and 13 (16 %) in Group 4. Antiplatelet therapy consisted on aspirin, ticlopidine, clopidogrel, cilostazol, or others such as dipyridamole, beraprost and sarpaglogrel hydrochloride. Distribution of antiplatelet agents in each group is shown in Table. Dual antiplatelet treatment comprised 7 (9%) patients on aspirin and ticlopidine/clopidogrel, 3 (23%) on aspirin and others, 2 (15%) on aspirin and cilostazol, 1 (8%) on cilostazol and ticlopidine. Thrombotic events recurred in 25 patients (3.4 100 patient-year). No recurrences were observed in the Group 4. However, a high incidence of recurrences rate observed in Groups 1, 2, 3 (Log-rank p = 0.01) (Fig). There was no statistically significant difference in the bleeding events nor in the mortality rate between the study groups.

Table. Distribution of anti-platelet agents in each treatment groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Warfarin</th>
<th>Antiplatelet</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>82 N</td>
<td>13 N</td>
<td>82 N</td>
</tr>
<tr>
<td>Warfarin monotherapy</td>
<td>-</td>
<td>26 (74%)</td>
<td>17 (81%)</td>
</tr>
<tr>
<td>Antiplatelet monotherapy</td>
<td>-</td>
<td>3 (9%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Warfarin plus antiplatelet</td>
<td>-</td>
<td>3 (9%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Warfarin combination antiplatelet</td>
<td>-</td>
<td>3 (9%)</td>
<td>1 (5%)</td>
</tr>
</tbody>
</table>

Fig. Kaplan-Meier analysis shows that the treatment with dual antiplatelet therapy was more effective for the prevention of thrombotic recurrences than other therapies (Log-rank p = 0.01).

Conclusion: Dual antiplatelet therapy may be an effective therapy for prevention of recurrent arterial thrombosis in patients with APS.

Disclosure: Y. Fujieda, None; O. Amengual, None; T. Watanabe, None; M. Kono, None; Y. Kanetsuka, None; T. Kurita, None; T. Odani, None; K. Otomo, None; T. Bohgaki, None; T. Horita, None; S. Yasuda, None; T. Atsumi, None.

ACR Concurrent Abstract Session
Epidemiology and Health Services Research IV: Outcomes and Costs in Rheumatic Disease
Tuesday, November 13, 2012, 2:30 PM–4:00 PM

2461
Cost-Effectiveness of Systemic Therapies for Acute Gouty Arthritis. Kimberly Reiter*, Jeremy Goldhaber-Fiebert* and Eswar Krishnan*. Stanford University School of Medicine, Palo Alto, CA, *Stanford, Stanford, CA, †Stanford University, Stanford, CA

Background/Purpose: Rising prevalence has led to increased demand for newer and potentially costly treatments for acute gouty arthritis, but few studies comparing effectiveness and costs of both older and novel treatments exist to guide best clinical practice. We aimed to assess the effectiveness and cost-effectiveness of currently available drug classes (non-selective and COX-2 selective non-steroidal anti-inflammatory drugs, colchicine, and systemic corticosteroids), as well as a long-acting biologic agent for the treatment of acute gout flare.

Methods: We modeled acute gout flare in 50 year old adult men with definite gout and no contraindications to considered therapies. Our decision analytic model incorporated quality of life impact of the flare, and costs and health effects of drugs and drug-related adverse events. The perspective was that of a third party payer, with an 8 week time horizon. Probabilities of response to therapies and adverse events, health state utilities, and costs in 2010 U.S. dollars were informed by published literature, U.S. hospital statistics, and payment algorithms that may be employed by a third party payer. We utilized published data for canakinumab (Ilaris®, Novartis) as a representative of a long-acting biologic drug, although this drug is not approved for use in gout. Outcomes were measured in quality-adjusted-life-years (QALYs) and quality-adjusted-life-months (QALMs).

Results: Literature review revealed relatively small differences in overall effectiveness between treatments, in spite of a wide range of costs. Steroids provided 47.17 QALMs, colchicine 47.39 QALMs, and biologic 47.57
QALDs. After accounting for toxicities and for the cost of COX-2 selective NSAIDs, both NSAID sub-classes were more expensive and less effective than other non-biologics. Intramuscular steroid cost $11,935 per QALY over no treatment, and branded colchicine cost $18,234 per QALY compared to steroid. The biologic drug cost over $22 million per QALY gained. Results were sensitive to untreated flare duration, probability of first-day drug response, and drug costs. When priced as an unbranded product, colchicine offered greater benefits at a lower cost than all other non-biologic drugs. A scenario analysis assuming equivalent efficacy of oral prednisone to intramuscular steroid showed prednisone to cost less than $3,000 per QALY, in which case branded colchicine exceeded a traditional willingness-to-pay threshold of $50,000 per QALY.

Conclusion: Compared to moderate dose intramuscular corticosteroid, colchicine provides reasonable value for money in the treatment of acute gout flare. When priced as an unbranded product, it is more effective and less expensive than all other options. If oral prednisone is similar in effectiveness to intramuscular steroid, then it is most cost-effective and branded colchicine costs much more for its incremental benefits. At current prices, biologic therapy does not provide additional benefits commensurate with its higher cost.

Limitations: These results apply only to uncomplicated gout among men in outpatient settings. Non-canakinumab biologics may have a different cost-effectiveness profile.

Disclosure: K. Reiter, None; J. Goldhaber-Fiebert, None; E. Krishnan, savient, 1, URL, takeda, metoheX, ARDEA, 2, METABOLEX TAKEDA, 5.

2462

Projecting the Direct Cost Burden of Osteoarthritis in Canada Using a Population-Based Microsimulation Model From [2010–2031]. Belham Sharif1, Jacek A. Kopee1, Mushifqur Rahman1, Nick Bansback2, Eric C. Sayre1, Philippe Finex2, Hubert Wong3 and Aslam H. Anis4. 1Arthritis Research Centre of Canada, Vancouver, BC, 2St Paul’s Hospital, University of British Columbia, Vancouver, V6Z 1Y6, Canada, Vancouver, BC, 3Statistics Canada, 150 Tunney’s Pasture Driveway, Ottawa, ON, Canada, Ottawa, ON

Background/Purpose: POHEM-OA (Population Health Model-Osteoarthritis) is a population-based microsimulation model that uses Canadian Community Health Survey-2001 to generate the initial population and models every individual’s life history in terms of osteoarthritis (OA) diagnosis and treatment for the entire Canadian population. The objective of this study was to incorporate treatment and other costs of OA into POHEM-OA to project the future direct cost burden of OA in Canada for the years 2010 to 2031.

Methods: Average healthcare treatment costs were estimated from the British Columbia (BC) linked health administrative database spanning 1986/87–2003/03 that included physician visits, surgical procedures, medication, and all hospital admissions covered by the Medical Services Plan (MSP) of BC. Surgical procedures related to OA were micro-costed based on unit costs available from the fully allocated St. Paul’s Hospital (Vancouver) cost model. Since the number of hip and knee replacements almost doubled in the last 10 years, replacement rates were recalibrated and a time trend was introduced based on the Canadian Joint Registry database from 1997–2007. Average drug costs (both over-the-counter and prescription drugs) were estimated from the PharmaNet (BC) database in 2003 and the National Population Health Survey for four main types of OA-related drugs (acetaminophen, NSAID, coxibs and opioids). Each patient was assigned a cost variable based on sex, age category, OA stage (defined by OA diagnosis, orthopedic surgeon visit, primary replacement surgery, and revision), and time in each stage. All costs were implemented in POHEM according to two categories: “ongoing costs” as they accumulated based on the person-years of each individual staying in a given OA stage and “event-based costs” for hip and knee replacement surgeries. A 5% annual discount rate was applied.

Results: The total direct costs of OA in Canada were estimated to rise from $1.8 billion dollars in 2010 ($0.7 and $1.1 billion dollars for males and females, respectively) to $8.1 billion dollars in 2031 ($3.3 and $4.8 billion dollars for males and females, respectively) (Figure 1). This rise is in part attributable to an increase in the number of persons living with OA, due to increasing OA incidence and general longevity. OA prevalence is projected to increase from 3 million (14%) in 2010 to 5.8 million (18%) in 2031 (Figure 1). Other contributing factors are the increasing number of total knee/hip replacements, greater use of services by patients treated surgically, and the aging of the OA population.

Conclusion: This population simulation model predicts a 350% increase in the total costs of OA over the next 20 years. The model will be helpful in the estimation of the economic consequences of potential changes in the prevailing model of care for persons with OA.

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2463

Cost-Effectiveness of Tocilizumab Monotherapy Vs. Adalimumab Monotherapy in the Treatment of Severe Active Rheumatoid Arthritis. Josh J. Carlson1, Sarika Ogale2, Fred Dejouckheere3 and Sean Sullivan3. 1University of Washington, Seattle, WA, 2Genentech, South San Francisco, CA, 3F. Hoffmann-La Roche Ltd, Basel, Switzerland

Background/Purpose: The ADACTA trial found that biologic naïve patients with severe active RA who are methotrexate (MTX) intolerant or in whom continued MTX treatment is inappropriate, achieved a significant benefit after 24 weeks on tocilizumab (TCZ) 8mg/kg IV every 4 weeks monotherapy vs. 40mg adalimumab (ADA) every 2 weeks monotherapy. The objective of our study was to estimate the cost-effectiveness of TCZ vs. ADA used as monotherapy (mono) for RA from the U.S. payer perspective.

Methods: We compared treatment initiation with TCZ (8mg/kg every 4 weeks) mono vs. two different dose regimens of ADA mono: 1) 40mg weekly, 2) 40mg every 2 weeks. Efficacy for TCZ and ADA every 2 weeks was obtained from ADACTA. Efficacy for ADA weekly was estimated by adjusting upward the ADA response in ADACTA, using a ratio of response rates for ADA weekly:ADA every 2 weeks derived from the 2004 van de Putte et al. study, which evaluated both doses of ADA mono. For the 6-month trial period, we calculated the incremental cost per additional ACR20, 50, 70 responder, and low disease activity score (LDAS) achieved for TCZ vs. ADA (“6-month model”). We also used a patient-level simulation model (10,000 patients, 2,000 simulations) to estimate the lifetime incremental cost per quality-adjusted life year (QALY) of initiating treatment with TCZ vs. ADA mono (“life-time model”). In this model, both drugs are followed by an etanercept-cetirizumab-palliative care sequence. Non-responders discontinue at 6 months; responders experience a constant probability of discontinuation thereafter. Discontinued patients go to the next treatment in the sequence. Trial-based ACR responses are linked to changes in HAQ scores at 6 months. HAQ remains constant while on biologics and is mapped to utility to estimate QALYs using pooled data from TCZ trials (Diamantopoulos 2012). Costs are derived from published sources and include drug treatment, monitoring, and direct medical resource utilization (derived from HAQ score; Kobelt 1999). Costs and QALYs were discounted at 3%. Sensitivity analyses were performed to test the robustness of the model results.

Results: In the 6-month and lifetime models, TCZ 8mg/kg mono had higher ACR response rates and QALYs, respectively, and lower costs.
compared with ADA mono 40mg weekly (Table). Compared with ADA 40mg every 2 weeks, the 6-month incremental cost for TCZ ranged from $2,077 per additional LDAS achiever to $4,509 per additional ACR70 responder; in the lifetime model the incremental cost-effectiveness ratio was $49,195/QALY. Based on one-way sensitivity analyses, model results were most sensitive to changes in drug costs and ACR response rates.

**TCZ Monotherapy** | **ADA Monotherapy** | **Difference:** TCZ-ADA Monotherapy | **Incremental Cost-effectiveness Ratio (ICER)**
--- | --- | --- | ---
**Comparison 1:** Life-time Cost/QALY for TCZ Mono 8mg/kg every 4 weeks vs. ADA Mono 40mg every week
Costs | $202,707 | $270,779 ($68,072) |
Life-years | 16.13 | 16.09 | 0.04 |
QALYs | 7.49 | 7.35 | 0.14 |
**Comparison 1a:** TCZ Dominates ADA weekly (more effective, less costly)
Costs | $202,707 | $270,779 |
Life-years | 16.13 | 16.09 |
QALYs | 7.49 | 7.35 |

Conclusion: TCZ (8mg/kg every 4 weeks) mono dominates (more effective and less costly) ADA (40mg weekly) mono and is cost-effective compared to ADA (40mg every 2 weeks) mono, from a US payer perspective, in patients with severe RA for whom methotrexate treatment is not appropriate.


2464

Cost-Sharing and Utilization of Biologic and Non-Biologic DMARDs Among U.S. Medicare Beneficiaries with Rheumatoid Arthritis. Chris Tonner, Gabriela Schmajuk and Naoz Haydami. University of California, San Francisco, San Francisco, CA

**Background/Purpose:** While Medicare’s Part D prescription drug benefit expanded access to drugs for many patients, it also includes a controversial provision called the “coverage gap” during which beneficiaries are fully responsible for drug costs. As an initial step in understanding the potential impact of cost-sharing for beneficiaries with rheumatoid arthritis (RA), we compared drug utilization and out-of-pocket (OOP) costs for biologic and non-biologic disease-modifying anti-rheumatic drugs (DMARDs) for two groups of patients: those with a coverage gap and those who were not subject to cost-sharing because they were fully eligible for the low-income subsidy program. We found that a significantly larger proportion of biologic DMARD users were enrolled in the low-income subsidy program compared to non-biologic DMARD users. Whether the low rates of biologic DMARD use among Medicare beneficiaries who are not eligible for financial subsidies is a consequence of substantial cost-sharing warrants further investigation.

Disclosure: C. Tonner, None; G. Schmajuk, None; J. Yazdami, None.

2465

Seroresponse Rates After Influenza Vaccination in Rheumatoid Arthritis Patients Treated with Biological Agents During the 2011–2012 Flu Season. Masatoshi Hayaishi1, Toshihisa Kojima2, Naoki Ishiguro3, Tomonori Kobayakawa1 and Toshisaha Kanamono1. 1Nagano Red Cross Hospital, Nagano, Japan, 2Nagoya University, School of Medicine, Nagoya, Japan, 3Nagoya University, Graduate School & Faculty of Medicine, Nagoya, Aichi, Japan

**Background/Purpose:** At present, annual vaccination against influenza is recommended for rheumatoid arthritis (RA) patients. However, whether humoral responses to influenza vaccine are impaired in RA patients treated with biological agents remains controversial. This study aimed to compare seroresponse rates after influenza vaccination in RA patients treated with five biological agents.

**Methods:** Trivalent influenza subunit vaccines containing A/H1N1, A/H3N2, and B-1 were administered subcutaneously once to 64 RA patients treated with methotrexate (MTX, control, n = 15), infliximab (IFX, n = 12), etanercept (ETN, n = 11), adalimumab (ADA, n = 3), tocilizumab (TCZ, n = 12), or abatacept (ABT, n = 11). We measured antibody titers using hemagglutination inhibition (HI) test at baseline and 4–8 weeks after vaccination. The immunogenicity end points were the proportion of patients with antibody titers of 1:40 or more on HI test and the proportion of patients with either seroconversion or a significant increase in antibody titer.

**Results:** Table 1 shows baseline characteristics of all the 64 RA patients. Seroconversion and seropositive rates (%) after subcutaneous vaccination were 54.3 and 64.4, respectively, in MTX; 46.2 and 61.1, respectively, in IFX; 73.3 and 87.9, respectively, in ETN; 62.5 and 66.7, respectively, in ADA; 48.3 and 58.3, respectively, in TCZ; and 21.4 and 33.3, respectively, in ABT. Seronegative rates (%) were 45.7 in MTX, 53.6 in IFX, 26.7 in ETN, 37.5 in ADA, 51.7 in TCZ, and 78.6 in ABT (Table 2). Both the decrease in the seroresponse rate after influenza vaccination in the ABT group and increase in the seropositive rate in the ETN group were significant compared with those in the MTX control group (P < 0.01) (Table 2). Of the 64 RA patients, only one patient in the MTX group was infected by influenza during this season.
Table 1. Baseline characteristics of 64 RA patients

<table>
<thead>
<tr>
<th>Agents</th>
<th>Number of patients</th>
<th>Males (%)</th>
<th>Mean age ± SD (years)</th>
<th>PSL rate (%)</th>
<th>Mean usage of PSL ± SD (mg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTX</td>
<td>15</td>
<td>6.7</td>
<td>68.3 ± 9.8</td>
<td>33.3</td>
<td>4.1 ± 2.2</td>
</tr>
<tr>
<td>IFX</td>
<td>12</td>
<td>16.7</td>
<td>61.6 ± 10.8</td>
<td>66.7</td>
<td>3.9 ± 2.1</td>
</tr>
<tr>
<td>ETN</td>
<td>11</td>
<td>9.1</td>
<td>58.6 ± 15.6</td>
<td>54.5</td>
<td>3.5 ± 2.4</td>
</tr>
<tr>
<td>ADA</td>
<td>3</td>
<td>33.3</td>
<td>69.3 ± 7.0</td>
<td>33.3</td>
<td>5.0 ± 0.0</td>
</tr>
<tr>
<td>TCZ</td>
<td>12</td>
<td>25.0</td>
<td>67.7 ± 12.8</td>
<td>58.3</td>
<td>3.6 ± 1.7</td>
</tr>
<tr>
<td>ABT</td>
<td>11</td>
<td>27.3</td>
<td>62.0 ± 9.8</td>
<td>81.8</td>
<td>3.8 ± 2.8</td>
</tr>
</tbody>
</table>

R4, rheumatoid arthritis; SD, standard deviation; PSL, prednisolone; MTX, methotrexate; IFX, infliximab; ETN, etanercept; ADA, adalimumab; TCZ, tocilizumab; ABT, abatacept

Results: RA patients treated with ABT exhibited compromised immune responses to influenza vaccine compared with those treated with MTX or other biological agents. Therefore, RA patients treated with ABT would benefit from repeated influenza vaccinations.

Disclosure: M. Hayashi: None; T. Kojima: None; N. Ishiguro, Abbott Japan, Chugai Pharmaceutical Co., Ltd., Eisai Co., Ltd., Mitsubishi Tanabe Pharma, Pfizer Japan Inc., and Takeda Pharmaceutical Co., Ltd., 2, Abbott Pharmaceuticals, 2, Bristol-Myers Squibb, 2, UCB, 2, Roche Pharmaceuticals, 2, Sanofi-Aventis Pharmaceuticals, 2; O. Almagor: 1Northwestern University, Chicago, IL, 2Boston University School of Medicine, Boston, MA, 3Boston University, Boston, MA, 4Klinikum Augsburg, Augsburg, Germany, 5University of Maryland, Baltimore, MD, 6Warren Alpert Medical School at Brown University, RI, 7Columbia University Medical Center, New York, NY, 8Ohio State University, Columbus, OH, 9University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 10University of California-San Francisco, San Francisco, CA

Background/Purpose: The fully human, anti-tumor necrosis factor monoclonal antibody, adalimumab (ADA), is approved for the treatment of rheumatoid arthritis (RA), psoriatic arthritis, ankylosing spondylitis, juvenile idiopathic arthritis, Crohn’s disease and psoriasis in the United States and elsewhere. The effect of ADA during human pregnancy is unknown. Outcome data collected by the Organization of Teratology Information Specialists (OTIS) provides some information on the safety of ADA when used by pregnant patients with RA.

Methods: In this ongoing, prospective cohort study, women with RA in the U.S. or Canada exposed to ADA during the first trimester of pregnancy were enrolled, followed 1-year postpartum, and medical records are obtained. Additionally, live born infants receive a dysmorphology exam for both major and minor structural anomalies. Outcomes in the ADA-exposed group are primarily compared with those in a disease-matched group of women without ADA exposure during pregnancy, and secondarily compared to those in a group of pregnant women who neither have autoimmune disease nor have been treated with ADA, all followed in the same manner.

Results: Between November 2004 and May 2012, pregnancy outcomes were collected on 312 women in the ADA RA cohort study. Of these, 69 were in the ADA-exposed cohort, 80 in the disease-matched comparison group, and 163 in the healthy comparison group (Table 1). Spontaneous abortion (SAB) occurred in 10.1% of ADA-exposed, compared to 7.5% and 2.5% of the disease-matched and healthy comparison women respectively. After adjustment for gestational age at enrollment, the relative risk (RR) for SAB in the ADA-exposed group compared to the disease-matched group was not statistically significant (RR 1.33, 95% CI, 0.42, 4.28, \( p = 0.62\)). Among all births with known outcome, major birth defects were found in 4.5% of the ADA-exposed pregnancies, 5.2% of the disease-matched pregnancies, and 6.0% of the healthy comparison pregnancies (\( p = 1.0 \) for ADA-exposed vs. disease-matched group). There was no evidence of a pattern of either major or minor structural defects in the ADA-exposed group, nor were there any statistically significant differences between the ADA-exposed group and the disease-matched comparison group for preterm delivery (\( p = 0.49 \)), birth weight in full-term infants (\( p = 0.59 \)) or serious infections (\( p = 1.0 \) (Table 1).

Table 1.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>ADA-Exposed n=69</th>
<th>RA Comparison n=80</th>
<th>p-value ADA-Exposed vs. RA Comparison</th>
<th>Healthy Comparison n=163</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live born – n (%)</td>
<td>60 (87.0)</td>
<td>71 (88.8)</td>
<td>0.80</td>
<td>148 (90.8)</td>
</tr>
<tr>
<td>Spontaneous Abortion – n (%)</td>
<td>7 (10.1)</td>
<td>6 (7.5)</td>
<td>0.62**</td>
<td>4 (2.5)</td>
</tr>
<tr>
<td>Therapeutic Termination – n (%)</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stillbirth – n (%)</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lost to follow-up - n (%)</td>
<td>2 (2.9)</td>
<td>3 (3.8)</td>
<td>1.0</td>
<td>11 (6.7)</td>
</tr>
<tr>
<td>Preterm live born infants – n (%)</td>
<td>8/59 (13.6)</td>
<td>13/71 (18.3)</td>
<td>0.49</td>
<td>8/148 (5.4)</td>
</tr>
<tr>
<td>Birth Weight full term infants – gm (SD)</td>
<td>3292 (489)</td>
<td>3342 (460)</td>
<td>0.59</td>
<td>3468 (503)</td>
</tr>
<tr>
<td>Number of infants with major birth defects among live born infants – n/N (%)</td>
<td>3/60 (5.0)</td>
<td>3/71 (4.2)</td>
<td>1.0</td>
<td>10/148 (6.8)</td>
</tr>
<tr>
<td>Number of infants with major birth defects among all pregnancies – n/N (%)</td>
<td>3/67 (4.5)</td>
<td>4/77 (5.2)</td>
<td>1.0</td>
<td>10/152 (6.6)</td>
</tr>
<tr>
<td>Serious infections in live born infants up to 1 year of age – n (%)</td>
<td>2 (3.3)</td>
<td>2 (2.8)</td>
<td>1.0</td>
<td>3 (2.0)</td>
</tr>
</tbody>
</table>

*Excludes lost-to-follow-up. **After adjustment for gestational age at enrollment

Conclusion: Based on these findings, there are no significant differences for any adverse pregnancy outcome studied in the ADA-exposed group vs. the primary comparison group of women with RA and no ADA exposure. Additionally, there is no evidence of a specific pattern of major or minor malformations in infants born to women with ADA-exposure.

Disclosure: C. D. Chambers, Abbott Laboratories, 2, Amgen, 2, UCB, 2, Roche Pharmaceuticals, 2, Sanofi-Aventis Pharmaceutical, 2, Bristol-Myers Squibb, 2, Apotex Inc, 2, Sandoz Pharmaceuticals, 2, Heritage Pharmaceuticals, 2, Teva Pharmaceuticals, 2, D. L. Johnson, None; Y. Luo, None; J. L. Jimenez, None; N. Mirrassoul, None; E. Salas, None; K. L. Jones, Abbott Laboratories, 2, Amgen, 2, Bristol-Myers Squibb, 2, UCB, 2, Roche Pharmaceuticals, 2, Sanofi-Aventis Pharmaceuticals, 2, Apotex Inc, 2, Heritage Pharmaceuticals, 2, Sandoz Pharmaceuticals, 2, Teva Pharmaceuticals, 2;

ACR Concurrent Abstract Session

Osteoarthritis - Clinical Aspects II: Structural Risks for Osteoarthritis End-points and Potential Treatments

Tuesday, November 13, 2012, 2:30 PM–4:00 PM

2467 Tissue Lesions in Osteoarthritis Initiative Participants with Normal X-Rays and Risk Factors for Incident Cartilage Damage. Leena Sharma1, Ali Guermazi2, Orit Almagor1, Michel Crema1, Dorothy D. Dunlop1, Frank Roemer4, Marc C. Hochberg5, Charles Eaton6, Joan M. Bathon7, Rebecca D. Roemer4, Marc C. Hochberg5, Charles Eaton6, Joan M. Bathon7, Rebecca D. Ali Guermazi2, Orit Almagor1, Michel Crema3, Dorothy D. Dunlop1, Frank Roemer4, Marc C. Hochberg5, Charles Eaton6, Joan M. Bathon7, Rebecca D. H. Murialdo, 1Northwestern University, Chicago, IL, 2Boston University School of Medicine, Boston, MA, 3Boston University, Boston, MA, 4Klinikum Augsburg, Augsburg, Germany, 5University of Maryland, Baltimore, MD, 6Warren Alpert Medical School at Brown University, RI, 7Columbia University Medical Center, New York, NY, 8Ohio State University, Columbus, OH, 9University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 10University of California-San Francisco, San Francisco, CA

Background/Purpose: Understanding factors underlying initial development of knee OA is crucial to effective prevention strategy design. Our goals were to: 1) determine extent of tissue damage on MRI in knees of persons at higher risk for knee OA and in whom both knee x-rays were normal (KL 0), and 2) evaluate whether presence of any bone marrow lesions (BML), meniscal tears (MT), meniscal extrusion (ME), or hand OA is associated with risk of incident cartilage damage.

Methods: The Osteoarthritis Initiative (OAI) is a cohort study of men
and women, 45–79 years, all with or at increased risk to develop knee OA. 850 participants had had bilateral KL 0 at 12 months (baseline for this study) by centralized reading. On their right knee MRI, we undertook assessment of cartilage morphology, BML, MT, and ME using a modified MOAKS scoring system. Readers were blinded to hypotheses, clinical data, and KL grade. The definition of hand OA relied upon number of bony enlargements. 12 and 48 month image assessments occurred within an ancillary study; in addition, OAI clinical data V6.2.1 and BU x-ray reading data V1.5 were used. Multiple logistic regression models were used to evaluate associations between baseline data and incident cartilage damage by 3 year follow-up; results are reported as adjusted odds ratios (aORs) and 95% CIs.

Results: 850 persons met criteria for inclusion [mean age 59.6 years (8.8, SD), mean BMI 26.7 kg/m²(4.2), 475 (56%) women]. Among the 850 KL 0 knees, the number with abnormal tissue in one or more subregions at baseline was: 483 (57%) with cartilage damage (full-thickness in 67); 353 (42%) with BML; 180 (21%) with MT; and 117 (14%) with ME. In only 56 (7%) knees were all of these tissues normal. 367 persons [age 58.5 (8.8), BMI 26.4 (4.2), 226 (62%) women] contributed 367 knees with normal cartilage morphology in all regions at baseline. Of the 367, 80 had BML, 45 had MT (32 horizontal, 9 vertical, 4 partial maceration), and 25 had ME. Lesions coexisted in some knees (11 with BML+MT, 7 with BML+ME, and 10 with MT+ME). In separate analyses, adjusting for age, gender, BMI, and hand OA, BMI [aOR 2.24, 95% CI (1.15, 4.34)] and ME [aOR 2.83, 95% CI (1.03, 7.79)] were each associated with incident cartilage damage. In a model including all covariates, BML continued to be significant [aOR 2.19, 95% CI (1.12, 4.28)], while ME was not quite significant [aOR 2.71, 95% CI (0.97, 7.58)]. No hand OA presence was consistently associated with incident cartilage damage, e.g., in the fully adjusted model, aOR 2.30, 95% CI (1.15, 4.60) for this variable.

Conclusion: Cartilage damage was already present in 57% of right knees from persons without OA in either knee by protocolized x-ray, but at higher risk, suggesting that radiographic studies of incident OA in this population, even restricted to KL 0, are frequently evaluating not incidence but early progression. Among knees with normal cartilage morphology, hand OA, BML, and ME were each associated with an increased risk of incident cartilage damage. While MRI is superior to x-ray, the optimal window for BML, and ME were each associated with an increased risk of incident progression. Among knees with normal cartilage morphology, hand OA, BML, and ME were each associated with an increased risk of incident cartilage damage. While MRI is superior to x-ray, the optimal window for BML, and ME were each associated with an increased risk of incident progression. Among knees with normal cartilage morphology, hand OA, BML, and ME were each associated with an increased risk of incident cartilage damage. While MRI is superior to x-ray, the optimal window for BML, and ME were each associated with an increased risk of incident progression.

Disclosure: L. Sharma, None; A. Guermazi, Boston Imaging Core Lab 1, Stryker, 5, Merck Serono, 5, Genzyme Corporation, 5, AstraZeneca, 5, Novartis Pharmaceutical Corporation, 5; O. Almagor, None; M. Crema, Shareholder Boston Imaging Core Lab, LLC, 1; D. D. Dunlop, None; F. Roemer, Boston Imaging Core Lab 1, National Institute of Health, 5, Merck Serono, 5; M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Biotherics, 5, Gilead Sciences, 5; T. A. Schwartz, None; N. E. Lane, None; J. M. Jordan, None.

2468 Incident Symptomatic Hip Osteoarthritis Is Associated with Differences in Hip Shape by Active Shape Modeling: The Johnston County Osteoarthritis Project. Amanda E. Nelson1, Felix Liu2, John A. Lynch3, Jordan B. Hunter2, Zhijie Wang3, Frank Roemen4, Felix Eckstein5, Michael J. Hannon3, Ali Guermazi4 and C. Kent Kwoh6. 1University of Pittsburgh, Pittsburgh, PA, 2University of Sydney, Sydney, Australia, 3University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 4Paracelsus Medical University, Salzburg, Austria, 5University of Pittsburgh and VA Healthcare System, Pittsburgh, PA

Background/Purpose: Hip joint replacement (KR) is a cost-effective procedure with good long-term outcomes, but has limitations as an endpoint in OA intervention trials. A definition of virtual total joint replacement (vTKR) based on clinical measures may be a more useful, efficient and practical outcome measure. The aim of this study was therefore to develop and evaluate a potential vTKR definition based on clinical measures in the OAI.

Methods: The sample included 8204 knees from 4143 individuals (42% male, age 61.6 ± 9.2) in the Progression, Incident and Control cohorts. A total of 187 individuals underwent KR (216 knees) over the five years after baseline. Individuals with continuous health care coverage during the five years were included, except for individuals who underwent KR. Clinical measures individually predictive of KR, thus considered for inclusion in the model, were: WOMAC Knee Pain, Stiffness, Disability and Total scores; KOOS Knee Pain (KOOSKP), Symptoms, ADL, Quality of Life (QOL) and Total scores; Knee pain severity in past 30 days and PASE. Several other clinical measures were excluded as not predictive. At each annual visit, logistic regression models were developed predicting actual KR during the following year. Baseline, the two prior visits, and change between them entered models with up to three clinical measures. Sensitivity, specificity, ROCs and AUCs were evaluated. Adapting a propensity-score approach, the 5% of non-KR knees with the highest predicted probability of being a KR were eligible vTKR knees. We then further
required that clinical measures at the incident vTKR timeframe be as poor or worse than baseline and also did not improve through year 5.

Results: A combination of KOOS Knee Pain and QOL scores was identified as the best KR-predicting vTKR model. vTKR criterion was based on three factors that increased the predicted odds of KR: crossing a threshold of severe knee pain (KOOS), a threshold of sufficiently poor quality of life, a weighted combination of these two, and/or a marked increase in knee pain over the year prior. Cross-validated AUCs, distinguishing between KR and non-KR knees across annual visits ranged from 0.867 to 0.921. A parity-inducing probability cutpoint correctly separated KR from non-KR knees with sensitivity and specificity of 0.85. A total of 399 knees maintained or got worse after their first vTKR. Of these, 143 were as bad or worse than baseline.

Final clinical variable vTKR prediction model Odds-ratios* (95% C.I.):s for KOOSKP and KOOSQOL (during preceding two periods) Predicting Actual KR

<table>
<thead>
<tr>
<th>vTKR</th>
<th>KOOSKP Threshold (OR per 1 unit lower)</th>
<th>KOOSQOL Threshold (OR per 1 unit lower)</th>
<th>Additional effect if KOOSKP got worse during preceding two periods (OR per 1 unit worsening)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24M</td>
<td>1.047 (1.028, 1.065)</td>
<td>1.032 (1.013, 1.051)</td>
<td>1.018 (0.997, 1.039)**</td>
</tr>
<tr>
<td>36M</td>
<td>1.043 (1.025, 1.062)</td>
<td>1.028 (1.011, 1.044)</td>
<td>1.054 (1.035, 1.073)</td>
</tr>
<tr>
<td>48M</td>
<td>1.053 (1.035, 1.072)</td>
<td>1.027 (1.010, 1.044)</td>
<td>1.060 (1.041, 1.079)</td>
</tr>
<tr>
<td>60M</td>
<td>1.048 (1.030, 1.066)</td>
<td>1.023 (1.008, 1.039)</td>
<td>1.049 (1.028, 1.067)</td>
</tr>
</tbody>
</table>

vTKR month 24: Model predicting KR during following 12 month OAI outcome model for all OR's were statistically significant at p<0.0003, except KOOSKP worsening at 24M * KOOSKP worsening at 24m = p=0.0903

Conclusion: We have developed a promising vTKR criterion based on a combination of threshold KOOS Knee Pain and QOL scores, and/or worsening KOOS Knee Pain. This vTKR criterion may be a useful outcome measure for OA intervention trials.

Disclosure: R. M. Boudreau, None; D. J. Hunter, None; Z. Wang, None; F. Roemer, None; F. Eckstein, None; M. J. Hannon, None; A. Guermazi, None; C. K. Kwoh, None.

2470

Does Structural Progression of Knee Osteoarthritis Measured with Magnetic Resonance Imaging or Radiography Predict Knee Replacement?— Data From the Osteoarthritis Initiative. Felix Eckstein1, C. Kent Kwohi, Robert M. Boudreaux, Zhijie Wang, Michael J. Hannon, Wolfgang Wirth, Ali Guermazi2, Frank Roemer1, Michael C. Nevitt1, Markus R. John1, Leena Sharma1, Jeffrey W. Duryea10, David J. Hunter1, and Osteoarthritis Initiative Investigators.1, 2Paracelsus Medical University, Salzburg, Austria, University of Pittsburgh and VA Healthcare System, Pittsburgh, PA, 3University of Pittsburgh, Pittsburgh, PA, 4University of Pittsburgh School of Medicine, Pittsburgh, PA, 5Boston University, Boston, MA, 6Klinikum Augsburg, Augsburg, Germany, 7University of California-San Francisco, San Francisco, CA, 8Novartis Pharma AG, Basel, Switzerland, 9Northwestern University, Chicago, IL, 10Brigham & Women, Boston, MA, 11University of Sydney, Sydney, Australia, 12San Francisco

Background/Purpose: Imaging biomarkers that predict relevant clinical endpoints, such as knee replacement (KR), are valuable tools for knee osteoarthritis prognosis. Currently, measurement of minimum radiographic joint space width (mJSW) is the accepted standard for testing the efficacy of disease modifying drugs (DMOADs) in clinical trials. The purpose of this study was to compare the predictive power of magnetic resonance imaging (MRI)-based longitudinal measures of cartilage loss and mJSW for KR.

Methods: We studied knees from Osteoarthritis Initiative (OAI) participants who received a KR between 24 and 60 months (M) follow-up (confirmed by radiography and/or review of hospital records). A matched control knee that did not receive a KR during this period was selected for each case, with the same sex, similar age (within 5 years), and the same baseline Kellgren Lawrence (KL) grade (central X-ray readings; strata 0–1, 2, 3, 4). Knees were not discordant for medial vs. lateral semi-quantitative joint space narrowing (JSN). Medial femorotibial compartment (MFTC) cartilage thickness change was determined from a sagittal 3 Tesla double echo steady state water excitation (DESSw) MRI sequence, and mJSW from fixed flexion radiography. The time points prior to KR (T0) and that 12 months earlier (T–1) were analyzed in case knees (i.e. in a knee with KR between 24M and 36M: 24M=T0;12M=T–1), and the same time points in control knees, with blinding to acquisition order. P-values for differences in longitudinal change between case/control pairs were assessed using the Wilcoxon signed rank test, and the area (AUC) under the receiver operating curve (ROC).

Results: 261 knees of 225 OAI participants received a KR (between 24M and 60M). Of these, 93 had central X-ray readings, JSW, and MRI readings available at both T0 and T–1, and a matched control based on the above criteria (38 men, 55 women, age 63.4±9.3; BMI 30.2±4.9). Medial (MFTC) cartilage loss over a 12 month period prior to KR, measured with MRI, was significantly greater in KR case than control knees (-0.13±0.29 vs. -0.04±0.15mm; p=0.038, AUC=0.57). The differences in longitudinal change was borderline significant for the central MFTC (0.24±0.57 vs. -0.07±0.23 mm; p=0.079; AUC=0.57) and was not significant for the change in radiographic mJSW (0.19±0.91 vs. 0.01±0.89mm; p=0.397; AUC=0.53). The difference in cartilage loss (MRI) between KR case and control knees was particularly strong in knees with early radiographic OA (KL2: n=22; MFTC p=0.008; AUC=0.72), whereas no difference in mJSW change was detectable in KL2 case/control pairs (p=0.126; AUC=0.58).

Conclusion: Medial compartment longitudinal cartilage thickness loss, measured with MRI, predicts knee replacement as a clinical endpoint. In contrast, no significant difference in the 12 month change of radiographic mJSW was detected between case and control knees in the above sample. Given the relationship with an important clinical endpoint (i.e. knee replacement), MRI-based measures of cartilage change are useful imaging biomarkers for clinical trials, for instance to demonstrate the efficacy of a DMOAD. The current findings also support the concept that treatments that slow cartilage loss may delay or prevent KR.

Disclosure: F. Eckstein, Chondrometrics GmbH, 3, Chondrometrics GmbH, 4, Novartis AG, 2, Novartis, Merck Serono/Abbott, Perceptive, BioIntra, 5; C. K. Kwoh, None; R. M. Boudreau, None; Z. Wang, None; M. J. Hannon, None; W. Wirth, Chondrometrics GmbH, 3, Chondrometrics GmbH, 4, MerckSerono, 5; A. Guermazi, BiCLC, 1, 4, AstaZeneca, Genzyme, Novartis, and MerckSerono, 5; F. Roemer, Boston College Lab, 1, National Institute of Health, 5, Merck Serono, 5; M. C. Nevitt, None; M. R. John, Novartis Pharma AG, 1, Novartis Pharma AG, 3; L. Sharma, None; J. W. Duryea, None; D. J. Hunter, None.

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Oral Glucosamine Sulphate for the Prevention of Knee Osteoarthritis in Overweight Females; The First Ever Preventive Randomized Controlled Trial. Jos Runhaar1, Marienke van Middelkoop1, Max Reijman1, Edwin Oei1, Dannam Vroegindeweij1, Gerjo van Osch1, Bart Koes1 and Sitja Biemans-Zenstra1. 1Erasmus MC, Rotterdam, Netherlands, 2Maassstad Hospital, Rotterdam, Netherlands

Background/Purpose: Previous studies showed the largest effects of glucosamine on osteoarthritis (OA) symptoms of the knee joint and when used in an early phase of the disease. The present study evaluates the effect of a tailor made diet and exercise program (DEP) and of oral glucosamine sulphate, in a 2 × 2 factorial design, on the incidence of knee OA over 2.5 years in a high risk group of overweight, middle-aged females; free of clinical knee OA at baseline (ISRCTN 42823086; financed by The Netherlands Organisation for Health Research and Development). Worldwide, this is the first large RCT on prevention of knee OA. Here we present the results of the glucosamine intervention and the interaction with DEP.

Methods: 50 general practitioners contacted all registered women between 50 and 60 years. In total, 407 women met all inclusion criteria (BMI ≥ 27, no clinical knee OA (ACR criteria), no contraindications to MRI, no rheumatic diseases, no recent glucosamine usage), were invited for baseline measurements and were randomised. All subjects were instructed to dissolve and consume 1500 mg of the distributed study drug (crystalline glucosamine sulphate and placebo) each day, for 2.5 years. Pre-specified primary outcome was incidence of knee OA, defined by incidence of either K&L ≥ 2, joint space narrowing of ≥ 10 mm or incident clinical knee OA (ACR criteria).

Results: After 2.5 years of follow-up, forty-three women (11%) were lost to follow-up. Twenty-nine percent of all subjects reported one or more adverse events throughout the study; without difference in frequency between groups (p = 0.23). The interaction term between both interventions on the primary outcome proved to be significant (p = 0.04). Adjusted Generalized Estimated Equations showed no significant effect of glucosamine sulphate within the DEP control group (OR 0.59; 95%CI 0.31–1.12) or within the DEP intervention group (OR 1.44; 95%CI 0.83–2.48), for the Intention To Treat population (see table). The difference in direction of the association, however, is notable. Within subjects compliant to the study drug (≥75% of study drug, N=250), also no significant effects of glucosamine sulphate over placebo were found (OR 0.69, 95%CI 0.32–1.52 and OR 1.32, 95%CI 0.70–2.51 respectively). Interestingly, among subjects compliant to DEP the interaction effect became stronger (p = 0.01) and, hence the contrast...
of the effects in the placebo and glucosamine group more distinct (see table).

Baseline characteristics and incident OA figures for Intention To Treat and Per Protocol analyses

<table>
<thead>
<tr>
<th>Diet &amp; Exercise Program</th>
<th>Control group</th>
<th>Intervention group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>Glucosamine</td>
<td>Placebo</td>
</tr>
<tr>
<td>N - subjects</td>
<td>102</td>
<td>102</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>55.7 ± 3.3</td>
<td>55.7 ± 3.1</td>
</tr>
<tr>
<td>BMI (kg/m2)</td>
<td>32.6 ± 4.3</td>
<td>32.4 ± 4.6</td>
</tr>
<tr>
<td>Heberden nodes</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>uni-lateral</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>bi-lateral</td>
<td>70%</td>
<td>68%</td>
</tr>
<tr>
<td>N - knees</td>
<td>204</td>
<td>204</td>
</tr>
<tr>
<td>K&amp;L</td>
<td>grade 0</td>
<td>53%</td>
</tr>
<tr>
<td>grade ≥ 1</td>
<td>46%</td>
<td>53%</td>
</tr>
<tr>
<td>Varus</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>Mild symptoms</td>
<td>17%</td>
<td>20%</td>
</tr>
<tr>
<td>Past injury</td>
<td>14%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Incident knee OA (after 2.5 years)

<table>
<thead>
<tr>
<th>ITT</th>
<th>PP glucosamine</th>
<th>PP DEP</th>
<th>PP glucosamine and DEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>19%</td>
<td>21%</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>13%</td>
<td>17%</td>
<td>17%</td>
<td>13%</td>
</tr>
<tr>
<td>35%</td>
<td>23%</td>
<td>35%</td>
<td>24%</td>
</tr>
<tr>
<td>46%</td>
<td>32%</td>
<td>46%</td>
<td>32%</td>
</tr>
</tbody>
</table>

ITT: Intention To Treat population (all randomized subjects). PP: Per Protocol population (compliant to intervention). DEP: diet and exercise program

Conclusion: Although safe compared to placebo, crystalline glucosamine sulphate was ineffective for the prevention of knee OA in overweight females over 2.5 years of follow-up.

Disclosure: J. Runhaar None; M. van Middelkoop None; M. Reijnman None; E. Oei None; D. Vroegindeijewi N; G. van Osch None; B. Koes None; S. Biema-Zeinstra None.

A Randomized, Multicentre, Double Blind, Placebo-Controlled Trial of Anti TNF Alpha (adalimumab) in Refractory Hand Osteoarthritis: The Dora Study

Xavier Chevalier1, Philippe Ravaud 2, Emmanuel Maheu 3, Gabriel Baron4, Amandine Rialland5, Philippe Vergnaud6, Christian Roux7, Yves Maugars8, Denis Mulleman9, Bernard Combe10, Pierre Laforge11, Damien Loeuille13, Violaine Foltz14 and Pascal Richette15. 1Department of Rheumatology Hopital Henri Mondor, Creteil, France, 2Hopital Hotel Dieu, Paris Descartes University, Paris, France, 3AP-HP, St Antoine Hospital, Paris, France, 4Epidemiology, Paris, France, 5Unite´ de recherche clinique Henri Mondor, Creteil, France, 6CCRB Synarc Lyon, Lyon, France, 7CHU L' Archet Hospital, Nice, France, 8Lariboisie`re Hospital, Paris, France, 9Department of Rheumatology Hopital Henri Mondor, Creteil, France, 10Hotel Hospital Dieu, Paris Descartes University, Paris, France, 11AP-HP, St Antoine Hospital, Paris, France, 12Epidemiology, Paris, France, 13Unité de recherche clinique Henri Mondor, Creteil, France, 14CCRB Synarc Lyon, Lyon, France, 15Lariboisie`re Hospital, Paris, France

Methods: The digital osteoarthritis in refractory hand OA study (DORA), is a phase 3 randomized superiority, double-blind (patients and assessors of outcomes), parallel, placebo controlled, 26 weeks, (DORA), is a phase 3 randomized superiority, double-blind (patients and assessors of outcomes), parallel, placebo controlled, 26 weeks, multicenter trial (conducted in 16 French clinical sites), using TNF blocking agent (adalimumab) in 2 sub cutaneous injections at week 0 and week 2. Patients meeting the American College of Rheumatology criteria for hand OA with pain above 40 mm on a 100 mm visual analogue scale (VAS), OA with pain above 40 mm on a 100 mm visual analogue scale (VAS), involving at least 3 painful interphalangeal joints and at least 3 OA joints at Kellgren Lawrence (KL) grade ≥ 2 on a recent radiograph, who did not respond to analgesics and NSAIDs, were recruited. Randomization and allocation to trial group were carried out by a central computer system. The primary endpoint was change in pain score after 6 weeks. Secondary outcomes at 6 weeks were change in the number of spontaneous painful joints, in number of painful joints on pressure, in number of swollen joints, in morning stiffness, in patient’ and practitioner’ global assessments, in functional index for hand OA (FIHOA) and Cochin hand functional index. Consumption of analgesics was recorded (acetaminophen up to 3g/D was the only rescue medication allowed until week 6). Serum markers (COMP, PIIINAP, HA, usCRP, cytokines level of TNF a, IL-6, IL-1) and urine level of CTX-II (corrected by creatinine) were measured at W0 and W6.

Results: On the 99 patients selected, 85 were randomized (42 in the placebo group, 41 in the adalimumab group). 35 patients in the placebo group and 38 in the adalimumab group received the two injections. 78 patients with at least one injection were analyzed (37 placebo and 41 adalimumab) (mITT). Mean (SD) age was 62.5 (6.9), 85 % of women, mean (SD) level of pain was 65.4 (12.9) mm; mean (SD) number of painful IP joints: 11 (6), mean number of joints with clinical synovitis was 5.9(4.4), mean FIHOA score 15.6 (6.3). The difference in the mean change in pain score on VAS (0–100 mm) over 6 weeks between adalimumab and placebo (primary endpoint) was: -2.5 mm (95% CI, -14.0 to 9.0), p: 0.67, non significant. No statistically significant differences were found for any of the secondary outcomes, except for a decrease in the number of swollen joints between week 0 and week 26 which favoured adalimumab group: mean difference: -1.9 (95% CI, -3.2 to -0.6), p: 0.006. Analgesics use was similar between groups. There were no safety concerns. There was none variations of any biological markers between the 2 groups. TNF alpha serum level was not correlated with clinical outcome in the group of patients treated with adalimumab.

Conclusion: In a group of patients with refractory hand OA, TNFa blockers (adalimumab, 2 sc injections) failed to demonstrate any clinical improvement.

Trial registration clinicaltrials.gov Identifier: NCT00597623

Academic study supported by APH clinical Research; supported by Osteoarthritis group of the French Society

Disclosure: X. Chevalier None; P. Ravaud None; E. Mahé None; G. Baron None; A. Rialland None; P. Vergnaud None; C. Roux None; Y. Maugars None; D. Mulleman None; B. Combe None; D. Wendling None; P. Lafargue None; D. Loeuille None; V. Foltz None; P. Richette None.

ACR Concurrent Abstract Session

Pediatric Rheumatology: Clinical and Therapeutic Disease III: Childhood Systemic Lupus Erythematosus and Other Vasculitides

Tuesday, November 13, 2012, 2:30 PM– 4:00 PM

A Randomized Trial in New Onset Juvenile Dermatomyositis: Prednisone Versus Prednisolone Plus Cyclosporine Versus Prednisolone Plus Methotrexate

Nicolina Ruperto, Angelo Pistorio, Sheila Oliveira, Ruben J. Cuttitta, Angelo Raveli, Michel Fischbach, Stefan Hagelberg, Tadea Avcin, Emmanuel Cheuret, Fabrizia Corona, Gerard Couillault, Frank Dressler, Valeria Gerli, Gary Sterba, Francesco Zulian, Maria Teresa Apaz, Adriana Cespedes-Cruz, Rolando Cimaz, Fabrizio De Benedetti, Pierre Quartier, Ricardo Russo, Nico Wulffraat, Simona Angioloni and Alberto Martini. Paediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

Background/ Purpose: Data regarding the safety and efficacy of treatment regimens for juvenile dermatomyositis(JDM) tends to be from anecdotal, small, uncontrolled, non-randomized case series. This randomized trial was aimed to find out the treatment regimen associated with the lowest occurrence of flares and the lowest drug related toxicity.

Methods: Children with newly diagnosed JDM were randomized in an open fashion to receive one of three different therapeutic approaches: prednisone (PND) versus PND plus methotrexate (MTX) versus PND plus Cyclosporine A. The overall hypothesis to be tested in this trial was that the early introduction of combination therapy of corticosteroids and either MTX or CSA will prove more effective and safe than corticosteroids alone in the treatment of JDM.

Primary outcome measures after 6 months of treatment: response rate according to the PRINTO provisional definition of improvement in the 3 arms (20% improvement in at least 3 core set variables with no more than 1 of the remaining variables, muscle strength excluded), worsened by less than 30%). The PRINTO JDM core set variables are: 1) muscle strength by the mean of the Childhood Myositis Assessment Scale (CMAS); 2) physician’s global assessment of disease activity on a 10 cm VAS; 3) global

S1042

Tuesday, November 13, 2012, 2:30 PM–4:00 PM
disease activity assessment by the mean of the Disease Activity Index (DAS); 4) parent’s/patient’s global assessment of overall well-being on a 10 cmVAS; 5) functional ability assessment by the mean of the Childhood Health Assessment Questionnaire (CHAQ); 6) health-related quality of life assessment.

Primary outcome measures after 24 months of treatment: a) time to inactive disease; b) time to major therapeutic changes because of inefficacy/failure/adverse events.

Results: 138/139 randomized patients were included in the efficacy dataset. There were 81/138 females (59%) with a median age at onset of 7.4 years (1st–3rd quartiles 1.1–15.4) and a median disease duration of 2.8 months (1.4–5.3). Frequency of response at 6 months was for 24/46 (52.2%) for PDN, 31/46 (67.4%) for PDN + CSA and 34/46 (73.9%) for PDN + MTX (p 0.082). Time to inactive disease (Figure) in the combination group (PDN + CSA or PDN + MTX) was significantly shorter than that of PDN alone (p 0.031). Time to major therapeutic changes in the combination group (PDN + CSA or PDN + MTX) was significantly longer than that of PDN alone (p 0.006). Total number of adverse events were frequent in PDN (78/276 (28.3%) in PDN + CSA and 78/276 (28.3%) in PDN + MTX (p < 0.0001). Skin and subcutaneous tissue disorders, and nervous system disorders were statistically more frequent in PDN + CSA (p 0.0015, p 0.039 respectively).

Conclusion: combined therapy with PDN and either CSA or MTX was more effective than with PDN alone. However the safety profile favour the combination with MTX toward that with CSA.

Disclosures: None.

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Cancer in Pediatric-Onset Systemic Lupus: What Is the Role of Disease Duration and Other Factors on Risk? Sasha Bernatsky1, Ann F. Clarke2, Jerome Labrecque1, Emily von Scheven1, Laura E. Schanberg4, Earl D. Silverman3, Hermine I. Brunner2, Kathleen A. Haines2, Randy Q. Cron4, Kathleen M. O’Neill1, Kiern Oen10, Alan M. Rosenberg11, Ciaran M. Duffy12, Jennifer LF Lee13, Mruganka Kale13, Elizabeth M. Turnbull1 and Rosalind Ramsey-Goldman14. 1McGill University, Montreal, QC; 2Research Institute of the McGill Univ. Health Ctr, Montreal, QC; 3UC San Francisco, San Francisco, CA; 4Duke University Medical Center, Durham, NC; 5PRSGC, Cincinnati, OH; 6 Cincinnati Children’s Hospital Medical Center, Cincinnati, OH; 7Hackensack Univ Med Ctr, Hackensack, NJ; 8Univ of Alabama-Birmingham, Birmingham, AL; 9Okla Univ Health Science Ctr, Oklahoma City, OK; 10University of Manitoba, Winnipeg, MB; 11Royal University Hospital, Saskatoon, SK; 12Children’s Hospital of Eastern Ontario, Ottawa, ON; 13RI McGill Univ Cancer Ctr, Montreal, QC; 14Northwestern University Feinberg School of Medicine, Chicago, IL.

Background/Purpose: Compared to adults with SLE, relatively little is known about cancer risk in pediatric-onset SLE. We assessed cancer incidence in a multi-centre pediatric-onset SLE cohort, compared to general population cancer rates.

Methods: We ascertained cancers within SLE clinic registries at 10 pediatric centers, located in Birmingham AL; Cincinnati OH, Durham NC; Hackensack NJ; Oklahoma OK; San Francisco CA; Montreal QC; Toronto ON; Saskatoon SK; and Winnipeg MB. Subjects were linked to state or provincial cancer registries for the observational interval, spanning 1974–2009. In-situ cancers were excluded. Follow-up was calculated from the date first seen at the clinic, and the first of 3 possible events: death, cancer, or end of study interval (Dec. 2009). We pooled observed cancers and person-years of observation. The cancers expected to occur were calculated by multiplying the person-years in the cohort by the geographically matched age, sex, and calendar year-specific cancer rates. The ratio of observed to expected cancers represents the SIR, or relative cancer risk in pediatric SLE, versus the general population. We provided estimates for total cancer and for hematological cancers, and also results stratified on sex, age group, and SLE duration.

Results: There were 999 patients aged <18 at cohort entry. Most (82%) were female; mean age at cohort entry was 12.9 years (SD=3.6). The majority were Caucasian. Subjects were observed for a total of 7,986 patient-years (average 8.0 years). Within this interval, only 3.0 invasive cancers were expected, however, 14 invasive cancers occurred, for an SIR of 4.7, 95%
confidens interval, CI 2.6, 7.8. Three hematologic cancers were found (2 non-Hodgkin’s lymphoma, 1 leukemia), for an SIR of 5.2 (95% CI 1.1, 15.2). The non-hematologic cancers included one cancer each of bladder, brain, breast, and thyroid, 3 head and neck cancers, and 4 unspecified cancers. At time of cancer diagnosis, mean SLE duration was 12.3 years (range 0.1, 25.2 years). Excluding cancers that occurred within the first year of cohort entry, the over-all cancer SIR was 3.0 (95% CI 2.3, 7.8). The SIRs stratified by age group were similar across strata (though more precise for females than males, due to relatively small numbers of males). Though not definitive, there was a trend for heightened relative risk in the period 10–19 years after SLE diagnosis. However, in absolute terms, this stratum experienced only 8 cancers.

Conclusion: These up-dated results suggest an increased cancer risk in pediatric onset SLE versus the general population. However, in absolute terms, this still translates into few events, which is somewhat re-assuring. A limitation is that some patients may have developed a cancer after relocating to another state or province, thus under-representing the true cancer incidence. Of note, risk may be highest in the period 10–19 years after SLE diagnosis, at a time when patients will have transferred to an adult provider. Further work will assess other potential factors of interest, such as race/ethnicity and calendar effects. Our work highlights the importance of continuity as adolescents transition to adult care, and a need for collaborations to allow longitudinal assessment of long-term risks.

Disclosure: S. Bernatsky, None; A. E. Clarke, None; J. Labrecque, None; E. von Scheven, None; L. E. Schanenber, UCSF, 5; AstraZeneca, 5; Pfizer Inc, 2; E. Silverstein, None; H. I. Brunner, None; K. A. Haines, None; R. Q. Cron, Genentech and Biogen IDEC Inc., 5; Novartis Pharmaceutical Corporation, 5, Swedish Orphan Biovitrum, 5; K. M. O’Neil, None; K. Oen, None; A. M. Rosenberg, None; C. M. Duffy, None; J. L. Lee, None; M. Kate, None; E. M. Turnbull, None; R. Ramsey-Goldman, None.

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Role of Whole-Body Magnetic Resonance Imaging in the Assessment of Disease Activity in Juvenile Dermatomyositis. A Pilot Study. Clara Malattia1, Annalisa Madeo1, Silvia Pederzoli1, Anna Providenti1, Marta Mazzoni1, Agnese Beltramo1, Alessandro Consolaro1, Stefania Viola1, Antonella Buoncompagni2 and A. Martini, 1Istituto G Gaslini, Pediatria II, Reumatologia, Genova, Italy, 2Istituto G Gaslini, Genova, UO Fisioterapia, Genova, Italy

Background/Purpose: Musculoskeletal MRI represents a valuable non-invasive technique for detecting muscle inflammation in idiopathic inflammatory myopathies (IIM). So far, all MRI studies in juvenile dermatomyositis (JDM) have focused on the thighs muscles. Whole-body MRI (WB-MRI) is a new technique which allows to screen the entire musculoskeletal system and gives a complete assessment of the total inflammatory burden in patients with IIM. However, its potential in children with JDM has never been explored so far.

Purpose: to evaluate the contribution of WB-MRI examination in the clinical assessment of JDM patients and to investigate its feasibility and validity in the assessment of disease activity.

Methods: WB-MRI images were obtained from 30 JDM patients (12M;18F, median age 8.6 years) and from 30 children (13M: 17F, median age 10.4 years) without inflammatory myopathies (control group), using a 1.5 Tesla and Short Tau Inversion Recovery (STIR) sequences. Signal intensity was scored using a 0–2 point scale in 42 muscular groups; myofascial and subcutaneous tissue inflammation were assessed on the upper and lower extremities using a 0–1 point scale. Validation procedures included the analysis of reliability, construct validity, discriminant validity and sensitivity to change.

Results: in addition to a symptomatic proximal distribution of inflammation, WB-MRI revealed asymptomatic distal legs muscle inflammation in 19 out of 30 patients (70%) and asymptomatic forearms inflammation in 13 out of 30 patients (50%). Twenty-three patients showed a typical patchy and heterogeneous distribution of muscular inflammation. In 3 patients the abnormal hyperintense areas tended to be diffusely and homogeneously distributed within the muscles. WB-MRI showed inactive disease in 4 patients. Fascial and subcutaneous tissue inflammation were detected in 9 out of 30 (30%) and 18 out of 30 (60%) patients, respectively. WB-MRI scores were significantly increased in active JDM when compared with the inactive JDM group (p<0.02) and the control group (p<0.0001), indicating an excellent discriminant validity of the WB-MRI. The inter- and intra-reader agreement for the muscular, subcutaneous and fascial WB-MRI scores were excellent (intraclass correlation coefficient >0.8). The muscular WB-MRI score showed moderate to excellent correlations with indicators of disease activity such as the Manual Muscle Test (MMT; rs=0.86), the Childhood Myositis Assessment Scale (CMAS; rs=0.85) and physician’s assessment of disease activity (VAS Phys; rs=0.75). WB-MRI score showed a higher responsiveness to change (standardized response mean=0.86) compared to MMT (CMAS; rs=0.51), CMAS (CMAS; rs=0.28), VAS Phys (CMAS; rs=0.63) and CRP (CMAS; rs=0.17).

Conclusion: WB-MRI provides additional information to the clinical assessment by revealing a wider involvement of muscle groups and different patterns of distribution of muscle inflammation. WB-MRI score allows to reliably visualize the extent of the inflammatory process and therefore it represents a promising non-invasive tool to estimate the total disease burden, to adjust treatment to disease severity and to monitor treatment efficacy in JDM.

Disclosure: C. Malattia, None; A. Madeo, None; S. Pederzoli, None; A. Providenti, None; M. Mazzoni, None; A. Beltramo, None; A. Consolaro, None; S. Viola, None; A. Buoncompagni, None; A. Martini, None.

2477

Background/Purpose: Systemic polyarteritis nodosa (PAN) is a predominantly medium sized vessel vasculitis characterized by non-granulomatous necrotizing vasculitis. We aimed to evaluate clinical, laboratory and imaging features of cutaneous (cut-) PAN and the PAN form and to develop a new set of diagnostic criteria for cut-PAN in a large international pediatric vasculitis registry available on the PRINTO database.

Methods: We extracted from the PRINTO database all the patients who fulfilled the Ankara 2008-EULAR/Pres/PRINTO criteria for PAN. The cut-PAN patients as per the treating physician diagnosis were also extracted. To define clinical and laboratory characteristics who could help to differentiate cut-PAN from PAN and univariate logistic regression analysis was performed.

Developing a new set of diagnostic criteria for cut-PAN: Principle component analysis were performed to detect best representative factors of cutaneous symptoms in cut-PAN patients. The one with the highest sensitivity and specificity in the generated models were accepted as diagnostic criteria in our study.

Results: There were 109 and 45 patients classified as PAN, and cut-PAN respectively with a mean age at diagnosis of 9.47±5.59 years; and 9.12±3.83 years; respectively. The female/male ratio and ethnicity did not differ in the 2 subtypes. The cutaneous group had significantly less constitutional features and less acute phase reactant levels, as expected. The median values (IQR 25–75%) for the ESR and CRP for PAN were 78 (48–108) mm/h and 7.36 (2.76–15.03) mg/dL. Musculoskeletal features such as myalgia was present in 82 (75.2 %) patients with PAN and 18 (40.9%) patients with cut-PAN (p<0.001) both groups. As differentiating features skin infarcts were observed in PAN only and constitutional features, angiographic abnormalities, and organ involvement was not seen in any of the cut-PAN patients. Malaise, fever, severe headache, motor mononeuritis multiplex, sensory peripheral neuropathy, abdominal pain, and hematuria were the most statistically significant clinical characteristics able to differentiate these two entities.

New set of diagnostic criteria for cut-PAN is the absence of any organ involvement (constitutional and musculo skeletal symptoms are acceptable) and presence of any of 4 cutaneous findings (Livedo reticularis, skin nodules, polymorphous exanthema, panniculitis). Sensitivity of proposed diagnostic criteria obtained from the existing database for cut-PAN was calculated as 88.8%, specificity 97.8%, positive predictive value 83.3% and negative predictive value 98.6%.
Conclusion: The large number of patients with other vasculitides and cutaneous PAN has enabled us to have a significant specificity and sensitivity for the suggested criteria. Further biological studies are needed to effectively differentiate the two entities.

Disclosure: E. Demirkaya, None; S. Ozan, None; T. Turker, None; R. J. Cattina, None; P. Brogan, None; F. Quaer, None; J. Anton, None; N. Aktay Ayaz, None; S. M. Garay, None; G. Espada, None; R. Khuchbandani, None; F. Zulian, None; A. Bagga, None; A. Belot, None; C. A. Silva, None; S. Al-Mayouf, None; A. Itanaz Estrella, None; S. Oliveira, None; C. Aieliet, None; C. Saad-Magalhaes, None; A. Martini, None; N. Ruperto, None.

2478 Identification of Disease-Specific Neuroimaging Phenotypes in Childhood Inflammatory Brain Diseases. Tania Cellucci, Pascal N. Tyrrell, Shehla Sheikh, Suzanne Laughlin and Susanne M. Benseler. The Hospital for Sick Children, Toronto, ON

Background/Purpose: Magnetic resonance imaging (MRI) is a key diagnostic modality of childhood inflammatory brain diseases (IBrainD). While overlapping clinical features contribute to significant diagnostic uncertainty, neuroimaging characteristics may provide guidance for a targeted diagnostic approach. The aim of this study was to identify specific MRI patterns at diagnosis of distinct childhood IBrainD.

Methods: This single centre cohort study included children less than 18 years old who were diagnosed with an IBrainD between June 1989 and December 2010 and were enrolled in the BrainWorks cohort at SickKids Hospital. All patients also had a high-quality brain MRI based on institutional protocol at diagnosis. Demographic, clinical, laboratory, neuroimaging and histologic data at diagnosis were collected. Correspondence analysis was performed to obtain a multidimensional representation of the relationship between MRI findings and IBrainD diagnoses. Pearson residuals (PR) were calculated to estimate the strength of associations.

Results: A total of 142 children (51% females, median age 8.8 years) with IBrainD were identified: 104 primary angiitis of the CNS (ePACNS), 11 secondary CNS vasculitis, 8 neuronal antibody syndromes, 6 post-infectious IBrainD and 13 unclassified IBrainD. Children with angiography-positive non-progressive ePACNS were likely to have unilateral, unifocal and ischemic lesions (PR 4.2, 3.4, and 3.0, respectively). Common sites for lesions were the basal ganglia (PR 3.5), middle cerebral artery territory (PR 1.8), and internal capsule (PR 1.3). Angiography-negative ePACNS was grouped together with multifocal lesions (PR 1.64) and involvement of the leptomeninges (PR 2.3), perivascular or temporal lobes (PR 1.5, 2.8), and subcortical or deep white matter (PR 2.8, 1.5). Optic neuritis (PR 2.9), volume loss (PR 1.8) and frontal lobe lesions (PR 1.5) were more likely in neuronal antibody syndromes. Frontal lobe involvement was also seen in post-infectious IBrainD (PR 1.6). Symmetric lesions were grouped with secondary CNS vasculitis (PR 2.6) and unclassified IBrainD (PR 2.7).

Conclusion: Childhood inflammatory brain diseases are characterized by distinct patterns of neuroimaging findings with respect to location and type of lesion. Identifying these patterns requires a standardized approach involving high-quality MRI for any child with suspected IBrainD. The neuroimaging phenotype may guide further diagnostic work-up and should be incorporated into diagnostic algorithms for childhood IBrainD in the future.

Disclosure: T. Cellucci, None; P. N. Tyrrell, None; S. Sheikh, None; S. Laughlin, None; S. M. Benseler, None.

ACR Concurrent Abstract Session
Rheumatoid Arthritis - Clinical Aspects IV:
Non-biologic Drugs for Rheumatoid Arthritis:
New Insights on Comorbidities and Adverse Events
Tuesday, November 13, 2012, 2:50 pm–4:00 pm

2479 Rheumatoid Arthritis Does Not Increase Risk of Short Term Total Knee Replacement (TKR) Adverse Events (AE). Zachary J. LoVerde1, Lisa A. Mandell2, Beverly K. Johnson3, Mark P. Figgie4, Friedrich Boettner5 and Susan M. Goodman6, 7 New York Medical College, Valhalla, NY, 8Hospital for Special Surgery, New York, NY

Background/Purpose: TKR is commonly performed for rheumatoid arthritis (RA) and osteoarthritis (OA). Historically, RA patients were at higher risk of post-operative AEs. The purpose of this study was to evaluate whether this is true in the era of widespread DMARD and biologic use.

Methods: Patients participating in the institution’s TKR registry between 2007 and 2010 were screened for RA by ICD-9 code or self report, and the diagnosis confirmed by chart review. AEs were identified by 6 month questionnaire, and review of office and hospital notes. Self-reported AEs were validated by chart review or phone call. Infection was defined as any surgical site infection as well as systemic infections. Each RA patient was matched to 2 controls by age (+/- 5 years), gender, and primary vs. revision surgery. Baseline characteristics of RA and OA patients were compared by standard statistics and bivariate relationships to AE calculated.

Results: 159 RA TKA patients were identified, and matched to 318 OA controls. Mean age: 63 years (range 22-93), 88% female. 20% of RA were on corticosteroids, and 67% were on DMARDs. Assessment of co-morbidities using Charlson co-morbidity scores did not reveal a significant difference between groups. RA had significantly worse baseline WOMAC pain (47.1 vs. 53.7; p-value < 0.01) and function scores (43.8 vs. 54.2; p-value < 0.01), and lower perceived health status on the EQ-5D (0.59 vs. 0.65; p-value < 0.01), and SF-36 PCS (29.3 vs. 33.3; p-value < 0.01). Operative time (144 minutes RA vs. 146 minutes OA; p-value = 0.66) and length of stay (5 days for both) were no different between groups. There were no deep joint infections in either group, and there was no significant difference between OA and RA rates of superficial infection, i.e. cellulitis or stitch abscesses (9.4% RA vs. 10.1%; p-value = 0.72) or thromboembolism (1.2% RA vs. 0.6%; p-value = 0.60). Re-operation was more common in OA (2.5% vs. 8.8%; p-value = 0.015), largely due to manipulations.

Conclusion: The belief that RA increases post-operative AEs may be outdated. In spite of worse pre-operative function, and high steroid and DMARD use, infection and wound healing complications were not increased in RA in a high volume orthopedic hospital. RA patients additionally had

S1045
lower rates of re-operation. These data are reassuring, but further study is needed to see if these trends continue and are generalizable.

Disclosure: Z. J. LoVerde, None; L. A. Mandl, None; B. K. Johnson, None; M. P. Figlie, None; F. Boettner, None; S. M. Goodman, None.

Table 1.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Parameter</th>
<th>OR (95% CI) at index visit</th>
<th>OR (95% CI) at 12 mo follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMARD use</td>
<td>N (%)</td>
<td>3541 (85.3%)</td>
<td>3825 (82.0%)</td>
</tr>
<tr>
<td>RA onset ≤70 yr</td>
<td>0.996 (0.997, 1.00)</td>
<td>1.005 (1.004, 1.006)</td>
<td></td>
</tr>
<tr>
<td>Duration of RA</td>
<td>0.998 (0.998, 1.00)</td>
<td>0.999 (0.999, 1.00)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.999 (0.999, 1.00)</td>
<td>0.999 (0.999, 1.00)</td>
<td></td>
</tr>
<tr>
<td>Patient global assessment</td>
<td>0.997 (0.99, 0.997)</td>
<td>0.998 (0.998, 1.00)</td>
<td></td>
</tr>
<tr>
<td>Physician global assessment</td>
<td>1.035 (1.034, 1.036)</td>
<td>1.035 (1.034, 1.036)</td>
<td></td>
</tr>
<tr>
<td>Swollen joint count</td>
<td>0.998 (0.997, 0.999)</td>
<td>1.000 (0.999, 1.001)</td>
<td></td>
</tr>
<tr>
<td>Tender joint count</td>
<td>1.000 (0.999, 1.00)</td>
<td>1.000 (0.999, 1.00)</td>
<td></td>
</tr>
<tr>
<td>Modified HAQ</td>
<td>0.907 (0.906, 0.907)</td>
<td>0.907 (0.906, 0.907)</td>
<td></td>
</tr>
<tr>
<td>DAS28</td>
<td>0.930 (0.930, 0.931)</td>
<td>0.930 (0.930, 0.931)</td>
<td></td>
</tr>
</tbody>
</table>

| Biologic use | N (%) | 2021 (34.8%) | 1744 (31.0%) |
| RA onset ≤70 yr | 0.961 (0.961, 0.962) | 0.961 (0.961, 0.962) |
| Duration of RA | 1.002 (1.002, 1.003) | 1.002 (1.002, 1.003) |
| Age | 0.997 (0.997, 0.998) | 0.997 (0.997, 0.998) |
| Patient global assessment | 1.000 (1.000, 1.001) | 1.000 (1.000, 1.001) |
| Physician global assessment | 0.997 (0.996, 0.998) | 0.997 (0.996, 0.998) |
| Swollen joint count | 1.001 (1.000, 1.002) | 1.001 (1.000, 1.002) |
| Tender joint count | 1.001 (1.000, 1.002) | 1.001 (1.000, 1.002) |
| Modified HAQ | 1.046 (1.045, 1.047) | 1.046 (1.045, 1.047) |
| DAS28 | 1.000 (0.999, 1.000) | 1.000 (0.999, 1.000) |

| Infection requiring hospitalization | N (%) | 34 (0.7%) | 41 (0.7%) |
| RA onset ≤70 yr | 0.403 (0.403, 0.404) | 0.403 (0.403, 0.404) |
| Duration of RA | 1.002 (1.001, 1.002) | 1.002 (1.001, 1.002) |
| Age | 0.999 (0.999, 0.999) | 0.999 (0.999, 0.999) |
| Patient global assessment | 1.001 (1.000, 1.001) | 1.001 (1.000, 1.001) |
| Physician global assessment | 1.002 (1.001, 1.002) | 1.002 (1.001, 1.002) |
| Swollen joint count | 1.002 (1.001, 1.002) | 1.002 (1.001, 1.002) |
| Tender joint count | 1.002 (1.001, 1.002) | 1.002 (1.001, 1.002) |
| Modified HAQ | 2.763 (1.658, 4.604) | 2.933 (1.753, 4.905) |
| DAS28 | 1.458 (1.012, 2.100) | 1.458 (1.012, 2.100) |
| h/o MTX | 1.876 (0.572, 6.150) | 2.321 (0.714, 7.544) |
| h/o biologic | 4.381 (1.980, 9.696) | 2.631 (1.375, 5.034) |

**Conclusion:** Most elderly (>70) RA pts in this large cohort received DMARD therapy, but DMARD and biologic toxicities were very low (<5%). Age of RA onset and age at f/u were not associated with increased biologic side effects. Greater RA severity and longer RA duration influenced if elderly RA patients were on DMARD or biologic therapy. Disability was strongly associated with risk of serious infection in this older age group. Limitations of this study include limited data on co-morbid conditions and precise medication timing. These data confirm that elderly RA patients tolerate DMARD and biologic therapy well with low rates of side effects and emphasize that treatment decisions for RA should never be based on age alone. However, disabled elderly RA patients are at high risk for serious infections. This vulnerable population should be the focus of future studies to determine strategies to improve outcomes beyond measures of RA activity alone.

Disclosure: R. L. Manno, None; D. A. Pappas, None; K. C. Saunders, Corrona, 3; G. Reed, Corrona, 5, Corrona, 2; S. Grant, Axio Research LLC, 3; C. O. Bingham III, Roche, Genentech, Biogen/IDEC, 2, Roche, Genentech, 5.
**Background/Purpose:** Recent data report significant decreases in low-density lipoprotein (LDL) and total cholesterol (TC) levels in predominantly female Caucasian rheumatoid arthritis (RA) patients treated with hydroxychloroquine (HCQ). We evaluated the association of HCQ use with lipid profiles in Veterans Affairs registry (VARA) patients; a predominantly male cohort with multiple comorbidities.

**Methods:** VARA patients that had post-enrollment lipid profiles available were evaluated. [LDL, TC, hDL, triglycerides (TG)] values and HCQ status were extracted through links to national VA administrative and pharmacy databases. HCQ user was defined as at least 3 consecutive months of prescription prior to the index lipid value. Patient data included socio-demographics, DMHQA, RA disease activity measures (TJC, SJC, ESR, CRP, 3vDAS28), treatment [DMARD (excluding HCQ), anti-TNF], statin and prednisone use, and presence of diabetes mellitus (DM). HCQ users and HCQ non-users were compared using chi-square tests for categorical variables and t-tests for continuous variables. Multivariate analysis was performed, controlling for age, gender, race, 3vDAS28, prednisone, DMARD, statin use and DM.

**Results:** A total of 1012 VARA patients had at least one lipid profile following enrollment; 208 were excluded (<3 consecutive months of HCQ use). Of 804 patients, the mean age was 62.5 yrs, predominantly male (91.7%) and Caucasian (79.6%), with established disease (10.6 yrs, SD22.7). Seventy-five percent received DMARDs, 24.6% biologic therapy. One hundred and sixty-six patients (20.7%) were HCQ users and 638 (79.3%) were HCQ non-users. Significant differences in HCQ-users versus non-users were age (64.4 vs 62.1 yrs, p<0.009), disease duration (13.0 vs 10.0 yrs, p=0.003), TJC (3.9 vs 5.8, p<0.001), SJC (3.5 vs 5.0, p=0.001), 3vDAS28 (3.4 vs 3.8, p=0.001), and DMARD use (94.6 vs 70.5%, p<0.001).

**Conclusion:** A higher proportion of patients are starting CS early in their disease course now compared to previously. Although more patients are other discontinuing CS now compared to previously, the proportion of patients on CS at any given time point of disease duration is higher now than previously.

**Disclosure:** A. Makol, None; J. M. Davis III, None; C. S. Crowson, None; T. M. Thernau, None; E. Gabriel, None; E. L. Matteson, None.

### Table

**Univariate and Multivariate Associations of Lipid values in HCQ Users vs Non-Users in RA patients**

<table>
<thead>
<tr>
<th>Lipid</th>
<th>Total n=638</th>
<th>Current n=183</th>
<th>Never n=455</th>
<th>Analysis (p value)</th>
<th>Total n=638</th>
<th>Never n=455</th>
<th>Analysis (p value)</th>
<th>Total n=638</th>
<th>Never n=455</th>
<th>Analysis (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>102.2 (37.7)</td>
<td>178.1 (31.4)</td>
<td>182.7 (38.8)</td>
<td>0.006</td>
<td>9.1 (0.894)</td>
<td>-1.1 (0.052)</td>
<td>-1.4 (0.088)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL</td>
<td>108.4 (35.4)</td>
<td>75.8 (50.4)</td>
<td>110.6 (33.9)</td>
<td>0.040</td>
<td>8.1 (0.087)</td>
<td>-0.9 (0.049)</td>
<td>-0.5 (0.047)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dLDL</td>
<td>46.8 (39.6)</td>
<td>47.7 (16.6)</td>
<td>47.5 (13.6)</td>
<td>0.128</td>
<td>1.5 (0.341)</td>
<td>1.0 (0.279)</td>
<td>1.7 (0.293)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td>46.0 (15.2)</td>
<td>44.4 (11.6)</td>
<td>47.5 (14.6)</td>
<td>0.088</td>
<td>0.6 (0.491)</td>
<td>0.6 (0.283)</td>
<td>1.4 (0.068)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC/HDL</td>
<td>4.3 (1.0)</td>
<td>3.8 (1.2)</td>
<td>4.4 (1.6)</td>
<td>0.006</td>
<td>0.4 (0.005)</td>
<td>0.4 (0.005)</td>
<td>0.4 (0.005)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** In a cohort of US Veterans, RA patients taking HCQ had more optimal lipid profiles than those not using the drug. However, African Americans on HCQ did not demonstrate similar benefits as Caucasian patients. For a relatively inexpensive, low-risk drug, there may be a potential lipid lowering role for HCQ in some RA patients.

**Disclosure:** N. A. Kiefer, None; G. S. Kerr, None; J. S. Richards, None; L. A. Davis, None; L. Caplan, None; J. Huang, None; G. W. Cannon, None; H. Sayles, None; K. Michaud, None.

### 2483

**Folic Acid Pathway Single Nucleotide Polymorphisms Associated with Methotrexate-Related Significant Adverse Events**

<table>
<thead>
<tr>
<th>SNP</th>
<th>Univariate Model Coefficients (p value)</th>
<th>Multivariate Model Coefficients (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rs1801133</td>
<td>0.45 (0.001)</td>
<td>0.5 (0.947)</td>
</tr>
<tr>
<td>rs7010484</td>
<td>9.8 (0.003)</td>
<td>9.3 (0.004)</td>
</tr>
<tr>
<td>rs4617146</td>
<td>7.9 (0.011)</td>
<td>7.6 (0.011)</td>
</tr>
<tr>
<td>rs719235</td>
<td>7.9 (0.011)</td>
<td>7.6 (0.011)</td>
</tr>
<tr>
<td>rs11988534</td>
<td>11.0 (0.005)</td>
<td>10.5 (0.005)</td>
</tr>
</tbody>
</table>

**Background/Purpose:** Methotrexate (MTX) is the cornerstone medication in the treatment of rheumatoid arthritis (RA). While MTX has been associated with a number of adverse events (AE), most are insignificant and do not result in cessation of MTX. We examined whether single nucleotide polymorphisms (SNPs) in enzymes that participate in the folic acid pathway ([GGH], gamma-glutamyl hydrolase [GGH], and methylenetetrahydrofolate reductase [MTHFR]) are associated with significant adverse events (SigAE) complicating MTX treatment.

**Methods:** Patients (n=319) enrolled in the prospective Veterans Affairs RA (VARA) registry and who were taking MTX were genotyped for multiple SNPs with DNA samples derived from whole blood. Genes and associated SNPs included: FPGS, gamma-glutamyl synthetase (FPGS), gamma-glutamyl hydrolase (GGH), and methylenetetrahydrofolate reductase (MTHFR) were associated with significant adverse events (SigAE) complicating MTX treatment.

**Conclusion:** The SNP associated with an increased odds of SigAE by logistic regression was the minor allele of GGH rs1254893 (OR 3.4, 95% CI 1.58–7.48) (see Table). This same variable was also associated with an increased hazard ratio (HR) of SigAE (HR 2.24, 95% CI 1.32–4.41) (see Figure).
Background/Purpose: Ectopic deposition of liver fat (steatosis) is associated with insulin resistance (IR), cardiovascular disease (CVD), and is a potent risk factor for cirrhosis. RA patients are at risk for IR and CVD, and cirrhosis risk is a concern with several RA pharmacotherapies.

Methods: RA patients underwent abdominal computed tomography (CT). Liver images were analyzed using Slice-o-Matic software, with the average radiographic attenuation [in Hounsfeld units (HU)] for five (250 pixels each) sites of liver parenchyma, selected away from hepatic vasculature. Attenuation was corrected using a tissue phantom of known density. Steatosis was defined as average hepatic attenuation <48 HU (a standard definition that correlates histologically to ≥30% fatty deposition).

Results: A total of 113 RA patients were studied [mean age 64 ± 8 years, 70% female, median RA duration =13 years, median DAS28 =3.1]. Mean hepatic attenuation was 54 ± 9 HU and steatosis was detected in 20 (18%). Steatosis was unrelated to age, gender, or ethnicity. Those with steatosis reported fewer minutes of exercise and more minutes of daily television watching, had significantly higher IR and serum triglyceride levels, and lower HDL levels. All measures of adiposity were higher among those with steatosis. Current alcohol use, and average and maximum number of alcoholic drinks consumed were not significantly associated with liver density in any analysis. Liver HU was not associated with coronary calcium score, ultrasound measures of carotid atherosclerosis, or ankle brachial index.

Conclusion: RA subjects on MTX may be at increased risk of AE leading to cessation of MTX if they have ≥1 copy of the minor allele in GGH rs12548933. Further investigation is warranted, as this SNP may indicate a susceptibility to MTX toxicity.

Disclosure: L. A. Davis, None; B. Ivan Polk, None; A. D. Mann, None; R. K. Wolff, None; G. S. Kerr, None; A. M. Reimold, None; G. W. Cannon, None; T. R. Mikuls, None; L. Caplan, None.

Table. Final Regression results for logistic and Cox models

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Logistic</th>
<th>Cox</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR 95% CI</td>
<td>p-value</td>
</tr>
<tr>
<td>GGH, rs12548933, ≥1 copy of minor allele</td>
<td>3.43 1.58 7.43</td>
<td>0.002</td>
</tr>
<tr>
<td>GGH, rs7010484, ≥1 copy of minor allele</td>
<td>2.86 1.31 6.27</td>
<td>0.009</td>
</tr>
<tr>
<td>MTHFR, rs1801131, ≥1 copy of minor allele</td>
<td>2.67 1.33 5.36</td>
<td>0.006</td>
</tr>
</tbody>
</table>

ACR Concurrent Abstract Session
Rheumatoid Arthritis Treatment - Small Molecules, Biologies and Gene Therapy: Safety & Efficacy of Janus Activated-Kinase (JAK) Inhibitors

Tuesday, November 13, 2012, 2:30 PM–4:00 PM


Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. Phase (P) 3 studies demonstrated tofacitinib is effective and has a manageable safety profile at both 5 and 10 mg twice daily (BID) doses. These post-hoc analyses of pooled P3 and long-term extension (LTE) data assessed whether there are relative differences in efficacy or safety between the two doses.

Methods: Data from patients (pts) receiving tofacitinib 5 or 10 mg BID were pooled from five randomized P3 and two open-label LTE studies. Pooling was justified by similarity of demographic and baseline (BL) disease characteristics of pts across the studies. For efficacy comparisons, pooled P3 data were assessed for signs and symptoms (rates of ACR response, rates of DAS28-4[ESR] (DAS) ≤3.2 and <2.6), physical function (rates of HAQ-DI improvement ≥0.3), and fatigue (rates of FACIT improvement ≥4) (all at Month 3). For safety comparisons, pooled P3 and LTE incidence rates (IR) (events/100 pt-y) were assessed for all-cause mortality, serious infection events (SIE), malignancies (excluding non-melanoma skin cancer), lung cancers, major adverse cardiovascular events, GI perforations and herpetic zoster. Results were expressed as probability (proportion of responders for efficacy) or IR (IR for safety) ratios, respectively, for 10 mg BID divided by that of 5 mg BID, with 95% confidence intervals (CIs).

Results: In the efficacy analysis, the robust group sizes (approximately 1100 pts each) allowed demonstration of statistical separation (95% CIs excluding 1) of 10 mg BID from 5 mg BID for each of the efficacy parameters. PK and safety CIs were not associated with liver density in any analysis. Liver HU was not associated with coronary calcium score, ultrasound measures of carotid atherosclerosis, or ankle brachial index.
endpoints except fatigue. Point estimates for the 10 mg BID/5 mg BID ratios were between 1.11 and 1.15 for ACR20 responses, ACR50 responses and HAQ-DI improvement ≥0.3, and between 1.30 and 1.43 for ACR70 responses and rates of DAS28 ≤3.2 and <2.6, indicating a greater likelihood of achieving the more stringent outcomes with the 10 mg BID dose compared with 5 mg BID. In the safety analyses, all the CIs for important safety events included 1, indicating similar rates between doses, with the exception of increases in SIEs for 10 mg BID in LTE (risk ratio 1.74 [95% CI 1.24, 2.45]). In contrast to LTE, SIE risk ratio was 0.92 (95% CI 0.55, 1.56) in P3. Malignancy risk ratios were 1.59 (95% CI 0.52, 4.86) in P3 and 1.17 (95% CI 0.67, 2.05) in LTE. As patients from P2 received 5 mg BID in LTE, and pts from P3 received 10 mg BID in LTE, there were more pts receiving 10 (N=2415) compared with 5 mg BID (N=1370) in LTE but the exposure was greater for 5 than 10 mg BID (2700 vs 1700 pt-y).

Conclusion: Both doses of tofacitinib, 5 and 10 mg BID, are efficacious across multiple domains of efficacy. Pooled analyses show statistical separation of 10 mg BID vs 5 mg BID on most efficacy parameters except fatigue. Event rates for safety are generally similar between the two doses but differences were noted in SIE rates in LTE, favoring 5 mg BID. Importantly, event rates for the tofacitinib 5 and 10 mg BID dose groups in both the P3 and LTE studies are well within the ranges observed with biologic therapies approved for treatment of RA.


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Radiographic, Clinical and Functional Comparison of Tofacitinib Monotherapy Versus Methotrexate in Methotrexate-Naïve Patients with Rheumatoid Arthritis. Eun Bong Lee1, Roy M. Fleischmann2, Stephen Hall3, Ronald F. van Vollenhoven4, John Bradley5, David Gruben1, Tamas Koncz6, Sriram Krishnaswami5, Gene Wallenstein5, Samuel H. Zwillich5, Bethanie E. Wilkinson5 and the ORAL Start Investigators7. 1Seoul National University, Seoul, South Korea, 2Metroplex Clinical Research Center, Dallas, TX, 3Cabrini Health and Monash University, Melbourne, Australia, 4Karolinska Institute, Stockholm, Sweden, 5Pfizer Inc., 1, Pfizer Inc., New York, NY, 6Gastrointestinal disorders (%) 21.0 25.1 34.3

Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. This Phase 3, 24-week study (ORAL Start; NCT01039068) compared efficacy, including inhibition of structural damage, and safety of tofacitinib vs methotrexate (MTX, 10–20 mg/week) in MTX-naïve patients (pts) with active RA.

Methods: Pts were randomized 2:2:1:1 to receive placebo (PBO) or 1 of 4 once-daily doses of tofacitinib (5 mg BID, 10 mg BID, 5 mg BID, 10 mg BID) for 24 weeks. The primary endpoint was a comparison of ACR70 response rates at week 24 between the 5 mg BID and 10 mg BID doses of tofacitinib compared with MTX. Secondary endpoints included measures of radiographic progression (mTSS), clinical response (ACR20, ACR50, ACR70, ACR90), HAQ-DI improvement, and safety. 5 mg BID dose groups in both the P3 and LTE studies are well within the

Efficacy (Month 6)

<table>
<thead>
<tr>
<th>Tofacitinib</th>
<th>Methotrexate</th>
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</thead>
<tbody>
<tr>
<td>5 mg BID (N=371)</td>
<td>10 mg BID (N=395)</td>
</tr>
<tr>
<td>Efficacy</td>
<td>50.5</td>
</tr>
<tr>
<td>ACR70 (%)</td>
<td>74.8***</td>
</tr>
<tr>
<td>ACR50 (%)</td>
<td>27.2</td>
</tr>
<tr>
<td>ACR90 (%)</td>
<td>12.0</td>
</tr>
<tr>
<td>Safety (Months 0–12)</td>
<td>69.9</td>
</tr>
</tbody>
</table>

Conclusion: In this Phase 3 study tofacitinib monotherapy significantly inhibited progression of structural damage and improved RA signs and symptoms and physical functioning vs MTX in MTX-naïve pts. The safety of tofacitinib was similar to that reported in other Phase 3 trials reported previously.


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24-Week Results of a Blinded Phase 2b Dose-Ranging Study of Baricitinib, an Oral Janus Kinase 1/Janus Kinase 2 Inhibitor, in Combination with Traditional Disease-Modifying Anti-rheumatic Drugs in Patients with Rheumatoid Arthritis. Mark C. Genovese1, Edward Keystone2, Peter Taylor3, Edit Drescher4, Pierre-Yves Bercz3, Chin H. Lee1, Douglas E. Schlichting5, Scott O. Metzler5, Rosanne K. Fidelus-Gort6, Monica E. Luch9, William Macias5, 1Stanford University Medical Center, Palo Alto, CA, 2University of Toronto, Toronto, ON, 3University of Oxford, Oxford, United Kingdom, 4Veszprém Csölönyi Ferenc County Hospital, Department of Rheumatology and Physical Rehabilitation, Veszprém, Hungary, 5Eli Lilly and Company, Indianapolis, IN, 6Incyte Corporation, Wilmington, DE

Background/Purpose: Baricitinib (formerly LY3009104/INCB028050), a novel, oral inhibitor of JAK1 and JAK2 in the JAK-STAT signaling pathway, has been evaluated in a 24 week blinded phase 2b study in patients (pts) with moderate to severe RA with inadequate response to methotrexate (MTX). The primary endpoint after 12 weeks of treatment was met. The 24 week safety and efficacy findings are reported here.

Methods: Pts with active RA (defined as at least 8 swollen and 8 tender joints based on the 66/68 joint assessment) on stable MTX were randomized 2:1:1:1:1 to receive placebo (PBO) or 1 of 4 once-daily baricitinib doses (1, 2, 4, or 8 mg) for 12 wks. Pts assigned to 2 mg, 4 mg or 8 mg continued blinded treatment for an additional 12 wks. Pts assigned to placebo or 1 mg were reassigned to an exploratory 4 mg daily or 2 mg twice daily group between weeks 12–24 and were excluded from the primary 24-week analysis.

Results: Three hundred one pts entered the study. After 12 weeks of treatment, significant differences versus placebo (p<0.05) were observed in the proportion of patients achieving ACR20, ACR50 and ACR70, DAS28CRP<2.6 and CDAI≤2.8, and for DAS28CRP, HAQ-DI and CDAI (Table). At week 24, patients receiving 2 mg, 4 mg or 8 mg baricitinib

S1049
Background/Purpose: Baricitinib (formerly, LY3009104/INCB028050) is a novel, oral inhibitor of JAK1 and JAK2 in the JAK-STAT pathway. Primary results of this phase 2b study have already been reported and show that baricitinib reduces signs and symptoms of rheumatoid arthritis (RA) with no unexpected safety signals. MRI was used in this study to examine dose dependency of baricitinib on joint changes in a subgroup of patients (pts) with erosive RA and inadequate response to methotrexate (MTX).

Methods: In this phase 2b randomized, double-blind, placebo-controlled trial, 301 pts with active, established RA (≥ 8 swollen and 8 tender joints) on stable MTX were randomized 2:1:1:1:1 to placebo or 1 of 4 once-daily LY doses (1, 2, 4 or 8 mg) for up to 24 weeks. 208 pts (placebo [n=68], 1 mg [n=34], 2 mg [n=40], 4 mg [n=33], 8 mg [n=33]) with definitive radiographic erosion had MRI of the dominant hand/wrist at baseline, week 12 and week 24. Pts assigned to placebo or 1 mg were reassigned to an exploratory 4 mg or 2 mg twice daily group at week 12 and excluded from the 24-week analysis. Fat-suppressed, T1-weighted 3D gradient-echo and STIR images were obtained with and without gadolinium contrast using 1.5T MRI and a hand frame to ensure reproducible positioning. MR images were read independently by 2 expert radiologists blinded to treatment and visit order. Images were scored using RAMRIS and a validated 9-point cartilage loss scale. Total inflammation (osteoit + 3x synovitis) and total joint erosion (joint + 2.5x cartilage loss) scores were calculated. ANCOVA adjusting for baseline score and dose group was used for analysis. Due to the exploratory nature of the substudy, 1-sided p-values less than 0.01 were considered indicative of possible MRI difference (trends) vs placebo.

Results: There was a significant (≥ smallest detectable change) decrease in osteitis over 12 weeks in 15% of pts on placebo vs 29% and 29% on baricitinib 4 and 8 mg, respectively. Similarly, synovitis decreased in 18% of pts on placebo vs 31% and 29% of pts on 4 or 8 mg baricitinib. Bone erosion did not progress in 80% of placebo vs 96% and 88% of pts on 4 or 8 mg baricitinib. Significant decreases in adjusted mean synovitis, osteitis and total inflammation scores were observed in the 4 mg and 8 mg groups compared to placebo at week 12 that persisted to week 24 (table 1). A trend in improvement in total joint damage was also observed for the 4 mg group. These MRI improvements correlated with significant improvements in tender and swollen joints in the 4 mg and 8 mg groups and with numeric decreases in median CRP.

Table 1. MRI and Clinical Changes Over 12 and 24 weeks

<table>
<thead>
<tr>
<th>MRI and Clinical Parameters</th>
<th>Placebo</th>
<th>1-mg</th>
<th>2-mg</th>
<th>4-mg</th>
<th>8-mg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Synovitis</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>12-week LS Mean change</td>
<td>−0.6</td>
<td>−1.2</td>
<td>−0.6</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>p-valuea</td>
<td>NS</td>
<td>NS</td>
<td>0.036</td>
<td>0.047</td>
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</tr>
<tr>
<td>24-week mean change</td>
<td>−0.8</td>
<td>−1.7</td>
<td>−2.1</td>
<td></td>
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</tr>
<tr>
<td><strong>Osteitis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-week LS Mean change</td>
<td>−0.4</td>
<td>−1.3</td>
<td>−0.8</td>
<td>−3.2</td>
<td>−2.2</td>
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<tr>
<td>p-valuea</td>
<td>NS</td>
<td>&lt;0.001</td>
<td>0.027</td>
<td></td>
<td></td>
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<tr>
<td>24-week mean change</td>
<td>−1</td>
<td>−3.7</td>
<td>−2.1</td>
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<tr>
<td><strong>Total Inflammation</strong></td>
<td></td>
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<tr>
<td>12-week LS Mean change</td>
<td>−2.1</td>
<td>−4.9</td>
<td>−2.7</td>
<td>−8.6</td>
<td>−6.6</td>
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<td>NS</td>
<td>0.003</td>
<td>0.027</td>
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<tr>
<td>24-week mean change</td>
<td>−3.5</td>
<td>−8.7</td>
<td>−8.3</td>
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<tr>
<td><strong>Bone Erosion</strong></td>
<td></td>
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<tr>
<td>12-week LS Mean change</td>
<td>0.8</td>
<td>0.1</td>
<td>0.3</td>
<td>0.5</td>
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</tr>
<tr>
<td>p-valuea</td>
<td>0.071</td>
<td>0.051</td>
<td>NS</td>
<td>NS</td>
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<tr>
<td>24-week mean change</td>
<td>0.5</td>
<td>−0.5</td>
<td>−0.2</td>
<td>−0.1</td>
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<tr>
<td><strong>Cartilage Loss</strong></td>
<td></td>
<td></td>
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<td>12-week LS Mean change</td>
<td>−0.2</td>
<td>−0.2</td>
<td>−0.4</td>
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</tr>
<tr>
<td>p-valuea</td>
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<td>NS</td>
<td>NS</td>
<td>NS</td>
<td></td>
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<tr>
<td>24-week mean change</td>
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<td>−0.3</td>
<td>−0.1</td>
<td></td>
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<tr>
<td><strong>Total Joint Damage</strong></td>
<td></td>
<td></td>
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<tr>
<td>12-week LS Mean change</td>
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<td>0.1</td>
<td>−0.3</td>
<td>−0.8</td>
<td>−0.1</td>
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<td>p-valuea</td>
<td>NS</td>
<td>0.068</td>
<td>NS</td>
<td>NS</td>
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<tr>
<td>24-week mean change</td>
<td>0.9</td>
<td>−1.3</td>
<td>0</td>
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<tr>
<td><strong>CRP (mg/L)</strong></td>
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<td></td>
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<tr>
<td>12-week median</td>
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<td>3.1</td>
<td>2.4</td>
<td>2.3</td>
<td>2.6</td>
</tr>
<tr>
<td>24-week median</td>
<td>−0.4</td>
<td>3.4</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tender joints (of 68)</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12-week LS Mean change</td>
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<td>−8.8</td>
<td>−10.8</td>
<td>−13.7</td>
<td>−13.4</td>
</tr>
<tr>
<td>p-valuea</td>
<td>NS</td>
<td>0.064</td>
<td>&lt;0.001</td>
<td>0.001</td>
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<tr>
<td>24-week mean change</td>
<td>−12.4</td>
<td>−14</td>
<td>−17.5</td>
<td></td>
<td></td>
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<tr>
<td><strong>Swollen joints (of 66)</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12-week LS Mean change</td>
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<td>−8</td>
<td>−10.5</td>
<td>−10.1</td>
</tr>
<tr>
<td>p-valuea</td>
<td>NS</td>
<td>&lt;0.001</td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-week mean change</td>
<td>−10</td>
<td>−10.5</td>
<td>−12.2</td>
<td></td>
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</tbody>
</table>
| a 1-sided comparison vs Placebo; b 2-sided comparison vs Placebo; NS = non-significant
Conclusion: MRI findings in this subgroup of pts with active erosive RA suggest dose-dependent suppression of synovitis, osteitis and total inflammation by baricitinib for the 4-mg and 8-mg groups at 12 and 24 weeks. These findings corroborate previously demonstrated clinical efficacy of baricitinib.

Disclosure: F. Vanhoutte, Galapagos NV, 1, Galapagos NV, 3; M. Mazur, None; A. Van der Aa, Galapagos NV, 3; P. Wigerinck, Galapagos NV, 1; G. van ’t Klooster, Galapagos NV, 3.

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Herpes Zoster and Tofacitinib Therapy in Patients with Rheumatoid Arthritis
K. L. Winthrop1, H. Valdez2, E. Mortensen3, R. Chew4, S. Krishnaswami5, T. Kawabata6 and R. Riese7. Division of Infectious Disease, Oregon Health and Science University, Portland, OR; 2Pfizer Inc., New York, NY; 3Pfizer Inc., Collegeville, PA; 4Pfizer Inc., Groton, CT

Background/Purpose: Patients (pts) with RA are at increased risk for herpes zoster (HZ) i.e. ‘shingles’. Tofacitinib, a novel oral Janus kinase inhibitor investigated as a targeted immunomodulator and disease-modifying therapy for RA, down-regulates cytokine-induced signalling that is potentially important to HZ immunity. It has been reported previously that HZ incidence rates (IRs) in the tofacitinib RA program are higher than those reported with biologic and non-biologic DMARDs, however the reasons are unknown.

Methods: Adverse events of HZ were identified in the randomized controlled Phase 2, 3, and open-label long-term extension (LTE) tofacitinib RA studies (data cut March 29, 2011). HZ IRs (per 100 pt-years [pt-ys] [95% CI]) were calculated and logistic regression was used to evaluate potential risk factors for HZ.

Results: In the tofacitinib RA program Phase 2, 3, and LTE studies (4789 pts with 5651 pt-ys of tofacitinib treatment), 239 tofacitinib-treated pts experienced HZ. One case (0.4%) was multidrug resistant, and none involved visceral dissemination or death. Twenty-five pts with HZ (<10.5%) permanently discontinued tofacitinib and 16 (6.7%) were hospitalized or received intravenous antiviral drugs. In Phase 3 studies the number of HZ cases and IRs per 100 pt-ys (95% CI) for each treatment were: tofacitinib 90 cases, IR 4.4 (3.5, 5.4); placebo 3 cases, IR 1.5 (0.5, 4.6); and adalimumab (including as active control in one study) 5 cases, IR 2.8 (1.2, 6.8). In LTE studies, 134 HZ cases were identified in tofacitinib recipients, with an IR of 4.5 (3.8, 5.3). Tofacitinib-associated HZ IRs varied widely across countries of enrollment and were significantly higher among Asians (7.6 [6.3, 9.2]) vs whites (3.3 [2.8, 4.0]), blacks (2.3 [0.7, 7.1]), and others (3.0 [1.8, 4.9]). For tofacitinib-treated pts, those aged ≥65 years (odds ratio [OR] 1.26 [95% CI 0.91, 1.75]), females (OR 1.31 [95% CI 0.89, 1.92]), those using glucocorticoids (OR 1.24 [95% CI 0.95, 1.61]), and those with a longer disease duration (OR 1.02 for each extra year of RA [95% CI 1.00, 1.03]) were more likely to develop HZ. There was no association between HZ risk and background non-biologic DMARD use (i.e. tofacitinib monotherapy or in combination with a DMARD), neutrophil or lymphocyte count, or baseline RA severity. In Phase 3 studies, patients treated with tofacitinib 5 mg BID were no more likely to develop HZ than those treated with 10 mg BID (OR 0.96 [95% CI 0.62, 1.51]).

Conclusion: In the tofacitinib RA program, rates of HZ observed among placebo, adalimumab, and tofacitinib-treated pts (particularly in pts of Asian race) were higher than those reported in the literature for patients with RA treated with biologic and non-biologic DMARDs (IRs 0.56–1.32 events per 100 pt-ys [95% CI] 0.56–1.32 events per 100 pt-ys). HZ was more common among tofacitinib-treated pts compared with placebo-treated subjects, although confidence intervals were overlapping, with similar rates between tofacitinib 5 mg and 10 mg BID dose groups. Complicated HZ was rare in tofacitinib-treated pts.

References

Disclosure: K. L. Winthrop, Oxford Immunotec, Pfizer Inc., 2; Abbott, Pfizer Inc., UCB, Amgen, Celisseis, 5; H. Valdez, Pfizer Inc., 1, Pfizer Inc., 3; E. Mortensen, Pfizer Inc., 1, Pfizer Inc., 3; R. Chew, Pfizer Inc., 1, Pfizer Inc., 3; S. Krishnaswami, Pfizer Inc, 1; Pfizer Inc, 3; T. Kawabata, Pfizer Inc., 1, Pfizer Inc., 1; R. Riese, Pfizer Inc., 1, Pfizer Inc., 3.
IL-17 Expression Is Low in Psoriatic Arthritis Synovium Compared to Expression in Matched Lesional Skin Lesion. Jennifer Belasco1, Hiroshi Mitsui1, Mayte Suarez-Farinas1, James S. Louie2, Nathan Wei3, Nicholas Gulati1 and James G. Krueger1. The Rockefeller University, New York, NY, 2UCLA School of Medicine, Los Angeles, CA, 3Arthritis Treatment Center, Frederick, MD.

Background/Purpose: Psoriatic arthritis (PsA) is an inflammatory joint disease associated with psoriasis. It is known that treatment modalities are not equally effective for both skin and joint disease, indicating that there are different pathomechanisms driving each component. For example, TNF antagonists are relatively effective treatments for both psoriasis vulgaris and skin/joint manifestations of PsA. However, results from the set of emerging IL-17 antagonists for psoriasis show marked asymmetry of treatment response following recommendations by the ACR. We examined gene expression in paired skin and synovium samples from patients with psoriatic arthritis to better define the inflammatory pathways of PsA in both skin and joint pathogenesis.

Methods: Matched lesional psoriatic skin samples and synovial samples from inflamed joints were obtained from subjects with PsA (n=13). Gene expression analysis was conducted using Affymetrix HGU133 2.0 plus arrays. The gene expression profile of each diseased tissue was then compared to that of corresponding normal tissue. We considered differentially expressed genes (DEGs) with a cut-off of fold change >2.0 and false discovery rate <0.01. Results were confirmed using RT-PCR with coupled directed pre-amplification. Ingenuity Pathway Analysis (IPA) was utilized to identify canonical pathways among differentially expressed genes.

Results: Principal components analysis demonstrates that there is a clear difference between gene expression patterns of skin and synovium from psoriatic arthritis patients even when adjusted for tissue specificity. The total number of DEGs after adjustment for tissue specificity in both skin and synovium was 2532. The number of genes shared by both tissues was 1328. IPA revealed that the role of IL17A in psoriasis was significant in lesional skin but not in synovial tissue. RT-PCR confirmed the marked expression of IL17A, IL17F, and IL22 in lesional skin compared to inflamed synovium (p<0.05). TNF was present in both tissues without any significant difference between the two. There was no correlation at the messenger level of IL17A, IL17F, IL22 and TNF between pairs of skin and synovium from the same subject.

Conclusion: These results demonstrate that gene expression differs greatly between matched pairs of lesional psoriatic skin and synovium from inflamed joints in patients with PsA. Our results support clinical trial data that indicate psoriatic arthritis skin and joint disease are both responsive to TNF antagonists whereas skin shows better results when compared to joints with IL17 antagonists. Genes selectively expressed in PsA synovium might direct future therapies for this condition.

Disclosure: J. Belasco, None; H. Mitsui, None; M. Suarez-Farinas, None; J. S. Louie, Abbott, Amgen, Genentech, Pfizer, Roche, UCB, 5, Abbott, Amgen, Genentech, Pfizer, 5; N. Wei, None; N. Gulati, None; J. G. Krueger, Centocor, Inc., 5, Lilly, 5, Pfizer Inc, 5.
Incidence and Severity of Spondyloarthritis and Crohn’s Ileitis Are Determined by Interaction Between the Microbiota and Genetic Susceptibility in Beta-Glucan-Treated SKG Mice. Ranjeny Thomas1, Linda Rehaume1, Daniel Aguirre de Cárcer2, Stan Mondot3, Jared Velasco1, Helen Benham1, Merja Ruutu1, Mark Morrison2 and Michael McGuckin3. 1University of Queensland Diamantina Institute, Brisbane, Australia, 2CSIRO Livestock Industries, Brisbane, Australia, 3Mater Medical Research Institute, Brisbane, Australia

Background/Purpose: Spondyloarthritis and inflammatory bowel disease (IBD) or microscopic gut inflammation co-exist in many patients. These conditions share genetic associations in the IL23R signaling pathway. Rodent models of spondyloarthritis or IBD typically improve in germ free (GF) conditions and intestinal microbial diversity is reduced in Crohn’s disease, with enrichment in Gram negative rods. Thus resident microbiota are implicated in pathogenesis. We hypothesized that microbiota directly affect incidence and severity of spondyloarthritis and ileitis in SKG mice, where the ZAP-70W163C mutation of the BALB/c strain reduces T cell receptor signaling.

Methods: SKG and BALB/c mice were housed in SPF or rederived to GF conditions then injected i.p. with 1,3-D beta-glucan (curdlan). Paw width was scored for 8 weeks. Joint, tail and small intestinal histological sections were scored at sacrifice. The fecal microbiota of BALB/c and SKG mice was assessed by 454 pyrosequencing 0, 3, 7, 10 and 14 days after curdlan treatment. Double principal components analysis (DPCA) and other methods were used to compare phylotypic groups across samples.

Results: In SPF conditions, i.p. curdlan triggered IL-23-dependent severe spondyloarthritis and Crohn’s-like ileitis in 100% and 70% of female SKG mice respectively. BALB/c control mice developed mild peripheral arthritis without ileitis. In GF conditions, the incidence of spondyloarthritis in SKG mice was 10% and ileitis 0%. No priming of anti-proteoglycan autoantibodies occurred without spondyloarthritis. Spondyloarthritis and ileitis incidence and severity, and anti-proteoglycan antibodies were restored when GF mice were reconstituted with a limited bacterial consortium. Within days after curdlan under SPF but not GF conditions, IL-23 and Grp-78 mRNA increased in the ileum, and activated dendritic cells (DC) were recruited to the mesenteric lymph nodes, where IL-17 mRNA expression increased. By DPCA of fecal and cecal microbiota, a large shift in community structure occurred in SKG but not BALB/c mice 3 days after curdlan, related to increased Bacteroides-affected sequences. Segmented filamentous bacteria were absent. When BALB/c and SKG mice were cohoused after weaning and injected with curdlan at 6 weeks of age, arthritis and ileitis severity was similar in BALB/c and SKG mice cohoused in each cage.

Conclusion: Microbiota are necessary and sufficient for priming spondyloarthritis and Crohn’s-like ileitis by DC in gut draining lymph nodes in SKG mice. The SKG mutation predisposes to lack of control of particular transmissible microbial species triggered by systemic delivery of curdlan, which enhance susceptibility to spondyloarthritis and Crohn’s-like ileitis.

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Results: In this study we identified 16 new AS risk loci reaching genome-wide significance (P < 5 x 10^{-8}), bringing the number of known non-MHC loci to 27. All attempted genome-wide significant loci reported in European populations were replicated. We found multiple independent association signals in 8 of these loci, caused by both common and low frequency variants, suggesting that multiple genetic variants within a gene can affect disease susceptibility. Three AS-loci encoding four aminopeptidases were identified which are involved in peptide handling prior to MHC Class I presentation; protective variants at two of these are associated with both reduced aminopeptidase function and MHC Class I cell surface expression. European and Asian specific signals were observed in IL23R and PTGER4. Identified loci implicate microbial sensing (NOS2, NKK2-3, SH2B3 and ICOSLG), intracellular antigenic peptide handling (ERAP1, ERAP2, LNPPEP, NPEPPS) and CD8+ T cells (EOMES and IL7R) pathways as important in AS etiology as well as increase the number of susceptibility genes in the TH17 pathway (TYK2 and IL6R). A second MHC association with the classical HLA-A*0201 was observed in both HLA-B*27 positive and negative disease (OR = 1.2; P = 4.5 x 10^{-5}).

Conclusion: This increased characterization of the genetic architecture of AS aids greatly in explaining the currently poorly understood high observed heritability and familiality in AS. This data also guides functional studies towards uncovering how these genes cause disease and in the development of new therapeutics.

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1Charite Medical University, Campus Benjamin Franklin, Berlin, Germany, 2Endokrinologikum Berlin, Berlin, Germany, 3Charite Universitaetsmedizin Berlin, Berlin, Germany

Background/ Purpose: In the recent years several predictors of radiographic spinal progression/syndesmophyte formation in ankylosing spondylitis (AS) were identified: syndesmophyes at baseline (the strongest predictor so far), smoking, elevated level of the C-reactive protein [1]. Furthermore, a number of predictive biomarkers (such as matrix metalloproteinase 3, procollagen II N-terminal propeptide, Wnt-antagonists) were identified, all however, with a rather modest predictive value. Vascular endothelial growth factor (VEGF) is an essential mediator of the endothelial cell formation) in patients with AS.

Methods: Altogether 54 patients with AS from the German Spondyloarthritis Inception Cohort (GESPIC) were included in this analysis. Radiographs of the lumbar (lateral and anteroposterior views) and cervical spine (lateral view) performed at baseline and after 2 years of follow-up were centrally collected, digitized, and subsequently scored independently by two trained readers. Syndesmophyes were considered to be present if both readers agreed on it. Serum VEGF levels were detected at baseline.

Results: At baseline, syndesmophyes were present in 25 patients (46%), after 2 years of follow-up new syndesmophyes developed in 6 patients (11%). Mean baseline VEGF value was significantly higher in patients who developed new syndesmophyes in comparison to those without radiographic progression: 544 ± 167 vs 296 ± 159 pg/ml, p = 0.004. Receiver operating characteristic (ROC) analysis demonstrated a good performance of VEGF as a predictor of radiographic progression: area under the curve (AUC) = 0.851, p = 0.005—figure. A threshold of 494 (rounded for further analysis to 500) pg/ml demonstrated both high sensitivity (83%) and specificity (92%). Elevated VEGF had a positive predictive value of 56%, negative predictive value of 98%, positive likelihood ratio (LR) = 10, negative LR = 0.18, and an odds ratio (OR) = 45.0 (95% CI 1.5–593.4). p = 0.001, as a predictor of new syndesmophyes development. This association remained statistically significant also after adjustment for the baseline level of CRP, presence of syndesmophyes at baseline (or mSASSS at baseline), and smoking status.

Conclusion: High serum level of VEGF (>500 pg/ml) seems to be highly predictive for development of new syndesmophyes in patients with AS.

References

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Altered Circulating Follicular Helper T Cell Phenotype and Subset Composition Are Associated with Disease Activity in Patients with Systemic Lupus Erythematosus. Hsi-en Ho1, Jin Young Choi2, Viviane M. Bunnin3, Sandra G. Pasto4, Solange Carrasco5, Eduardo F. Borba6, Celio R. Goncalves7, Priscila R. Costa8, Esper G. Kallas9, Eloisa Bonfa10 and Joseph E. Craft2. 1Yale University School of Medicine, New Haven, CT, 2Yale University School of Medicine, Internal Medicine, Section of Rheumatology, New Haven, CT, 3Universidade de Sao Paulo, Division of Rheumatology, Faculdade de Medicina, Sao Paulo, Brazil, 4Universidade de Sao Paulo, Division of Immunology, Faculdade de Medicina, Sao Paulo, Brazil

Background/ Purpose: Autoreactive B cells in SLE undergo autoantigen selection, suggesting a requirement for germinal center follicular helper T (Tfh) cells in their maturation. However, evidence for dysregulation of Tfh cells in SLE and their potential contribution to disease remains unclear. Recently, blood CXCR5+ CD4 T cells, a heterogeneous pool consisting of functionally distinct Th1-, Th2- and Th17-like subsets, have been proposed to be the circulating counterpart of Tfh (eTfh) cells. We now ask if changes in eTfh markers or subset composition within blood CXCR5+ cells are found in SLE patients, and the extent to which such alterations are associated with B cell and disease activity.

Methods: Blood samples from 49 clinically well-characterized SLE patients, 28 Behcêt’s disease (BD) patients, and 16 healthy controls were included. Expression of Tfh surface markers (CXCR5; ICOS, inducible T-cell costimulator; PD-1, programmed cell death protein-1), composition of blood CXCR5+ subsets, and frequency of plasmablasts were enumerated by flow cytometry. The phenotype of blood CXCR5+ subsets was
correlated with disease activity, clinical history, and plasmablast expansion.

Results: SLE patients had significant expansion of CXCR5+ ICOS+ PD-1+ CD4+ T cells compared to controls (p < 0.001). PD-1, but not ICOS or CXCR5, expression was markedly elevated in CD4+ T cells of SLE patients compared to BD patients and healthy controls (p < 0.001). PD-1 MFI in CXCR5+ cells correlated with SLE disease activity index (SLDAI; Spearman ρ = 0.43; p = 0.03). PD-1 MFI also correlated with expansion of plasmablasts (Spearman ρ = 0.34; p = 0.02). In SLE patients with high anti-dsDNA antibody titers, PD-1 expression in CXCR5+ cells was also significantly elevated compared to patients with no detectable titers (p = 0.004). Enhanced PD-1 expression was neither a function of disease duration nor past activity; rather, it reflected current disease activity. Compared to BD patients, SLE patients also had an increase in the CXCR5+ Th2 (p < 0.05) and a decrease in the Th17 (p < 0.001) subsets. Concurrently, PD-1 expression in SLE patients was significantly higher in CXCR5+ Th2 cells compared to Th17 cells (p < 0.01). The expansion of the CXCR5+ Th2 subset was also positively associated with SLEDAI scores.

Conclusion: Our results demonstrate that dysregulation of cTfh cells is strongly correlated with disease activity in SLE, supporting a potential causal relationship. The altered composition of blood CXCR5+ cells also appeared to be a fundamental cellular defect in SLE, with our results revealing a novel dimension of Tfh dysregulation that may be central to disease pathogenesis.

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Biomarkers of Mitochondrial Dysfunction Correlate with Disease Activity in SLE. Zhe-Wei Lai1, Tiffany Teloarcº2, Robert Hanczko3, Adam Burnts3,1, Lisa Frances3,4, Haij I. Tity2, Ricardo Garcia2,1, Maha M. Dawood2,1, Jianghong Yu2, Ashwin Shadakshari2, Paul E. Phillips6 and Andras Perl7. 1Division of Rheumatology, University of Michigan, Ann Arbor, MI, 2University of Michigan, Dearborn, MI, 3SUNY, Syracuse, NY, 4SUNY Upstate Medical University, Syracuse, NY, 5SUNY Upstate medical university, Syracuse, NY, 6SUNY, NY, 7SUNY Upstate, Syracuse, NY, 8SUNY-Upstate Medical Univ, Syracuse, NY.

Background/ Purpose: Systemic lupus erythematosus (SLE) patients’ T cells exhibit mitochondrial dysfunction, characterized by the persistent elevation of the mitochondrial transmembrane potential (Δψmit) or mitochondrial hyperpolarization (MHP), that predisposes to oxidative stress, activation of the mammalian target of rapamycin (mTOR), and pro-inflammatory death via necrosis. Here, we evaluated metabolic checkpoints of mitochondrial dysfunction as biomarkers of disease activity in patients with SLE.

Methods: 49 female SLE patients and 41 female healthy controls were matched for 209 independent study visits. SLE disease activity was assessed by the Systemic Lupus Assessment Group (BILAG), SLE Disease Activity Index (SLDAI), and Fatigue Assessment Scale (FAS). Peripheral blood lymphocytes (PBL) and untouched T cells (using Dynal negative T-cell isolation kit) were freshly isolated on the same morning from patients and controls matched for ethnicity and age within 10 years and investigated in parallel for Δψmit, mitochondrial mass, glutathione, NO and ROI production, cytosolic [Ca2+]i and mitochondrial calcium levels ([Ca2+]mit) and mitochondrial mass, and mitochondrial dysfunction by flow cytometry with CFSE, MTO and by suppression assays of T effector cells. These effects of PIO were not observed in control T cells.

Results: Several T cell-related pathways were highlighted in the analysis of the 1363 transcripts altered by PIO-treated vs. untreated SLE PBMCs. In contrast, only 215 mRNAs were modified in the PIO-treated vs. untreated controls. Resulting network analysis showed Interferon-y as a major regulatory node, with PIO treatment downregulating various genes implicated in T-cell responses. These suppressive effects of PIO were confirmed in in purified CD4+ and CD8+ T cells by real-time PCR, with significative induction of downregulation of IFN-gamma, CCL4, CCR5, CXCL10 and HES1, among others. PIO downregulated lupus CD4+ T cell proliferation, while it significantly increased numbers and function of lupus T regulatory cells, as assessed by IL-10 synthesis and suppression assays of T effector cells. These effects of PIO were not observed in control T cells.

Conclusion: These results indicate that PPAR-γ agonists selectively modulate T cell function in SLE. Given their beneficial effect in murine lupus, these results support the concept that PIO and related-agents should be further explored as potential therapies in this disease.

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Podocyte Injury in Membranous and Proliferative Lupus Nephritis: Distinct Underlying Mechanisms? Gabriela M. Rezende1, Vilma S. T. Viana1, Denise M. Malheiro2, Elaine P. Leon1, Eduardo F. Borba3, Neila AS Silva4, Irene L. Noronha5, Cleonice Silva5 and Eloisa Bonfa6. 1Division of Rheumatology, 2Faculty of Medicine of the University of São Paulo, São Paulo, Brazil, 3Division of Anatomopathology - Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 4Faculty of Medicine of the University of São Paulo, São Paulo, Brazil, 5Division of Nephrology - Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 6University of São Paulo, São Paulo, Brazil.

Background/Purpose: Podocyte Injury in Membranous and Proliferative Lupus Nephritis (LN) is a major cause of morbidity and mortality in patients with systemic lupus erythematosus (SLE) with proteinuria being the predominant common manifestation and may therefore reflect podocyte injury. Podocytes are highly specialized cells that have a relevant role in the glomerular filtration barrier and alteration in the expression of their biomarkers has been shown to be associated with podocyte dysfunction in some glomerulopathies.

A systematic analysis of podocyte-associated molecules encom-
passing different subcellular compartments was performed in a large series of LN biopsies. Expression of Wilms’ tumor protein (WT1), Synaptopodin (Synpo) and glomerular epithelial protein 1 (GLEPP1) with nuclear, cytoplasmic and membrane distribution respectively, were evaluated attempting to identify if podocyte phenotype is distinct in proliferative and membranous nephritis. Possible association of molecular expression alterations with long term proteinuria severity and outcome in lupus nephritis was investigated.

Methods: Immunohistochemistry analysis was performed using monoclonal antibodies to WT1, Synpo and GLEPP1 proteins in 52 biopsies from patients with lupus nephritis fulfilling the revised ACR criteria for SLE. Demographic, clinical and laboratory data at the time of biopsy were analyzed.

Results: Thirty-nine (75%) biopsies were classified as proliferative LN and thirteen (25%) as pure membranous class V. Immunohistochemistry analysis in normal kidney revealed preserved staining of WT1, Synpo and GLEPP1 podocyte biomarkers along the capillary walls. Preserved and concomitant WT1 and Synpo staining was observed in a significant higher frequency in pure class V biopsies than in proliferative LN (69.23 vs. 2.56%, p = 0.0001). Likewise, preserved GLEPP1 expression was also more frequent in pure class V LN (53.85 vs. 2.86%, p = 0.0002). Proteinuria and serum albumin levels at the time of biopsy did not statistically differ in the two groups (p = 0.87 and p = 0.41) whereas in the mean long-term follow-up of four years a tendency of lower proteinuria (p = 0.05) was observed in those patients with biopsies expressing preserved WT1/Synpo staining.

Conclusion: This is the first study comparing proliferative and membranous lupus nephritis which evaluated simultaneously the expression of proteins in different subcellular podocyte compartments and provided novel evidence of preserved podocyte structural architecture predominantly in membranous lesions which may account for a better long term outcome of patients with this LN histological class. These findings suggest possible different underlying mechanisms for proteinuria in both conditions.

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2501

Mirorna Mir-150 Contributes to Chronic Kidney Injury in Lupus Nephritis by Increasing the Synthesis of Fibrotic Proteins Via Downregulation of SOCS1. Hua Zhou1, Sarfaraz A. Hasni1, Mayank Tandon1, Shiy-Ing Jang1, Howard A. Austin2, James E. Balow1, Ilia Alevizos1 and Galbor G. Illei3. 1NIDCR/NIH, Bethesda, MD, 2NIAMS/NIH, Bethesda, MD, 3NIH/DKD/NIH, Bethesda, MD

Background/Purpose: We have previously shown that renal expression of miR-150 correlates with chronicity index (CI) in lupus nephritis. Since fibrogenic genes are the principal feature of the CI we explored the role of miR-150 in renal fibrosis. Our data showed a positive correlation between miR-150 expression and fibrosis and miR-150 expression. In this study, we have observed that miR-150 increases the production of pro-fibrotic molecules by downregulating a regulator of fibrotic proteins. The European Bioinformatic Institute (EBI) database identified SOCS-1 (suppressor of cytokine signaling-1) as such a target of miR-150. SOCS-1 has previously been shown to decrease fibronectin in mesangial cells as well as reduce fibronectin and collagen I in renal tubular fibroblast. SOCS1~mut mice developed lupus nephritis-like disease. We hypothesized that miR-150 increases the synthesis of profibrotic molecules by down regulating SOCS1.

Methods: The localization of miR-150 in kidney was identified by in situ hybridization in 6 kidney needle biopsies from patients with lupus nephritis (3 from patients with high renal miR-150 and 3 from patients with low renal miR150) and 2 kidneys from autopsies without known kidney diseases. Renal collagen I(COL1) immunofluorescent staining was performed on the same samples. Primary human renal proximal tubular epithelial cells (RPTEC) and primary human mesangial cells (MC) were used for transfection with miR-150. To confirm SOCS-1 as a miR-150 target a luciferase gene linked with the 3’UTR of SOCS1 was cotransfected with miR-150 in RPTEC cells and the luciferase activity was measured 48hrs after the cotransfection. Protein expression of SOCS1 and fibrotic proteins, COL1, collagen 3 (COL3) and fibronectin (FN) were analyzed by western blot in these cultured cells 48hr after miR-150 transfection.

Results: miR-150 predominantly localized in renal cortical proximal tubular cells. Moderate staining was seen in podocytes in kidney biopsies with high but not in those with low renal mir-150 expression. Immunofluorescent staining showed significantly increased COL1 in kidney biopsies with high renal miR-150 and high CI compared to the kidneys with low renal miR-150 and low CI. Luciferase activity linked to the 3’UTR of SOCS1 was downregulated to 68.5% (p<0.01) of control cells by miR-150 in RPTEC, confirming SOCS1 as a direct target of miR-150. miR-150 transfection significantly decreased SOCS1 signal and increased expression of FN in both RPTEC and MC whereas it led to increased levels of COL3 in RPTEC and COL1 levels in mesangial cells.

Conclusion: miR-150 transfection increased the synthesis of pro-fibrotic molecules in two primary human renal cells by downregulating the expression of SOCS1, a negative regulator of fibrosis. These data together with the previously described observation that miR-150 expression in lupus nephritis correlates with chronicity index suggest that mir-150 plays an important role in chronic kidney injury in lupus nephritis.

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2502


Background/Purpose: Neutrophil extracellular traps (NETs) contain numerous bactericidal proteins and are an important defense mechanism against microorganisms. Clearance of NETs is impaired in a subset of patients with systemic lupus erythematosus (SLE), which may contribute to disease pathogenesis. Additionally, we recently described that NETs are vigorously and spontaneously released from low density granulocytes (LDGs) isolated from lupus patients and that these lattices are toxic to the endothelium, expose immunostimulatory molecules and may participate in organ damage through incompletely characterized pathways. We propose that in antigen presenting cells, NETs may act as strong activators of inflammatory pathways, such as the inflammasome, contributing to organ damage. We have examined the role of NETs in inflammasome activation and have specifically characterized the ability of one NET-associated antibacterial peptide, LL37, in stimulating this process.

Methods: Primary human macrophages were derived from monocytes isolated from control and lupus patients. Murine macrophages were cultured from bone marrow. M1 and M2 differentiation were promoted by growth in GM-CSF or M-CSF, respectively and confirmed by FACs. Spontaneously-induced NETs from LDGs were isolated by micrococcal nuclease incubation to allow their release into the supernatant. Macrophages were primed for 4 hours with 100 ng/ml LPS, prior to stimulation with LL37 peptide or NETs for 2 hours. Active IL-1belta and IL-18 release was determined by ELISA. Quantitation of caspase-1 activation was determined by incubating macrophages with a specific fluorogenic marker, followed by fluorescent microscopy.

Results: Stimulation of human macrophages with NETs resulted in activation of caspase-1 and in IL-1beta and IL-18 activation and secretion. Incubation of macrophages with the NET-associated peptide LL37 resulted in robust activation of caspase-1 and release of IL-1beta and IL-18; this activation was enhanced in M1 versus M2 macrophages. Caspase-1 activation required the NLRP3 inflammasome, as murine macrophages deficient in NLRP3, ASC or caspase-1 did not respond to the murine LL37 analog mCRAMP, whereas wild-type macrophages demonstrated caspase-1 activation and IL-1beta release. Comparison of control versus lupus macrophage dose responses to LL37 revealed a lower threshold for inflammasome activation in lupus macrophages, suggesting that exposure to this molecule in vivo may trigger enhanced inflammatory responses. Exposure of lupus macrophages to NETs also led to a significant increase in caspase-1 activation when compared to control macrophages.

Conclusion: Macrophages isolated from lupus patients have enhanced activation of the inflammasome in response to NETs or to the NET-associated peptide LL37. As NETs are increased in SLE, these results suggest that these structures could be an important trigger for inflammasome activation and the resultant downstream inflammatory pathways in SLE patients.

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CD8+Foxp3+CD103+- Regulatory T Cells Generated Ex Vivo with TGF-β Suppress Autoimmunity Through IL-10-Dependent Mechanism
Ya Liu1, An-Ping Xu2, David A. Horwitz3 and Song G. Zheng1. 1USC Keck School of Medicine, Los Angeles, CA, 2nd Affiliated Hospital of Sun Yat-sen University, 3Keck School of Medicine of USC, Los Angeles, CA

Background/Purpose: TGF-β is crucial for induction of CD4+Foxp3+ Tregs and maintenance of immunologic tolerance. It is, however, unclear if TGF-β also induces the similar CD8+ Tregs.

Methods: CD8+Foxp3- cells isolated from Foxp3-GFP knock-in mice were stimulated with anti-CD3/28 antibodies and IL-2 with (Tregs) or without TGF-β (Tcon cells). After 3–4 days, Granzyme A/B, Perforin and other Tregs related markers were examined by FACS staining. GFP+, GFP-, GFF+CD103+, GFP+CD103-, and GFP-CD103- were sorted. Suppressive activity in vitro was examined by adding various ratios of CD8+ subsets to responder T cells. Anti-TGF-β, anti-IL-10R, or the TGF-β receptor I (ALK5) inhibitor was added to some cultures. The effect of CD8+ Tregs in vivo was tested following iv injection with 5 × 105 C57BL/6 CD4+CD45RB+ cells to Rag2-/- mice. CD8+ iTregs were also injected to Experimental Allergic Encephalomyelitis (EAE) model and lupus-like chronic Graft-versus-host disease (GVHD) model.

Results: While CD8+ iTregs displayed much low Foxp3 expression compared with compartment CD4+ cells, their suppression activity in vitro and in vivo was equivalent or even better. These cells did not express Granzyme A, B or Perforin A and lacked cytotoxic activity on T response cells. CD8+ iTregs generated from Granzyme B and Perforin A KO mice still suppressed autoimmunity. Transwell experiments revealed that cell-contact is required for their suppression. CD8+ iTregs infusion markedly suppressed experimental colitis, EAE and cGVHD. Both Foxp3- and Foxp3+ subsets from TGF-primed CD8+ cells had suppressive activities. Among CD8+Foxp3- cells, CD103 is crucial for their generation and function since CD8+ but not CD4+ iTreg production decreased on CD103 KO mice. CD4+CD103+ Foxp3- subset suppressed colitis through IL-10 signal.

Results: While CD8+ cells primed with TGF-β (CD8+ iTregs) displayed much low Foxp3 expression compared with compartment CD4+ cells, their suppression activity in vitro and in vivo was equivalent or even better than CD4+ Tregs. These cells did not express Granzyme A, Granzyme B or Perforin A and lacked cytotoxic activity on T response cells. Additionally, CD8+ iTregs generated from Granzyme B and Perforin A KO mice still suppressed autoimmunity. Transwell experiments revealed that cell-contact is required for their suppression. Adoptive transfer of the CD8+ iTregs markedly suppressed experimental colitis, EAE and cGVHD. We further found both Foxp3- and Foxp3+ subsets from TGF-primed CD8+ cells had suppressive activities. Among CD8+Foxp3- cells, we identified CD103 expression is crucial for their generation and function since CD8+ but not CD4+ iTreg production decreased on CD103 KO mice. Adoptive transfer of CD4+CD103+Foxp3- subset suppressed colitis and EAE and IL-10 signal seems to be crucial for this therapeutic effect.

Conclusion: TGF-β can induce CD8+ Foxp3- and CD8+Foxp3+ iTreg subsets that displayed suppressive activity in cell contact-dependent, non-cytotoxic manner and have protective effects on autoimmune diseases. Generation of CD8+ iTregs may have considerable therapeutic potential on patients with autoimmune diseases.

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2503

SOCIS1 Is One of the Key Molecules to Prevent the Plasticity of Regulatory T Cells and the Development of Autoimmunity
Reiko Takahashi1, Kenji Itoh1, Fumihiko Kinuma2 and Akihiko Yoshimura3. 1National Defense Medical College, Tokorozawa, Japan, 2Keio University School of Medicine, Tokyo, Japan

Background/Purpose: Suppression of autoimmunity or inflammation by regulatory T cells (Tregs) is now well established, recently, natural Foxp3+ T cells have been shown to be a heterogeneous population consisting of a committed Treg lineage and an uncommitted subpopulation with development plasticity. Tregs have been reported to convert into Th1- or Th17-like cells (exFoxp3 cells) under lymphopenic or inflammatory conditions, which might be one of causes of autoimmunity. SOCS1 is defined as an important mechanism for the negative regulation of the cytokine-JAK-STAT pathway. SOCS1-deletion specifically in T cells (LckCre-SOCS1-foxl mice) or Tregs (Foxp3Cre-SOCS1-foxl mice) induced lupus-like phenomenon such as dermatitis, splenomegaly and lymphadenopathy, suggesting a defective Treg function in these mice.

We examined the role of SOCS1 to maintain the Foxp3 expression or suppressive functions in natural Tregs.

Methods: Natural Tregs (CD3+CD4+CD25+Foxp3+Pp) from LN of wild type (WT), LckCre-SOCS1-foxl, or Foxp3Cre-SOCS1-foxl mice sorted by flowcytometry.

Transfer of T cells with naïve T cells into Rag2-/- mice
Single transfer of Tregs into Rag2-/- mice
Tregs cultured with CD3/CD28 or antigen presenting cells in vitro

Results: 1) SOCS1+/- Tregs from WT mice efficiently suppressed colitis induced by naive CD4+ T cell transfer into Rag2-/- mice, however, SOCS1-/- Tregs from LckCre-SOCS1-foxl mice could not prevent it (n=3). Only SOCS1-/- Tregs transferred into Rag2-/- mice caused colitis, lost Foxp3 expression more rapidly, and converted into IFNγ-producing cells accompanying with hyperactivation of STAT1 (n=3). Foxp3 was stable in IFNγ-/SOCS1-/- Tregs (n=3).

2) Because Tregs from LckCre-SOCS1-foxl mice were constantly exposed to inflammatory cytokines from non-Treg cells in vivo, we then analyzed T reg-specific SOCS1 deficient mice (Foxp3Cre-SOCS1-foxl). Tregs from Foxp3Cre-SOCS1-foxl mice maintained Foxp3 expression transferred into Rag2-/- mice, on the contrary, those from LckCre-SOCS1-foxl mice (n=3).

3) Tregs from LckCre-SOCS1-foxl mice produced IFNγ after culture with CD3/CD28 in vitro; however, Tregs from Foxp3Cre-SOCS1-foxl mice did not (n=3). When Tregs from Foxp3Cre-SOCS1-foxl mice were cultured with antigen presenting cells (APCs) from LckCre-SOCS1-foxl mice, they produced IFNγ, which was blocked by anti-IL-12 antibodies (n=3).

Conclusion: SOCS1 plays important roles in maintaining Foxp3 expression and is necessary for suppression activity of Tregs by regulating STAT1 under inflammatory conditions in which APCs are highly activated.

Disclosure: R. Takahashi, None; K. Itoh, None; F. Kinuma, None; A. Yoshimura, None.

2504

Involvement of CD4+ FoxP3+ Regulatory T Cells in Interleukin-6 Receptor Targeted Treatment in Murine Arthritis and Rheumatoid Arthritis
Allan Thiolat1, Jerome Biton 1, Luca Semerano 1, Yves-Marie Pers2, Pierre Portales2, Delphine Lemeiter1, Patrice Decker1, Christian Jorgensen1, Pascale Louis-Plence2, Natacha Bessis3 and Marie-Christophe Boissier1. 1EA4222, Li2P, University Paris 13, Sorbonne Paris Cité and Rheumatology Department, Avicenne Hospital, Assistance Publique-Hôpitaux de Paris (AP-HP), Bondy, 93009, France, Bondy, France, 3Inserm U644, CHU Saint-Eloi, Université Montpellier 1, CHU Lapeyronie, Montpellier, France

Background/Purpose: Studies have demonstrated the clinical efficacy of tocilizumab, a humanized anti-IL-6 receptor (R) antibody (Ab), in patients with rheumatoid arthritis (RA). The rational for blocking IL-6 in this disease mainly lays on the pro-inflammatory role of this cytokine in the disease. However, only few works have studied the consequences of anti-IL-6R treatment on Tregs cells and mainly focuses on their frequency. Our objective was thus to elucidate anti-IL-6R mode of action, by studying the consequences of this treatment on Tregs phenotype and biological activity, in RA patients treated with tocilizumab and in a RA model, namely collagen-induced arthritis (CIA).

Methods: Mice with CIA were treated at day 0 by MR16-1 (a rat anti-mouse IL-6 receptor monoclonal Ab provided by Chugai Pharmaceutical Co. Ltd, Japan) and the evolution of Tregs (defined as CD4+FoxP3+) during arthritis course was assessed at key time points (day 8–18–28 and 42 after CIA induction) by studying their number, frequency and phenotype (expression of GTR, ICOS, Helios, CD62L, CTLA-4 and CD39) in lymph nodes (LN), thymus and spleen by flowcytometry. The immunosuppressive activity of the T cells on CFSE-labeled CD4+CD25- T effector (Teff) cells proliferation was also studied. Numerical analysis of Th17 and Th1 cells was also performed at the same times by flowcytometry.

Twenty patients with severe and active RA, refractory to methotrexate or anti-TNF therapies were recruited and treated with 8mg/kg of tocili-
zumab monthly. Peripheral blood was recovered for each patient at day 0, as well as 1 and 3 month, and Th17 and Tregs were analyzed by flow cytometry.

Results: In mice, clinical and histological evaluation of arthritis in mice treated with anti-mouse IL-6r mAb showed, as expected, a less severe disease as compared to control lg treated mice. Th17 frequency was unchanged, but Tregs frequency was enhanced in the LN of MR1-6t treated mice. Thus, we observed an enhanced frequency of Tregs. These results highlight the benefit of therapeutic treatment in RA, that could result in an enhanced central and peripheral fraction of FoxP3+ Tregs. Previous data demonstrated that in SLE patients, we have shown that tocilizumab did not change Th17 and Th17 cytokine expression, whereas FoxP3+ Tregs phenotype was modified in treated mice, with an increased frequency of CD39+ Tregs (LN and spleen), suggesting an enhanced ATP hydrolysis immunosuppressive activity of Tregs. In contrast, the immunosuppressive activity of the Tregs on T effector cells proliferation was not modified.

In RA patients, we also showed that tocilizumab did not change Th17 frequency but rather acted on Tregs. Indeed, in responder patients to tocilizumab, CD4+CD25+FoxP3+ staining was confined to CD127low+Tregs, suggesting the induction of induced Tregs following treatment.

Conclusion: Tregs, but not Th17, are modified by anti-IL-6r treatment in RA, that could result in an enhanced central and peripheral generation of Tregs. These results highlight the benefit of therapeutic approaches based on Treg promotion in RA, and stress the relevance of the monitoring of cell populations in arthritis following cytokine treatment.

Disclosure: A. Thiolat, None; J. Biton, None; L. Simerano, None; Y. M. Pers, None; P. Portales, None; D. Lemeiter, None; P. Becker, None; C. Jorgensen, None; P. Louis-Plence, None; N. Bessis, None; M. C. Boissier, None.

2506

Expression of Helios Facilitates Distinction Between FoxP3+ Treg and FoxP3+ Activated T Conventional Cells in Patients with Systemic Lupus Erythematosus. Amit Golding1, Sarfaraz A. Hasmi1, Gabor G. Iller1 and Ethan M. Shevach4. 1NIAID/National Institutes of Health, Bethesda, MD, 2National Institutes of Health, Bethesda, MD, 3NIDCR/NIH, Bethesda, MD, 4NIAID/NIH, Bethesda, MD

Background/Purpose: FoxP3 is not a reliable marker for distinguishing regulatory T (Treg) cells in humans due to the fact that FoxP3+ may be expressed in TcellHelp, Tconvs. The use of FoxP3+ Tregs and that the majority of cells in both FoxP3 cells is, in fact, the “non-Treg” group. The transcription factor Helios has recently been defined as a marker of thymus-derived Tregs in both mouse and man (J. Immunol. 2010). The goal of this study was to determine if expression of Helios could reliably indicate what fraction of FoxP3+ cells are true Tregs in healthy controls and in SLE patients.

Methods: Samples included 35 healthy donors and 52 SLE patients (23 SLEDAI 0; 19 SLEDAI 2–4; 10 SLEDAI 6–20). Ficoll-purified PBMCs were surface stained followed by fixation/pemelization and intracellular staining prior to FACS analysis. When appropriate, cells were pre-stimulated for 4–5 hours with PMA/ionomycin/golgostip. CpG methylation analysis of sorted cells was performed using the Quant Epitect platform.

Results: We found that CD4+ T cells in SLE patients contain both resting (RA+) and activated (RA++) Tregs and that the majority of cells in each group were Helios+. 3/4 and 4/5, respectively). Surprisingly, even within the sub-group defined as “non-Tregs”, the majority of the cells in both healthy controls (2/3) and SLE patients (3/4) were Helios-. All FoxP3+ Helios- cells, including those within the “non-Treg” RA- sub-set, were found to be demethylated at the FoxP3 locus (a gold standard epigenetic marker of the Treg lineage), as compared to Helios+ cells. In pre-stimulated cells, FoxP3+ Helios- cells consistently produced significantly higher amounts of cytokines (IFN-gamma and IL-2), whereas FoxP3+ Helios- cells produced essentially no cytokines, which is characteristic of Tregs. In SLE patients with mild and highly active disease, there was a significant increase in both the % FoxP3+ Helios- and % FoxP3+ Helios+ relative to both healthy controls and inactive patients (p<0.05, Mann-Whitney test).

Conclusion: Expression of Helios is a highly useful tool for distinguishing true Tregs from FoxP3+ cells that include activated Tconvs. The use of Helios has allowed us to de-convolute the largest subset of CD45RA-based grouping of FoxP3 cells. Furthermore, we have also shown that active SLE patients do have a higher frequency of FoxP3+ Helios- Tregs, but that in active SLE patients these are counter-balanced with a higher frequency of FoxP3+ Helios+ cells that contain cytokine-producing Tconvs. Future studies may make use of Helios to reliably monitor both true Tregs and activated Tconvs in SLE and other autoimmune diseases.

Disclosure: A. Golding, None; S. A. Hasmi, None; G. G. Iller, None; E. M. Shevach, None.

2507

Activated Cullin-Ring Ubiquitin Ligases (CRLs) Dampen T Cell Signaling and Inactivation of Crls Arrests the Progression of Inflammatory Arthritis. Leonard L. Dragone1, Lisa K. Peterson1, Allison Berger2 and Samantha F. Friend3. 1National Jewish Health, Denver, CO, 2Millennium Pharmaceuticals, Inc, Cambridge, MA

Background/Purpose: The role of Cullin-Ring ubiquitin ligase (CRL) activity in regulating T cell function is largely unexplored. Thus, we sought to determine if cullin neddylation and CRL activity regulates signaling initiated through the T-cell receptor (TCR) complex to modulate T cell activation and effector functions.

Methods: To determine if TCR complex signaling affects CRL activity, we treated T cells in vitro with specific neddylation inhibitor (MLN4924), a drug currently undergoing clinical trials for several malignancies, that prevents CRL activation in combination with CD3 activation and measured IL-2 production. We then assessed CRL activity during TCR complex signaling by examining the neddylation status of the cullin subunit of the CRL. In addition, we knocked down the cullin subunit of the CRLs in T cell lines and examined T cell function. Further we treated arthritis prone mice that have a TCR signaling defect with MLN4924 in vivo to assess the impact of CRL inactivation on T cell activation and effector function.

Results: Treatment with MLN4924 lowered the threshold for TCR signaling, as evidenced by enhanced IL-2 production and regulatory T cell (Treg) development upon suboptimal TCR stimulation. Moreover, MLN4924 treatment of the arthritis-prone SKG mouse, arrests arthritis progression and decreases the numbers of IL-17 producing T cell effectors in vivo. We found that strong TCR complex signaling results in cullin deneddylation, which renders the CRL inactive. After knocking down cullin in T cell lines, we found that IL-2 production is increased compared to the parental cell line, but some individual cullin knockdowns do not achieve the same enhancement of IL-2 production as MLN4924 treatment, suggesting that multiple CRLs contribute to regulating TCR complex signaling and IL-2 production.

Conclusion: Thus, we propose that strong TCR complex signaling normally triggers cullin deneddylation to shut off CRL activity and the otherwise tonic ubiquitination and degradation of proteins essential for TCR complex signaling and IL-2 production. Ongoing studies are elucidating the specific CRL targets that contribute to the phenotype seen.

Significance: These findings represent the first step in understanding the interplay between neddylation, CRL-mediated ubiquitination and TCR complex signaling. Expanding our knowledge of how CRLs neddylation regulates TCR complex signaling and T cell function will create opportunities for developing drugs to modulate T cell function to treat immune-mediated diseases.

Disclosure: L. L. Dragone, None; L. K. Peterson, None; A. Berger, Millennium Pharmaceuticals, 3; S. F. Friend, None.

2508

miR142-3p Interferes with T Cell Proliferation by Targeting the Expression of Garp in Patients with Rheumatoid Arthritis. Qihui Zhou, Sonja Haupt, Johannes Thomas Kreuzer, Hendrik Schulze-Koops and Alla Skapenko. University of Munich, Munich, Germany

Background/Purpose: Rheumatoid arthritis (RA) is a systemic chronic inflammatory disorder, characterized by severe joint destruction. Regulatory T cells (Tregs) have been implicated to be important for maintaining peripheral tolerance and controlling disease development. A novel surface protein, Glycoprotein A repetitions predominant (GARP), was recently identified to be specifically expressed on human Tregs and important for the suppressive capacity of Tregs. Several studies suggest that GARP expression in Tregs is post-transcriptionally regulated. In this study, we investigated in detail miRNA regulation of GARP expression, and dissected
the functional outcome of miRNA:GARP-mRNA interaction and its resulting effects in patients with RA.

**Methods:** In silico analysis was performed to predict putative miRNA binding sites (MRE) in the 3'UTR of the GARP mRNA. Luciferase reporter vectors were used to identify specific GARP 3'UTR-recognizing MREs. Ribonucleaseprotein immunoprecipitation (RNP-IP) was performed using antibodies against the Ago1- or Ago2-associated RISC complex. For cell proliferation and GARP expression, CD25+ and CD25- CD4 T cells were isolated from the peripheral blood. Cells were transfected with miRNA mimics or antagomirs and labeled with CFSE. The proliferating capacity was accessed by FACS. For Treg function assays, CD25+ T cells were transfected with miRNA mimics and co-cultured with CFSE-labeled CD25- T cells. Eight patients with early treatment naive RA (disease duration 3.0±2.4 months, DAS28 5.2±1.2) and 20 age and gender-matched healthy individuals were analyzed for GARP surface expression as accessed by FACS, or GARP mRNA and miRNA expression as measured by RT-PCR.

**Results:** The distal part of the GARP 3'UTR was capable to down-modulate reporter protein expression. Within this region, one MRE was recognized by its miRNA, miR142-3p. Mutation of this site abrogated the respective miRNA recognition confirming the specificity of the binding to the GARP 3'UTR. GARP mRNAs and miR142-3p were both immunoprecipitated in the Ago2-associated RISC complex by RNP-IP using an antibody against Ago2. Co-transfection with the antagonist of miR142-3p prevented GARP mRNA loading into the Ago2-associated RNP complex. CD25+ CD4 T cells treated with the antagonist showed a higher proliferating capacity upon stimulation. Complementary, treatment of cells with miRNA mimics lead to reduction of proliferation. CD25+ CD4 T cells treated with miRNA mimics showed a reduced suppressive capacity. The up-regulation of miR-142-3p expression was more prominent in RA patients than in healthy individuals resulting in consequentially diminished up-regulation of GARP.

**Conclusion:** We identified and characterized miR-142-3p regulation of GARP expression in Tregs. miR142-3p is critical for high GARP expression on Tregs, and therefore for Treg function. Delineation of miR-142-3p expression and the linked GARP expression in RA provides an important hint on Tregs and therefore for Treg function.

**Disclosure:** Q. Zhou, None; S. Hauto, None; J. T. Kreuzer, None; H. Schulze-Koops, None; A. Skapenko, None.

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**ACR/ARHP Combined Abstract Session**

**ACR/ARHP Combined Epidemiology Abstract Session**

Tuesday, November 13, 2012, 2:30 PM–4:00 PM

**2509**

**Cost-Effectiveness of Training Rural Providers to Perform Joint Injections.**

Michael J. Battistone, Richard E. Nelson, William D. Ashworth, Andrea Barker, Marissa Grotzke, Timothy A. Huhtala, Robert Z. Tashjian and Grant W. Cannon, Salt Lake City VA and University of Utah, Salt Lake City, UT.

**Background/Purpose:** Community based outpatient clinics (CBOCs) have been established by the Department of Veteran Affairs (VA) to provide primary care services to veterans living in remote and rural regions. While CBOCs provide excellent primary care services, the current model does not allow providers in CBOCs to develop and deliver specialty services. The objective of this study was to evaluate the cost-effectiveness of training rural primary care providers to perform knee injections in CBOCs, rather than referring the patient to an urban medical center with rheumatology and orthopedic specialists. Referral often involves significant travel for patients in rural areas.

**Methods:** We developed a decision analytic model to compare costs and outcomes between rural providers who are trained to perform knee injections and those who are not trained. In the model, each type of provider is presented with a hypothetical patient who has knee pain and should receive an injection. Costs included in the model (including medical management for patients who do not receive an injection, travel of the rural provider to perform injections, travel reimbursement for patients who are sent to an urban medical center) were from the perspective of the VHA. The effectiveness outcome was quality-adjusted life years (QALYs). In our primary analysis, a range of values were used for 2 key inputs: the number of patients with knee pain presenting to the rural clinic in 1 year period (range:10–100) and the average distance from the patients’ home address to the urban medical center (range:50–500). Probabilistic sensitivity analyses were performed using 1,000 2nd order Monte Carlo simulations and the benefits of knee injection were assumed to last 90 days.

**Results:** In our base case analyses (which assumed 30 patients per year presenting with knee pain that could benefit from an injection and an average distance of 100 miles from the patient’s home adders to the urban medical center), the incremental cost-effectiveness ratio (ICER) for trained rural providers was $27,692/QALY. ICERs were more sensitive to the number of patients than to distance Table 1. Training rural providers was cost-effective in 68.6% of 1,000 Monte Carlo simulations at a willingness to pay threshold of $50,000/QALY.

Incremental cost effectiveness ratios for range of values for average distance and number of patients per year (US dollars/QALY).

<table>
<thead>
<tr>
<th>Distance</th>
<th>Number of patients</th>
<th>ICER (QALY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50</td>
<td>$70,732</td>
</tr>
<tr>
<td>30</td>
<td>100</td>
<td>$70,536</td>
</tr>
<tr>
<td>50</td>
<td>200</td>
<td>$70,145</td>
</tr>
<tr>
<td>100</td>
<td>300</td>
<td>$68,970</td>
</tr>
</tbody>
</table>

**Conclusion:** Training rural providers to perform knee injections for patients with knee pain appears cost-effective at the commonly used threshold of $50,000/QALY if sufficient numbers of such patients are seen at rural primary care clinics. We are currently implementing such a training program to test the validity of these projections.

**Disclosure:** M. J. Battistone, None; R. E. Nelson, None; W. D. Ashworth, None; A. Barker, None; M. Grotzke, None; T. A. Huhtala, None; R. Z. Tashjian, None; G. W. Cannon, None.

**2510**

**Patient and Provider Factors Associated with Compliance with Rheumatoid Arthritis Treatment Recommendations.**

Leslie R. Harrold1, George W. Reed2, Katherine C. Saunders3, Ying Shan4, Tanya Spruill5 and Jeffrey D. Greenberg6. 1UMass Medical School, Worcester; MA, 2CORRONA, Inc, Southborough; MA, 3NYU School of Medicine, New York, NY, 4New York University School of Medicine, New York, NY.

**Background/Purpose:** Only approximately 50% of rheumatoid arthritis (RA) patient with active disease receive care consistent with the American College of Rheumatology (ACR) recommendations for the use of biologic and nonbiologic disease modifying anti-rheumatic drugs (DMARDs). Therefore we examined patient and provider factors associated with receipt of the recommended care using data from a multi-center observational registry within the United States (the Consortium of Rheumatology Researchers of North America: CORRONA).

**Methods:** We identified biologic naive RA patients cared for within the CORRONA network between 12/08 and 12/11. Initiation or dose escalation of biologic and nonbiologic DMARDs in response to active disease (using the Clinical Disease Activity Index) was assessed in comparison to the ACR recommendations. The population was divided into two mutually exclusive cohorts: 1) methotrexate (MTX) only users; and 2) multiple non-biologic DMARD users. We compared the characteristics of patients (age, gender, race/ethnicity, working status, insurance
and RA disease characteristics) who received care consistent with the ACR recommendations and their treating providers (gender, years since medical school graduation, academic vs. private practice and region of the country [Northeast, South, Midwest and West]) to those who did not in the two cohorts with active disease using logistic regression adjusting for clustering of physicians and patients.

**Results:** There were 5,196 patients who met inclusion criteria cared for by 191 providers at 86 practice sites. Of the 991 MTX only users with active disease (moderate disease activity with a poor prognosis or high disease activity), 44% received care consistent with the treatment recommendations. In adjusted analyses, patient characteristics including age 65 and older (OR 0.70; 95% CI 0.54–0.91), female gender (OR 1.47; 95% CI 1.10–1.98) and prednisone dose (OR 1.37; 95% CI 1.05–1.79) were associated with care practices while physician characteristics were not. Among the 1209 multiple nonbiologic DMARD users with moderate or high disease activity, 48% received care consistent with the recommendations. Patient age 65 and older (OR 0.73, 95% CI 0.57–0.94), residence in the South (OR 0.69, 95% CI 0.50–0.94) or Midwest (OR 0.73, 95% CI 0.54–0.99) and care by a private practice rheumatologist (OR 0.56, 95% CI 0.37–0.83) were associated with a reduced likelihood of receiving care consistent with the recommendations.

**Conclusion:** Compliance with the ACR treatment recommendations is influenced by both patient and provider characteristics. Identification of these characteristics will help us identify which patients and providers to target for interventions to improve care.

**Disclosure:** L. R. Harrold, NHI-K23AR053856, 2, Corona, 5; G. W. Reed, Corona, 2, University of Massachusetts Medical School, 3, Corona, 5; Harvard Medical School; K. C. Saunders, Corona, 3; Y. Shan, None; T. Spruill, None; J. D. Greenberg, Corona,Inc., 1, Astra Zeneca, Inc. Novartis, Pfizer, 5.

### 2511

#### Potential Barriers That Limit Access to Rheumatologists Among Patients with Early Rheumatoid Arthritis in a Universal Access Health Care System

Jessica Widdifield1, J. Michael Paterson1, Sasha Bernatsky1, Karen Tu2, Nadia Gunraj2, None: Ivers, None; D. Butt2, None; R. Liisa Jaakkimainen1, None; J. C. Thorne, None; V. Ahluwalia, None; C. Bombardier, None.

**Background/Purpose:** Changes in bone marrow lesions (BMLs), common magnetic resonance (MR) imaging findings in osteoarthritis (OA), are predictive of OA progression. However, it is unclear if quantitative measurements of BML volume change are related to knee pain. Therefore, the purpose of this study was to determine whether quantitative measures of BML volume change are positively associated with knee pain change.

**Methods:** The sample comprised 404 participants in the Osteoarthritis Initiative (OAI) progression cohort who had sagittal intermediate-weighted, turbo spin echo, fat-suppressed MR images at the 24- and 48-month OAI visits. The right knee was assessed unless contraindicated. BML volume was determined on the sagittal fat-suppressed MR images by one rater using a semi-automated segmentation method (ICC [3,1 model] = 0.95). BML volumes were calculated for each knee region and then summed to form a total knee BML volume (cm³). Knee pain was defined based on WOMAC pain score at the 24- and 48-month OAI visits. Multiple linear regressions were used to evaluate the association between the WOMAC pain, as an outcome, and BML volume while controlling for sex, weight, height, and age. To further explore these associations we assessed the associations stratified among tertiles based on baseline BML volume. Based on diagnostic tests (e.g., DFFITs, Cook’s D) for the linear regression models among tertiles we opted to perform robust regression models* with Baseline Model* with baseline

**Results:** The cohort included 199 (49%) females and were 64.9 ± 9.2 years old, 85.3 ± 16.2 kg, and 1.7 ± 0.1 m. The average baseline total knee BML volume was 2.6 ± 2.7 cm³ (range = 0.1 to 10.2 cm³). Total knee BML volume change was -0.2 ± 2.1 cm³ (range = -12.7 to 10.2 cm³; see Figure). Larger BML volumes are associated with greater knee pain and larger BML volume changes are associated with worsening knee pain (see Table). Stratified analyses by baseline BML volume (tertiles) indicated that only in the first tertile (no BMLs or BMLs < 1.0 cm³) was BML volume change and WOMAC pain change significantly related (estimate = 0.65, standard error = 0.25, p = 0.009).

**Table.** Cross-sectional and Longitudinal Association between BML Volume and WOMAC Pain

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Descriptive Statistics</th>
<th>Models* with Baseline BML Volume</th>
<th>Models* with BML Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline BML Volume Terity</strong></td>
<td><strong>Mean ± SD</strong></td>
<td><strong>B (p-value)</strong></td>
<td><strong>B (p-value)</strong></td>
</tr>
<tr>
<td>Full Cohort (n = 404)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WOMAC pain (baseline)</td>
<td>3.3 ± 1.4</td>
<td>0.16 (0.01)</td>
<td>n/a</td>
</tr>
<tr>
<td>WOMAC pain (change)</td>
<td>0.0 ± 3.0</td>
<td>-0.01 (0.87)</td>
<td>0.21 (0.004)</td>
</tr>
</tbody>
</table>

* All models adjusted for sex, weight, height, and age. SD = standard deviation, BML = bone marrow lesion, B = parameter estimate, n/a = not assessed.
Figure. Scatter plot of WOMAC Pain Change by BML Volume Change Stratified by Tertiles (colors). Tertiles, based on baseline BML volume, had average baseline total knee BML volumes of 0.6 $\pm$ 0.2 cm³, 1.6 $\pm$ 0.5 cm³, and 5.5 $\pm$ 2.9 cm³, respectively.

Conclusion: Change in BML volume is associated with change in knee pain severity. This association may primarily be driven by knees that are progressing from no or small BML volumes to larger BML volumes.

Disclosure: J. B. Driban, None; L. L. Price, None; G. H. Lo, None; J. Pang, None; E. Miller, None; C. Eaton, None; J. A. Lynch, None; T. E. McAlindon, None.

2513


Kathryn Remmes Martin1, Dane Van Donkelen1, Matthew Pantell1, Ming-yang Hung1, Tamara B. Harris1 and Kushang Patel1. 1NIA/NIH, Bethesda, MD, 2University of Washington, Seattle, WA

Background/Purpose: To compare the prevalence of meeting current public health activity guidelines by arthritis and knee-hip joint pain status, and to examine the relationship between arthritis, joint pain and accelerometer-measured PA in US older adults.

Methods: Data are a sample of 1680 men and women from the 2003–2004 NHANES aged $\geq$50 years who had 4+ valid days ($\geq$ 10 hrs of hip-worn accelerometer wear-time. PA was examined 2 ways: 1) adherence to PA guidelines of accumulated 10-minute bouts of moderate/vigorous physical activity (MVPA) (inactive: no bouts; insufficient <150 min \cdot wk$^{-1}$; recommended: $\geq$150 min \cdot wk$^{-1}$) using average daily minutes; and 2) average counts per minute (CPM) during wear-time and min $\cdot$ d$^{-1}$ spent in sedentary, light, lifestyle, and MVPA. Participants self-reported doctor-diagnosed arthritis and knee and/or hip joint pain, and were categorized as follows: 1) no arthritis or joint pain (NEITHER); 2) arthritis only (ARTH); 3) joint pain only (JP); and 4) arthritis and joint pain (BOTH). Regression analyses adjusted for age, education, race, occupation, BMI, smoking status, self-rated health, self-reported functional limitations, arthritis-attributable limitations, and current pain medication use. All analyses were stratified by gender and accounted for NHANES PA monitor sampling weights.

Results: Age-adjusted prevalence of arthritis and joint pain (knee and/or hip) was 44% and 47%, respectively. These conditions co-occurred in 33% of participants (BOTH); 42% had NEITHER condition, 11% had ARTH only, and 14% had JP only. Having BOTH was more common among women (40%) than in men (24%).

The proportions of women meeting PA guidelines in the NEITHER (5%) and JP (6%) groups were similar. Women with ARTH and BOTH had the lowest proportion of recommended PA (<1%; 2%). Only 7% of men without either condition (NEITHER) achieved recommended PA, which was similar to men with ARTH (7%); however, the proportion meeting recommended PA was substantially lower in men with JP or BOTH (2%, 3%).

Regression models adjusted for demographics showed that women with ARTH, JP, or BOTH had lower CPM and lower levels of PA by various measures, which remained significant, though attenuated, after further adjustment for health conditions and functional limitations. Relative to the NEITHER group, women with ARTH had fewer CPM (B = -23.6, p = 0.027) and fewer min $\cdot$ d$^{-1}$ of MVPA (B = -12.2, p = 0.004); women with BOTH had 2.4 fewer min $\cdot$ d$^{-1}$ of MVPA (p = 0.013). Among men, only those with BOTH had fewer min $\cdot$ d$^{-1}$of MVPA compared to men in the NEITHER group (B = -12.2, p = 0.004); however further adjustment for health conditions and functional limitations yielded unexpectedly higher CPM, fewer sedentary min $\cdot$ d$^{-1}$, and greater time in lifestyle-intensity activity in men with ARTH and BOTH compared to men in the NEITHER group.

Conclusion: Adherence to PA guidelines was low across all groups. Our data suggests gender differences in the relationship between arthritis, joint pain and PA. Women with ARTH and BOTH were generally less active, whereas men with ARTH and BOTH were more active than those with NEITHER. Continued PA promotion and pain management should be intensively targeted to US older adults with arthritis and joint pain.

Disclosure: K. R. Martin, None; D. Van Donkelen, None; M. Pantell, Pfizer Inc, 2; M. Y. Hung, None; T. B. Harris, None; K. Patel, None.

2514


Aniket A. Kawatkar1, Cecilia Portugal1, Li-Hao Chu2 and Rajan Iyer1. 1Kaiser Permanente Southern California, Pasadena, CA, 2Kaiser Permanente Southern California, Pasadena

Background/Purpose: As epidemiologic studies throughout the world have shown significant variations, we sought to characterize racial differences in longitudinal epidemiologic trends of adult rheumatoid arthritis (RA) in a large, racially diverse, managed care organization. The study objective was to estimate racial/ethnic differences in incidence density (ID) and prevalence rates (PR) of RA over time, while adjusting for age, and gender.

Methods: This was a retrospective population based study using active members from a large managed care health plan, during 01/01/2002 and 12/31/2010. RA patients were identified using a diagnosis code for RA in combination with the use of a disease modifying antirheumatic treatment within a year of the diagnosis code date. Subjects were required to be between the ages of 18 years and 100 years at the time of diagnosis. Non-RA adult health plan members informed the denominator for the ID and PR rates which were calculated on an annual basis. The longitudinal trend of ID and PR across 2002 to 2010, was further stratified by race/ethnic groups (Caucasian; Hispanic; African American; Asian and Other race); age (18–34; 35–44; 45–54; 55–64; and > 65), and gender. Negative binomial regression models were used to estimate age, gender and race, adjusted rate ratios, for incidence density (aIDr) and prevalence (aPRr). The negative binomial models also included yearly dummy indicators to evaluate the statistical significance (alpha 0.05) in changes of these rates overtime.

Results: During the study period, a total of 8,108 incident cases and 58,644 prevalent cases of RA were identified. The majority of incident (76.9%) and prevalent (77.8%) cases were females. The major race/ethnic group was Caucasians, in the incident (55.8%) as well as the prevalent (64.2%) cases. Due to the predominance of females, the negative binomial models were stratified by gender. For females, the aIDr (mean 95% CI) with Caucasians as reference category) was as follows: Asian 0.7 (0.51–0.89); African Americans 1.0 (0.77–1.35); Hispanics 0.6 (0.45–0.78) and other race 0.9 (0.72–1.25). The aPRr in females (with Caucasians as reference category) was as follows: Asian 0.69 (0.56–0.83); African Americans 1.02 (0.84–1.24); Hispanics 0.65 (0.43–0.95) and other race 0.88 (0.73–1.07). Additionally, as compared to the 18–34 year age group, all other age groups had significantly higher aIDr and aPRr in both genders. Lastly, as compared to reference year 2002, the time trend for aPRr confirmed a statistically significant increase in prevalence rates in both genders.

Conclusion: We find evidence of racial differences in epidemiologic trends in RA with Asians and Hispanics having significantly lower incidence density and prevalence rates as compared to Caucasians. We also find evidence on increase in incidence and prevalence of RA with increasing age and also increase in prevalence rates over time.

Disclosure: A. A. Kawatkar, None; C. Portugal, None; L. H. Chu, None; R. Iyer, None.

S1061

Acr Concurrent Abstract Session

Biography and Pathology of Bone and Joint: Regulation of Bone Cells

Tuesday, November 13, 2012, 4:30 PM–6:00 PM

2515

Low Density Lipoprotein Receptor Deficiency Results in Osteophyte Formation During Experimental Osteoarthritis Which Is Enhanced Under High Cholesterol Conditions. Wouter de Munter, Birgite Walgreen, Monica M. Helsen, Annet W. Sloetjes, Wim B. van den Berg and Peter L.E.M. van Lent. Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

Background/Purpose: Synovial macrophages are involved in osteophyte formation during experimental collagenase-induced osteoarthritis (OA). Accumulated LDL can be oxidized in an inflammatory environment such as OA and be taken up by scavenger receptors of macrophages, changing the macrophage phenotype. The effect of LDLr deficiency and cholesterol accumulation on OA pathology was investigated using an experimental OA model.

Methods: LDLr deficient (LDLr/−/−) mice and their wild type (WT) controls received either a high cholesterol or control diet for 120 days. Experimental OA was induced by intra-articular injection of collagenase on day 84 and 86. Paraffin sections of total knee joints were stained with safranin O – fast green or haematoxylin – eosin to determine OA development. Thickening of the synovial lining layer was measured using an arbitrary scale (0 to 3). Cartilage destruction was determined in four cartilage surfaces of the knee joint (lateral and medial femur and tibia) using the OA score developed by Pritzker et al. (2006), adapted for use in mice (0 to 30). Size of osteophyte formation was determined using image analysis by measuring osteophyte surface areas at the margins of the tibial plateau and femoral condyles. Data are depicted as mean ± SD.

Results: WT mice receiving a normal diet developed moderate cartilage destruction (6.1 ± 2.6), synovial thickening (1.4 ± 0.6), and osteophyte formation (56.5 ± 39.6). Both LDLr/−/− groups showed comparable cartilage destruction and showed no change in bodyweight (23.99 g ± 1.85). WT mice receiving a cholesterol-rich diet showed increased bodyweight compared to the other three groups (28.82 g ± 4.81; p<0.0001), however, no significantly increased cartilage destruction was observed. No differences between the four groups were found regarding synovial thickening. LDL levels were significantly higher in LDLr/−/− mice compared to WT mice (7.33 mmol/L ± 1.44 and 0.54 mmol/L ± 0.11 respectively; p<0.0001), which was additionally increased by a cholesterol-rich diet (38.73 mmol/L ± 9.84; p<0.0001). At the tibial plateau, LDLr/−/− mice showed almost a 4 times increase of osteophyte formation compared to WT mice (206.3 ± 196.3; p<0.0001). When receiving a cholesterol-rich diet, osteophyte formation at the lateral side of the tibial plateau in LDLr/−/− mice further increased from 107.0 ± 156.0 to 309.4 ± 132.0 (p<0.05).

Conclusion: Enhanced LDL levels correlate with increased osteophyte formation in LDLr/−/− mice, suggesting a pathological role of LDL accumulation during OA.

Disclosure: W. de Munter, None; B. Walgreen, None; M. M. Helsen, None; A. W. Sloetjes, None; W. B. van den Berg, None; P. L. E. M. van Lent, None.

2516

Adenosine Receptors Stimulate Bone Regeneration by Targeting Osteoclasts. Aranzazu Mediero1, Tueer Wilder1 and Bruce N. Cronstein2. 1NYU School of Medicine, New York, NY, 2NYU School of Medicine, Division of Rheumatology, New York, NY.

Background/Purpose: Various types of orthopedic procedures, including spinal fusion and repair of bone defects due to trauma, infection or metastatic disease, require formation of new bone. Adenosine, generated from the catabolism of adenosine nucleotides, modulates cell function by interacting with specific cell-surface receptors (A1, A2a, A2b, A2c, A3). We have previously reported that A2a receptor blockade and A2b stimulation inhibit osteoclast (OC) differentiation but only A2b receptor stimulation affects osteoclast (OB) differentiation or function. We determined whether A1 receptor blockade, A2a receptor stimulation or enhancing adenosine concentrations via blockade of purine transport into cells via ent1 with dipyridamole regulates bone formation in a murine calvarial model.

Methods: Male C57Bl/6 mice were anesthetized, a 3mm trephine defect was formed and covered with a collagen scaffold soaked in saline or 1mM adenosine receptor agonists/antagonists. Animals received appropriate treatment daily until sacrifice. At 0, 2, 4, 6 and 8 weeks calvarias were harvested and prepared for microCT and histology. XenoLight RedJect Bone Probe 680 was injected intravenously at different time points.

Results: 8 weeks after surgery microCT examination of mouse calvarias demonstrate that an A1R antagonist (DPCPX), A2aR agonist (CGS21680M) markedly enhanced bone regeneration (77±0.2%, 60±2.0% and 79±2.0% bone regeneration, respectively, vs. 32±4% in control, p<0.001, n=5 mice per condition) whereas an A2b agonist (IB-MECA) had no effect (32±3% regeneration, n=5). In DPCPX-, CGS21680- and dipyridamole-treated mice there is increased immunostaining for osteoblast or bone formation markers (Alkaline Phosphatase, Osteocalcin and Osteonectin) in the bone defects (Alkaline Phosphatase positive cells/hpf increased from 15±1 for control to 22±1 for DPCPX, 21±1 for CGS21680 and 24±1 for Dipyridamole, p<0.001), and diminished immunostaining for macrophages (CD163, TNfa) and osteoclasts (RANKL, RANK) in treated defects when compared to control. TRAP staining revealed fewer OCs in DPCPX-, CGS21680- and Dipyridamole-treated defects (14±1, 17±1 and 16±1 OC/hpf respectively vs. 24±1 Osteoclast/hpf for control, p<0.001) 8 weeks after defect formation. In vivo imaging with XenoLight RedJect Bone Probe 680 (a marker of bone formation) reveals a strong fluorescent signal in treated animals (DPCPX, CGS21680 and Dipyridamole) compared to control as soon as one week after bone defect formation and lasting for at least 7 weeks.

Conclusion: Inhibition of OC formation via A2bR stimulation, A1 receptor blockade or increasing local adenosine concentration stimulates new bone formation and represents a novel approach to stimulating bone regeneration.

Disclosure: A. Mediero, None; T. Wilder, None; B. N. Cronstein, Canfi BioPharma, 1, NIH, URL Pharma, OSI, 2, Bristol-Myers Squibb, Novartis, URL, Regeneron, Gismo Therapeutics, 5, Arthritis Foundation, SLE Foundation, 6, Patents on use of adenosine receptor antagonists to treat or prevent fibrosis. Multiple other patents.

2517

Inhibition of Notch Signaling Increases the Severity of Experimental Osteoarthritis. Neng-Yu Lin1, Aliyya Distler2, Christian Beyer2, Clara Dees2, Jingang Huang3, Francesco Dell’Accio4, Oliver Distler4, Georg A. Schett1 and Joerg HW Distler1. 1Department of Internal Medicine III and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 2Department of Internal Medicine 3 and Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany, 3University of Erlangen-Nuremberg, Erlangen, Germany, 4William Harvey Research Institute, Barts and the London Queen Mary’s School of Medicine and Dentistry, Centre for Experimental Medicine and Rheumatology, London, United Kingdom, 5Department of Rheumatology and Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland.

Background/Purpose: Notch signaling is triggered by binding of ligands such as Jagged-1 (Jag-1) to Notch receptors, which results in cleavage of Notch receptors by the γ-secretase complex and subsequent release of the active Notch intracellular domain (NICD). The NICD is the central regulator of the pathway, which translocation to nucleus where it interacts with the DNA binding factor RBP-J. Aberrant Notch signaling has been implicated into the pathogenesis of various diseases including cancer, Alzheimer’s disease and fibrosis. Of note, increased expression of Notch signaling pathway has recently been observed in OA chondrocytes. However, the implications of the findings for the pathogenesis of OA and potential therapeutic implications have not been investigated so far.

Here, we aimed to further elucidate the role of Notch signaling pathway in OA using genetic and pharmacological inhibition of Notch signaling in the mouse model of destabilization of the medial meniscus (DMM) induced OA.

Methods: To analyze the activation status of the Notch cascade, we quantified the mRNA expression of Notch receptor family by real-time PCR and also analyzed the expression of NICD and Jag-1 protein by immunohistochemistry. To characterize the effects of Notch inhibition on osteoarthritis development in vivo, we evaluated the outcome of Notch anti-sense transgene mice or mice treated with the γ-secretase inhibitor DAPT in the DMM (destabilization of the medial meniscus) model of OA. We used a modified Mankin score to analyze the histological changes. Hypertrophic differentiation of chondrocytes was analyzed by staining for Collagen X. We also analyzed the mRNA level of Eps1l and Aggrecanase-1 by real-time PCR.

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Results: We demonstrated that the mRNA levels of Notch1 are increased by 200 ± 79 % in human OA cartilage (p<0.05). Moreover, the protein levels of Jag-1 and of the NICD are upregulated in human OA cartilage. Similar results were also obtained in murine OA induced by DMM.

However, genetic or pharmacologic inhibition of Notch signaling exacerbated the osteoarthritic changes in the DMM model. The modified Mankin score upon surgical DMM was significantly increased in mice expressing a Notch-1 anti-sense construct or upon treatment with DAPT (50 ± 6% increase in Notch as tg and 60% ± 5 increase in DAPT treated mice compared to non-transgenic or sham-treated DMM controls, respectively, p<0.01 for both). Immunostaining for Col X was also strongly increased upon inhibition of Notch signaling indicating increased differentiation into hypertrophic chondrocytes. Genetic or pharmacologic inactivation of Notch signaling also enhanced the mRNA expression of OA markers, such as Espin (increases by up to 94 ± 10% (p<0.05)). Aggrecanase-1 (increases by up to 150 ± 20% (p<0.01)).

Conclusion: We demonstrate that Notch signaling is hyperactivated in chondrocytes of OA patients. However, inhibition of Notch signaling pathway enhances chondrocartilage hypertrophy and exacerbates osteoarthritis in the DMM model, indicating that the activation of Notch signaling in OA is a counter-regulatory mechanism to ameliorate chondrocyte dedifferentiation and cartilage damage.

Disclosure: N. Y. Liu, None; A. Distler, None; C. Beyer, None; C. Does, None; J. Huang, None; P. Dell'Acre, None; O. Distler, Actelion, Pfizer, Boehringer-Ingelheim; Bayer, Roche, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrium, Novartis and Active Biotec, 2, Actelion, Pfizer, Boehringer-Ingelheim, Bayer, Roche, Ergonex, BMS, Sanofi-Aventis, United BioSource Corporation, medac, Biovitrium, Novartis and Active Biotec, 5, Actelion, Pfizer and Ergonex, 8; G. A. Schett, None; J. H. Distler, None.

2518

The Sphingosine-1-Phosphate Pathway Is a Key Regulator of Bone Substrate-Mediated Osteoclast Differentiation in Inflammatory Arthritis. P. Edward Purdue1, Jon Hill2, Steven R. Goldring3, Nikolaus, B. Binder1, Jennifer L. Swantek4, Zhenxin Shen5, Tania N. Crotti5, Gerald H. Nabozny4, J. H. Distler, None.

Background/Purpose: Multiple lines of evidence have established that osteoclasts are required for physiologic bone resorption and pathologic bone loss in inflammatory disorders. Isolation of differentiated osteoclasts from bone is technically challenging, but with the discovery that M-CSF and RANKL are sufficient for osteoclast differentiation came the ability to generate multinucleated osteoclasts from myeloid precursor cells in vitro with high efficiency. In vivo, analysis of osteoclasts at sites of bone resorption reveals that functionally activated osteoclasts are almost exclusively localized to the immediate bone surface, indicating that cell-substrate interactions contribute to terminal osteoclast differentiation. In this study, we have employed a unique in vitro osteoclastogenesis system using authentic bone substrates and expression profiling and pathway analysis to identify critical bone substrate-mediated pathways of osteoclast formation and activation. We have further validated the sphingosine-1-phosphate (SIP) generation, transport and signaling pathway as a key component of the bone-substrate regulated osteoclast differentiation program in vitro and in vivo.

Methods: Murine bone marrow derived macrophages were cultured in the presence or absence of RANKL on plastic, hydroxyapatite, or calvarial bone discs. RNA was isolated at different stages of osteoclast generation and subjected to microarray analysis. Pathway analysis was performed using GSEA and Ingenuity pathway analysis. SphK inhibitors were used to validate involvement of SIP1 signaling in osteoclastogenesis in vitro. Immunohistochemical analysis of the RA bone-pannus interface was used assess activation of this pathway in osteoclasts in vivo.

Results: Microarray analysis revealed unique clusters of RANKL induced and bone substrate-modulated osteoclast genes. Of 1490 genes upregulated by RANKL in differentiated osteoclasts, 5.4% were further upregulated by culture on the bone substrate; an additional 8.5% were downregulated. Pathway analysis identified the SIP pathway as significantly regulated by both RANKL and bone substrate, and that this regulation was dependent upon the presence of integrin beta 3, a key mediatior of osteoclast attachment to bone. SphK inhibitors dose-dependently blocked RANKL-induced human and mouse osteoclastogenesis in vitro. Furthermore, SphK1 was highly induced in osteoclasts at sites of RA bone erosions.

Conclusion: Interaction of osteoclasts with the bone surface regulates multiple critical pathways of osteoclast formation and activation. Pathway analysis and in vitro/in vivo validation identifies the SIP pathway as a critical regulator of RANKL-dependent osteoclastogenesis. This pathway represents a novel therapeutic target for preventing osteoclast-mediated bone destruction in inflammatory bone loss disorders.

Disclosure: P. E. Purdue, Boehringer Ingelheim, 2; J. Hill, Boehringer Ingelheim, 3; S. R. Goldring, Boehringer Ingelheim, 2; N. B. Binder, Boehringer Ingelheim, 2; J. L. Swantek, Boehringer Ingelheim, 3; Z. Shen, Boehringer Ingelheim, 3; T. N. Crotti, Boehringer Ingelheim, 2; G. H. Nabozny, Boehringer Ingelheim, 3; K. P. McGhiugh, Boehringer Ingelheim, 3.

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IL-1β and TNF-α Regulate the Global and Locus-Specific hydroxymethylation of Genomic DNA by Modulating the Expression and Activity of Tet-1 in Human OA Chondrocytes. Abdul Haseeb1 and Tariq M. Haqqi2. 1Case Western Reserve University, Cleveland, OH, 2Casey Medical Center, Cleveland, OH

Background/Purpose: 5-hydroxymethylcytosine (5-hmc), which is formed by the oxidation of 5-methylcytosine (5-mC), is a recently discovered epigenetic mark and is highest in brain and in embryonic stem cells. There have been reports supporting the notion that generation of 5-hmc may be a mechanism of DNA demethylation and thus important in the regulation of gene expression. In the present study we investigated the global and locus-specific 5-hmc content in the promoter region of MMP-3 gene and its expression in human OA chondrocytes. We also investigated the effect of IL-1β and TNF-α on the level of 5-hmc, expression and activity of the enzymes responsible for hydroxylation of 5-mC to generate 5-hmC and 5-hmC in human chondrocytes.

Methods: Primary human chondrocytes were isolated from the deep zone of the cartilage obtained from OA patients who underwent total joint replacement (n=8) and were treated with IL-1β and TNF-α for 48 hr. Global 5-hmc content in genomic DNA was quantified using a 5-hmc-specific ELISA (Epigentek, Farmingdale, NY). Total Tet methylcytosine dioxygenase (Tet) activity was determined by an ELISA based activity assay kit (Epigentek). Tet-1, Tet-2 and Tet-3 and MMP-3 5-mRNA levels were quantitated by using the TaqMan assays (Applied Biosystems, Carlsbad, CA). Locus specific 5-mC and 5-hmc content in the MMP-3 promoter was examined by using Epimark 5-mC and 5-hmc analysis kit (NEB, Ipswich, MA), which uses methylation sensitive HpaII and BglII restriction enzymes followed by the treatment of genomic DNA with Tet-1/BglII glucosyltransferase, and PCR using specific primers. Data were derived using Origin 6.1 software and P<0.05 was considered significant.

Results: The global content of 5-hmc in human chondrocytes was found to be 0.1–0.2% of the total genome. There was approximately 70% decrease (P<0.05) in the 5-hmc content upon treatment with IL-1β in combination with TNF-α for 48 hrs. This correlated with the reduction of Tet enzyme activity in chondrocytes after treatment with IL-1β and IL-1β + TNF-α. There was a significant (upto 20 fold) reduction in the level of Tet-1 mRNA expression while expression of Tet-3 mRNA was increased slightly (2–3 fold). The level of Tet-2 mRNA expression did not change upon treatment with the cytokines. MMP-3 promoter contained a high percentage (70%) of 5-hmc at HpaII locus in deep zone chondrocytes and these chondrocytes showed a dramatic (40 fold) increase in the expression level of MMP-3 upon treatment with IL-1β and TNF-α.

Conclusion: Our results demonstrate for the first time the presence of a significant amount of 5-hmc in human chondrocyte DNA. We also for the first time show that the 5-hmc content of the genomic DNA can be modulated by treatment with proinflammatory cytokines IL-1β and TNF-α in a short span of 48 hrs. The changes in 5-hmc levels correlated with the Tet-1 gene expression level and Tet enzyme activity in chondrocytes stimulated with IL-1β + TNF-α. Our data also demonstrate that the expression of MMP-3 was significantly (P<0.005) increased in chondrocytes with high content of 5-hmc in its promoter region. Taken together our novel data identify an important role for DNA hydroxymethylation in cartilage and may be important in understanding the mechanism and pathogenesis of OA.

Disclosure: A. Haseeb, None; T. M. Haqqi, None.
Suppressor of Cytokine Signaling 3 Is Reduced in Obese Patients with Osteoarthritis and Regulates Leptin Responses in Chondrocytes. Anna Koskinen, Katrinia Vuolteenaho, Riku Korhonen, Teemu Mollanen, and Eeva Mollanen. The Immunopharmacology Research Group, University of Tampere School of Medicine and Tampere University Hospital, Tampere, Finland, Coxa Hospital for Joint Replacement, Tampere, Finland.

**Background/Purpose:** Leptin is an adipokine whose concentrations in circulation are proportional to body fat stores and body mass index (BMI). Initially leptin was discovered to regulate energy metabolism and body weight. More recently it has been recognized as effector and regulator in inflammation and arthritis. Leptin has been shown to have detrimental effects on cartilage metabolism including upregulation of proinflammatory and catabolic factors.

Suppressor of cytokine signaling 3 (SOCS-3) is an intracellular regulator of inflammatory response and a negative regulator of leptin’s effects in hypothalamus. It has also been shown to be expressed in chondrocytes and overexpression of SOCS-3 has been reported to reduce severity of arthritis in mice models.

The aim of the present study was to explore how SOCS-3 expression in osteoarthritic (OA) cartilage is related to obesity and synovial fluid levels of matrix metalloproteinases (MMPs) 1 and 3 and leptin in OA patients. We also studied the role of SOCS-3 in regulating leptin-induced inflammatory responses in chondrocyte cultures.

**Methods:** We collected synovial fluid and cartilage samples from 91 OA patients (age 70.2 (9.6) years, BMI 30.8 (5.8) kg/m²; mean (sd); females 66%) undergoing knee replacement surgery. Leptin, MMP-1 and MMP-3 in synovial fluid were measured by immunoassay. SOCS-3 expression in cartilage (from a subgroup of the patients, n = 28) was determined by Western blotting. The results were analyzed in the whole group and in two subgroups divided by BMI (non-obese, BMI < 30 kg/m²; obese, BMI > 30 kg/m²; n = 46). In addition, H4 chondrocytes and OA cartilage were used in the cell culture experiments. Interleukin-6 (IL-6), MMP-1 and MMP-3 were measured in the culture media by ELISA, and inducible nitric oxide synthase (iNOS) expression was determined by RT-PCR and Western blotting.

**Results:** Leptin concentrations in synovial fluid were higher (p = 0.0013) and SOCS-3 expression in cartilage samples was lower (p = 0.032) in obese than in non-obese patients. Leptin correlated positively with MMP-1 and MMP-3 levels in synovial fluid from obese (r = 0.49, p = 0.001; r = 0.48, p = 0.001, respectively) but not from non-obese patients. SOCS-3 levels in the cartilage correlated negatively with synovial fluid MMP-1 and MMP-3 (r = -0.49, p = 0.013; r = -0.44, p = 0.024, respectively). Leptin enhanced MMP-1, MMP-3, IL-6 and iNOS expression in chondrocyte cultures. Interestingly, when SOCS-3 was down-regulated by small interfering RNA, chondrocytes’ response to leptin was enhanced.

**Conclusions:** The results show, for the first time, that SOCS-3 is associated with and regulates leptin-induced responses in cartilage; When SOCS-3 expression was down-regulated, leptin-induced effects were enhanced. In OA patients high leptin levels and low SOCS-3 levels were associated with cartilage degradation (high MMP levels) and obesity. Assuming that SOCS-3 is a factor that inhibits the effects of leptin in cartilage, obese patients are possibly more susceptible to detrimental effects of leptin not only because of its elevated levels in joint, but also because of the disturbed regulation mechanism.

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**ACR Concurrent Abstract Session**
**Innate Immunity and Rheumatic Disease**
**Tuesday, November 13, 2012, 4:30 PM–6:00 PM**

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**2521**

**Immunoglobulin G Fc Receptor Activity in Vivo Is Under Complement Control.** Evelyne Y. Wu, Haixiang Jiang, C. Garren Hester and Michael M. Frank. Duke Univ Med Ctr, Durham, NC.

**Background/Purpose:** Immunoglobulin G receptors (FcyR) are critical in the development of autoimmune and pathogenesis of immune complex (IC) diseases. Although ICs activate complement, contributing to tissue damage, it is reported complement does not affect IC interaction with FcyR. We have re-explored this issue and find complement has a major impact on IC interaction with FcyR. Specifically, the classical pathway (CP) down-regulates and the alternative pathway (AP) promotes IC binding to FcyR. We performed reverse passive Arthus reactions, a model of IC-mediated cutaneous vasculitis, in normal C57Bl/6 mice and mice genetically deficient in complement proteins C1q, C4 and Factor B. It is also reported that complement does not contribute to Arthus reactions in mice, unlike in other animals. We hypothesized the CP, rather than contributing to vasculitis, down-regulates tissue injury caused by IC interaction with activating FcyR; therefore, its absence (C1q−/− and C4−/−) would enhance cutaneous vasculitis, while absence of the AP (Factor B−/−) would diminish cutaneous vasculitis.

**Methods:** Sedated and shaved mice (normal, C1q−/−, C4−/−, and Factor B−/−) were injected intradermally with 20 μl of PBS alone on one side and affinity purified rabbit anti-bovine serum albumin (BSA) IgG 5 μg in PBS on the opposite side. Immediately following, BSA 100 μg and 125 0.25 μg in PBS containing 1% Evans blue was injected intravenously. After 4 hours, mice were sacrificed and the extravasated blue spot and control injection spot were dissected and weighed. Radioactivity per specimen weight (cpm/gm) of treated skin was divided by that of control skin to determine an Arthus index (AI) for each mouse. Arthus indices were first analyzed by Kruskal-Wallis ranked test, followed by Mann-Whitney U test to evaluate for significant differences in median AI. P values less than 0.05 were considered significant.

**Results:** Complement activation strongly influenced the degree of cutaneous vasculitis in mice (Fig. 1, p = 0.0013). C1q−/− (mean AI 3.8 ± 0.7, p = 0.0125) and C4−/− (mean AI 4.7 ± 2.3, p = 0.004) mices exhibited more extensive vasculitis than normal animals (mean AI 2.6 ± 1.2). Conversely, Factor B deficient (mean AI 1.4 ± 0.5, p = 0.053) mice trended towards significantly reduced vasculitis compared to normal animals.

**Conclusions:** Cutaneous vasculitis is significantly greater in mice deficient in CP complement proteins and appeared reduced in mice deficient in AP complement proteins. Our results are the first to provide physiologic evidence in vivo that complement critically influences IC and FcyR mediated inflammation. They also refute previous data suggesting complement possesses no role in Arthus-induced vasculitis in mice. They may further our understanding of why individuals with CP defects are noted to have frequent signs of autoimmune pathology.

**Disclosure:** E. Y. Wu, None; H. Jiang, None; C. G. Hester, None; M. M. Frank, None.

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Fig 1. Reverse Passive Arthus Reactions
M-Ficolin, an Activator of the Complement System, Is the Strongest Predictor of Both DAS28 Remission and Low Disease Activity in a Cohort of 180 Early DMARD Naive Rheumatoid Arthritis Patients Followed in the Opera-Study. Christian G. Ammitzbøll1, Jens Christian Jensenius2, Torkell Ellingsen3, Steffen Thiel4, Kim Horslev-Petersen5, Merete L. Hetland6, Peter Junker7, Julia Johansen8, Mikkel Østergaard9, Jan Podenphant10 and Kristian Stengaard-Pedersen11. 1Arhus University Hospital, Aarhus, Denmark, 2Aarhus University, Aarhus, Denmark, 3Silkeborg Regional Hospital, Silkeborg, Denmark, 4University of Southern Denmark, Graasten, Denmark, 5Copenhagen University and Glostrup Hospital, Copenhagen, Denmark, 6Odense University Hospital, Odense, Denmark, 7Glostrup Hospital, Glostrup, Denmark, 8Copenhagen University Hospital Glostrup, Glostrup, Denmark, 9Gentofte Hospital

Background/Purpose: M-ficolin is a soluble pattern recognition molecule that activates the complement system. We recently reported a finding that 300 difference in the synovial fluid M-ficolin concentration between rheumatoid arthritis (RA) and osteoarthritis, suggesting a pathogenic role of M-ficolin (1). We assessed M-ficolin in DMARD naïve early RA patients, investigated correlations between M-ficolin and disease activity markers, and analyzed the predictive value of M-ficolin.

Methods: 180 DMARD naïve RA patients with disease duration <6 months were included in a randomized double blind placebo-controlled trial (OPERA) of methotrexate, intraarticular glucocorticoids + either adalimumab (ADA)/placebo (PLA). As with type-1-resolved immunofluorometric test using monoclonal antibodies was used for quantification of M-ficolin in the OPERA cohort, 101 healthy adults and 51 chronic RA patients in remission. Concentrations are reported as medians. Spearman test. Students T-test and one-way analysis of variance were used. Logistic regression analyses were performed and adjusted for CRP, treatment group (ADA/PLA), x-ray erosions, anti-CCP, IgM,RF, neutrophils and monocytes.

Results: The highest M-ficolin levels were measured in the OPERA cohort at baseline (2.84µg/mL, CI 2.63–3.09), and during treatment the level decreased 24% (CI 18–31%, p=0.001) at year one (2.31µg/mL, 2.14–2.50). The healthy adults had significantly lower concentrations (1.88µg/mL, CI 1.72–2.06) than the OPERA cohort at baseline (p=0.001) and year one (p<0.001), and the chronic RA patients (2.17µg/mL, CI 1.94–2.42) (p=0.03). At baseline M-ficolin correlated to DAS28 (r=0.29, p<0.001) and the four variables constituting DAS28 (0.001 < p < 0.05). At year one M-ficolin correlated to DAS28 (r=0.36, p=0.001) and 3 of the 4 variables constituting DAS28 (0.001 < p < 0.05), except tender joint count 28 (p=0.23). Furthermore M-ficolin correlated to HAQ at debut (r=0.25, p=0.003) and year one (r=0.23, p<0.001).

Logistic regression analysis determined M-ficolin as the strongest predictor of DAS28<2.6 at year one (coefficient=1.42, p=0.001) followed by treatment group (PLA/ADA) (coefficient=1.23, p=0.001) and erosions on baseline x-ray (coefficient=1.19, p=0.02), but M-ficolin was the only variable able to predict DAS28<3.2 at year one (coefficient=0.89, p=0.02). Low baseline M-ficolin level was the only variable associated with low disease activity at year one, and this was further analyzed by comparing the group with the 25% lowest baseline M-ficolin levels with the remaining 75% of patients (cut-off 2.00 µg/mL). This resulted in a sensitivity of 29%, a specificity of 96%, and a positive predictive value of 98% in determining a DAS28 score <3.2 at year one.

Conclusion: The elevated baseline M-ficolin levels in early RA correlated consistently to disease activity markers, most notably DAS28 and HAQ, thus reflecting essential parts of the disease activity. Low M-ficolin level at baseline was the strongest predictor of a favorable DAS28 level after one year, and has a positive predictive value of 98% of a DAS28<3.2 after one year irrespective of treatment and well-known prognostic factors.

Reference
1) Ammitzbøll CG, et al. Rheumatol Int 2011

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Periodontal Pathogens Directly Promote Autoimmune Experimental Arthritis by Inducing a Toll-Like Receptor 2 and Interleukin-1 Driven Th17 Response. Shahla Abdollahi-Roodsaz, Sabrina Garcia de Aquino, Mojdeh Leide,TOOLS Fons A. van de Loo1, Ger J. Prujin2, Mario J. Avila Campos3, Fernando Q. Cunha4, Joni A. Cirelli5 and Winn B. van den Berg1.

1Rheumatology Research and Advanced Therapeutics, Department of Rheumatology, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 2Department of Diagnosis and Oral Surgery, Periodontic Division, Araraquara Dental School, Sao Paolo, Brazil, 3Radboud University Nijmegen, Nijmegen, Netherlands, 4Department of Microbiology, Institute of Biomedical Sciences—ICB/USP, Sao Paulo, Brazil, 5Department of Pharmacology, School of Medicine of Ribeirao Preto, Sao Paolo, Brazil

Background/Purpose: The periodontal pathogen Porphyromonas gingivalis has been associated with the pathogenesis of rheumatoid arthritis (RA) because of its ability to citrullinate mammalian proteins and to induce disease-specific anti-citrullinated peptide antibodies (ACPA). The aim of this study was to investigate the influence of periodontal pathogens on the development of experimental arthritis and the T helper cell balance as a possible underlying mechanism for disease modulation.

Methods: The effect of P. gingivalis and Prevotella nigrescens, the latter lacking citrullinating enzymes, on T cell differentiation and the involvement of Toll-like receptors (TLRs) was studied in vitro using either wild-type or TLR deficient antigen-presenting cells (APCs) and CD4+ T cells in co-culture. In vivo, mice with collagen-induced arthritis received five oral inoculations of either P. gingivalis or P. nigrescens every other day starting from day 14 after immunization. Joint histopathology, synovial gene expression, collagen-specific T cell phenotype and presence of ACPA were analyzed on day 30.

Results: P. gingivalis strongly induced an interleukin-1 driven Th17 differentiation in the co-culture of APCs with CD4+ T cells, as measured by FACS and IL-17 production. This Th17 induction strongly depended on TLR2 expression on APCs and was substantially increased in the absence of IL-1 receptor antagonist. Remarkably, the Th17 inducing capacity was shared by another major periodontal pathogen, Prevotella nigrescens, lacking citrullination capability. In addition, both bacteria were weak inducers of Th1 and interferon γ production, which was dependent on TLR2 expression directly on T cells.

When applied in collagen-induced arthritis model through repeated oral inoculations, both P. gingivalis and P. nigrescens promoted antigen-specific Th17 response in vivo and aggravated the severity of arthritis. This occurred under conditions where ACPA against major citrullinated peptide candidates such as α-enolase and vimentin were undetectable. Instead, the levels of IL-17 induced by periodontal pathogens directly correlated with the intensity of artritic bone erosions. In addition, while P. gingivalis induced local joint-destructive factors such as cathepsin K and matrix metalloproteinase 9 in synovial tissue, P. nigrescens suppressed the anti-inflammatory IL-4 production by T cells.

Conclusion: Our data reveal a novel mechanism, besides citrullination capability, by which periodontal pathogens influence autoimmune arthritis through direct modulation of the T cell phenotype, with a remarkable impact on bone erosion. This study further supports the relevance of periodontal pathogens in the pathogenesis of RA.

Disclosure: S. Abdollahi-Roodsaz, None; S. Garcia de Aquino, None; M. Leide, None; F. A. van de Loo, None; G. J. Prujin, None; M. J. Avila Campos, None; F. Q. Cunha, None; J. A. Cirelli, None; W. B. van den Berg, None.

Snapin Is Critical for the Maturation of Autophagosome and Phagosome in Macrophages. Bo Shi, Ququan Huang, Robert Birkett, Renee E. Koessler, Andrea Dorfleuter, Christian Stellik and Richard M. Pope, Northwestern University Feinberg School of Medicine, Chicago, IL

Background/Purpose: We found that Snapin, a SNARE complex protein required for synaptic vesicle docking and fusion, was significantly increased in rheumatoid arthritis (RA) synovial tissue compared to control synovial tissues. Snapin was highly expressed in CD68 positive macrophages (MΦs) in synovial tissue, which correlated with inflammation. Snapin expression in MΦs co-localized with Rab7, a marker of late endosomes. Therefore, studies were performed to determine the role of Snapin in the formation of autophagosomes and their fusion with lysosomes.
Methods: The forced reduction of Snapin in primary human MØs was performed using siRNA. Snapin, Lamp1, 2 and LC3 protein levels were determined by Western blot analysis. MØ phagocytosis of living bacteria was performed by infection of Staphylococcus aureus and intracellular bacteria number was determined by counting the bacterial colonies on LB-agar plates with MØ lysates. Forced reduction of Snapin in Raw 264.7 macrophage cell line was performed by infection with a lentiviral vector expressing Snapin shRNA, followed by puromycin selection. Phagocytosis of fluorescent pHrodo-labeled dead S. aureus by Raw stable cell lines was performed and the amount of intracellular bacteria was determined either by mean fluorescence with flow cytometry or by cell fluorescence microscopy.

Results: The expression of Snapin progressively increased during human monocyte differentiation. The forced reduction of Snapin in MØs (documented by immunoblot analysis) resulted in elevated levels of LC3-II, a marker for autophagosomes, and Lamp-1, Lamp-2, two lysosomal markers. Snapin siRNA combined with cell starvation by FBS deprivation to promote autophagy, further increased LC3-II. However, the reduction of Snapin in MØs co-treated with chloroquine, an autophagy efflux blocker, did not affect LC3-II levels, suggesting that the reduction of Snapin does not affect autophagy formation but leads to accumulation of autophagosomes by impaired autolysosome formation.

Phagocytosis of pHrodo fluorescent labeled dead S. aureus by Raw 264.7 stably expressing Snapin shRNA demonstrated a 25% increase in mean fluorescence intensity (MFI) by flow cytometry compared to control shRNA infected Raw cells. Following the forced reduction of Snapin in primary human MØs, phagocytosed S. aureus numbers at 1 hour after infection did not show differences, compared to non-targeting siRNA transfected MØs. However, after 5 hours of infection, there were significantly increased numbers of S. aureus remaining intracellularly in Snapin siRNA transfected MØs compared to control siRNA treated MØs (2.6 verses 1.7 colony formation units per cell, p<0.05). These data suggested Snapin is important for phagosomal fusion with lysosomes and the clearance of bacteria in MØs.

Conclusion: Reduction of Snapin in MØs resulted in the blockage of the fusion of autophagosomes and phagosomes with lysosomes. By promoting autophagy, the increased expression of Snapin in the RA joint may contribute to the long term survival of MØs which contribute to the disease pathogenesis and joint destruction.

Disclosure: B. Shi, None; Q. Huang, None; R. Birkett, None; R. E. Koessler, None; A. Dorfleutner, None; C. Stehlik, None; R. M. Pope, None.

2526

Bruton’s Tyrosine Kinase and Calreticulin: A Novel Interaction with Implications for Inflammatory and Autoimmune Disease

Background/Purpose: Bruton’s Tyrosine Kinase (Btk) regulates innate immune responses downstream of multiple Toll-like receptors (TLRs), including TLR7. Given the role of TLR7 in driving type I interferon and inflammatory cytokine production in the autoimmune condition systemic lupus erythematosus (SLE), pharmacological inhibition of the tyrosine kinase Btk has been proposed as a potential therapeutic. Given this interest it is essential that the role of Btk downstream of TLR7 activation be thoroughly explored.

Methods: Primary WT and Btk deficient murine macrophage were used to carry out a 2D protoeic study to identify differences downstream of TLR7 stimulation. Immunoprecipitation studies were carried out in macrophages and the human monocytic cell line THP-1. Confocal analysis was used to investigate localisation of proteins as well as uptake of apoptotic cells by primary macrophages.

Results: Btk was expressed at equivalent levels in patients with RA and PsA, and no relationship was observed between expression levels and patient clinical characteristics (CRP, ESR, DAS28, RF-positivity). In RA, but not PsA, there was a significant relationship between Btk expression and numbers of synovial macrophages (R = 0.57, p< 0.01), T cells (R = 0.64, p< 0.005) and fibroblast-like synovocytes (FLS) (R = 0.56, p< 0.05) but not B cells, plasma cells, or endothelial cells. qPCR and immunoblotting experiments confirmed that Btk was expressed in B cells, monocytes, and macrophages, but not T cells or RA FLS. RN486 (1µM) inhibited macrophage IL-6 production in response to Fe receptor stimulation (40% inhibition, p< 0.01) and anti-CD40 antibodies (50%, p< 0.05), but not TNFα or LPS stimulation. qPCR analysis of human macrophages demonstrated that RN486 inhibited by more than 2-fold 12 of 21 genes induced by IgG, 11 of 52 genes induced by CD40 stimulation, and 6 of 25 genes induced by RA SF in 3 independent experiments. RN486 also inhibited spontaneous IL-6 production by cultured RA synovial explants (65%, p< 0.01).

Conclusion: Our data demonstrate that Btk is expressed in RA synovial tissue and suggest that macrophages would be the prominent synovial targets of strategies aimed at inhibiting Btk in RA. As Btk activity is needed to drive macrophage activation in response to multiple stimuli relevant to RA, and drives IL-6 production in RA synovial tissue, pharmacological targeting of Btk may be of therapeutic benefit in the treatment of RA.

Disclosure: L. M. Hartkamp, None; I. E. van Es, None; J. S. Fine, Hoffmann-La Roche, Inc., 3; Hoffmann-La Roche, Inc., 1; M. Smith, Hoffmann-La Roche, Inc., 3; Hoffmann-La Roche, Inc., 1; J. Woods, Hoffmann-La Roche, Inc., 3; Hoffmann-La Roche, Inc., 1; S. Narula, Hoffmann-La Roche, Inc., 3; Hoffmann-La Roche, Inc., 1; J. DeMartino, Hoffmann-La Roche, Inc., 3; Hoffmann-La Roche, Inc., 1; P. P. Tak, GlaxoSmithKline, 3; K. A. Reccoquist, Hoffmann-La Roche, Inc., 2.
SLE, our data indicates that further investigation into the effect of Btk inhibition with regard to myeloid cell function is warranted.

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Disclosure: J. C. Byrne, None; J. N. Gabhann, None; K. Stacey, None; B. M. Coffey, None; E. M. McCarthy, None; W. Thomas, None; E. S. Molloy, None; G. M. Kearns, None; C. Jeffries, None.

**ACR Concurrent Abstract Session**

Miscellaneous Rheumatic and Inflammatory I

Tuesday, November 13, 2012, 4:30 PM–6:00 PM

**2527**

Prozone Phenomenon Leads to Low IgG4 Concentrations in IgG4-Related Disease. Arezou Khosroshahi, Lynn A. Cheryk, Mollie Carruthers, Judith A. Edwards, Donald B. Bloch and John H. Stone. Massachusetts General Hospital, Boston, MA; 3Mayo Medical Laboratories, Andover

**Background/Purpose:** IgG4-related disease (IgG4-RD) is frequently associated with elevations in serum IgG4 concentration. However, the frequency of serum IgG4 elevation varies in published series from 44%–100%. The prozone effect, also known as the “hook” effect, occurs when antigen excess interferes with antibody-based assay methods that require immune complex formation for detection, and can lead to spuriously low results. Additional sample dilutions are the solution to the prozone effect. After identifying the prozone effect in one patient with IgG4-RD whose serum IgG4 correlated following appropriate dilutions from 17 to 1850 mg/dL (nl: 2.4–121 mg/dL), we examined additional samples to determine the frequency of this problem.

**Methods:** We re-tested 38 serum samples from patients with the diagnosis of IgG4-RD whose original serum IgG4 results had been reported earlier. The IgG subclasses were measured by nephelometry in dilutions up to 1:160,000, using two different commercially-available reagents (Siemens; The Binding Site). The testing laboratory was blinded to the patients’ clinical history and previous values. The serum IgG4 concentrations from these assays were compared to the original results.

**Results:** Falsely low IgG4 values were reported in 10/38 patients (26%) using The Binding Site assay (Table). The prozone effect was identified as the cause of 8 incorrect values (21% of all samples tested). Correction of the prozone effect by sample dilution until the concentration reported was stable, led to a revision of the mean IgG4 result from 21.6 to 2440. In contrast, samples measured by the Siemens reagent were checked automatically for antigen excess as part of the testing method; the appropriate numbers of dilutions were performed either automatically by the instrument or manually as the result of a flag associated with the value, thereby avoiding the prozone effect. The Binding Site assay gave no indication that antigen excess might be present.

**Table.** Characteristics of patients with IgG4-RD with significant differences in their retested IgG4 results

<table>
<thead>
<tr>
<th>Case #</th>
<th>Original reported IgG4 values (mg/dL)</th>
<th><strong>Retested IgG4 values (mg/dL)</strong></th>
<th>X-fold increase after increase in dilution</th>
<th>Number of affected organs</th>
<th>Active disease</th>
<th>Presence of prozone effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.3</td>
<td>2470</td>
<td>247</td>
<td>1</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>2</td>
<td>28.4</td>
<td>941</td>
<td>33</td>
<td>3</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>3</td>
<td>29.3</td>
<td>219</td>
<td>7.5</td>
<td>1</td>
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<td>No</td>
</tr>
<tr>
<td>4</td>
<td>59.8</td>
<td>337</td>
<td>5.6</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>12.7</td>
<td>5340</td>
<td>420</td>
<td>3</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>6</td>
<td>17.6</td>
<td>1850</td>
<td>105</td>
<td>4</td>
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<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>8.0</td>
<td>5160</td>
<td>645</td>
<td>7</td>
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<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>43.9</td>
<td>1030</td>
<td>23</td>
<td>4</td>
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<tr>
<td>9</td>
<td>14.4</td>
<td>1910</td>
<td>132</td>
<td>7</td>
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<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>37.5</td>
<td>819</td>
<td>22</td>
<td>1</td>
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<td>Yes</td>
</tr>
</tbody>
</table>

* The Binding Site reagent was used for the assay

**Conclusion:** We have identified a major issue in the serological measurement of IgG4 concentrations. The prozone effect which led to substantial underestimations of IgG4 concentrations in 21% of the samples, offers potential explanations for the poor correlation observed between disease activity and serum IgG4 level in some patients. This phenomenon should be considered when the serum IgG4 measurement appears discordant with the clinician’s assessment of disease activity.

Disclosure: A. Khosroshahi, None; L. A. Cheryk, None; M. Carruthers, None; J. A. Edwards, None; D. B. Bloch, None; J. H. Stone, None.

**2528**


**Background/Purpose:** Hypertrophic pachymeningitis (HP) is an inflammatory condition in which the dura mater of the cranium or spine becomes thickened, leading to symptoms that result from mass effect, nerve compression, or vascular compromise. The differential diagnosis of HP includes immune-mediated conditions such as rheumatoid arthritis and vasculitides, malignancies, and infections. Many times, no diagnosis is reached; in such cases, the disease has been described as idiopathic HP. IgG4-related disease (IgG4-RD) is a recently described inflammatory condition known to cause tumefactive lesions at myriad anatomical locations. Both IgG4-RD and idiopathic HP share similar demographics, histopathology, and natural history. We hypothesized that IgG4-RD is a common cause of idiopathic HP.

**Methods:** To investigate this hypothesis, we identified all pathology specimens diagnosed as HP in a 25-year time span at our institution. Fourteen cases had extant stained slides and cell blocks to permit review of the original hematoxylin and eosin (H&E) stained slides as well as immunostaining of cell blocks. Recently published consensus guidelines describing characteristic histopathology and the necessary quantity of IgG4+ plasma cell infiltrate were used to diagnose IgG4-RD.

**Results:** Four cases (29%) that had been regarded previously as representing idiopathic HP were diagnosed as IgG4-RD (Table 1). Of the remaining cases, there were three cases associated with granulomatosis with polyangiitis (GPA), two with lymphoma, and one each with rheumatoid arthritis, giant cell arteritis, and sarcoidosis. Two of the cases could not be diagnosed more precisely and were classified as undifferentiated HP.

**Table 1.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Diagnosis</th>
<th>Site</th>
<th>Age</th>
<th>Gender</th>
<th>Symptoms</th>
<th>Lupus anticoagulant</th>
<th>CREST</th>
<th>Sjogren's</th>
<th>SS-A/SS-B</th>
<th>Serum ANA</th>
<th>Anti-Ro/SS-A</th>
<th>Anti-La/SS-B</th>
<th>Anti-ENA</th>
<th>Anti-dsDNA</th>
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<tbody>
<tr>
<td>1</td>
<td>IgG4-related Disease</td>
<td>Intracranial</td>
<td>50</td>
<td>Female</td>
<td>Seizures</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>2</td>
<td>IgG4-related Disease</td>
<td>Intracranial</td>
<td>52</td>
<td>Female</td>
<td>Headache</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>3</td>
<td>IgG4-related Disease</td>
<td>Intracranial</td>
<td>30</td>
<td>Male</td>
<td>Headache &amp; paresthesias</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>IgG4-related Disease</td>
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<td>32</td>
<td>Male</td>
<td>Weakness</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>No</td>
<td>No</td>
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<tr>
<td>5</td>
<td>Granulomatosis with Polyangiitis</td>
<td>T2/T9 disks</td>
<td>50</td>
<td>Female</td>
<td>Sensor paresthesias &amp; sensory indications</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
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</tr>
<tr>
<td>6</td>
<td>Granulomatosis with Polyangiitis</td>
<td>Intracranial</td>
<td>75</td>
<td>Female</td>
<td>GI instability</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>No</td>
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<tr>
<td>7</td>
<td>Granulomatosis with Polyangiitis</td>
<td>Intracranial</td>
<td>55</td>
<td>Male</td>
<td>Pseudocyst</td>
<td>Y</td>
<td>Y</td>
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<td>N</td>
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<td>N</td>
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<tr>
<td>8</td>
<td>Rheumatoid Arthritis</td>
<td>Intracranial</td>
<td>58</td>
<td>Female</td>
<td>Arthritis, myalgias &amp; Visual loss</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>9</td>
<td>Giant Cell Arteritis</td>
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<td>Male</td>
<td>Arteritis</td>
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<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>11</td>
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<td>Male</td>
<td>Headache &amp; dizziness</td>
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<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>14</td>
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<td>75</td>
<td>Male</td>
<td>PULS, gastroparesis &amp; eye pain</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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</tr>
</tbody>
</table>
Conclusion: This case series demonstrates that IgG4-RD may be the most common etiology of non-infectious HP and highlights the necessity of biopsy for accurate diagnosis. Clinical history, serologic tests, cerebrospinal fluid studies, and radiology alone could not identify the cause of HP. Rather, biopsy with histopathology and immunostaining was necessary to reach an accurate diagnosis. Significant IgG4+ plasma cell infiltrates were observed in rheumatoid arthritis, granulomatosis with polyangiitis, and lymphoma, underscoring the importance of histopathology in making the diagnosis of IgG4-RD.

Disclosure: Z. S. Wallace, None; M. Carruthers, None; A. Khodoroshi, None; R. Carruthers, None; S. Shinagare, None; A. Stemmer-Rachaminov, None; V. Deshpande, None; J. H. Stone, Genentech, 5.

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Molecular Mechanism of IgG4 Class Switch Recombination in IgG4-Related Disease. Hiroto Tsuibo1, Mana Iizuka1, Hiromitsu Asashima1, Sayaka Tsuzuki1, Yuya Kondo1, Akiko Tanaka2, Masafumi Moriyama2, Hiroto Tsuboi1, Mana Iizuka1, Hiromitsu Asashima1, Sayaka Tsuzuki1, Yuya Kondo1, Akiko Tanaka2, Masafumi Moriyama2, Isao Matsumoto1, Seiji Nakamura2 and Takayuki Sumida1. 1University of Tsukuba, Tsukuba, Japan, 2Kyushu University, Fukuoka, Japan

Background/Purpose: IgG4-related disease (IgG4-RD) is a new disease entity characterized by high serum IgG levels, IgG4-positive plasmacytic infiltration and fibrosis in various organs. Although the clinical features including serum abnormalities, organ involvement, diagnosis, and the therapeutic approach have been reported recently, the molecular mechanism of this disease remains unclear. The purpose of this study was to determine the mechanism of up-regulation of IgG4 class switch recombination in IgG4-RD.

Methods: 1) We extracted RNA from PBMC of patients with IgG4-RD (n=6), Sjögren’s syndrome (SS) (n=6), and healthy control (HC) (n=8), from CD3 positive T cells and CD20 positive B cell sorted from PBMC of patients with IgG4-RD (n=3), SS (n=4), and HC (n=4). The RNAs were also prepared from labial salivary glands (LSG) of patients with IgG4-RD (n=11), SS (n=13), and HC (n=3).
2) The mRNA expression levels of IgG4-specific class switch-related molecules such as Th2 cytokines (IL-4 and IL-13), Treg cytokines (IL-10 and TGFβ), transcriptional factors (GATA3 and Foxp3) were examined by quantitative PCR assay.
3) IgG4-non-specific class switch related molecules such as CD40, CD154, BAFF, APRIL, IRF4, and AID were also examined by quantitative PCR assay.

Results: 1) IgG4-specific class switch-related molecules. The mRNA expression level of IL-4 was significantly higher in LSG of IgG4-RD than HC (P<0.05). Treg cytokines (IL-10 and TGFβ) were significantly higher in LSG of IgG4-RD than SS and HC (P<0.05, each). There were no significant differences in the expression levels of various cytokines among the three groups. In LSG, the expression of GATA3 was significantly lower in IgG4-RD than in SS, Foxp3 was significantly higher in IgG4-RD and SS than in HC (P<0.05, each).
2) IgG4-non-specific class switch-related molecules. The mRNA expression levels of CD40 and CD154 were significantly lower in PBMC of patients with IgG4-RD than CD20 positive B cells and that of CD154 in CD3 positive T cells were comparable in the three groups. The expression of BAFF was significantly higher in LSG of IgG4-RD than HC (P<0.05). The expression of APRIL was significantly lower in PBMC of IgG4-RD than HC (P<0.05). The expression of AID was significantly higher in LSG of IgG4-RD than SS and HC (P<0.05, each).

Conclusion: In LSG of IgG4-RD, increased Treg cytokines (IL-10 and TGFβ) might play important roles in IgG4-specific class switch recombination and fibrosis, which are characteristic features of IgG4-RD. High expression of AID could also contribute to up-regulation of IgG4-specific class switch recombination along with IL-10 in LSG of IgG4-RD. Thus overexpression of IL-10, TGFβ, and AID in LSG might play important pathogenic roles in IgG4-RD. This study showed different expression levels of IgG4 class switch-related molecules in LSG than in PBMC of IgG4-RD, which suggested that IgG4 class switch recombination seem be mainly up-regulated in affected organs.

Disclosure: H. Tsuibo, None; M. Iizuka, None; H. Asashima, None; S. Tsuzuki, None; Y. Kondo, None; A. Tanaka, None; M. Moriyama, None; I. Matsumoto, None; S. Nakamura, None; T. Sumida, None.

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Anti-Ribosomal P Antibodies in a Large Cohort of Autoimmune Hepatitis with No Evidence of Lupus: A Common Underlying Mechanism Targeting Liver? Ana Luisa Calich1, Vilma S. T. Viana1, Eduardo L. Cançado1, Débora R. Terrabuio1, Francisco Tustumi1, Elaine P. Leon1, Clovis Artur Silveira2, Eduardo F. Borba Neto3 and Eloisa Bonfa3. 1Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil, 2Pediatric Rheumatology International Trials Organization (PRINTO), Istituto Giannina Gaslini, Genova, Italy

Background/Purpose: Anti-ribosomal P proteins antibodies (anti-rP) is a highly specific marker for systemic lupus erythematosus (SLE) and it is associated with liver involvement in this disease. Similarities between autoimmune hepatitis (AIH) and SLE-associated hepatitis raised the possibility that anti-rP antibodies may also have relevance in AIH. This study was therefore undertaken to evaluate the frequency and clinical significance of anti-rP antibodies in a large AIH cohort before treatment.

Methods: Ninety-six patients with AIH diagnosed according to the Revised Original Pretreatment Scoring System of the International Autoimmune Hepatitis Group were studied. Charts were reviewed for demographic, clinical, treatment and laboratory parameters. 82 healthy individuals were included as control. Available frozen sera samples from AIH patients obtained at diagnosis were tested for IgG anti-rP by ELISA using a commercial kit employing synthetic 22 amino acid C-terminal peptide as antigen and reactivity was confirmed by immunoblotting using rat liver ribosomal fraction. All sera were screened for other lupus specific autoantibodies, anti-dsDNA and anti-Sm. Three patients positive for anti-dsDNA (n=1) and anti-Sm (n=2) were excluded.

Results: Moderate to high titers (>40U) of anti-rP antibody were found in 9.7% (9/93) AIH patients and in none of the controls (p=0.003). Mean antibody titer was 93.6 ± 33.1 units. Positive results by ELISA were confirmed by immunoblotting. Patients with positive results for anti-rP were referred to the Rheumatology Outpatient Clinic for a more detailed clinical evaluation. No sign of lupus was found in all of them. At presentation, AIH patients with and without anti-rP antibodies had similar demographic/clinical features, including the frequency of cirrhosis (44% vs 28%, p=0.44), hepatic laboratory findings (p=0.05), corticosteroid and azathioprine therapy frequencies (100% vs. 99%, p=0.17 and 78% vs 92%, p=0.17, respectively). The long follow up period was also comparable in those with and without anti-rP antibodies (10.7±5.1 vs. 10.3±5.2 years, p=0.68). Importantly, at the final observation AIH patients with anti-rP had a significantly higher frequency of cirrhosis compared to negative group (100% vs. 60%, p=0.04) despite no difference in the frequency of drugs at the last visit (p>0.05).

Conclusion: The novel demonstration of anti-rP in AIH patients without clinical and laboratorial evidence of SLE suggests a common underlying mechanism targeting liver in these two diseases. In addition, this antibody seems to predict a group of patients with worse AIH prognosis.

Disclosure: A. L. Calich, None; V. S. T. Viana, None; E. L. Cançado, None; D. R. Terrabuio, None; F. Tustumi, None; E. P. Leon, None; C. A. Silva, Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ), 2, Fedeco Foundation Grants, 2; E. F. Borba Neto, None; E. Bonfa, Grants, 2.
ease. Here, we describe the development of a score for assessing disease activity in RP, the Relapsing Polychondritis Disease Activity Index (RPDAI).

Methods: This study reflects a multi-center, international and inter-disciplinary collaboration of experts involved in the management of RP. Selection and definition of items for disease activity were established by consensus between 27 experts during a 4-round internet-based Delphi survey. Then, twenty-six experts assessed the Physician’s Global Assessment (PGA) of disease activity of 43 test cases on a 0–100 scale. The weight of each item was estimated by multivariate regression models with generalized estimating equation, using PGA as the dependent variable.

Results: Experts decided in consensus that the RPDAI should consider the 28-day period before each scoring. Twenty-seven items were selected using the Delphi survey and a glossary defining each item was derived by consensus. Then, item weighting was performed by 26 experts, who assessed the Physician’s Global Assessment (PGA) of disease activity of 43 test cases on a 0–100 scale. Inter-rater reliability assessed by the intra-class correlation coefficient for these PGA ratings was 0.51 (CI95%; 0.41–0.64). Multivariate analysis revealed that the individual weight of items ranged from 1 to 24. The final RPDAI score therefore comprised 27 items with a maximum theoretical score of 265. Correlation between the RPDAI scores calculated for all test cases based on the weights derived from the final consensus model, and the PGA of these cases was good (r = 0.56, p < 0.0001).

Conclusion: We have developed a consensus scoring system to measure disease activity in relapsing polychondritis (see www.RPDAI.org for online scoring). We believe this tool will be valuable for improving the care of patients with this rare disease.

Disclosure: L. Arnaud, None; H. Devilliers, None; S. L. Peng, None; Z. Amoura, None.

2532 Whole Transcriptome Analysis in Relapsing Polychondritis: A Single-Center Analysis of 35 Patients. Laurent Arnaud1, Alexis Mathian1, Bruno Faivre2, Karim Dorganham2, Julien Haroche3, Nathalie Costedoat-Chalumeau4, Jean-Charles Piette5, Guy Gorochov6 and Zahir Amoura1. 1Hoˆpital Pitie`-s Salpetriere, Paris, France; 2University of Maryland, Baltimore, MD; 3VA Maryland Health Care System, Baltimore, MD; 4VA Maryland Health Care System, Baltimore, MD

Background/Purpose: Relapsing polychondritis (RP) is a severe and episodic inflammatory condition involving cartilaginous structures, predominantly those of the ears, nose, and laryngotraheobronchial tree. Other affected structures may include the eyes, cardiovascular system, peripheral joint, skin, and the middle ear and CNS. To date, gene expression profiling has not been performed in RP. The aim of this study was to analyze the transcriptome of RP compared to healthy individuals, as a manner to identify new pathways involved in the pathogenesis of the disease as well as new therapeutic targets.

Methods: Total RNA was extracted from peripheral blood mononuclear cell (PBMC) obtained in 35 patients with RP (according to Michel criteria) and 36 healthy individuals. Complementary DNA (cDNA) was hybridized in Illumina Human HT-12v4 Expression Bead Chips. Statistical analysis of Microarray (SAM) algorithm with Benjamini and Hochberg multiple testing correction was used to determine the statistical significance of the differences in gene expression while controlling the false-discovery rate. Cluster analysis was also performed with IMP8 software. Differentially expressed genes were analyzed to identify potential functional pathways using Ingenuity® Pathway Analysis (IPA).

Results: Gene expression analysis using SAM showed 165 significantly down- or up-regulated transcripts between RP patients and controls. Cluster analysis of these transcripts by similarity on gene expression patterns identified several clusters containing only RP patients, healthy individuals, or both, underlining the strong heterogeneity of the disease. The set of genes statistically different between RP and healthy individuals was further analyzed with IPA Analysis, which revealed a role for genes related to growth factor and cytokine activities, control of the cell-cycle, and kinase-phosphorylation.

Conclusion: This transcriptome analysis of 35 patients with relapsing polychondritis reveals that complex gene expression patterns are involved in the pathogenesis of the disease. This may be seen as a significant advance in this under researched disease with complex clinical presentation and non-formally codified therapeutic management.

Disclosure: L. Arnaud, None; A. Mathian, None; B. Faivre, None; K. Dorganham, None; J. Haroche, None; N. Costedoat-Chalumeau, None; J. C. Piette, None; G. Gorochov, None; Z. Amoura, None.

ACR Concurrent Abstract Session

Osteoarthritis - Clinical Aspects I: Weight, Activity, and Metabolic Effects on Osteoarthritis

Tuesday, November 13, 2012, 4:30 PM–6:00 PM

2533 Weight Loss Is Associated with Structure Modification in Subjects with Radiographic Osteoarthritis of the Knee: Data From the Osteoarthritis Initiative. Marc C. Hochberg1, Danuta I. Bujak2, Jeffrey W. Duryea3, Knachelle Favor2 and John D. Sorkin3. 1University of Maryland, Baltimore, MD; 2Brigham & Women, Boston, MA; 3VA Maryland Health Care System, Baltimore, MD

Background/Purpose: Obesity is a risk factor for the development and progression of knee osteoarthritis (OA) and weight loss is recommended as part of the management of patients with knee OA. We tested the hypothesis that weight loss is associated with structural progression, as measured by the rate of decline in joint space width (JSW), in subjects with radiographic knee OA.

Methods: Data for this analysis were obtained from the Osteoarthritis Initiative (OAI) public access database (http://www.oai.ucsf.edu). At each visit, subjects completed an extensive battery of questionnaires; weight was measured with a balance beam scale; and fixed flexion, weight-bearing PA radiographs of both knees were obtained using a standard protocol and the Synaflexer platform. We examined data from the baseline, 12-, 24-, 36- and 48-month follow-up visits for subjects with radiographic knee OA. Medial compartment JSW was determined using digitized images and a software tool; all images from a subject were analyzed together blinded to time sequence (see http://oai.epi-ucsf.org/datalicense/SASDocs/kXR_QJSW_Duryea_descrip.pdf for documentation). Mean change in both minimum (mJSW) and JSW.025 were examined using multiple variable random effects (random slope and random intercept) models including weight, age, WOMAC pain score and use of analgesic and/or anti-inflammatory medications at each visit along with sex, race/ethnicity, and study site from baseline.

Results: Data from 2683 subjects with radiographic OA in one or both knees (Kellgren-Lawrence grade > = 2 on baseline radiograph), with measurement of mJSW and JSW.025 at one or more time points (median = 3) were included in the analysis. If both knees were affected by radiographic OA, data for the right knee were arbitrarily used in the analysis. Mean (SD) age was 62.1 (9.1) years, weight was 83.9 (16.0) kg, mJSW was 3.97 (1.46) mm and JSW.025 was 5.36 (1.54) mm at baseline. The mean rate of decline in JSW was more rapid for JSW.025 than mJSW (0.110 [0.0055] mm vs. 0.088 [0.0055] mm; difference = 0.021 mm/year [95% CI 0.006, 0.037], P = 0.006). Heavier weight was significantly associated with narrower joint space at both mJSW and JSW.025 at all visits (P < 0.0001). There was a significant inverse association between change in weight and change in both mJSW and JSW.025 in the multiple variable adjusted models such that subjects with a decline in weight over time had a smaller adjusted rate of decline in both mJSW and JSW.025 that those who had an increase in weight. The rate of decline in JSW per unit change in weight did not differ, however, both mJSW and JSW.025 were significantly associated with narrower joint space at both mJSW and JSW.025 at all visits (P < 0.0001). The hypothesis that weight loss is associated with structural progression, as measured by the rate of decline in joint space width (JSW), in subjects with radiographic knee OA.

Conclusion: Weight loss should be recommended as part of the management of subjects with knee OA. Weight loss was associated with an increased rate of decline in JSW and JSW.025 in those who had a decrease in weight.

Disclosure: L. Arnaud, None; A. Mathian, None; B. Faivre, None; K. Dorganham, None; J. Haroche, None; N. Costedoat-Chalumeau, None; J. C. Piette, None; G. Gorochov, None; Z. Amoura, None.

Disclosure: M. C. Hochberg, Abbott Laboratories, Astra-Zeneca, Bioiberica S.A., Eli Lilly Inc., Genentech/Roche, Merck Inc., Novartis Pharma A.G., Pfizer Inc., Stryker LLC, Xomna, None; D. I. Bujak, None; J. W. Duryea, None; K. Favor, None; J. D. Sorkin, None.

S1069
The Intensive Diet and Exercise for Arthritis Trial (IDEA): 18-Month Radiographic and MRI Outcomes. David J. Hunter1, D. Beavers2, Felix Eckstein2, Ali Guermazi3, Richard F. Loeser4, Barbara J. Nicklas5, Shannon McMillan6, Matthew Boesl7, Mary Lyles3,8, J. D. Williamson9, Stephen P. Messier1, 2University of Sydney, Sydney, Australia, 3Wake Forest University School of Medicine, Winston-Salem, NC, 4Wake Forest University, Winston-Salem, NC, 5Wake Forest University School of Medicine, Winston-Salem, NC, 6Wake Forest University School of Medicine, Winston-Salem, NC, 7University of Massachusetts Amherst, Amherst, MA, 8Wake Forest University School of Medicine, Winston-Salem, NC, 9Wake Forest University School of Medicine, Winston-Salem, NC.

**Background/Purpose:** Dietary induced weight loss is a proven non-pharmacologic option for osteoarthritis. Based upon current literature it is unclear if weight loss modifies structural progression. We report the radiographic and MRI structural outcomes of an 18 month study of intensive weight loss, with or without exercise compared to exercise alone in older, overweight and obese adults with symptomatic knee osteoarthritis.

**Methods:** The Intensive Diet and Exercise for Arthritis trial (IDEA) was a prospective, single-blind, randomized controlled trial that enrolled 454 overweight and obese (BMI = 27–42 kg/m2) older (age ≥ 55 yrs) adults with pain and radiographic evidence of tibiofemoral osteoarthritis (KL = 2–3). Participants were randomized to one of three 18-month interventions: intensive dietary weight loss-only (D); intensive dietary weight loss-plus-exercise (D+E); or exercise-only control (E). X-rays and MRIs were acquired at baseline and 18 months of follow-up. Standardized weight bearing x-rays (N = 325) were acquired and joint space width (JSW) was measured (blinded to time point) using an automated algorithm. MRIJSW and JSW at 4 fixed locations in the tibiofemoral compartment. MRIs were obtained on a subsample of study participants (N = 105) and tibiofemoral cartilage thickness measured and semi-quantitative (SQ) MRI scoring performed using BLOKS. We used an intention to treat analysis to compare change between groups at 18 month follow-up. X-ray and MRI results were analyzed using ANCOVA adjusted for baseline values, BMI, and gender. X-ray was also adjusted for inter-rim distance. Ordinal logistic regression was used for the ordinal SQ analyses, adjusting for baseline values, BMI and gender.

**Results:** Mean baseline descriptive characteristics of the cohort included: age, 65.6 yrs; BMI 33.6 kg/m2; 72% female; 51% white. A total of 399 (88%) participants completed the study and returned for FU/18month testing. Mean weight loss was D, -9.5%; D+E, -11.4%; E, -2.2%. There were no baseline differences between groups in JSW (0.225) 4.5 (1.9)mm or for cartilage thickness of the medial tibia and central femoral femor 2.90 (0.08)mm. All 3 groups demonstrated continued progression of JSW loss with no significant difference between groups D -0.07(0.22)mm, D+E -0.27(0.22)mm and E -0.16(0.24)mm (p=0.79). All 3 groups demonstrated continued progression of MRI cartilage loss with no significant difference between groups D -0.10(0.05)mm, D+E -0.13(0.04)mm and E -0.05(0.04)mm (p=0.42). Maximal bone marrow lesion (BML) size showed a trend to improvement for the D+E OR 0.70 (0.25–1.95) and D OR 0.44 (0.16 – 1.23) groups.

**Conclusion:** Despite the potent effects of weight loss on symptoms, there does not appear to be any amelioration in the rate of structural progression either on x-ray or MRI cartilage measurement. The evidence of a trend towards improvements in BML suggests that this may be one mechanism for the symptom improvements related to weight loss.

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Disclosure: D. J. Hunter, ARC Future Fellowship, 2, Dondoy, 2, NIH, 2, NHMRC, 2, D. Beavers, None; F. Eckstein, Chondrometics, 3; A. Guermazi, BICI, LLC, 4, Astrazeneca, Genzyme, Novartis, and MerckSerono, S; R. F. Loeser, None; B. J. Nicklas, None; S. Milhalo, None; G. D. Miller, None; M. Lyles, None; P. DeVita, None; C. Legault, None; J. J. Carr, None; J. D. Williamson, None; S. P. Messier, None.

**2535**

**Childhood Physical Fitness Predicts Adult Knee Cartilage Volume and Bone Area: A 25-Year Cohort Study.** Benny Samuel Eathakkattu Antony, G. Jones, None; A. Venn, None; L. Blizzard, None; F. Ciucutti, None; L. March, None; T. Dwyer, None; C. Ding, None.

**Background/Purpose:** Previous studies on the effects of weight loss and exercise on bone mass show conflicting results and there are no studies of older adults with knee OA. We examined change in bone mineral density (BMD) in response to weight loss, with and without exercise, and to exercise alone in older adults enrolled in the IDEA trial and determined whether BMD changes were related to the magnitude of fat mass loss and to changes in leptin.

**Methods:** 454 overweight and obese (avg BMI 34) adults (avg age 66yrs, 72% female) with symptomatic knee OA were randomized to 18 months of intensive dietary induced weight loss (D); intensive weight loss plus exercise (D+E); or exercise control (E). The weight loss goal for the two diet groups was 10% of baseline body weight. The exercise intervention consisted of low to moderate intensity walking and resistance training 3 d/wk for 1 hr. A total of 399 (88%) participants completed the study. BMD at the hip (total hip=thigh and femoral neck=FN) and spine, as well as total body fat mass, were measured by DXA and vitamin D levels (baseline only) were assessed in 392 subjects. Osteoporosis (OP) and osteopenia (OPE) were defined as location-specific t-scores < -1 or -2.5 respectively. A subset of 162 subjects had serum leptin levels measured. Treatment group means were compared using ANCOVA, adjusted for baseline dependent variable values, BMI, and gender. Corrections for multiple comparisons used regarding its effect on knee structure. In particular, there is little evidence relating childhood physical performance measures to adult joint structure. The aim of this cohort study was to determine the associations between childhood physical performance measures and knee cartilage volume and tibial bone area in adults 25 years later.

**Results:** There were consistent and significant associations of all childhood measures including BMD on tibia and femur at 25–42 kg/m2 (BMI 27–42 kg/m2) older (age ≥ 55 yrs) adults with pain and radiographic evidence of tibiofemoral osteoarthritis (KL = 2–3). Participants were randomized to one of three 18-month interventions: intensive dietary weight loss-only (D); intensive dietary weight loss-plus-exercise (D+E); or exercise-only control (E). X-rays and MRIs were acquired at baseline and 18 months of follow-up. Standardized weight bearing x-rays (N = 325) were acquired and joint space width (JSW) was measured (blinded to time point) using an automated algorithm. MRIJSW and JSW at 4 fixed locations in the tibiofemoral compartment. MRIs were obtained on a subsample of study participants (N = 105) and tibiofemoral cartilage thickness measured and semi-quantitative (SQ) MRI scoring performed using BLOKS. We used an intention to treat analysis to compare change between groups at 18 month follow-up. X-ray and MRI results were analyzed using ANCOVA adjusted for baseline values, BMI, and gender. X-ray was also adjusted for inter-rim distance. Ordinal logistic regression was used for the ordinal SQ analyses, adjusting for baseline values, BMI and gender.

**Results:** Mean baseline descriptive characteristics of the cohort included: age, 65.6 yrs; BMI 33.6 kg/m2; 72% female; 51% white. A total of 399 (88%) participants completed the study and returned for FU/18month testing. Mean weight loss was D, -9.5%; D+E, -11.4%; E, -2.2%. There were no baseline differences between groups in JSW (0.225) 4.5 (1.9)mm or for cartilage thickness of the medial tibia and central femoral femor 2.90 (0.08)mm. All 3 groups demonstrated continued progression of JSW loss with no significant difference between groups D -0.07(0.22)mm, D+E -0.27(0.22)mm and E -0.16(0.24)mm (p=0.79). All 3 groups demonstrated continued progression of MRI cartilage loss with no significant difference between groups D -0.10(0.05)mm, D+E -0.13(0.04)mm and E -0.05(0.04)mm (p=0.42). Maximal bone marrow lesion (BML) size showed a trend to improvement for the D+E OR 0.70 (0.25–1.95) and D OR 0.44 (0.16 – 1.23) groups.

**Conclusion:** Despite the potent effects of weight loss on symptoms, there does not appear to be any amelioration in the rate of structural progression either on x-ray or MRI cartilage measurement. The evidence of a trend towards improvements in BML suggests that this may be one mechanism for the symptom improvements related to weight loss.

Support by grants from NIH R01 AR052528, P30 AG21332, M01 RR020111

Disclosure: B. S. Eathakkattu Antony, None; G. Jones, None; A. Venn, None; L. Blizzard, None; F. Ciucutti, None; L. March, None; T. Dwyer, None; C. Ding, None.
Tukey’s method. Linear associations of change measures used a general model, adjusted for baseline values, BMI, gender, and treatment arm.

**Results:** Mean weight loss was: D+E, 11.4%; D, 9.5%; E, 2.2%. BMD declined at the hip but not the spine in both weight loss groups (D = -0.024 g/cm² thip; -0.013 FN; both p < .0001 and D + E = -0.020 thip; -0.012 FN; both p < .0001) but not the E group (-0.002 ± 0.54 thip; -0.001; p = 0.8 FN). At baseline 10 subjects (2.5%) had OP (4 hip and 6 spine) and 45% had OPE in at least 1 site. Following intervention, 9 subjects had OP and no subjects with OPE became OP. The mean serum vitamin D level at baseline was 29 ng/mL and baseline BMD values were not related to vitamin D levels. The D and D + E groups but not the E group had significant declines in fat mass and leptin. Changes in hip (but not spine) BMD correlated positively with changes in fat mass (β = .003 g/cm²/kg, p < .0001) (Fig 1) and changes in leptin (β = .001 ng/mL/kg, p < .0001).

**Conclusion:** To our knowledge, this is the longest study to date that analyzed change in BMD with intentional weight loss and the first in older adults with knee OA. Weight loss and the associated reduction in fat mass resulted in a decrease in total hip and femoral neck, but not spine, BMD. The addition of exercise did not prevent these declines. The bone loss was not severe enough to result in osteoporosis but the findings suggest patients with low BMD should be monitored when starting a weight loss intervention.

**Disclosure:** N. R. Walton, None; R. F. Loeser, None; D. Beavers, None; B. J. Nicklas, None; M. Lyles, None; S. P. Messier, None.

2538

**The Association of Fat Mass and Skeletal Muscle Mass with Clinical and Structural Knee Osteoarthritis: The Netherlands Epidemiology of Obesity Study.** A. Willemien Visser, Marijke Loef, Martin den Heijer, Monique Reijnierse, Frits R. Rosendaal and Margreet Kloppenburg. Leiden University Medical Center, Leiden, Netherlands

**Background/Purpose:** Body mass index (BMI) is an important risk factor for knee osteoarthritis (OA), but BMI depends only upon height and weight and gives no insight in underlying causal pathways. The objective of this study was to investigate whether the association of BMI with clinical and structural OA can be explained by the amount of fat mass (FM) and/or skeletal muscle mass (SMM).

**Methods:** Participants of the NEO (Netherlands Epidemiology of Obesity) study, a population-based cohort of individuals aged 45–65 years with a BMI ≥ 27 kg/m² and a control group with a BMI < 27 kg/m², were used. BMI was assessed by measured weight and length. FM and SMM were assessed using bioelectrical impedance analysis. Clinical OA was defined according to the ACR criteria; based on self-reported knee complaints and physical examination of the knees. Structural OA was defined based on MR imaging of the right knee, performed on 1.5T (Philips, Best, The Netherlands) using a standard knee protocol. Osteophytes were scored according to the Knee Osteoarthritis Score System in nine compartments. Osteophytes were graded from 0 (absent) to 3 (severe). A total score was calculated for each individual, a score of ≥ 6 was considered as structural OA. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to associate BMI, FM, SMM and the FM/SMM ratio with OA using logistic regression analyses, stratified for sex and adjusted for age.

**Results:** In 4562 participants (mean age 56 years, 52% women) median (IQR) BMI was 28.4 (26.8–30.8), FM 33.5 kg (27.5–40.8) kg and SMM 28.3 (23.0–33.8) kg. Clinical OA was present in 24% of women and 12% of men. MRI data were available in 1134 participants; structural OA was present in 34% of women and 35% of men. In women and men, BMI was associated with clinical and structural OA. Both FM and SMM were associated with clinical OA, in women ORs were 1.02 (1.01–1.03) and OR 1.05 (1.02–1.08) respectively, and in men; ORs 1.02 (1.01–1.04) and 1.04 (1.01–1.07), respectively. Comparable associations were found with structural OA. Remarkably, in clinical OA the FM/SMM ratio was positively associated with OA (ORs 1.48 (1.13–1.94) and 1.92 (1.20–3.06) in women and men respectively), meaning that a higher FM relative to SMM is unfavorable. In structural OA we found that in multivariate analysis including BMI and FM, the association between BMI and OA disappeared, but the association between FM and OA was unchanged, suggesting that FM is mediating the association of BMI with OA. In multivariate analysis including BMI and SMM, the association of both BMI and SMM with structural OA decreased, suggesting that SMM acts as a partial mediator.

**Conclusion:** BMI, FM and SMM were associated with structural and clinical OA in both women and men. Further analyses suggest that both FM and SMM are involved in the underlying mechanisms of developing knee OA and associated complaints.

**Disclosure:** A. W. Visser, None; M. Loef, None; M. den Heijer, None; M. Reijnierse, None; F. R. Rosendaal, None; M. Kloppenburg, None.
Fine-Specificity of Anti-Citullinated Peptide Auto-Antibodies: Associations with Cardiac Structure and Function in Rheumatoid Arthritis. Laura Geraldino-Pardilla1, Jon T. Giles1, Jeremy Sokolove2, William H. Robinson1 and Joan M. Bathon1,2

Background/Purpose: Despite advancements in rheumatoid arthritis (RA) treatment, standardized mortality rates remain up to 3 times higher than in the general population. Cardiovascular disease (CVD) is the leading cause of excess deaths in RA. Our group has recently found lower left ventricular (LV) mass in RA patients which was associated with anti-CCP antibody levels. Although anti-CCP Abs have been associated with increased CVD and mortality in RA, little is known about the underlying pathophysiology and whether specific anti-citullinated peptide antibodies (ACPAs) play a role in altering cardiac function or structure. Our objective was to test the association of autoreactivity of a selected panel of ACPAs with myocardial function and structure parameters in RA patients.

Methods: This study was nested in an RA cohort without known CVD. A cross-sectional analysis was performed using clinical data and collected serum from a subset of participants who underwent cardiac magnetic resonance (CMR) imaging at baseline. With a custom multiplex bead based antigen array using the BioPlex platform and run on the Luminex 200 instrument, the autoreactivity against a panel of 17 ACPAs was tested. The association of each ACPA with CMR-derived cardiac measures was tested by linear regression analyses, adjusting for potential confounders.

Results: A total of 76 RA patients underwent CMR [mean age 59±9 years, 49% male, mean disease duration 12±11 years, mean DAS28=3.5 ± 1.1]. At an established level of significance of <0.05, categories of anti-citullinated vimentin (epitopes 58–77), anti-citullinated histone2b (epitopes 62–81) and anti-citullinated enolase antibodies were associated with a decrease in LV end diastolic mass. A decrease in LV mass index was associated with categories of anti-citullinated histone2b, anti-citullinated histone2b (epitopes 62–81), anti-citullinated fibrinogen (epitopes 211–230, 556–575), anti-citullinated histone2a (epitopes 1–20) and anti-citullinated enolase antibodies. These and additional associations with other tested cardiac parameters are shown in table 1.

Table 1. Summary of Linear Regression Analysis of the Associations between Specific ACPAs and Statistically significant directional changes in each individual left ventricular measure

<table>
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<th>ACPA categories-per quartile</th>
<th>EDM</th>
<th>MI</th>
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<td>Anti-cit-histone2a (1–20)</td>
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<td>Anti-cit-apo E (277–296)</td>
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<td>Anti-cit-enolase</td>
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EDM = LV end diastolic mass, MI = LV mass index, EDVI = LV end diastolic volume index, HR = heart rate, ESV = end systolic volume, EF = ejection fraction, SV = stroke volume, CO = cardiac output, ESVI = end systolic volume index. *increase, †decrease. Adjusted for Framingham score. Statistical significance: p-value <0.05.

Conclusion: Our results suggest that categories of specific ACPAs are associated with alterations in cardiac parameters in RA patients. Identifying the specific peptide(s) against which the anti-CCP reactivity is directed represents an indirect, but important, advance in understanding the pathophysiology of accelerated CVD in RA.

Disclosure: L. Geraldino-Pardilla, None; J. T. Giles, Roche/Genentech, 5; J. Sokolove, None; W. H. Robinson, None; J. M. Bathon, None.

2540

Prescription of Tumour Necrosis Factor α Anti-Is osteoporosis is a Strongly Associated with a Reduction in Hospital Admissions and in Musculoskeletal Surgical Procedures for Rheumatoid Arthritis Based On a 16 Year Analysis of Nationwide Data. Leonard C. Harty1, Gary O’Toole2, Kathleen Bennett3, and Oliver M. FitzGerald1

Background/Purpose: Comorbidities, joint destruction leading to orthopaedic intervention and physical disability are predictable outcomes of uncontrolled Rheumatoid Arthritis (RA). Synthetic DMARDs have a slow mechanism of action and used as monotherapy induce remission in <20% of RA patients. Tumour Necrosis Factor inhibitors (TNFi) were first prescribed in 1999, have a faster mechanism of action and in combination with methotrexate in early RA induce remission in up to 50%. It is argued that the clinical, functional and quality of life benefits of TNFi may not be sufficient to justify their significant economic cost (National expense, >€100 million/year in 2010). We thus sought to evaluate the number of hospital inpatient days and of musculoskeletal surgical procedures (MSKSPs) in RA patients from 1995 to 2010 and to assess whether there is any association with TNFi usage.

Methods: The Hospital In-Patient Enquiry System (HIPE), which is a national system recording information on hospital bed utilization, was evaluated from 57 hospitals from 1995–2010 for patients admitted with a diagnosis of RA. Age group, number of inpatient days, gender and reason for admission (ICD codes) were also recorded. Annual prescription data for TNFi usage nationally was separately analysed from 2000 to 2010. Descriptive analyses are presented as totals, mean (standard deviation (SD)) and mean % change. Correlations were examined by Spearman’s rho; p<0.05 was considered statistically significant.

Results: 57,774 inpatient records in RA patients were reviewed from 1995–2010; F: M 2:1, mean age 66 (16). Annual TNFi prescribing has increased by 156% per annum (pa) from 2389 units in 2000 to 116,747 in 2010. An increase in TNFi prescribing coincided with a decrease in RA inpatient days for any reason: 49,000 (4880) pa pre-2002, reducing by 13% pa thereafter to 31000 pa in 2010 (r=−0.78, p=0.0005), likely contributing significantly to savings of approximately €16,000,000 pa based on current inpatient hospital costing. 550 (51) pa MSKSPs were recorded pre-2002 with a subsequent reduction of 8% pa to 40 in 2010 (r=−0.96, p<0.0001). 71 (27) pa elective hip procedures (64 replacements) were recorded pre-2002 with a subsequent reduction of 10% pa to 291 in 2010 (overall 47% decrease) and correlating significantly but negatively with number of TNFi prescriptions (r=−0.96, p<0.0001). A 44% decrease on pre 2002. 79 (12) pa elective knee procedures (64 replacements) were recorded pre-2002 with a subsequent reduction of 8% pa to 40 in 2010 (r=−0.88, p=0.0007), a 53% decrease on pre-2004. Annual prescription data for TNFi usage also correlates negatively with a reduction in all MSKSPs and to 37 in 2010 (r=−0.96, p=0.003), a 53% decrease on pre-2004.

Conclusion: Increased prescription of TNFi drugs for RA patients negatively correlates with reduction in RA hospital inpatient bed days and likely contributed significantly to estimated €16,000,000 pa savings. TNFi usage also correlates negatively with a reduction in all MSKSPs and specifically with both elective hip and knee procedures. It is recognised that factors other than TNFi usage, such as improved use of non-biologic disease-modifying treatments and prevention of comorbidities, may have also contributed to these improved patient outcomes. Further analysis of these data including the economic impact is underway.

Disclosure: L. C. Harty, None; G. O’Toole, None; K. Bennett, None; O. M. FitzGerald, Abbott Immunology Pharmaceuticals, Bristol-Myers Squibb, 2, Abbott Immunology Pharmaceuticals, UCB, 5, Abbott Immunology Pharmaceuticals, 8.
2541


Background/Purpose: Comorbidity in Rheumatoid arthritis (RA) has been a focus of intensive research in recent years, but little is known about the incidence of critical illness in RA, as defined by admissions to Intensive Care Units (ICU). While hospital care is the largest component of health resource use in Canada, admissions to ICU consume a disproportionate share of costs. Using a large, population-based database we determined the incidence of ICU admissions in RA patients.

Methods: In a stable population of over 900,000 adults, we used hospital claims from a large administrative database linked to a population based ICU database to determine the incidence of ICU admissions from 2000–2010. RA patients were compared to a cohort from the general population, matched on sex, year of birth and region of residence, with up to 5 controls for each case. Individuals with any diagnostic codes (ICD-9/10) for autoimmune inflammatory disease were excluded from the general population cohort. We estimated the annual incidence rates by age group, sex, and geographic region by stratification; (number of persons in each cohort who had at least one ICU admission/number of persons alive in that cohort at year-end). The results were age and sex standardized to the general Canadian population. The incidence of ICU admission between the RA cohorts and matched cohorts were compared using incidence rate ratios (RR). We compared the 10 year cumulative incidence of ICU admission for the period 2000–2010 (number of persons with disease who had at least one episode of critical illness/person-years at risk).

Results: The age and sex standardized annual incidence of ICU admission was relatively stable over the 10 year period, at 0.82–1.18% for RA patients compared to 0.32–0.59% for the matched cohort. RR 1.53–3.14. The risk of ICU admission increased with age (age 18–39, 0.38% for RA vs. 0.10% for controls; age 40–59, 0.81% vs. 0.31%; age 60+ 1.74% vs. 1.09%) in a similar pattern to that seen in the general population. The 10 year cumulative incidence rate for RA patients was 6.8% compared to 4.73% in the general population, with a RR of 1.62 (95% CI 1.46–1.80).

Conclusion: The risk of ICU admission is significantly increased in RA patients compared to the general population, with more than 1% of adults with RA developing critical illness each year, and a 10 year risk near 8%. This represents a substantial disease burden and cost to the healthcare system. Further work is ongoing to determine causes and predictors of ICU admission.

Disclosure: C. Peschken, None; C. A. Hitchon, None; A. Garland, None; C. N. Bernstein, None; R. Fransoo, None; R. A. Marrie, None.

2542

The Association Between Inflammatory Markers and Hyperlipidemia and the Risk of Myocardial Infarction in Patients with Rheumatoid Arthritis. Jie Zhang1, Lang Chen1, Elizabeth S. Delzell1, Paul M. Mintner1, William B. Hillegass2, Monika M. Safford1, Iris E. Navarro1 and Jeffrey R. Curtis1, 1University of Alabama at Birmingham, Birmingham, AL, 2Birmingham, AL, 3Univ of Alabama-Birmingham, Birmingham, AL

Background/Purpose: Patients with rheumatoid arthritis (RA) are at increased risk of developing myocardial infarction (MI) which is not explained by Framingham CHD risk factors. We examined the association between RA-related inflammatory markers, hyperlipidemia and the risk of MI in RA patients.

Methods: We conducted a retrospective cohort study of RA patients using administrative claims data from a large U.S. commercial health plan from 2005 to 2010. Eligible patients were required to have two or more RA diagnoses from physician visits that were between 7 and 365 days apart, a baseline period of 6 months with continuous enrollment with medical and pharmacy benefits, and have results for at least one of the three lab tests occurring either during baseline or follow-up. Labs of interest included erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and low density lipoprotein cholesterol (LDL-C) and were available for a subset of RA patients from electronic records of tests performed by a national laboratory chain ordered during routine clinical care. We identified the first hospitalized MI event in inpatient primary ICD9 diagnosis codes ‘41001’, ‘41011’, ‘41021’, ‘41031’, ‘41041’, ‘41051’, ‘41061’, ‘41071’, ‘41081’, or ‘41091’ with at least a 3 day length of stay (or expired as the discharge status of the hospitalization). We examined the association between ESR, CRP and LDL-C quartiles (to avoid assumptions of linearity) and hospitalized MI, controlling for age and sex; and stratified by sex, controlling for age, using proportional hazard regression to estimate hazard ratios (HRs).

Results: We identified 116,181 RA patients, 74.8% of whom were women. Mean age was 48.2 ± 15.2 SD years and 74.8% were female. Depending on lab tests of interest, the numbers patients who had MI during follow-up ranged from 85 to 110 (table). The overall and sex-specific crude incidence rates of MI were 2.7 cases per 1,000 person-years, 2.1 among women, and 4.8 among men. After controlling for age and sex, higher CRP (highest compared to the lowest CRP quartile) was associated with a 3.0 (95% CI: 1.5–5.9) and higher ESR (highest compared to the lowest quartile of ESR) had an HR = 2.5 (95% CI: 1.5–4.3) for MI, but higher LDL-C was not significantly associated with increased MI risk (table). The observed association between CRP and MI appeared greater for women.

Table. Hazard Ratios (95% CI) for Factors Associated with Myocardial Infarction

<table>
<thead>
<tr>
<th>C-Reactive Protein quartile (mg/dL)</th>
<th>Overalla</th>
<th>Menb</th>
<th>Womanb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events, N</td>
<td>85</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>1st (&lt;1.2) [referent]</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>2nd (&gt;1.2 and &lt;=3.1)</td>
<td>1.09</td>
<td>0.48</td>
<td>2.48</td>
</tr>
<tr>
<td>3rd (&gt;3.1 and &lt;=8.1)</td>
<td>2.56</td>
<td>1.28</td>
<td>5.15</td>
</tr>
<tr>
<td>4th (&gt;8.1)</td>
<td>2.97</td>
<td>1.49</td>
<td>5.93</td>
</tr>
</tbody>
</table>

| Erythrocyte sedimentation rate quartile (mm/hr) | Overalla | Menb | Womanb |
| Events, N                                    | 95       | 40   | 55     |
| 1st (<4) [referent]                          | 1.00     | 1.00 | 1.00   |
| 2nd (4 and <=9)                              | 0.85     | 0.40 | 1.77   | 0.95 | 0.34 | 2.72 | 0.81 | 0.29 | 2.27 |
| 3rd (9 and <=20)                             | 1.52     | 0.81 | 2.83   | 2.00 | 0.82 | 4.88 | 1.30 | 0.55 | 3.11 |
| 4th (>20)                                    | 2.52     | 1.46 | 4.34   | 2.77 | 1.24 | 6.19 | 2.40 | 1.12 | 5.11 |

| Low density lipoprotein cholesterol quartile (mg/dL) | Overalla | Menb | Womanb |
| Events, N                                      | 110      | 59   | 51     |
| 1st (<83) [referent]                           | 1.00     | 1.00 | 1.00   |
| 2nd (>83 and <=105)                            | 1.09     | 0.66 | 1.81   | 0.97 | 0.50 | 1.90 | 1.29 | 0.59 | 2.86 |
| 3rd (>105 and <=130)                           | 0.81     | 0.46 | 1.40   | 0.72 | 0.34 | 1.52 | 0.94 | 0.40 | 2.18 |
| 4th (>130)                                     | 1.03     | 0.60 | 1.78   | 0.97 | 0.46 | 2.04 | 1.15 | 0.50 | 2.64 |
a. Adjusting for age and gender; b. Adjusting for age.

Conclusion: Among this large national sample of RA patients, inflammatory markers (both CRP and ESR) were significantly associated with increased MI risk but LDL-C was not.

Disclosure: J. Zhang, None; L. Chen, None; E. S. Delzell, Amgen, 2; P. M. Mintner, Amgen, 2, 5; W. B. Hillegass, None; M. M. Safford, None; I. E. Navarro, None; J. R. Curtis, Roche/Genetech, UCB, Centocor, CORRONA, Amgen Pfizer, BMS, Crescendo, Abbott, 5; Roche/Genetech, UCB, Centocor, CORRONA, Amgen Pfizer, BMS, Crescendo, Abbott, 2;
Hospitalized Bacterial Infections Among U.S. Veterans with Rheumatoid Arthritis Initiating TNF Antagonist and Newer Biologic Agents. Jeffrey Curtis 1, Shao Yang 1, Nivedita M. Patkar 2, Lang Chen 1, Jasvinder A. Singh 1, Grant W. Cannon 1, Ted R. Mikuls 1, Elizabeth S. DeZell 1, Kenneth G. Saag 1, Monika M. Safford 1, Scott DuVall 1, Kimberly Alexander 2, Pavel Napalkov 2, Aaron Kamaan 2 and John Buddley 1. 1University of Alabama at Birmingham, Birmingham, AL, 2Univ of Alabama-Birmingham, Birmingham, AL, 3George E. Wahlen VA Medical Center, Salt Lake City, UT, 4Omaha VA and University of Nebraska Medical Center, Omaha, NE, 5VA Salt Lake City Health Care System and University of Utah School of Medicine, Salt Lake City, UT, 6Genentech, Inc., South San Francisco, CA, 7Anolinx, Boston, UT

**Background/Purpose:** Risks of hospitalized infections for newer biologic agents have not been well characterized compared to risks for anti-TNF therapy. **Purpose:** To compare the risk of hospitalized bacterial infections among RA patients starting rituximab (RTX), abatacept (ABA) or a new anti-TNF after failure of at least one previous anti-TNF agent. **Methods:** Using data from 1998–2011 from the U.S. Veteran’s Health Administration, we identified 3872 patients who started RTX, ABA, or anti-TNF therapy prior to exposure to another anti-TNF agent. To minimize confounding from channeling of cancer patients to certain biologics, the 720 patients with a history of cancer between 1998 and 2011 were excluded, leaving a final sample of 3152 patients. Baseline characteristics were defined in the year prior to treatment initiation. For each subject, exposure episodes were defined based upon days supply (injections) or usual dosing intervals (infusions), with 9 months assumed for RTX exposure. Current exposure was extended by 90 days for all biologics. The outcome was hospitalization with a primary diagnosis of bacterial infection. The hazard ratio (HR, 95% CI) for hospitalized infection for RTX and ABA vs. anti-TNFs was calculated, adjusting for confounders as in the Table.

**Table 1.** Multivariable Adjusted Hazard Ratios for Risks of Hospitalized infections Among RA Patients Switching to Abatacept or Rituximab Compared to Patients Switching to Another Anti-TNF (Analysis Restricted to Patients Without Prior Cancer)

<table>
<thead>
<tr>
<th>Medication Exposure (referent to anti-TNF therapy)</th>
<th>Hazard Ratio (95% CI)</th>
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<tbody>
<tr>
<td>Abatacept</td>
<td>0.72 (0.41–1.26)</td>
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<tr>
<td>Rituximab</td>
<td>1.14 (0.70–1.87)</td>
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<tr>
<td>Age Group (years) (referent to &lt;50)</td>
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<tr>
<td>50–60</td>
<td>1.82 (0.86–3.86)</td>
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<tr>
<td>60–70</td>
<td>1.78 (0.82–3.86)</td>
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<tr>
<td>70–80</td>
<td>2.11 (0.92–4.80)</td>
</tr>
<tr>
<td>≥80</td>
<td>2.40 (0.87–6.53)</td>
</tr>
<tr>
<td>Comorbidities</td>
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<tr>
<td>COPD</td>
<td>1.77 (1.20–2.59)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.06 (0.75–1.51)</td>
</tr>
<tr>
<td>Prednisone-equivalent steroid dose (referent to no use)</td>
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<tr>
<td>1–7 mg/day</td>
<td>1.33 (0.88–2.02)</td>
</tr>
<tr>
<td>7–10 mg/day</td>
<td>1.31 (0.83–2.08)</td>
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<tr>
<td>&gt;10 mg/day</td>
<td>1.71 (1.10–2.68)</td>
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*adjusted for variables included in the table and additionally for heart failure, recent biologic switch in last 90 days, number of biologic switches and calendar year; none were significantly associated with the outcome

**Results:** A total of 596 RTX, 451 ABA and 3111 anti-TNF (61% adalimumab) switcher treatment episodes (first initiation of the biologic) were identified among the eligible patients. Mean age was 60.2±10.6 years, 87% were male; 25% had diabetes, 14% had COPD, and 44% used oral glucocorticoids. Two-thirds of anti-TNF exposure episodes were adalimumab. The mean ± SD follow-up time for each treatment episode was 11±12 months. The most common types of hospitalized infections were pneumonia (37%), skin/soft tissue infections (22%), urinary tract infections (9%), and bacteremia/sepsis (7%).

Crude hospitalized infection rates/100 person years (95% CI) were: RTX=4.4 (3.1, 6.4), ABA=2.8 (1.7, 4.7), anti-TNF=3.0 (2.8, 3.9). Results were similar for a less restrictive cohort of RA patients excluding only hematologic cancer in the prior 12 months (4927 episodes, 372 RA patients).

**Conclusion:** In older, predominantly male US veterans with RA and a high comorbidity burden, risk of hospitalized bacterial infections for patients treated with RTX or ABA were comparable to patients switching to a different anti-TNF therapy (mostly adalimumab).

**Disclosure:** J. Curtis, Roche/Genetech, UCSF Center for Outcomes, Arming, Pfizer, BMS, Crescendo, Abbott, 2, Roche/Genetech,UCB, Centocor, CORRONA, Arming, Pfizer, BMS, Crescendo, Abbott, 5, S. Yang, None; N. M. Patkar, None; L. Chen, None; J. A. Singh, research and travel grants from Takeda, Savient, Wyeth and Arming, J. A.S. has received speaker honoraria from Abboc...
Background/Purpose: The objective of this study was to compare the efficacy and safety of tocilizumab (TCZ) subcutaneous (SC) and TCZ intravenous (IV) regimen in patients with adult rheumatoid arthritis (RA) who had an inadequate response to DMARDs (up to 20% may have failed IV regimen in patients with adult rheumatoid arthritis (RA) previous pharmacological studies. During the DB period, patients (pts) followed by a 72-week open-label phase. TCZ SC dose was based on 12% non-inferiority margin (NIM).

Methods: This 2-year Phase 3 trial is a randomized, active controlled, parallel group study including a 24-week double-blind (DB) period, followed by a 72-week open-label phase. TCZ SC dose was based on previous pharmacological studies. During the DB period, patients (pts) received TCZ SC 162 mg qw + placebo IV qw or TCZ IV 8mg/kg q4w + placebo SC qw, in combination with traditional DMARDs. The primary end point to demonstrate the non-inferiority of TCZ SC to TCZ IV was the proportion of patients in each group meeting the ACR20 improvement criteria at Week 24. Additional clinical efficacy, immunogenicity and safety assessments were evaluated as secondary outcomes.

Pts were stratified by body weight and regions at baseline. The hypothesis of non-inferiority of TCZ SC with respect to TCZ IV regarding ACR20 response was tested by means of 95% confidence interval (CI) and with a 12% non-inferiority margin (NIM).

Results: A total of 1182 pts were enrolled globally. Mean baseline characteristics were similar between TCZ SC and TCZ IV groups: age 53 years; RA duration 9 years; DAS28-ESR 6.6 and 6.7, respectively. At Week 24, 69.4% (95% CI: 65.5, 73.2) of TCZ SC-treated pts versus 73.4% (95% CI: 69.6, 77.1) of TCZ IV-treated pts achieved an ACR20 response (weighted difference between groups 4.0% [95% CI: -9.2, 1.2]); a 12% NIM was met. ACR50/70 responses, disease activity and physical function improvements were also comparable between TCZ SC and TCZ IV groups. Up to Week 24, the proportions of pts with at least one adverse event (AE) and serious AE were 76.2% and 4.6%, respectively in the TCZ SC group compared with 77.0% and 5.2%, respectively in the TCZ IV group. The most common AEs in both groups were infections. Injection site reactions occurred more frequently in the TCZ SC (placebo IV) group than the TCZ IV (placebo SC) group (10.1% vs 2.3%, respectively); most were grade 1 severity. No anaphylaxis was reported over the 24-week period.

Conclusion: TCZ SC 162mg qw demonstrated comparable efficacy and safety to TCZ IV 8mg/kg q4w. No new clinically meaningful safety signals were identified in TCZ SC-treated pts.

Disclosure: G. R. Burmester, Roche, Abbott, Pfizer, UCB, BMS, MSD, 2, Roche, Chugai, Pfizer, UCB, BMS, 5, Roche, Pfizer, MSD, BMS, Abbott, 8; A. Rubbert-Roth, Roche, Pfizer, Roche, Chugai, MSD, Pfizer, Abbott, UCB, 5, Roche, UCB, 8; A. G. Cantagrel, Chugai, BMS, Roche, UCB, Abbott, Pfizer, 5, UCB, Pfizer, 2; S. Hall, None; P. Leszczynski, Roche Pharmaceuticals, 5; D. Feldman, None; M. J. Rangaraj, Roche Pharmaceuticals, 2; G. Roane, None; C. L. Ludvico, Roche, BMS, Pfizer, Human Genome Science, Eli and Lilly, Sanofi-Aventis, 2; F. Ramirez, Roche Products Limited, 3; M. Bao, Genentech, Inc., 3.

Conclusion: In prognostically relevant subsets of patients with RA, especially in patients at increased risk of radiographic progression, both tofacitinib 10 and 5 mg BID demonstrated inhibition of damage progression compared to PBO. These analyses support the conclusion of the primary analysis that tofacitinib inhibits progression of structural damage.

Figure. Dots = means; Bars = confidence intervals

2546 Tofacitinib Inhibits Radiographic Progression in Patients with Rheumatoid Arthritis Prone to Develop Structural Damage: A Post-Hoc Analysis of a Phase 3 Trial. Désirée van der Heijde, Robert B. M. Landewe and David Gruben. 1Leiden University Medical Center, Leiden, Netherlands; 2Academic Medical Center/University of Amsterdam & Atrium Medical Center, Amsterdam, Netherlands; 3Pfizer Inc., Groton, CT

Background/Purpose: Tofacitinib is a novel, oral Janus kinase inhibitor being investigated as a targeted immunomodulator and disease-modifying therapy for RA. In the ORAL Scan trial [NCT00847613] progression in radiographic scores (mean change from baseline [BL] in modified Total Sharp Scores [mTSS] at Month 6) was a primary analysis using an Analysis of Covariance (ANCOVA). ANCOVA demonstrated statistically significant inhibition of structural damage progression for tofacitinib 10 mg but not 5 mg twice daily (BID) doses, versus placebo (PBO). Rank analysis of change from BL values performed as a sensitivity analysis demonstrated borderline evidence of inhibition by both doses. Mean change from BL in mTSS with PBO was <0.50 at Month 6 and also 77.7% of PBO patients showed no progression (mTSS change from BL ≤0.5). There is a trend towards less BID progression in recent radiographic studies driven, in part, by the early rescue of PBO patients. In ORAL Scan, PBO treatment was only 3 months for non-responders (<20% improvement from baseline in swollen/tender joint counts, approximately 50% of patients receiving PBO) and 6 months for all others. Thus analyses focusing on prognostically-relevant characteristics of patients at particular risk of damage progression may be informative.

Methods: Literature was reviewed for factors identified as predicting higher risk of structural progression. BL data were used to subset the patients by these high-risk factors, regardless of treatment group assignment. ANCOVA was then applied to each high-risk subset.

Results: Factors reported to predict increased risk of damage progression included: anti-CCP+: BL DAS28-4(ESR) ≥5.1; both seropositive (either RF+ or anti-CCP+) and BL erosion score ≥3; and >median BL mTSS (Figure). The primary analysis of the whole data set is displayed for reference. Each of these high-risk subsets showed maintained or increased differentiation between tofacitinib and PBO treatments. We further evaluated the predictive power of BL mTSS by tertiles, ie across three evenly divided groups irrespective of treatment assignment. In the first tertile, inhibition could not be demonstrated because of lack of progression in the PBO group. In the 2nd and 3rd tertiles, PBO progression led to large mean differences between both tofacitinib doses and PBO (Figure).

Background/Purpose: To compare clinical and functional responses with SC abatacept administered with or without an IV loading dose, in pts with active RA and inadequate response to MTX.

Methods: Pts from the intent-to-treat (ITT) populations of the ACQUIRE and AMPLE studies randomized to SC abatacept plus MTX were included in this analysis. All pts received fixed-dose SC abatacept 125 mg/week; in ACQUIRE, pts also received an IV loading dose (10 mg/kg based on weight range) on Day 1; no IV loading dose was administered in AMPLE. For this post-hoc analysis, assessments included ACR 20 and Health Assessment Questionnaire-Disability Index (HAQ-DI) response (improvement of ≥0.3) over 6 months, with pts who discontinued considered non-responders. Mean changes from baseline over 6 months in Disease Activity Score (DAS) 28 (C-reactive protein; CRP) were assessed in pts with DAS28 >4.4 at baseline.

Results: A total of 736 pts from ACQUIRE (IV loading dose) and 318 pts from AMPLE (no IV loading dose) were included. All pts were biologics-naïve to baseline, with mean disease duration of 7.6 and 1.8 years, respectively. Efficacy was compared at Days 15, 29, 57, 85, 113, 141 and 169. For pts treated with SC abatacept with an IV loading dose, ACR 20 response rates were 24.6, 44.5, 58.0, 66.6, 69.3, 72.4 and 74.8%, respectively. For pts treated without an IV loading dose, ACR 20 response rates were similar: 27.4, 42.5, 58.5, 60.1, 66.0, 70.1 and 66.0%, respectively. HAQ-DI response rates were also similar: 31.7, 45.1, 53.3, 59.5, 63.2, 64.4 and 68.3%, respectively, with the IV loading dose, and 31.8, 42.8, 54.4, 58.5, 60.1, 61.9 and 61.0%, respectively, without. For the overall populations, mean (SD) changes from baseline to Day 169 in DAS28 were −2.57 (1.30) and −2.09 (1.38) in ACQUIRE and AMPLE, respectively. For pts with baseline DAS28 >5.1, mean changes in DAS28 over time were also comparable for both studies (Figure).

Conclusions: Time to onset and magnitude of ACR 20 and HAQ-DI responses and DAS28 improvements were similar for pts treated with SC abatacept with or without IV loading in patients with RA and an inadequate response to MTX. Previous pharmacokinetic data show that in the absence of IV loading, target therapeutic concentrations are achieved in the majority of pts by Week 2 of SC abatacept treatment. The findings from this post-hoc analysis suggest that SC abatacept can be given effectively without an IV abatacept loading dose.

References

Disclosure: D. van der Heijde, Abbott, Amgen, AstraZeneca, BMS, Centocor, Chugai, Eli-Lilly, GSK, Merck, Novartis, Otsuka, Pfizer, Roche, Sanofi-Aventis, Schering-Plough, UCB; Wyley, S. Imaging Rheumatology, 4; R. B. M. Landewe, Pfizer Inc, Abbott, Janssen, Merck, 2; Abbott, Amgen, Astra, BMS, Centocor, GlaxoSmithKline, Janssen, Pfizer, UCB; Vertex, 5; D. Gruben, Pfizer Inc, 1; Pfizer Inc, 3.
Background/Purpose: In the COMET study, etanercept (ETN) plus methotrexate (MTX) therapy in patients with early rheumatoid arthritis (RA) yielded high clinical remission rates,1 but whether remission can be maintained after dose reduction or withdrawal (biologic-free) is unknown. The PRIZE trial is an ongoing, prospective, 121-wk, 3-period study to evaluate the efficacy of ETN/MTX as first-line therapy in patients with early, active moderate-to-severe RA and to assess whether efficacy can be maintained with reduced-dose or biologic-free therapy (Period 2) or drug free (Period 3). The main objective of Period 1, reported here, was to achieve DAS28 remission at wks 39 and 52 in patients treated with ETN 50 mg QW plus MTX (ETN50/MTX); responders (DAS28 <3.2 at wk 39 + DAS28 <2.6 at wk 52) qualified for Period 2 enrollment.

Methods: MTX- and biologic-naïve RA patients (symptom onset ≤12 mo from enrollment; DAS28 >3.2) received ETN50/MTX for 52 wks. At the discretion of the investigator, the initial 10 mg/wk MTX dose was titrated up to 25 mg/wk to achieve remission. Patients not achieving low disease activity (LDA; DAS28 3.2) received corticosteroid boosts at wks 13 and 26; those not achieving LDA at wk 39 (non-responders) were withdrawn from the study. In addition to DAS28 and SDAI remission and LDA, other standard clinical outcomes were assessed. Efficacy and safety analyses were conducted in all patients who received ≥1 ETN/MTX dose (mITT).

Results: A total of 306 patients (female, 70%; Caucasian, 94%; mean age, 50 yr; disease duration from symptom onset, 6.5 mo) were enrolled; 222 (72.6%) completed Period 1 (reasons for not completing Period 1 are listed in the Table). No patient was excluded from the mITT population. Efficacy analyses were performed in the mITT population. Efficacy changes were observed in all clinical assessments and endpoints (P<0.0001). LDA was achieved in ≥75% of patients and DAS28 and SDAI remission in >60% of patients. Twenty-nine percent of patients achieved DAS28 <2.6 + HAQ ≤0.5 + no radiographic progression. The most common treatment-emergent AEs were nausea and nasopharyngitis (13%), each. No unexpected safety or tolerability findings were reported.

Table. Summary of ETN50/MTX efficacy in Period 1 of the PRIZE trial (N = 306)a

<table>
<thead>
<tr>
<th>Efficacy Assessedb</th>
<th>Baseline Mean (SD)</th>
<th>Final on Therapy Mean (SD)</th>
<th>Δ from Baseline Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAS28</td>
<td>6.0 (1.1)</td>
<td>2.6* (1.5)</td>
<td>-3.5 (1.5)</td>
</tr>
<tr>
<td>SDAI</td>
<td>38.3 (4.0)</td>
<td>7.2* (11.9)</td>
<td>-31.1 (14.8)</td>
</tr>
<tr>
<td>Patient global assessment</td>
<td>58.9 (23.6)</td>
<td>16.3* (21.9)</td>
<td>-42.8 (28.4)</td>
</tr>
<tr>
<td>Tender/swollen joint count (28 joints)</td>
<td>14.1 (7.1)/11.1/5.9</td>
<td>2.5* (4.1)/3.4* (3.7)</td>
<td>-11.6 (7.6)/-9.7 (5.7)</td>
</tr>
<tr>
<td>HAQ DI</td>
<td>1.3 (0.7)</td>
<td>0.5* (0.6)</td>
<td>-0.8 (0.7)</td>
</tr>
</tbody>
</table>

% Patients (95% CI), Final on Therapy Visit

<table>
<thead>
<tr>
<th>Efficacy Endpointc</th>
<th>% Patients (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAS28 LDA (≤3.2)/remission (≤2.6)</td>
<td>70.8* (73.0, 65.0)/70.5* (65.0, 75.6)</td>
</tr>
<tr>
<td>SDAI LDA (≤3.1)/remission (≤3.3)</td>
<td>81.3* (81.4, 0.59)/55.1 (55.1, 66.4)</td>
</tr>
<tr>
<td>ACR Boolean remission</td>
<td>51.5* (45.7, 57.2)</td>
</tr>
<tr>
<td>ACR 20/50/70/90 responses</td>
<td>85.7* (81.2, 89.5)/ 76.1* (70.9, 80.8)/ 65.8* (60.1, 71.1)/ 34.9* (29.5, 40.6)</td>
</tr>
</tbody>
</table>

Complete response4 | 29.1* (24.1, 34.5) |

Results: 556 patients were randomized, with 85% completing 52 weeks of treatment. Baseline data were similar between the 2 groups (disease duration 8.2 yr, DAS28-ESR 6.3, HAQ-DI 1.47 [all mean values]) except for Genant-modified Sharp Score (GSS), which was higher in the switch group. Efficacy results are shown in the Table. Between Weeks 24 and 52, the proportion of patients receiving DMARD intensification was comparable in the add-on and switch arms (29% vs 33%). Clinical improvements at Week 24 in both groups were maintained or further improved up to Week 52 with a trend in favor of the add-on strategy for some endpoints. While the vast majority of patients did not experience a change from baseline, significantly more switch patients experienced radiographic progression (14.5% versus 7.6% in the add-on group). In a preliminary analysis in patients with samples available, 3.7% of patients developed antidrug antibodies (ADAs) up to week 52: 10/272 in the add-on group and 11/271 in the switch group. Neutralizing ADAs were developed by 3.3% of patients (9/272 in the add-on group and 4.1% (11/271) in the switch group. Rates of SAEs and serious infections per 100 PY were 14.2 and 4.9 in the add-on group and 17.7 and 6.3 in the switch group, respectively. In patients with normal baseline values, ALT elevations >3x the upper limit of normal were observed in 11% of add-on and 3% of switch patients.
Table. Week 24 Efficacy Results (ITT Population)

<table>
<thead>
<tr>
<th>Clinical Parameter</th>
<th>Address N = 277</th>
<th>Switch N = 276</th>
<th>P value</th>
<th>Address N = 277</th>
<th>Switch N = 276</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAS28 mean change from baseline</td>
<td>-3.0</td>
<td>-3.2</td>
<td>0.06</td>
<td>-3.6</td>
<td>-3.0</td>
<td>0.05</td>
</tr>
<tr>
<td>DAS28 remission</td>
<td>49.4</td>
<td>54.9</td>
<td>0.21</td>
<td>45.5</td>
<td>36.6</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Conclusion: This one year analysis suggests that TCZ monotherapy might be an acceptable therapeutic strategy in patients with a contraindication for or intolerance to MTX.

Disclosure: M. Dougados, Pfizer Inc; 2, Pfizer Inc; 6, Pfizer Inc, 5, Roche Pharmaceuticals, 2, Roche Pharmaceuticals, 6, Abbott Immunology Pharmaceuticals, 2, Abbott Immunology Pharmaceuticals, 6, UCB, 2, UCB, 6, UCB, 5, Roche Pharmaceuticals, 5, K. Kissel, F. Hoffmann-La Roche Ltd.; 3, P. G. Conaghan, Centocor, Inc., Roche; 2, Astra Zeneca, Bioberca, BMS, Centocor, Merck, Novartis, Pfizer, Roche, 8, E. Martin-Mola, Abbott Immunology, Roche, Pfizer, UCB, 5; 5, G. A. Schett, Roche, S. H. Amin, Almirall, None; 3, T. W. J. Huizinga, Abbott Immunology, Alex Shield Diagnostics, Biotest AG, BMS, Crescendo Bioscience, Roche, Novartis, Schering-Plough, UCB, Wyeth-Pfizer, 5.

ACR Concurrent Abstract Session Sjogren’s Syndrome II - Clinical

Tuesday, November 13, 2012, 4:30 PM–6:00 PM

2551

Validation of EULAR Primary Sjögren’s Syndrome Disease Activity and Patient Indexes. Raphaële Seror1, Elke Theander2, Johan G. Brun3, Manel Ramos-Casals4, Valeria Valim5, T. Dorner6, Xavier Martí7, Hendrika Bottema8, Athanasios G. Tsoufas9, Roser Solana-Laqué10, Jacques-Eric Gottenberg11, Eric Hachulla12, Wan-Fai NG13, Stefano Bombardieri14, Roberto Gerli15, Takayuki Sumida16, Alan Sarraux17, Matija Tomsic18, Roberto Caporali19, Roberta Priori20, Kathy Moser Sivils21, A.A. Kruize22, Cristina F. Vollenweider23, H. Bootsma24, E. Hachulla25, W. F. Ng26, None; 2, Bombardieri, None; 2, Gerli, None; 2, Sarraux, None; 2, T. Sumida, None; 2, A. Saraux, None; 2, M. Tomsic, None; 2, Caporali, None; 2, R. Priori, None; 2, M. Sivils, None; 2, A. A. Kruize, None; 2, F. Vollenweider, None; 2, V. Vitali, None; 2, S. J. Bowman, None.

2552

Clinically Significant and Biopsy-Documented Renal Involvement in Primary Sjögren’s Syndrome: Clinical Presentation and Outcome. Andreas V. Goules1, Ioanna P. Tatouli1, Alexandros A. Drosos2, Fotini N. Skopoulou3, Haroulas M. Moutsopoulos4 and Athanasia G. Tsoufas5, National University of Athens, Athens, Greece, 1Professor of Medicine/Rheumatology, Ioannina, Greece, 2Harokopion University, Athens, Greece, 3School of Medicine, University of Athens, Athens, Greece, 4School of Medicine, National University of Athens, Athens, Greece.

Background/Purpose: Primary Sjögren’s syndrome (pSS) may affect kidneys, causing either interstitial nephritis (IN) or glomerulonephritis (GMN). However, overt renal disease in pSS is rare and does not exceed 5% of patients. The aim of this study was to estimate the prevalence and investigate the clinical features and the outcome of clinically significant and biopsy documented renal involvement in a large cohort of pSS patients.

Methods: From a cohort of 715 patients who met the American-European criteria for pSS, those with clinically significant and biopsy documented renal involvement were identified and their clinical features were recorded. The primary outcomes included death, hemodialysis, lymphoma and chronic renal failure (CRF). Statistical analysis was performed to estimate the primary outcomes per 100 person-years.

Results: Thirty five (4.9 %) pSS patients had biopsy documented renal involvement, representing a total follow up time after renal diagnosis of 271.8 person-years. Twelve patients (34.3%) had IN, 18 (51.4%) had GMN and 5 (14.2%) developed both entities. Nine patients died (25.7%), 11 (31.4%) presented chronic renal failure (including 4 requiring maintenance hemodialysis) and 9 (25.7%) developed malignant lymphoma. Seven out of 11 (63.6%) patients with CRF had IN while the remaining 4 patients (36.4%) had GMN. The corresponding rates for lymphoma, chronic renal failure and hemodialysis were estimated at 3.30
Histological, Serological and Clinical Changes in Response to Abatacept Treatment of Sjögren’s Syndrome. Sabine Adler1, Meike Koerner2, Frauke Foerger3, Marco-Domenico Caversaccio4 and Peter M. Villiger5.

1 University Hospital Bern, Bern, Switzerland, 2 Inselspital-University Hospital, Bern, Switzerland, 3 University Hospital Bern, Inselspital, Bern, Switzerland, 4 Inselspital-University Hospital of Bern, Bern, Switzerland.

Background/Purpose: To prospectively evaluate histopathologic, blood and clinical responses to abatacept treatment in patients with primary Sjögren’s syndrome (pSS).

Methods: Blood, saliva and minor salivary gland biopsies were obtained prior to and after the last of 8 doses of abatacept in 11 pSS patients. Histology evaluated the number of lymphocytic foci and of B- and T-cell subtypes (CD20+, CD3+, CD4+, CD8+). The numbers of FoxP3+ regulatory T-cells and the FoxP3/CD3 ratio was calculated. The histologic data were compared with results from peripheral blood and with changes in saliva secretion.

Results: The numbers of lymphocytic foci decreased (p = 0.09) with a corresponding reduction of CD20+, CD3+, CD4+ and CD8+ T-cells. Numbers of local FoxP3+ T-cells decreased in 9 of 10 samples (p = 0.022). In peripheral blood CD3+ cells did not change in numbers while CD20+ B-cells increased (p=0.038). This increase was due to an expansion of the naïve B cell pool (p=0.012). The slight decrease in gamma globulins and IgG did not reach significance (P=0.09 and 0.169, respectively). Overall, saliva secretion did not change, however 7 of 11 patients showed an increase in saliva secretion (p=0.018 for the 7 responders).

Conclusion: Inhibition of T cell co-stimulation using CTLA4-Ig leads to a reduced inflammation in glandular tissue with a 50% decrease in FoxP3+ cells, to an expansion of peripheral naïve B cells and to an increase in saliva secretion in 70% of pSS patients. In conclusion, abatacept bears the potential of a disease-modifying biologic agent in pSS.

Disclosures: S. Adler, None; M. Koerner, None; F. Foerger, None; M. D. Caversaccio, None; P. M. Villiger, None.

Tuesday, November 13


Results of the Beliss Study, the First Open Phase 2 Study of Belimumab in Primary Sjögren’s Syndrome. Xavier Mariette1, Luca Quartuccio2, Raphaelle Seror3, Sara Salvini4, Frederic Desmoulins5, Martina Fabris5, Sara Villeneuve6, Philippe Ravaud7, and Salvatore De Vita8. 1 Université Paris-Sud, Le Kremlin Bicêtre, France, 2 Rheumatology Clinic, DSMB, University of Udine, Italy, 3 University Hospital Bern, 4 Cochin Hospital, 5 Université Paris-Sud, 6 Hotel Dieu, Paris, France, 7 Hotel Dieu, Paris, France, 8 Université Paris-Sud, DSMB, University of Udine, Italy.

Background/Purpose: There is evidence for a critical role of B cells in the pathogenesis of pSS. Both open labelled and small controlled studies suggested the efficacy of Rituximab (RTX) in specific subgroups of pSS (early or systemic). We conducted a multicenter, randomized, double-blind, placebo-controlled trial to evaluate the efficacy of RTX in a large group of patients with active recent and/or systemic pSS.

Methods: 122 Patients were assigned to receive either RTX infusions (1g) or placebo (Pl) at weeks 0 and 2. They were followed up for 24 weeks. All patients fulfilled the new American-European Consensus Group criteria for pSS, had an active disease as assessed by mean values of the 2 highest visual analog scales (VAS) ’50 evaluating dryness, pain, fatigue and global, and had either a recent (less than 10 years since first clinical sign) and a biologically active pSS [Auto antibodies (SSA or RF) or cryoglobulinaemia, or hypergammaglobulinaemia, or high level of beta 2-microglobulinaemia or hypo-complementeremia] or at least one extra-glandular manifestation. The primary end point was an improvement of at least a 30 mm on 2 of 4 VAS between weeks 0 and 24. Secondary end points included delta of improvement of all VAS separately, the ESSDAI score, the number of swollen joints, the basal salivary flow rate, results of the Schirmer test, the schirmer score, biological and extra glandular improvement, evaluated from week 0 to week 24.

Results: 24 of 122 patients (19.5%) had a recent pSS, 31 (25.4%) had systemic pSS and 67 (54.9%) had both. 33 (26.8%) had pulmonary manifestations, 63 (53%) an articular involvement and 33 (28%) a parotidomegaly. 113 patients were evaluated at week 24. For primary end point, 11/53 (20.7%) patients receiving placebo and 13/60 (21.7%) treated with RTX had a favourable overall response (P = 0.9). Similarly, the 30 points improvement for each VAS separately did not reach significance, although the delta of improvement of sicca and fatigue VAS were statistically improved in RTX group (P<0.05). Delta improvement between W24 and W0 was significant for the salivary flow rate (p<0.05) but not for other objectives variables (Schirmer, focus score, Chisholm score).

Conclusion: In this randomized, double blind, placebo controlled study, the efficacy of RTX, was not sufficient enough to allow its prescription in both recent and systemic pSS. Studies in specific unifrequent manifestations (thrombopenia, neurological disorders) or using more specific measurement tools (parotid ultrasound) are warranted.

Disclosures: V. Devauchelle-Pensec, Roche Pharmaceuticals, 5; X. Mariette, Roche Pharmaceuticals, 5; S. Jousse-Joulin, None; J. M. Berthelot, None; A. Perdriger, None; E. Hachulla, Roche Pharmaceuticals, 5; X. Puechal, None; V. Le Guern, None; J. Sibilia, J. E. Gottenberg, None; L. Chiche Sr, None; V. Goeb, None; G. Hayem, None; J. Morel, Roche Pharmaceuticals, 5; C. Zarnitsky, None; J. Dubost, None; J. O. Pers, None; E. Nowak, None; A. Saura, Roche Pharmaceuticals, 5.

2555

Results of the Beliss Study, the First Open Phase 2 Study of Belimumab in Primary Sjögren’s Syndrome. Xavier Mariette1, Luca Quartuccio2, Raphaelle Seror3, Sara Salvini4, Frederic Desmoulins5, Martina Fabris5, Sara Villeneuve6, Philippe Ravaud7, and Salvatore De Vita8. 1 Université Paris-Sud, Le Kremlin Bicêtre, France, 2 Rheumatology Clinic, DSMB, University of Udine, Italy, 3 University Hospital Bern, 4 Cochin Hospital, 5 Université Paris-Sud, 6 Hotel Dieu, Paris, France, 7 Hotel Dieu, Paris, France, 8 Université Paris-Sud, DSMB, University of Udine, Italy.

Background/Purpose: The BAFF (or BlyS) cytokine plays a key role in the pathogenesis of primary Sjögren’s syndrome (pSS). Belimumab, the first biological treatment inhibiting soluble BAFF, has proved its effectiveness and has been recently approved in systemic lupus. Lupus and pSS share a lot of pathogenic mechanism including interferon signature and BAFF involvement. Both open labelled and small controlled studies have suggested the efficacy of Rituximab in specific subgroups of pSS patients.

Methods: Patients were included in 2 simultaneous and identical studies in 2 European Centres. Patients had to fulfil AECG criteria, to be anti-SSA/SSB positive and had to have at the time of inclusion either systemic complications, early disease (≤ 5 years), or the presence of at least one other biomarker of B-cell activation (increase in IgG, C4, beta2-microglobulin, decrease in C4, presence of cryoglobulinaemia or monoclonal component). The patients were treated with belimumab 10 mg/kg W0, W2, W4 and then every four weeks until W24.

The primary end-point was evaluated at W28 and consisted of improvement...
of 2 of the 5 following items: 1- ≥ 30% reduction of patient’s dryness VAS, 2- ≥ 30% reduction of patient’s fatigue VAS, 3- ≥ 30% reduction of patient’s musculoskeletal pain VAS, 4- ≥ 30% reduction of physician’s systemic activity VAS, 5- ≥ 25% reduction of any of the following B cell activation biomarkers (free light chains of immunoglobulins, beta2-microglobulin, monoclonal component, cryoglobulinemia, IgG) or ≥ 25% C4 increase.

Results: Thirty patients were included, 15 in each center (all female, mean age 49.5 ± 16.5, mean disease duration = 5.7 yrs ± 5.6). 15 patients had systemic complications, 11 had early disease and 20 had at least one other biomarker of B-cell activation. 19/30 (63%) reached the primary end-point. For each individual component the response was as follows: VAS dryness: 10 (33%), VAS fatigue: 7 (23%), VAS pain: 7 (23%), VAS physician’s systemic activity: 12 (40%), biological component: 18 (60%). The percentage of responders was 81% (75%) in early disease and 715% (47%) in systemic disease.

The CSSDAI (EULAR Sjögren’s Syndrome Disease Activity Index) score decreased from 8.8 ± 7.39 to 5.59 ± 5.49 (p < 0.0001). The ESSPRI (EULAR Sjögren’s Syndrome Patients Reported Index) score decreased from 6.44 ± 1.11 to 5.56 (p = 0.01). There was no significant change of salivary flow (0.62 ± 1.23 to 0.75 ± 1.23; p = 0.43) and Schirmer test (4.09 ± 7.23 to 4.72 ± 8.08; p = 0.17).

The treatment induced significant changes of some biological data: serum IgG from 20.92 ± 10.25 to 18.53 ± 7.21 (p < 0.0001); serum IgA from 4.08 ± 3.02 to 3.23 ± 1.87 (p = 0.001), kappa free light chain from 33.15 ± 24.65 to 25.59 ± 25.42 (p < 0.0001), lambda free light chain from 28.31 ± 16.59 to 20.85 ± 12.24 (p < 0.0001), rheumatoid factor from 146 ± 174 to 97 ± 91 (p < 0.0001).

Concerning safety, we observed 1 severe adverse event which was a pneumococcus meningitis after 6 infusions of the drug. This patient, who was responder to belimumab, recovered completely without any sequelae.

Conclusion: Results of this first open phase 2 study of belimumab in pSS patients are very encouraging and justify the realization of randomized control trials with the drug in selected populations of patients with pSS.

Disclosure: L. Sun None; D. Wang None; J. Xu None; S. Wang None.

ACR Concurrent Abstract Session
Spondylarthropathies and Psoriatic Arthritis - Clinical Aspects and Treatment: Ps 241
Tuesday, November 13, 2012, 4:30 pm–6:00 pm

2557
Ustekinumab in Active Psoriatic Arthritis Including Patients Previously Treated with Anti-TNF Agents: Results of a Phase 3, Multicenter, Double-Blind, Placebo-Controlled Study. Christopher T. Ritchlin1, Alice B. Gottlieb1, Iain B. McInnes3, Lluis Puig4, Shu Li, Yuhua Wang6, Mitte K. Doyle1, Alan Mendelsohn8, and Arthur Kavanaugh9.

Double-Blind, Placebo-Controlled Study. Ustekinumab in Active Psoriatic Arthritis Including Patients Previously Treated with Anti-TNF Agents: Results of a Phase 3, Multicenter, Double-Blind, Placebo-Controlled Study. Christopher T. Ritchlin1, Alice B. Gottlieb1, Iain B. McInnes3, Lluis Puig4, Shu Li, Yuhua Wang6, Mitte K. Doyle1, Alan Mendelsohn8, and Arthur Kavanaugh9.

Disclosure: L. Sun None; D. Wang None; J. Xu None; S. Wang None.
Patients Achieving Endpoint at Week 24 (n/N [%] or Median [Min, Max]): Overall randomized population and Sub-groups (anti-TNF-naive [no prior anti-TNF use] and previous anti-TNF use)

<table>
<thead>
<tr>
<th>Week 24 Response</th>
<th>PBO</th>
<th>UST 45mg</th>
<th>UST 90mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR 20 Overall</td>
<td>N=312</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21/104 (20.2%)</td>
<td>45/103 (43.7%)</td>
<td>46/105 (43.8%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.001</td>
<td>p = 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous anti TNF (N=180)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9/62 (14.5%)</td>
<td>22/60 (36.7%)</td>
<td>20/58 (34.5%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.006</td>
<td>p = 0.011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-TNF-naive (N=112)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/42 (28.6%)</td>
<td>23/43 (53.5%)</td>
<td>26/47 (55.3%)</td>
<td></td>
</tr>
<tr>
<td>p = 0.021</td>
<td>p = 0.011</td>
<td></td>
<td></td>
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<tr>
<td>ACR 50 Overall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/104 (6.7%)</td>
<td>18/103 (17.5%)</td>
<td>24/105 (22.9%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.018</td>
<td>p = 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous anti TNF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/62 (6.5%)</td>
<td>9/60 (15.0%)</td>
<td>9/58 (15.5%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.138</td>
<td>p = 0.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-TNF-naive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/42 (7.1%)</td>
<td>9/43 (20.9%)</td>
<td>15/47 (31.9%)</td>
<td></td>
</tr>
<tr>
<td>p = 0.084</td>
<td>p = 0.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACR 70 Overall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/104 (2.9%)</td>
<td>7/103 (6.8%)</td>
<td>9/105 (8.6%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.190</td>
<td>p = 0.078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous anti TNF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/62 (1.6%)</td>
<td>3/60 (5.0%)</td>
<td>3/58 (5.2%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.322</td>
<td>p = 0.286</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-TNF-naive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/42 (4.8%)</td>
<td>4/43 (9.3%)</td>
<td>6/47 (12.8%)</td>
<td></td>
</tr>
<tr>
<td>p = 0.473</td>
<td>p = 0.215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASI 75* Overall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/80 (5.0%)</td>
<td>41/80 (51.3%)</td>
<td>45/81 (55.6%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.001</td>
<td>p &lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous anti TNF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/50 (2.0%)</td>
<td>20/44 (45.5%)</td>
<td>20/41 (48.8%)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.001</td>
<td>p &lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-TNF-naive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/30 (10.0%)</td>
<td>21/36 (58.3%)</td>
<td>25/40 (62.5%)</td>
<td></td>
</tr>
<tr>
<td>*p &lt; 0.001</td>
<td>p &lt; 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median HAQ-DI change from baseline Overall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00 (–0.13, 1.0)</td>
<td>0.13 (–1.0, 0.1)</td>
<td>0.25 (–1.0, 1.5)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.001</td>
<td>p = 0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00 (–1.0, 0.9)</td>
<td>0.13 (–1.0, 1.0)</td>
<td>0.19 (–1.0, 1.5)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.018</td>
<td>p = 0.012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-TNF-naive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00 (–1.3, 1.0)</td>
<td>0.25 (–1.5, 0.8)</td>
<td>0.25 (–1.4, 0.6)</td>
<td></td>
</tr>
<tr>
<td>*p = 0.034</td>
<td>p = 0.018</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*pAmong patients with ≥3% BSA psoriatic involvement at baseline

Conclusion: UST reduced signs & symptoms, improved physical func, enthesis & improved plaque PsO. Safety profiles were similar between UST & PBO.


2558

Clinical Response, Drug Survival and Predictors Thereof Among 548 Switchers of Tumor Necrosis Factor Alpha Inhibitor Therapy in Psoriatic Arthritis, Results From the Danish Nationwide Danbio Registry. Bente Glintborg1, Mikkel Østergaard2, Niels Steen Krogh1, Martin Dehn Andersen1, Ullrik Tarp1, Anne Gitte Løff, Hanne M. Lindegaard1, Mette Holland-Fischer1, Henrik Nordin1, Dorte Vendelbo Jensen2 and Merete L. Hetland1. 1Copenhagen University Hospital Gentofte, Copenhagen, Denmark, 2Glostrup Hospital, Copenhagen, Denmark, 3ZiteLab Aps, Copenhagen, Denmark, 4DANBIO, On behalf of Depts of Rheumatology, North, South, Central and Zealand Capital Region, Copenhagen, Denmark, 5Copenhagen University and Glostrup Hospital, Copenhagen, Denmark

Background/Purpose: Treatment with tumor-necrosis-factor-alpha inhibitors (TNFi) has improved the outcome in patients with psoriatic arthritis (PsA) who have failed treatment with synthetic disease modifying antirheumatic drugs (DMARDs). Failure may be due to insufficient effect or adverse events. However, knowledge on the effect of switching is scarce. We aimed to investigate frequencies and reasons for switching, treatment responses, drug survival and predictors in patients with PsA who switched TNFi treatment in routine clinical care.

Methods: PsA patients were identified in the Danish nationwide DANBIO registry. Disease activity, treatment responses (ACR20/50/70 and EULAR good response at 3 and 6 months), drug survival and predictors thereof were studied in patients receiving ≥2 different biological drugs.

Results: Of 1,422 PsA patients starting TNFi treatment, 548 patients (39%) switched to a second and 189 (13%) to a third biological drug during up to 10 years of follow-up. Compared to non-switchers, switchers were more frequently women (50%/45%), had shorter disease duration (4 years), higher Health Assessment Questionnaire (HAQ) (0.6–1.6)/0.9 (0.5–1.4) (median (interquartile-range)), higher 28-joint Disease Activity Score (DAS28) (4.8 (4.0–5.7)/4.4 (3.6–5.2)) and higher visual-analogue-scale (VAS) pain (65 (46–77)/62 (40–75) mm) and fatigue scores (67 (50–83)/64 (42–80) mm) when they started the first TNFi (all p<0.05). Main reason for switching was lack of response (57%). During the first, second and third treatment course HAQ, DAS28, CRP and VAS scores had decreased after 6 months’ treatment (all p<0.05). Median drug survivals were 2.2, 1.3 and 1.1 years respectively (Figure, p<0.001). Drug survivals were similar regardless of the reason for switching to the second TNFi. All response rates were lower during the second treatment course (all p<0.01 compared to the first treatment) and the proportion of patients achieving sustained ACR20, ACR50, ACR70 and EULAR good response between 3–6 months treatment was 22% (number needed to treat, NNT 4.5), 13% (7.9), 5% (20) and 19% (5.3), respectively. Male gender, fewer tender joints and lower VAS fatigue increased drug survival of the second TNFi.

Figure. Drug adherences by treatment course number. Kaplan Meyer drug survival curves.

Conclusion: Nearly 40% of PsA patients in clinical practice switched biological treatment. Response rates and drug survivals decreased after switching and only one fifth of patients achieved ACR20 or EULAR good response within 6 months after switching to a second biological.

Disclosure: B. Glintborg, None; M. Østergaard, Abbott Immunology Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 5, Abbott Immunology Pharmaceuticals, 8; Centocor, Inc., 5, Merck Pharmaceuticals, 5, Merck Pharmaceuticals, 8, Mundipharma, 8, Novo, 8, Pfizer Inc, 5, Pfizer Inc, 8, Roche Pharmaceuticals, 5, UCB, 5, UCB, 8, N. S. Krogh, None; M. D. Andersen, None; U. Tarp, None; A. G. Lof, MSD, UCB, Abbott, 8; H. M. Lindegaard, MSD, 8, Roche Pharmaceuticals, 8; M. Holland-Fischer, MSD, 8, UCB, 8; H. Nordin, None; D. V. Jensen, None; M. L. Hetland, Roche Pharmaceuticals, 5, Pfizer Inc, 8, MSD, 8, BMS, 8, Abbott Laboratories, 8, UCB, 8.

2559

Mortality in Patients with Psoriatic Arthritis Compared to Patients with Rheumatoid Arthritis, Psoriasis Alone, and the General Population. Alexis Ogdie1, Kevin Haynes2, Andrea Troxel2, Thorvardur Love3, Hyon K. Choi4 and Joel Gelfand3. 1University of Pennsylvania, Philadelphia, PA, 2University of Pennsylvania, Philadelphia, PA, 3Lapubital University Hospital, Reykjavik, Iceland, 4Boston University School of Medicine, University of British Columbia, Arthritis Research Centre of Canada, Boston, MA

Background/Purpose: Conflicting reports of the mortality risk among patients with psoriatic arthritis (PsA) exist in the literature, however excess mortality has been presumed given the elevated mortality rates in rheumatoid arthritis and psoriasis. Previous studies have been small, lacked internal compar-
ison groups, and were mostly performed in rheumatology clinics rather than the general population. The objective of this study was to examine the risk of mortality in patients with PsA as compared to matched controls as well as patients with psoriasis and rheumatoid arthritis (RA).

Methods: A longitudinal cohort study was performed. Patients aged 18–89 were selected from The Health Improvement Network (THIN), a large primary care medical record database in the United Kingdom, if they had a diagnosis of PsA, RA, or psoriasis. PsA and psoriasis diagnoses have been validated in THIN (positive predictive value 85% and 90% respectively). Up to 10 unexposed controls were matched on practice and start date within the practice for each patient with PsA. Data from 1994–2010 were included. Hazard ratios (HRs) were calculated using Cox proportional hazards models. A priori we hypothesized an interaction between disease status and Disease Modifying Antirheumatic Drug (DMARD) use. We used a purposeful selection modeling approach, including in the final model only confounders which changed the main effects by >15% and had a p-value of <0.1.

Results: Patients with PsA (N = 8,706), RA (N = 417,522), psoriasis (N = 138,424) and controls (N = 82,258) had mean age 50.7, 61.4, 47.6, and 49.9 years respectively. The average follow up time was 5.3 years, and 1,442,357 person-years were observed during which 21,825 deaths occurred. There was a significant interaction between disease and DMARD use and thus, stratified results are presented. Compared with population controls, patients with PsA did not have an increased risk of mortality after adjusting for age and sex and did not significantly differ by DMARD use (DMARD users: HR 0.94, 95% CI: 0.80–1.10, DMARD non-users: HR 1.06, 95% CI: 0.94–1.19). RA patients had increased mortality when compared to population controls (DMARD users HR 1.59, 95% CI: 1.32–1.96, DMARD non-users HR 1.54, 95% CI: 1.47–1.60). Similarly, patients with psoriasis who have not been prescribed a DMARD had a small increased risk of mortality compared to population controls (HR 1.08, 95% CI: 1.04–1.12) while those who had been prescribed a DMARD had a greater risk (HR 1.75, 95% CI: 1.56–1.95). These findings were unchanged after adjustment for baseline comorbidities including Charlson comorbidity index, cardiovascular disease, renal disease, diabetes, body mass index, depression and smoking status. Adjusting for start year in the cohort did not change the results.

Conclusion: Patients with RA and psoriasis had increased mortality compared to the general population, a finding corroborated by previous studies. Despite increased mortality in these related conditions, however, patients with PsA did not have a statistically significant increased risk of mortality in this study.

Disclosure: A. Ogdie, None; K. Haynes, None; A. Troxel, None; T. Love, None; H. K. Choi, None; J. Gelland, Amgen, 5; Abbott Immunology Pharmaceuticals, 5, Centocor, Inc., 5, Celgene, 5, Novartis Pharmaceutical Corporation, 5, Pfizer Inc, 5, Amgen, 2, Abbott Immunology Pharmaceuticals, 2, Pfizer Inc, 2, Novartis Pharmaceutical Corporation, 2, Genentech and Biogen IDEC Inc., 2.

2560

Response and Drug Survival of 1st TNF-Inhibitor in 440 Patients with Psoriatic Arthritis - What Is the Role of Co-Medication with Methotrexate? Karen M. Fagerli1, Elisabeth Lie1, Désiree van der Heijde2, Marte S. Heiberg3, Erikstad4, Luft5, K. Kvien1, 1Diakonhjemmet Hospital, Oslo, Norway, 2Leiden University Medical Center, Leiden, Netherlands, 3Diakonhjemmet hospital, Oslo, Norway, 4St. Olavs Hospital, Trondheim, Norway, 5Drømmen Hospital, Drammen, Norway, 6Tronson, Norway, 7Lillehammer Hospital for Rheumatic Diseases, Lillehammer, Norway

Background/Purpose: It is well established that methotrexate (MTX) co-medication improves efficacy of TNF-inhibitors (TNFi) in rheumatoid arthritis, while in ankylosing spondylitis it is widely accepted that it does not. The role of MTX co-medication in psoriatic arthritis (PsA) is still unclear. Our objective was to investigate if patients receiving concomitant MTX have better responses and drug survival to their 1st TNFi.

Methods: Data are from NOR-DMARD, an observational study of adult patients with inflammatory arthropathies starting DMARD-treatment. Patients with PsA receiving their 1st TNFi, either combined with MTX or in monotherapy, were selected. Due to heterogeneity in clinical presentation, the selected outcome measures were patient and physician global assessments, MHAQ and SF-6D. Baseline characteristics and state and change at 3, 6 and 12 months were compared by two-sample t-test and Chi² test, as appropriate. Drug survival at 1, 2 and 3 years was compared using Kaplan-Meier analysis with log-rank test, and sub-analyses were done for patients receiving Infliximab (IFX), Etanercept (ETN) and Adalimumab (ADA).

Results: 440 patients were included. We found significant baseline group differences in no. of swollen joints, physician global and SF6D scores (table 1). Three-month states and responses were similar between the groups, with significant differences only for physician global (table 1). Similar results were seen at 6 and 12 months. We did, however, find improved drug survival in the combination group (fig. 1) reaching statistical significance at 1 and 2 years. This was most prominent for IFX (p = 0.01) and negligible for ETN (p = 0.79), with a trend for ADA (p = 0.12).

Table 1.

<table>
<thead>
<tr>
<th>Baseline characteristics</th>
<th>Overall</th>
<th>No co-medication</th>
<th>MTX co-medication</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>46.5 (11.6)</td>
<td>47.0 (11.4)</td>
<td>46.1 (11.7)</td>
<td>0.46</td>
</tr>
<tr>
<td><strong>Females (%)</strong></td>
<td>46.4</td>
<td>47.6</td>
<td>45.6</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Disease duration (yrs)</strong></td>
<td>5.2 (1.5–12.5)</td>
<td>5.1 (1.1–11.7)</td>
<td>5.5 (1.6–12.7)</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>No of prev. DMARDs</strong></td>
<td>1.49 (1.09)</td>
<td>1.49 (1.20)</td>
<td>1.48 (1.02)</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>Swollen joints</strong></td>
<td>3 (1–9)</td>
<td>2 (0–5)</td>
<td>3 (1–7)</td>
<td>0.004</td>
</tr>
<tr>
<td><strong>CRP mg/l</strong></td>
<td>9 (5–20)</td>
<td>7 (3–22)</td>
<td>9 (5–20)</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>Physician global</strong></td>
<td>37.4 (17.9)</td>
<td>39.6 (19.2)</td>
<td>36.0 (16.9)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Patient global (0–100)</strong></td>
<td>54.6 (23.7)</td>
<td>56.5 (22.3)</td>
<td>53.4 (22.5)</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>MHAQ score (0–3)</strong></td>
<td>0.07 (0.46)</td>
<td>0.72 (0.47)</td>
<td>0.69 (0.46)</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>SF-6D score (0–1)</strong></td>
<td>0.59 (0.12)</td>
<td>0.57 (0.12)</td>
<td>0.60 (0.12)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

3-month responses

| Physician global | 15.9 (15.0) | 18.5 (17.1) | 14.4 (13.5) | 0.02 |
| Patient global | 21.7 (22.1) | 23.5 (22.1) | 22.6 (21.7) | 0.32 |
| **MHAQ score (0–3)** | 0.39 (0.44) | 0.42 (0.2) | 0.37 (0.40) | 0.50 |
| **SF-6D (0–1)** | 0.70 (0.15) | 0.68 (0.15) | 0.70 (0.14) | 0.15 |

Values are expressed as mean (SD) unless otherwise stated

**Median(IQR)**

Conclusion: We found similar responses at 3 months in PsA patients receiving their first TNFi with and without MTX co-medication. However, drug survival was better in patients receiving concomitant MTX, and this was most prominent in patients receiving IFX.

Disclosure: K. M. Fagerli, Abbott Immunology Pharmaceuticals, 8, Pfizer Inc, 8, Merck Pharmaceuticals, 8, Roche Pharmaceuticals, 8, E. Lie, Roche Pharmaceuticals, 5, Pfizer Inc, 8, D. van der Heijde, Abbott Laboratories; Amgen; AstraZeneca; BMS; Centocor; Chugai; Eli-Lilly; GSK; Merck; Novartis; Pfizer; Roche; Sanofi-Aventis; Schering-Plough; UCB; Wyeth, 5, Imaging Rheumatology, 4, M. S. Heiberg, None; E. Rodevand, None; S. Lebberg, Pfizer Inc, 8, Roche Pharmaceuticals, 8, Merck Pharmaceuticals, 8, Abbott Immunology Pharmaceuticals, 8, S. Kalstad, None; K. Mikkelson, None; T. K. Kielen, Abbott Immunology Pharmaceuticals, 8, AstraZenea, 8, Novartis Pharmaceutical Corporation, 5, Novartis Pharmaceuticals, 8, UCB, 8, BMS, 5, Abbott Immunology Pharmaceuticals, 5, Merck Pharmaceuticals, 5, NiCox, S.A., 8, Pfizer Inc, 8, Roche Pharmaceuticals, 5, UCB, 5.
Switching Between TNF-Inhibitors in Psoriatic Arthritis: Data From the NOR-DMARD Study. Karen M. Fagerli1, Elisabeth Lie2, Desiree van der Heijde3, Marte S. Heiberg4, Ase S. Lekberg5, Knut MikkelSEN6, Erik Rodevand7, Synnøve Kalstad7 and Tore K. Kvien1. 1Diakonhjemmet Hospital, Oslo, Norway, 2Leiden University Medical Center, Leiden, Netherlands, 3Diakonhjemmet hospital, Oslo, Norway, 4Vestre Viken, Drammen, Norway, 5Lillehammer Hospital for Rheumatic Diseases, Lillehammer, Norway, 6St. Olav’s Hospital, Trondheim, Norway, 7Tromsø, Norway

**Background/Purpose:** Although TNF-inhibitors (TNFi) have proven efficacy in psoriatic arthritis (PsA), some patients do not respond to or do not tolerate their first TNFi. The efficacy of a second TNFi in this group is not well established. Our objective was to investigate the efficacy of switching to a second TNFi in PsA patients.

**Methods:** Patients were selected from NOR-DMARD – a longitudinal observational study (LOS) in which patients with inflammatory arthropathies are included when starting a new disease-modifying anti-rheumatic drug (DMARD). Patients with PsA receiving their 1st TNFi were selected, and among these patients a subgroup who later switched to a 2nd TNFi was identified (switchers). Three-month response and one year drug-survival were assessed for non-switchers and for the 1st and 2nd TNFi of the switchers. Selected outcome measures were ACR20/50/70 and EULAR responses, DAS28 remission and low disease activity rates, patient and physician global, MHAQ and SF6D. Both state and change from baseline were assessed, and compared statistically between switchers and non-switchers using Chi² and MHAQ and SF6D. Both state and change from baseline were assessed, and these differences were significant differences between switchers and non-switchers at baseline. There also assessed.

**Results:** Baseline characteristics are shown in table 1. There were no significant differences between switchers and non-switchers at baseline. There were significant differences in response between non-switchers and switchers receiving their 1st TNFi for several outcome measures, and these differences were more pronounced for the 2nd TNFi of the switchers with highly significant p-values for most outcome measures (table 2). One-year drug survival for the 2nd TNFi in switchers and non-switchers was 0.56 vs. 0.83 (p-value<0.001).

**Table 1.** Baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Non-switchers (N=344)</th>
<th>Switchers (N=95)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong> (yrs)</td>
<td>46.8 (11.7)</td>
<td>46.1 (11.6)</td>
</tr>
<tr>
<td><strong>Males sex (%)</strong></td>
<td>55.2</td>
<td>48.4</td>
</tr>
<tr>
<td><strong>Type of TNFi (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Etanercept</td>
<td>40.4</td>
<td>52.6</td>
</tr>
<tr>
<td>Infliximab</td>
<td>10.5</td>
<td>13.7</td>
</tr>
<tr>
<td>Adalimumab</td>
<td>20.0</td>
<td>29.5</td>
</tr>
<tr>
<td>Golimumab</td>
<td>30.5</td>
<td>42.0</td>
</tr>
<tr>
<td>Certolizumab</td>
<td>1.2</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Co-Medication (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease duration (yrs)</td>
<td>6.0 (1.5–12.4)</td>
<td>4.7 (1.3–13.8)</td>
</tr>
<tr>
<td><strong>Current smoker (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.9</td>
<td>39.0</td>
<td>32.6</td>
</tr>
<tr>
<td>Previous DMDs (%)</td>
<td>15.1</td>
<td>15.1</td>
</tr>
<tr>
<td>CRP (median IQR)</td>
<td>9.5 (20)</td>
<td>8.4 (27)</td>
</tr>
<tr>
<td>Swollen joints</td>
<td>3 (1–6)</td>
<td>3 (1–6)</td>
</tr>
</tbody>
</table>

**Table 2.** 3-month response

<table>
<thead>
<tr>
<th></th>
<th>Non-switchers</th>
<th>Switchers</th>
<th><em>p</em>-value</th>
<th>Non-switchers</th>
<th>Switchers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR20 (%)</td>
<td>6.0 (3.3)</td>
<td>9.0 (2.8)</td>
<td>0.05</td>
<td>0.005</td>
<td>0.003</td>
</tr>
<tr>
<td>ACR50 (%)</td>
<td>40.0</td>
<td>35.2</td>
<td>0.04</td>
<td>0.002</td>
<td>0.003</td>
</tr>
<tr>
<td>ACR70 (%)</td>
<td>35.1</td>
<td>23.4</td>
<td>0.23</td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>EULAR response (%)</strong></td>
<td>5.0 (4.6)</td>
<td>7.0 (5.6)</td>
<td>0.65</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>DAS28 &lt;2.6 (%)</td>
<td>64.6</td>
<td>90.0</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>DAS43 S3.1 (%)</td>
<td>57.5</td>
<td>57.5</td>
<td>0.01</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>DAS84 S4.1 (%)</td>
<td>2.4 (0.3)</td>
<td>3.2 (1.6)</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Mean (SD) unless otherwise indicated.** Vas = Modified health assessment questionnaire; Sp-FD = Short form -6 dimensions (0–1).

The overall ACR 20/50/70 responses for the 1st TNFi (n=439) were 59.9/37/29.6%, and the estimated 1-year drug survival was 0.74 – hence clearly superior to the 2nd TNFi (table 2).

**Conclusion:** Among patients with PsA who switched to a second TNFi after having failed their first TNFi, less than half achieved a clinical response at 3 months in this LOS. This observation highlights the need for treatments for PsA with other mechanisms of action.

**Disclosure:** K. M. Fagerli, Abbott Immunology Pharmaceuticals, 8, Pfizer Inc, 8, Merck & Co., 8, Roche Pharmaceuticals, 8, Roche Pharmaceutical, 8, Merck & Co., 8, Merck & Co., 8, Merck & Co., 8; R. R. Enneking, None; S. Lexberg, Abbott Immunology Pharmaceuticals, 8, Pfizer Inc, 8, Roche Pharmaceuticals, 8, Merck & Co., 8; E. Rodevand, None; S. Kalstad, None; T. K. Kvien, Abbott Immunology Pharmaceuticals, 8, AstraZeneca, 8, Merck Pharmaceuticals, 8, NilCo, S.A., 8, Pfizer Inc, 8, Roche Pharmaceuticals, 8, UCS, 8, BMS, 5, Abbott Immunology Pharmaceuticals, 5, Merck Pharmaceuticals, 5, NilCo, S.A., 5, Pfizer Inc, 5, Roche Pharmaceuticals, 5, UCS, 5.

**2562**

**Ustekinumab in Patients with Active Psoriatic Arthritis: Results of the Phase 3, Multicenter, Double-Blind, Placebo-Controlled Puimt I Study.** Arthur Kavanaugh1, Iain M. McInnes2, Alice B. Gottlieb3, Lluís Puig4, Proton Rahman5, Christopher T. Ritchlin6, Shu Li7, Yuhua Wang7, Alan MendelsJoh1 and Mitti K. Doyle.1 1UCSD School of Medicine, La Jolla, CA, 2University of Glasgow, Glasgow, United Kingdom, 3Tufts Medical Center, Boston, MA, 4Universitat Autònoma de Barcelona, 5Memorial University, St. Johns, NF, 6University of Rochester Medical Center, Rochester, NY, 7Janssen Research & Development, LLC, Spring House, PA

**Background/Purpose:** To assess efficacy and safety of ustekinumab (UST) in reducing signs and symptoms of active psoriatic arthritis (PsA) in a Phase 3, multicenter, double-blind, placebo-controlled, 5-mg dose-escalation, pivotal trial in patients (pts) with PsA with active disease (≥3/5 SJC and ≥5 TJC; CRP≥0.3mg/dl) despite DMARD and/or NSAID therapy who were randomized to receive ustekinumab 45mg, 90mg, or PBO at wks 0, 4, and 12, respectively. At wk16, pts with ≤5% improvement in TJC & SJC entered blinded early escape (PBO—UST 45mg or 90mg until wk24). Stable concomitant MTX use was permitted but not mandated. Pts treated with prior anti-TNF agents were excluded. Primary endpoint was ACR20 response at wk24. Secondary endpoints at wk24 included: ACR 50/70; DAS28-2CRP response, change from baseline (BL) in HAQ-DI, PASI75 response (in pts ≤3% BSA involvement), and percent change from baseline in enthesitis and dactylitis scores (in pts affected at baseline). Adverse events (AE) are reported through the PBO-controlled period (wk16) and through wk24.

**Methods:** Adult PsA pts (n=615) with active disease (≥3/5 SJC and ≥5 TJC; CRP≥0.3mg/dl) despite DMARD and/or NSAID therapy were randomly assigned to receive ustekinumab 45mg, 90mg, or PBO at wks 0, 4, and 12, respectively. At wk16, pts with ≤5% improvement in TJC & SJC entered blinded early escape (PBO—UST 45mg or 90mg—until wk24). Stable concomitant MTX use was permitted but not mandated. Pts treated with prior anti-TNF agents were excluded. Primary endpoint was ACR20 response at wk24. Secondary endpoints at wk24 included: ACR 50/70; DAS28-2CRP response, change from baseline (BL) in HAQ-DI, PASI75 response (in pts ≤3% BSA involvement), and percent change from baseline in enthesitis and dactylitis scores (in pts affected at baseline). Adverse events (AE) are reported through the PBO-controlled period (wk16) and through wk24.

**Results:** Significantly greater proportions of UST-treated vs PBO-treated pts had ACR20 response at wk24 (Table). Significant improvements were also observed with UST45mg and 90mg for ACR50/70 responses and DAS28-2CRP responses at wk24 vs PBO. The changes from baseline in HAQ-DI at wk24 were significantly greater in the UST than PBO grp, and significantly greater proportions of UST-treated pts had a clinically meaningful change from baseline in HAQ-DI (≥0.3). Nearly half used concomitant MTX at baseline; this did not alter the likelihood of benefit of UST vs PBO. While ACR responses were greater with UST than PBO regardless of MTX use, differences were numerically larger among pts not taking MTX. Of 440pts with ≥3% BSA involvement at baseline, significantly larger proportions of UST pts achieved PASI 75 at wk24. Among pts affected with enthesis (n=425) or dactylitis (n=286) at baseline, significantly greater improvements in enthesis and dactylitis were observed at wk24 in the UST grp than PBO. Through wk16, the proportion of pts with ≥1 AE was similar between pts receiving UST (41.1%) and PBO (42.0%), with infections being the most common AE; 1.7% (UST) and 2.0% (PBO) had ≥1 serious AE. No
malignancies, serious infections, TB, opportunistic infections, or deaths occurred through wk 24.

<table>
<thead>
<tr>
<th>Table.</th>
<th>PSUMMIT efficacy results at Wk 24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PBO (n = 206)</td>
</tr>
<tr>
<td>ACR20, %</td>
<td>22.8</td>
</tr>
<tr>
<td>ACR50, %</td>
<td>8.7</td>
</tr>
<tr>
<td>ACR70, %</td>
<td>2.4</td>
</tr>
<tr>
<td>DAS28-CRP response, %</td>
<td>34.5</td>
</tr>
<tr>
<td>Median HAQ-DI change from baseline</td>
<td>0</td>
</tr>
<tr>
<td>Pts with ≥0.3 reduction, %</td>
<td>28.2</td>
</tr>
<tr>
<td>PASI75*, %</td>
<td>11</td>
</tr>
<tr>
<td>Median % change in enthesis score*</td>
<td>0</td>
</tr>
<tr>
<td>Median % change in dactylitis score*</td>
<td>0</td>
</tr>
</tbody>
</table>

* Among pts affected at baseline; p < 0.001 for all parameters vs PBO.

Conclusion: In pts with active PsA, UST significantly reduced the signs and symptoms of arthritis, improved physical function, enthesis and dactyritis, and improved plaque psoriasis vs PBO-treated pts at wk 24. Safety profiles were similar between UST- and PBO-treated pts.


ACR Concurrent Abstract Session
Vasculitis: Clinical Aspects
Tuesday, November 13, 2012, 4:30 PM–6:00 PM

2563
Factors Associated with Major Cardiovascular Events in Patients with Primary Systemic Necrotizing Vasculitides: Results of a Longitudinal Long-Term Follow-up Study.

Background/Purpose: The presence of autoantibodies specific for neutrophil cytoplasmic antigens (ANCA) is associated with higher cardiovascular (CV) risk in patients with ANCA-associated vasculitis (AAV). The objective of this study was to evaluate whether AAV is associated with an increased risk of major cardiovascular events.

Methods: We conducted a longitudinal, observational cohort study of patients with AAV diagnosed at 9 centers. The primary endpoint was the occurrence of a major adverse cardiovascular event (MACE), defined as death from CV disease, myocardial infarction, stroke, or CV hospitalization. Cox regression models were used to determine the adjusted hazard ratios for MACE associated with CV risk factors and other AAV-related variables. The model included all variables associated with MACE in univariate analysis.

Results: We evaluated 1,074 patients with AAV (53% GPA, 47% MPA) enrolled at the time of disease diagnosis. The median follow-up time was 6.0 years (range: 0.1–17.0 years). The cumulative incidence of MACE was 21% (95% CI: 18–23%). The adjusted hazard ratios for MACE associated with CV risk factors and other AAV-related variables are shown in Table 1. The most significant risk factors were age, female sex, hypertension, diabetes, and smoking. The presence of ANCA, particularly c-ANCA, was associated with a significantly increased risk of MACE. Patients with GPA had a lower risk of MACE compared to patients with MPA (HR: 0.56, 95% CI: 0.31–1.02).

Conclusion: AAV is associated with a significant increased risk of MACE. The risk is higher in patients with MPA compared to patients with GPA. The risk is independent of CV risk factors and can be accurately predicted using a Cox proportional hazards model that includes age, sex, hypertension, diabetes, smoking, and ANCA status.

Disclosure: F. Bach, None; C. Pagnoux, None; G. Chironi, None; A. Simon, None; L. Mouthon Sr., None; L. Guillemin, None; D. Jayne, None; M. Mahr, None.

2564
A Risk Score for Predicting Short-Term Incidence of Death or Relapse in Anti-Neutrophil Cytoplasmic Antibody-Associated Vasculitis.

Background/Purpose: Anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitis (AAV), combining granulomatosis with polyangiitis (GPA) and microscopic polyangiitis (MPA), is associated with a substantial risk of relapse or death. Particularly, the first year after diagnosis is characterized by a marked excess of vasculitis-related deaths. The factors determining risk of death or relapse in the long term have been widely investigated, but those determining short-term outcome are not well known. Accurate prediction of short-term prognosis is crucial to identify patients at highest risk of an adverse event. We aimed to develop a risk score to predict the 1-year risk of death or relapse in newly diagnosed AAV.

Methods: We studied patients with incident AAV enrolled in 4 international, randomized, multicenter clinical trials focusing on various subgroups with AAV. An initial set of 22 candidate variables, including the main demographic, clinical and laboratory data, all assessed at diagnosis, and GPA or MPA diagnoses, were considered for predicting 1-year survival or relapse risk. A stepwise approach using univariate and multivariate logistic regression models in 2,000 bootstrap samples was used to identify variables that best predicted death or relapse at 1 year. The regression coefficients computed in the final multivariate model were used to derive weights for each of the identified predictors of the composite outcome. The discriminative ability of the final score was evaluated by analysis of the area under the receiver operating characteristic curve (AUC). A sensitivity analysis was performed with multiple imputation methods to account for missing data and calculate an AUC for the complete dataset.

Results: Among the 535 subjects, we had complete data for all 22 analyzed variables for 441 subjects (244 GPA, 197 MPA). At 1-year follow-up, we recorded 44 deaths (10.0%) and 12 relapses (3.3%). We retained 9 variables, assigned weights of 1 to 3, for the final risk score model: age > 60 yr (1 point); female sex (1); ear, nose and throat involvement (1); serum creatinine level > 100 micro mole/l (1); ANCA directed against proteinase 3 (PR3-ANCA) (1) and myeloperoxidase (MPO-ANCA) (3); peripheral neutrophil count > 7,000/mm3 (2); hemoglobin level < 10 g/dl (1) and C-reactive protein level > 10 mg/l (1). Each patient was assigned a risk score between 0 and 15. Accordingly, the 1-year risk for death or relapse was low (<5%) for 32% of patients, medium (5–20%) for 50%, and high (>20%) for 18%. The AUC for the prediction model was 0.79 (95% confidence interval 0.73–0.85) and 0.78 for the whole dataset of 535 subjects after missing-data imputation.

Conclusion: This integrative AAV-risk prediction score may be useful in predicting a patient’s risk of death or relapse on short-term follow-up and may contribute to better risk-stratified characterization and management of AAV. Further validation in other AAV populations is required.

Disclosure: C. Maldini, None; M. Resche-Rigon, None; D. Jayne, None; K. Westman, None; A. Mahr, None.

Background/Purpose: Anti-neutrophil cytoplasmic antibodies (ANCAs), particularly those directed against proteasome 3 (anti-PR3) or myeloperoxidase (anti-MPO), are considered a highly specific hallmark of ANCA-associated vasculitis. Thus, false-positive ANCA tests have been reported in the context of drug exposure or infection, and several small case studies suggested that ANCAs can be detected in infective endocarditis (IE). This situation, combined with the multisystem protein presentation of IE, may lead to inappropriate diagnosis and therapy. Because the frequency of ANCAs in IE is unknown, we assessed the prevalence of ANCAs in a relatively large number of cases with IE.

Methods: The study was conducted in the framework of a prospective cohort of patients who were diagnosed with IE in 2005 in a single university hospital. Data on the principal demographic, clinical, laboratory (including serum creatinin and hematuria) and microbiological features were collected by a standardized questionnaire. Sera were stored for all patients who gave informed consent for blood sampling. Among the patients for whom sera were stored, we selected those with blood sampled not later than 30 days after the initiation of antibiotic therapy. All selected sera were tested for ANCAs in a central laboratory using indirect immunofluorescence (IIF) assays, and positive results were confirmed by ELISA. IIF involved ethanol-fixed neutrophils and categorized positive tests for C-ANCA (cytoplasmic pattern) or P-ANCA (perinuclear pattern). ELISA for anti-PR3 and anti-MPO specificities involved use of commercially available kits. In addition, we tested all sera for antinuclear antibodies by use of a commercially available indirect immunofluorescence test.

Results: Sera from 109 patients (81 [74%] men, mean age: 57.4 yrs [SD: 15.3]) were tested. All patients fulfilled Duke’s criteria for definite or probable endocarditis, and 33 (30%) had prosthetic valves. The major causative pathogens were Staphylococcus aureus (n = 30), Streptococcus (n = 23), Streptococcus bovis (n = 10) and Enterococci (n = 7). C-ANCA were found in 13 patients (12%, P-ANCA in 11 (10%) and 1 case (1%) showed both patterns. ELISA revealed anti-PR3 in 4 cases (3%) and anti-MPO in 4 (3%), some with very high titer. The 8 anti-PR3/anti-MPO–positive IE cases involved various pathogens and both native and prosthesis valves. Testing for antinuclear antibodies revealed 44 positive to one or more specificities.

Conclusion: This study is the first to assess the prevalence of ANCAs in IE and suggests that ANCAs, including those with anti-PR3 or anti-MPO specificities, occur in a significant subset of cases. These observations considerably substantiate the consideration of IE as a potential cause of false ANCA positivity.

Disclosure: A. Mahr, None; F. Batteux, None; S. Tubiana, None; M. Wolff, None; C. Goulvestre, None; T. Papo, None; F. Vrotvski, None; I. Klein, None; B. Jung, None; X. Duval, None.

Aβ-Related Angiitis: Comparison with Patients with Amyloid Cerebral Angiopathy without Inflammation. Carlo Salvarani1, Caterina Giannini2, Robert D. Brown Jr.3, Teresa J. H. Christianson4 and Gene G. Hunder.1

1Arcispedale S Maria Nuova. IRCCS, Reggio Emilia, Italy; 2Mayo Clinic, Rochester, MN; 3Hospital Cochin, Paris, France; 4Hospital Bichat, Paris, France.

Background/Purpose: Coexistence of sporadic cerebral amyloid angiopathy (CAA) and primary central nervous system vasculitis (PCNSV) has been reported, particularly in patients with granulomatous vasculitis. This condition was termed Aβ-related angiitis (ABRA). We analyzed the clinical, radiographic, and pathological findings in a series of consecutive patients with pathologically diagnosed CAA. We describe the clinical characteristics of the patients with ABRA and compare them with the characteristics of patients with CAA without inflammation. Furthermore, we compare the features of patients with ABRA with those of PCNSV.

Methods: We reviewed all patients seen at the Mayo Clinic, Rochester, MN over the 25 year period of 1987 to 2011, who were diagnosed pathologically with CAA. Biopsy specimens were reviewed by one pathologist with appropriate expertise with clinical information. Patients with changes of Alzheimer’s disease were excluded. Of 74 identified patients, 46 did not show inflammation, 23 had ABRA, and 5 CAA-related inflammation (perivascular only). We also utilized our updated cohort of 131 consecutive patients with PCNSV seen over a 25 year period of 1983 to 2007 at Mayo Clinic, Rochester, MN. The diagnosis of PCNSV was based on brain/spinal cord biopsy or cerebral angiography, or both. 14/131 patients had ABRA. 9 additional patients with ABRA were identified between 2008 and 2011.

Results: The 23 patients with ABRA were compared with the 46 cases with CAA without inflammation. The presence of altered cognition (15/23 or 65.2% vs 41/46 or 89.1%, p = 0.017), hemiparesis (3/23 or 13% vs 18/46 or 39.1%, p = 0.026), persistent neuropsychologic deficit or stroke (5/23 or 21.7% vs 25/46 or 54.3%, p = 0.010), and intracranial hemorrhage (2/23 or 8.7% vs 31/46 or 67.4%, p < 0.001) at presentation were significantly less frequent in patients with ABRA than in the others. More patients with ABRA showed meningeal gadolinium enhancing lesions at MRI (13/23 or 56.5% vs 7/26 or 26.9%, p = 0.035). No differences in the demographics and cerebrospinal fluid (CSF) findings were observed in the two groups. Survival of the patients with CAA without inflammation was significantly lower compared to that of ABRA. The 23 patients with ABRA were compared to the other 117 patients with PCNSV (excluding the 14 patients with ABRA). The median age of patients with ABRA was significantly higher at diagnosis (67 years vs 47 years, p < 0.001). In ABRA patients, hemiparesis occurred less frequently at presentation (3/23 or 13% vs 51/117 or 43.6%, p = 0.006), while gadolinium enhanced meningeal lesions occurred more frequently (13/23 or 56.5% vs 12/104 or 11.5%, p < 0.001). CSF abnormalities (a protein level > 700 mg/L) were observed more frequently in patients with ABRA (15/20 or 75% vs 40/90 or 47.1%, p = 0.024). The median protein CSF levels were higher in patients with ABRA (995 mg/L vs 660 mg/L, p = 0.009). No differences in the survival were observed between these 2 groups.

Conclusion: ABRA appears to represent a condition clinically distinct from CAA and PCNSV. However, the vasculitis seems to influence the clinical findings to a greater degree than the presence of amyloid deposits in the vessels.

Disclosure: C. Salvarani, None; C. Giannini, None; R. D. Brown Jr., None; T. J. H. Christianson, None; G. G. Hunder, None.

Background/Purpose: Most subjects with ANCA–associated vasculitis (AVV) respond to treatment for remission induction, but predictors for complete disease remission are lacking. We have previously demonstrated that selected markers of inflammation and platelet activation (C-reactive protein (CRP), CD40 ligand (CD40L) interleukins (IL) 6 and 8, monocyte chemoattractant protein 1 (MCP-1), P-selectin and vascular endothelial growth factor (VEGF) are associated with disease activity in AAV. The aim of this study was to explore if levels of marker predict future complete remission in AAV.

Methods: Subjects were participants in the Rituximab versus cyclophosphamide for AAV clinical trial (RAVE). Subjects with active disease were randomized to either rituximab or cyclophosphamide in addition to treatment with glucocorticoids. Data from the baseline, 2-month, 4-month, and 6-month visits were used for this analysis. Disease activity was assessed with Birmingham Vasculitis Score for Wegener’s Granulomatosis (BVAS/WG). Complete remission was defined as BVAS/WG score at the baseline, 2-month, or 4-month visits, as appropriate. Serum levels of the raw marker levels and 6 months predicted complete remission at 6 months, logistic regression was used with complete remission as the outcome variable and marker-tertiles as independent variables. In additional analyses, the raw marker levels and log-transformed marker levels were used as independent variables in the model. The position (fold change) of markers at the 2-4 months visits (compared to the baseline visit), with complete remission at the 6-month visit were tested with logistic regression. All analyses were adjusted for the BVAS/WG score at the baseline, 2-month, or 4-month visits, as appropriate.
**Results:** 197 subjects participated in the RAVE trial. The mean BVAS/WG score at baseline was 8.37 (sd 3.13). At the 6-month visit, 115 subjects achieved complete remission. Subjects with CRP levels in the third tertile at the 2-month and 4-month visits had lower odds of achieving complete remission at 6 months and subjects with IL-8 levels in the third tertile at the baseline, 2-month, and 4-month visits had lower odds of achieving complete remission at the 6-month visit compared to subjects in the lowest tertile (Table). In analyses using the raw or log-transformed marker levels, no marker was significantly associated with future remission, nor were changes in marker levels from the baseline visit associated with future complete remission.

Odds ratios and 95% confidence interval for achieving complete remission at 6 months, according to marker level

<table>
<thead>
<tr>
<th>Marker</th>
<th>Baseline (n=197)</th>
<th>Month 2 (n=184)</th>
<th>Month 4 (n=180)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lowest tertile</td>
<td>reference</td>
<td>reference</td>
<td>reference</td>
</tr>
<tr>
<td>middle tertile</td>
<td>0.67 (0.31–1.44)</td>
<td>0.81 (0.36–1.81)</td>
<td>0.52 (0.21–1.29)</td>
</tr>
<tr>
<td>highest tertile</td>
<td>0.79 (0.36–1.71)</td>
<td>0.43 (0.20–0.95)</td>
<td>0.37 (0.15–0.81)</td>
</tr>
<tr>
<td>IL-6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lowest tertile</td>
<td>reference</td>
<td>reference</td>
<td>reference</td>
</tr>
<tr>
<td>middle tertile</td>
<td>1.74 (0.83–3.66)</td>
<td>0.30 (0.13–0.68)</td>
<td>0.61 (0.26–1.43)</td>
</tr>
<tr>
<td>highest tertile</td>
<td>1.02 (0.49–2.12)</td>
<td>0.53 (0.23–1.22)</td>
<td>1.07 (0.44–2.6)</td>
</tr>
<tr>
<td>IL-8</td>
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<td></td>
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<tr>
<td>lowest tertile</td>
<td>reference</td>
<td>reference</td>
<td>reference</td>
</tr>
<tr>
<td>middle tertile</td>
<td>0.83 (0.4–1.73)</td>
<td>0.63 (0.29–1.36)</td>
<td>0.64 (0.26–1.6)</td>
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<tr>
<td>highest tertile</td>
<td>0.78 (0.38–1.62)</td>
<td>0.75 (0.34–1.63)</td>
<td>0.31 (0.13–0.76)</td>
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<tr>
<td>MCP-1</td>
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<tr>
<td>lowest tertile</td>
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<td>reference</td>
<td>reference</td>
</tr>
<tr>
<td>middle tertile</td>
<td>1.55 (0.75–3.2)</td>
<td>1.58 (0.74–3.4)</td>
<td>0.74 (0.31–1.74)</td>
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<tr>
<td>highest tertile</td>
<td>1.45 (0.72–2.98)</td>
<td>1.16 (0.54–2.46)</td>
<td>0.61 (0.25–1.45)</td>
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<tr>
<td>P-selectin</td>
<td>reference</td>
<td>reference</td>
<td>reference</td>
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<tr>
<td>middle tertile</td>
<td>0.86 (0.41–1.81)</td>
<td>1.41 (0.63–3.16)</td>
<td>1.46 (0.58–3.63)</td>
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<tr>
<td>highest tertile</td>
<td>0.81 (0.39–1.68)</td>
<td>0.60 (0.28–1.28)</td>
<td>0.46 (0.2–1.07)</td>
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<tr>
<td>VEGF</td>
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<tr>
<td>lowest tertile</td>
<td>reference</td>
<td>reference</td>
<td>reference</td>
</tr>
<tr>
<td>middle tertile</td>
<td>2.08 (0.97–4.47)</td>
<td>1.28 (0.58–2.84)</td>
<td>0.88 (0.35–2.22)</td>
</tr>
<tr>
<td>highest tertile</td>
<td>1.14 (0.55–2.36)</td>
<td>0.89 (0.41–1.93)</td>
<td>0.53 (0.22–1.27)</td>
</tr>
</tbody>
</table>

**Conclusion:** High CRP and IL-8 levels measured during treatment for remission induction of AAV are inversely associated with achieving complete remission. These markers may be of prognostic value.

**Disclosure:** G. Tomasson, None; P. A. Monach, None; K. Tanriverdi, None; U. Specks, None; J. H. Stone, None; L. Ding, None; F. Fervenza, Genentech and Biogen IDEC Inc.; Z. G. S. Hoffman, None; C. G. M. Kallenberg, None; C. A. Langford, None; D. J. Phippard, None; P. Seo, None; R. F. Spiera, None; E. W. St. Clair, None; N. Tchao, None; J. E. Freedman, None; P. A. Merkel, None.

### 2569

**The Risk of Pulmonary Embolism and Deep Vein Thrombosis in Giant Cell Arteritis:** A Population-Based Cohort Study

**Methods:** We studied 1,175 individuals with GCA (74% female, mean age of 75 years), 22 developed PE and 24 developed DVT. Compared with non-GCA individuals, the age-, sex-, and entry-time-matched RRs were 3.6 (95% CI, 2.1–5.8) for PE and 2.7 (95% CI 1.74–4.32) for DVT (Table). These RRs were attenuated slightly after adjusting for covariates, but remained significant. The time-specific, age-, sex-, and entry-time-matched RRs during the first year were 15.1 (95% CI, 6.6–36.2) for PE and 5.9 (2.9–11.4) for DVT.

**Table:** Relative Risk of Incident PE and DVT According to GCA Status

<table>
<thead>
<tr>
<th>GCA Case</th>
<th>Non-GCA Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE Cases, N</td>
<td>22</td>
</tr>
<tr>
<td>Incidence Rate/1000 Person-Years</td>
<td>5.2</td>
</tr>
<tr>
<td>Age-, Sex-, Entry time Matched RR (95% CI)</td>
<td>3.6 (2.1–5.8)</td>
</tr>
<tr>
<td>Multivariable RR (95% CI)</td>
<td>3.1 (1.9–5.1)</td>
</tr>
<tr>
<td>DVT Cases, N</td>
<td>24</td>
</tr>
<tr>
<td>Incidence Rate/1000 Person-Years</td>
<td>5.8</td>
</tr>
<tr>
<td>Age-, Sex-, Entry time Matched RR (95% CI)</td>
<td>2.7 (1.7–4.3)</td>
</tr>
<tr>
<td>Multivariable RR (95% CI)</td>
<td>2.4 (1.5–3.9)</td>
</tr>
</tbody>
</table>

**Conclusion:** This large population-based study provides the first evidence for a substantially increased risk of PE and DVT in GCA and shed light on corresponding risk trends over the duration of GCA among primarily outpatients. These findings support increased monitoring of venous-thromboembolic complications and risk factors in GCA at the population level.

**Disclosure:** J. A. Avina-Zubieta, None; D. Lacaille, None; E. C. Sayre, None; J. A. Kopee, None; H. K. Choi, None.

**Rheumatology Research Foundation Special Session**

Edmond L. Dubois, MD Memorial Lectureship

**Hydroxychloroquine Reduces Thrombosis in Systemic Lupus Erythematosus, Particularly in Antiphospholipid Positive Patients**

Tuesday, November 13, 2012, 4:30 pm–6:00 pm

**2569**

**Hydroxychloroquine Reduces Thrombosis (BOTH ARTERIAL AND VENOUS) in Systemic Lupus Erythematosus, Particularly in Antiphospholipid Positive Patients**

**Methods:** We studied 1795 SLE patients (56% Caucasian, 37% African American, 93.3% female, mean age 37.0 ± 12.5) with no previous thrombosis prior to entry in the cohort. The primary outcome was first thrombotic event (arterial or venous). Univariate analysis and multivariable modeling were used to examine associations between prednisone, hydroxychloroquine, and NSAID use with the risk of thrombosis.

**Results:** A total of 193 thrombotic events were observed over 10,508 person-years of follow-up (rate 18.4/1000 person-years). In the multivariable model controlling for age, traditional cardiovascular risk factors, and SLE disease activity, significant predictors for thrombosis included current prednisone dose (>20 mg/day, HR 4.4, p<0.0001) and Aspirin use (HR 1.8, p=0.0026). Hydroxychloroquine use remained protective for thrombosis (HR 0.6, p=0.0078). Subgroup analysis revealed that the protective effect of hydroxychloroquine was stronger in antiphospholipid antibody positive patients (HR 0.6, p=0.0090) than among antiphospholipid antibody negative patients (HR 0.8, p=0.57).
Conclusion: Current prednisone dose was found to be a significant independent predictor of thrombosis in SLE, after adjustment for disease activity. Current hydroxychloroquine use decreased the risk of thrombosis in this prospective cohort, particularly in those with positive antiphospholipid antibodies. Aspirin use was not protective, likely due to the bias of indication.

Disclosure: G. Law, None; L. S. Magder, None; H. Fang, None; M. Petri, None.

Results of the univariate and multivariate models to assess the hazard ratio (HR) of exposures on lymphoma development in patients with SLE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariate HR (95% CI)</th>
<th>Partially adjusted model (95% CI)</th>
<th>Multivariate HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside North America</td>
<td>1.04 (0.53, 2.05)</td>
<td>-</td>
<td>1.06 (0.45, 2.50)</td>
</tr>
<tr>
<td>Calendar year</td>
<td>1.00 (0.98, 1.05)</td>
<td>-</td>
<td>0.99 (0.94, 1.02)</td>
</tr>
<tr>
<td>Male</td>
<td>1.01 (1.03, 1.08)</td>
<td>1.27 (1.01, 1.57)</td>
<td>1.05 (1.01, 1.09)</td>
</tr>
<tr>
<td>White race/ethnicity</td>
<td>0.97 (0.55, 1.71)</td>
<td>-</td>
<td>0.86 (0.46, 1.59)</td>
</tr>
<tr>
<td>Sjogren’s syndrome</td>
<td>1.29 (0.66, 2.54)</td>
<td>-</td>
<td>1.21 (0.53, 2.78)</td>
</tr>
<tr>
<td>Glucocorticosteroids (GC) ever</td>
<td>1.39 (0.75, 2.56)</td>
<td>-</td>
<td>1.03 (0.40, 2.64)</td>
</tr>
<tr>
<td>Cumulative GC &gt; 3.5 gm</td>
<td>1.27 (0.75, 2.17)</td>
<td>-</td>
<td>1.59 (0.69, 3.67)</td>
</tr>
<tr>
<td>Cumulative CY ever</td>
<td>1.73 (0.90, 3.33)</td>
<td>1.90 (1.00, 3.96)</td>
<td>1.95 (0.61, 6.22)</td>
</tr>
<tr>
<td>Cumulative CY &gt; 6 gm</td>
<td>1.51 (0.63, 3.62)</td>
<td>-</td>
<td>0.79 (0.18, 3.54)</td>
</tr>
<tr>
<td>Azathioprine (AZA) ever</td>
<td>0.82 (0.45, 1.52)</td>
<td>-</td>
<td>1.53 (0.57, 3.97)</td>
</tr>
<tr>
<td>Cumulative AZA &gt; 36.5</td>
<td>0.49 (0.19, 1.25)</td>
<td>-</td>
<td>0.46 (0.14, 1.54)</td>
</tr>
<tr>
<td>Methotrexate ever used</td>
<td>0.99 (0.45, 2.16)</td>
<td>-</td>
<td>0.70 (0.30, 2.05)</td>
</tr>
<tr>
<td>Mycophenolate ever used</td>
<td>1.38 (0.58, 3.29)</td>
<td>-</td>
<td>1.74 (0.70, 4.34)</td>
</tr>
<tr>
<td>Antimalarials ever used</td>
<td>1.47 (0.80, 2.70)</td>
<td>-</td>
<td>1.59 (0.69, 3.54)</td>
</tr>
<tr>
<td>Disease activity (2nd tertile)</td>
<td>1.00 (0.55, 1.82)</td>
<td>-</td>
<td>1.10 (0.56, 2.14)</td>
</tr>
<tr>
<td>Disease activity (3rd tertile)</td>
<td>0.43 (0.22, 0.84)</td>
<td>0.49 (0.27, 0.89)</td>
<td>0.52 (0.24, 1.12)</td>
</tr>
</tbody>
</table>

Background/Purpose: In systemic lupus (SLE), concern exists about immunosuppressive drugs and lymphoma risk. Yet, the relative influence of disease activity vs treatment is unknown. Our objective was to determine, in SLE, the relative importance of disease activity vs drugs.

Methods: We performed case-cohort analyses within a multi-site SLE cohort. Cases were ascertained by cancer registry linkage. Adjusted hazard ratios (HRs) for lymphoma were generated in multivariate regression models, for time-dependent exposures to immunomodulators (cyclophosphamide, azathioprine, methotrexate, mycophenolate, anti-malarials, glucocorticoids) demographics, calendar year, Sjogren’s syndrome, SLE duration, and disease activity (mean adjusted SLEDAI-2k). Partially adjusted models were also performed, using only covariates whose HR confidence interval excluded the null value. Sensitivity analyses were performed, lagging cyclophosphamide exposures by 5 years. We used average mean SLE disease activity scores over time, and medications were treated both categorically (ever/never) and as cumulative doses.

Results: We studied 64 lymphomas (61 non-Hodgkin’s, 3 Hodgkin’s) and 4,739 cancer-free controls. As is seen in the general population, lymphoma risk in SLE was higher in males versus females, and increased with age. Lymphoma cases occurred a mean of 13.1 years (standard deviation 9.8, median 12.3) after SLE diagnosis. Univariate analyses suggested a decreased lymphoma risk within the highest tertile of disease activity (relative to those with the lowest activity) but in fully adjusted models (using all variables listed above), the confidence interval widened to include the null value. Sensitivity analyses, lagging cyclophosphamide exposures, showed similar results to that portrayed in the table below. In a partially adjusted model (retaining age and highest tertile of disease activity), the HR suggested a two-fold lymphoma risk after cyclophosphamide. Despite a trend towards greater cyclophosphamide use in cases versus cancer-free controls, in fully adjusted models, no drug exposure was estimated to be an independent risk factor. Still, due to corollation, it remains difficult to differentiate the effects of medications from disease activity.

Conclusion: We did not definitively demonstrate an increased risk for any medications, despite a trend to greater cyclophosphamide use in the lymphoma cases. If anything, we noted a protective effect for very high SLE disease activity. Further work will focus on genetic profiles that might interact with medication exposures to influence lymphoma risk in SLE.

Disclosure: S. Bernatsky, National Institutes of Health, Canadian Institutes of Health Research, 2; A. E. Clarke, None; K. H. Costenbader, None; M. B. Urowitz, None; D. A. Isenberg, None; A. Hoffman, None; P. R. Fortin, None; M. A. Dooley, None; E. M. Ginzer, None; C. Aranow, None; S. M. Edworthy, None; O. Nived, None; S. Jacobson, None; G. Ruiz-Irastorza, None; E. Yelin, None; S. G. Barr, None; I. Blanco, None; C. H. Feldman, None; R. Ramsey-Goldman, None.
as having hypertension if they had systolic blood pressure \( \geq 140 \text{ mm Hg} \) or diastolic blood pressure \( \geq 90 \text{ mm Hg} \) or if receiving any anti-hypertensive medications. Patients who had ever had hypertensive episodes during cohort follow-up were compared with patients who had never had hypertension with respect to clinical and demographic characteristics. Multivariate regression modeling using generalized estimating equations was used to assess the association between various factors and systolic blood pressure over cohort follow-up among patients with hypertension.

**Results:** There were a total 1630 (74%) patients with hypertension (91% female, 53% Caucasian, 42% African-American). Compared to non-hypertensive patients, those with hypertension were more likely to be African-American (p<0.0001), male (p=0.0004), smokers (p<0.0001), alcoholic (p<0.0001), older (p<0.0001), lower education (p<0.0001), lower household income (p<0.0001), higher disease activity (p<0.0001), higher body mass index (p<0.0001), higher prednisone dose (p<0.0001), higher urine protein to creatinine ratio (p<0.0001) and higher serum creatinine (p<0.0001).

We next examined, in just the patients with hypertension, the association between clinical variables and systolic blood pressure over followup. In the table, a negative number indicates better control of hypertension.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect on Mean Systolic Blood Pressure</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at assessment (per year)</td>
<td>0.22 \pm 0.03</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>-4.56 \pm 1.14</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African-American vs Caucasian</td>
<td>3.24 \pm 0.91</td>
<td>0.0004</td>
</tr>
<tr>
<td>Other ethnicity vs Caucasian</td>
<td>-3.64 \pm 1.45</td>
<td>0.012</td>
</tr>
<tr>
<td>Years of education (per year)</td>
<td>-0.32 \pm 0.14</td>
<td>0.45</td>
</tr>
<tr>
<td>Family income (per $1,000)</td>
<td>0.002 \pm 0.004</td>
<td>0.63</td>
</tr>
<tr>
<td>Smoking</td>
<td>1.19 \pm 0.86</td>
<td>0.17</td>
</tr>
<tr>
<td>Body mass index (per kg/m²)</td>
<td>0.56 \pm 0.05</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Number of anti-hypertensives</td>
<td>-3.08 \pm 0.35</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Prednisone (per mg/d)</td>
<td>0.13 \pm 0.02</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SELENA-SLEDAI</td>
<td>0.15 \pm 0.06</td>
<td>0.017</td>
</tr>
<tr>
<td>Urine dipstick protein</td>
<td>0.85 \pm 0.40</td>
<td>0.033</td>
</tr>
<tr>
<td>Urine protein/cr ratio</td>
<td>2.62 \pm 0.41</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>-1.94 \pm 0.79</td>
<td>0.014</td>
</tr>
</tbody>
</table>

In the multivariate model, age, male sex, African-American, BMI, prednisone, disease activity, and measures of renal lupus remained independent predictors of poor blood pressure control.

**Conclusion:** Hypertension remains an independent risk factor for cardiovascular events in SLE. As in the general population, older age, male gender, and African-American ethnicity are associated with both hypertension and poor control of hypertension. In SLE, body mass index, prednisone, disease activity, and urine protein to creatinine ratio remain independent predictors of poor blood pressure control. These modifiable risk factors are potential “treat to target” goals. In SLE, use of more than one anti-hypertensive was superior in blood pressure control.

Disclosure: H. Fang, None; R. Ahmad, None; L. S. Magder, None; M. Petri, None.

2573 Arthroplasty Rates Increased Among US Patients with Systemic Lupus Erythematosus: 1991–2005, Christina Mertelsmann-Voss1, Ting Jung Pan2, Huang Do2, Mark P. Figgie2 and Lisa A. Mandl2. 1Hospital for Special Surgery, Cornell University, New York, NY, 2Hospital for Special Surgery, New York, NY

**Background/Purpose:** There is little data regarding patterns of arthroplasty use in patients with Systemic Lupus Erythematosus (SLE). This study evaluates trends in total joint replacement (TJR) for SLE from 1991–2005. Comparisons are made to patients with non-inflammatory conditions.

**Methods:** Administrative hospital discharge databases from 10 states (AZ, CA, CO, FL, IA, MA, NJ, NY, WA, WI) and census data annual population estimates were used to compute annual rates per 100,000 population of knee arthroplasty, total and partial hip arthroplasty, and total and partial shoulder arthroplasty for the years 1991 to 2005 in patients with SLE and those with no inflammatory or autoimmune diseases. ICD-9-CM codes were used to identify specific diseases.

**Results:** During the 15 year study period, 4253 TJR were performed for patients with SLE and 2,762,660 TJR for patients with no inflammatory or autoimmune disease. SLE patients were younger (54 +/- 16 years vs 70.5 +/- 12.1 years) and much more likely to be female (90.2% vs 63.5%). Hip arthroplasty was the most frequent procedure in SLE patients (50.1% vs. 31.1%), whereas knee arthroplasty was most common in the non-inflammatory group (33.7% for SLE patients vs. 47.4%); TJR rates for patients with non-inflammatory conditions almost doubled from 1991 to 2005 (124.5/100,000 in 1991 vs. 247.5/100,000 in 2005, p-value <0.001). A similar trend was observed for SLE; (0.17/100,000 vs. 0.38/100,000, p<0.001). In particular, the proportion of total knee replacements among SLE patients increased from 15% in 1991 to 45% in 2005. The mean age of patients undergoing TJR with non-inflammatory conditions decreased (71.5 +/- 11.8 yrs in 1991, 69.0 +/- 12.0 yrs in 2005, p-value <0.001). In contrast, the mean age of SLE TJR increased (47.3 +/- 17.0 yr vs 56.8 +/- 16.0 p-value<0.001). When stratified by age and gender, TJRs in SLE patients increased in all groups except for women with SLE <44 years of age. In this group rates decreased from 0.073/100000 to 0.067/100000 (p-value=0.009).
Conclusion: To our knowledge this is the first evaluation of TJR rates in SLE patients. From 1991–2005 arthroplasty rates increased in patients with SLE in similar proportions to overall TJR rates. This was surprising, as we had expected a decrease in TJR mirroring improved SLE mortality rates and decreases in end stage renal disease. However, the decrease in TJR among women < 44 years suggests treatment may be preventing early damage from severe active disease. In addition, while the mean age of non-inflammatory TJR fell, the age at time of SLE TJR increased. We speculate that improvements in SLE therapy may allow patients to live long enough to suffer both the osteonecrotic effects of steroids, possibly develop degenerative changes and also be healthy enough to receive an elective TJR. Increases in knee arthroplasty among SLE patients may also reflect lower SLE morbidity, and mortality, with SLE patients living long enough to develop age/obesity related knee OA. Further study is needed to see if these trends continue with ongoing improvements in SLE clinical care.

Disclosure: C. Mertelsmann-Voss, None; T. J. Pan, None; H. Do, None; M. P. Figgie, None; L. A. Mandl, None.

2574
Smoking, Autoantibodies and Vascular Events in Systemic Lupus Erythematosus, Johanna Gustafsson1, Iva Gunnarsson2, Susanne Pettersson1, Agneta Zickert1, Anna Vikerfors4, Erik Hellbacher4, Sonia Möller3, Kerstin Elvin4, Henrik Källberg4, Julia F. Simard5 and Elisabet Svenungsson1.
1Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden, 2Department of Medicine, Rheumatology Unit, Karolinska Institute, Stockholm, Sweden, 3Karolinska University Hospital, Stockholm, Sweden, 4Karolinska Institutet, Stockholm, Sweden, 5Clinical Epidemiology Unit, Dept of Medicine, Karolinska Institutet, Stockholm, Sweden

Background/Purpose: Smoking is a risk factor for several autoimmune diseases including rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE). Smoking is also a major risk factor for cardiovascular disease (CVD), both in the general population and in SLE. Smoking has furthermore been specifically associated with the occurrence of autoantibodies in RA, SLE and also in animal studies of autoimmune diseases.

We investigated the associations between patients smoking history and a set of autoantibodies in SLE. We also studied the potential interaction between smoking and autoantibodies for the occurrence of previous vascular events.

Methods: 367 prevalent SLE patients from a single center were included. Clinical evaluation, history of previous vascular events and data on smoking habits and estimated number of smoked cigarettes were recorded at inclusion. Autoantibodies: anti(α)dsDNA, aSm, aRo52, a Ro60, aSSB and antiphospholipid (aPL) antibodies (anticardiolipin antibodies (aCL) IgG/IgM/IgA, anti-b2 glycoprotein-1 (ab2GP1) IgG/IgM/IgA) and the lupus anticoagulant (LAC) were measured using ELISA and multiplex methods. Association analyses between smoking status (ever, former, current) at inclusion and antibody status were performed through logistic regression. These variables were also investigated in relation to history of CVD through interaction analysis. Never smokers were used as reference.

Results: In a first screening we noted that ever smoking was positively associated with aCL IgG (p=0.007), ab2GP1 (p=0.002) and a positive LAC test (p=0.001) while the other investigated antibodies were not associated. Further analyses of the observed associations between aPL and smoking in multivariable models (including age, sex, age at disease onset, current smoking and former smoking) demonstrated that specifically former smoking was associated with LAC positivity OR 3.1(95% CI 1.6–5.9), ab2GP1 IgG OR 3.1(95% CI 1.6–6.1) and aCL IgG OR 2.9(95% CI 1.6–5.8). The amount of cigarettes smoked did not affect aPL status. Interaction analysis demonstrated an interaction between occurrence of any aPL and ever smoking for the risk of venous thromboembolism (VTE), OR 2.8 (95% CI 1.3 – 5.9), attributable proportion due to interaction (API)=0.66, p<0.05.

Conclusion: We demonstrate that among SLE patients ever smoking, and in particular former smoking, is associated with pro-thrombotic aPL. Furthermore, the combination of smoking and aPL positivity seems to interact and enhance the risk of vascular events. Our results demonstrate associations between smoking, an environmental exposure, humoral immunity and vascular events in SLE. Further studies are needed to investigate the directions and mechanisms behind these associations. Our results further underscore the importance of advocating a smoke free lifestyle among SLE patients.

Disclosure: J. Gustafsson, None; I. Gunnarsson, None; S. Pettersson, None; A. Zickert, None; A. Vikerfors, None; E. Hellbacher, None; S. Möller, None; K. Elvin, None; H. Källberg, None; J. F. Simard, None; E. Svenungsson, None.
Inhibition of Pathogenic Autoantibodies by Accelerating the Exit of Germinal Center B Cells Via Manipulation of Regulator of G-Protein Signaling

John D. Mountz1, John H. Wang2, James S. New3, Ping-Yi Yang3, Qi Wu3, Bao Luo3, Jun Li3, Kirk M. Druey3, and Hui-Chen Hsu3. 1Univ of Alabama at Birmingham and Birmingham VA Medical Center, Birmingham, AL, 2Cedars Sinai Medical Center, Los Angeles, CA, 3University of Alabama at Birmingham, Birmingham, AL.

Background/Purpose: Regulator of G-protein Signaling (RGS) plays a key role in inhibiting chemokine signaling by desensitizing G-protein coupled receptor signals. RGS13 and RGS16 are two major regulators of B cell migration and regulate responses to CXCL12 and CXCL13 during development of germinal centers (GCs). We previously showed that IL-17 increased Rgs13 and Rgs16 in GC B cells, leading to high levels of activation-induced cytokine deaminase (AICDA), somatic hypermutation (SHM) and enabled development of pathogenic autoantibodies that cause immune complex nephritis and erosive arthritis. The objective of this work is to use BXD2-Rgs13−/− and BXD2-Rgs16−/− mice to determine if loss of RGS regulation suppressed the development of pathogenic autoantibodies.

Methods: BXD2-Rgs13−/− and BXD2-Rgs16−/− mice were produced by backcrossing BXD2 with B6-Rgs13−/− and B6-Rgs16−/− mice for > 7 generations. Confocal imaging was used to determine the location of RGS13, RGS16, AID, and GC B cells in the spleen. Immunohistochemistry staining of spleen and kidney was used to determine the presence of plasmablasts and immune complex depositions. ELISA was used to determine serum levels of autoantibodies. The levels of GC B cell (Irx4, Pax5 and Bach2) and plasma cell (Irf4, Blimp1 and Xbp1) program transcripts in FACS purified GC B cells were determined by quantitative real-time PCR. T-B conjugates were analyzed by sorting CD19+ MZP− CD4− doublets followed by EDTA dissociation and FACS identification of B-cell subsets.

Results: In spleens of wild-type (WT) BXD2 mice, RGS13 was mainly expressed by GC B cells with light zone (LZ) B cells expressed slightly higher levels of Rgs13 compared to dark zone (DZ) B cells. RGS16 was expressed by LZ GC and marginal zone precursor (MZP) B cells in the LZ border. BXD2-Rgs13−/− mice exhibited higher IgM antibody titers at early age compared to WT mice; though smaller GCs, lower GC B-CD4 conjugates, and lower AID levels suggested a lesser extent of SHM and affinity maturation. RGS16 deficiency led to reduced aggregation of CD86+ MZP B cells in GC LZ vicinity, reduced MZP-T conjugates, and significantly fewer GCs, suggesting its role in MZP stabilization in GC LZ. Despite smaller GCs, there was increased IgM/Mnplasmablasts, upregulation of Irx4, Blimp1 and Xbp1 and down regulation of Aicda, Pax5 and Bach2 in GC B cells of BXD2-Rgs13−/− and BXD2-Rgs16−/− mice. At older ages, BXD2-Rgs13−/− and BXD2-Rgs16−/− mice showed lower titers of IgG autoantibodies and IgG deposits in the glomeruli, suggesting reduced autoimmune body pathogenicity.

Conclusion: Lack of either RGS13 or RGS16 signal is associated with reduction in GC program genes and premature exit of less pathogenic IgM plasmablasts. Our results suggest that, in autoimmune mice, prolonged B-T interactions in the GC light zone, mediated by upregulation RGS13 or RGS16, enhanced the selection and generation of high affinity pathogenic autoantibody producing B cells. Redirection of B cell migration within different GC compartments via regulation of RGS13 and RGS16 and their associated signaling pathways may be a novel strategy to abrogate development of autoreactive B cells that produce pathogenic autoantibodies.

Disclosure: J. D. Mountz, None; J. H. Wang, None; J. S. New, None; P. Yang, None; Q. Wu, None; B. Luo, None; J. Li, None; K. M. Druey, None; H. C. Hsu, None, 2.
as a diagnostic tool. Yet, despite the success of B cell targeted therapy, and evidence that ACPA may arise long before overt inflammatory arthritis, the roles of human B cells autoantigeneic for citrullinated protein antigens have been little explored.

Methods: For comprehensive B cell profiling, we developed a 12-color flow cytometry panel that assesses diverse B-cell subset specific markers, with live/dead discrimination and myeloid/T-cell exclusions. Fluorochrome-labeled tetramer forms were made with cyclic citrullinated peptide (CCP) used in clinical testing, as well as a panel of self-protein derived peptides implicated in RA, and control peptides with a single amino acid type substitution. ACPA labeled beads were included for internal calibration. Multivariate methods were used to identify natural divisions within B cell data sets, and Spearman coefficients to assess for correlations between flowmetric and clinical/laboratory data.

Results: During panel development, we performed cross-sectional studies of a total of 30 RA and 16 healthy adults. Pilot surveys demonstrated only a low background levels of CD19+ B-cell binding to CCP tetramer in RA and healthy adults (< 0.3% mean). While levels of B cell binding to CCP were overlapping between the groups, as some RA were indistinguishable from healthy controls, B cells from RA pts displayed significantly higher binding to CCP (7.46%+/−6.8, mean +/- SD) compared to binding of a control tetramer (p<0.0001, 2-tailed Mann-Whitney test). In RA, we found expansions of CCP-reactive B cells in diverse cellular subsets, which varied between subjects, and which included naive mature B cells (IgD+/ CD27−) and both CD27+/IgD− and CD27−/IgD− memory subsets. In each sample, CCP-binding by B cells was independent of relative CD4:CD8 levels, as assessed by CD38/HLA-DR. There were no significant relationships between levels of CCP-binding B cells and IgG, IgA or IgM anti-CCP or IgG to panel of peptide-specific ACPAs. Importantly, our surveys demonstrated a significant correlation between levels of CCP-binding by naive mature (CD27−/IgD+) B cells and DAS28 score (n=18, p=0.04, r=0.88). We also found correlations between CD95 expression (an activation marker) on CCP-binding B cells and DAS28 score (p=0.03, r=0.856) that was improved by exclusion of pts on biologic agents (n=7, p=0.01, r=0.89).

Conclusion: These studies have provided the first direct measurements of trafficking disease-specific B cells to citrullinated self-antigens. Our initial surveys found no relationship between levels of circulating CCP-reactive B cells with levels of serum ACPA, which therefore may reflect the contribution of sources no longer linked to synovial disease. However, we did find evidence of an association between levels of CCP-reactive B cells, and especially activated B cells, and overall disease activity by DAS28 score. Our investigative approach may therefore help to better stratify patients and identify those in whom autoantigen-specific lymphocytes are direct drivers of pathogenesis.

Disclosure: G. J. Silverman; None; J. Jung; None; J. D. Greenberg; None; A. J. Pelzek; None; C. Grunwail; None; J. Vas; None.

2579
Monoclonal IgG Antibodies (ACPAs) From Synovial Fluid B Cells of Rheumatoid Arthritis Patients – Antibody-Driven Affinity Maturation and Cross Reactivity. Khaled Amana, Johanna Steen, Fiona Murray, ID Apollob, Blanca Fernandez-Rodriguez, Vivian P. Byerky, Viveanne Engstroem, Omri Snir, Lena Israelsson, Anna I. Catrina, Hedda Wardemann, Davide Corti, Eric Mefiffe Sr., Lars Klareskog and Vivianne Malmstrom. 1Rheumatology unit, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden, 2Yale University School of Medicine, New Haven, CT, 3Institute for Research in Biomedicine, Bellinzona, Switzerland, 4Max Planck Institute for Infection Biology, Berlin, Germany

Background/Purpose: Antibodies targeting citrullinated proteins (ACPA) are commonly found in patients with Rheumatoid Arthritis (RA), strongly associate with distinct HLA-DR alleles and predict a more aggressive disease course as compared to seronegative patients. Still, many features of these antibodies, including their site of production and the extent of MHC class II driven antibody selection remain unclarified. In this study we have assessed the specificity and affinity of ACPA to citrullinated autoantigens when somatic mutations were reverted to the corresponding germline sequences. The observed cross reactivity suggests that multiple antibody clones could participate in driving these clones.

Disclosure: K. Amana; None; J. Steen; None; F. Murray; None; H. Morbach; None; B. Fernandez-Rodriguez; None; V. Balasingh; None; M. Engstroem; None; O. Snir; None; L. Israelsson; None; A. I. Catrina; None; H. Wardemann; None; D. Corti; None; E. Mefiffe Sr.; None; L. Klareskog; None; V. Malmstrom; None.

2579
Novel Autoantibodies to 14-3-3 Eta Are Highly Specific for Rheumatoid Arthritis. Walter P. Maksymowych1, Desree van der Heijde, R. Landewe2, Vivian P. Byerky3 and Anthony Marotta. 1University of Alberta, Edmonton, AB, 2Leiden University Medical Center, Leiden, Netherlands, 3Academic Medical Center/University of Amsterdam, Amsterdam, Netherlands, 4Hospital for Special Surgery, New York, NY, 5Augurex Life Sciences Corp, North Vancouver, BC

Background/Purpose: 14-3-3 eta is an RA biomarker whose extracellular expression is upregulated in many healthy individuals and RA patients. It has been reported to add incremental value to traditional markers like CRP, ESR and rheumatoid factor. This study investigated the specificity and sensitivity of 14-3-3 eta autoantibodies and by their loss of reactivity to citrullinated autoantigens when somatic mutations were reverted to the corresponding germline sequences. The observed cross reactivity suggests that multiple antibody clones could participate in driving these clones.

Disclosure: K. Amara; None; J. Steen; None; F. Murray; None; H. Morbach; None; B. Fernandez-Rodriguez; None; V. Balasingh; None; M. Engstroem; None; O. Snir; None; L. Israelsson; None; A. I. Catrina; None; H. Wardemann; None; D. Corti; None; E. Mefiffe Sr.; None; L. Klareskog; None; V. Malmstrom; None.

Methods: Detection of 14-3-3 eta autoantibodies was evaluated by examining immunoreactivity towards human recombinant 14-3-3 eta protein by immunoblot analysis using serum from healthy subjects and those with RA. Epitope mapping and in silico modeling was performed to identify putative epitopes of which 11 peptide regions were selected. To further specify high-priority regions, the serum expression levels of 14-3-3 eta autoantibodies were evaluated in 30 healthy individuals and 58 RA patients. Individual sequences were selected based on their absolute specificity for RA, of which 4 of 11 met this criteria with sensitivities ranging from 34–62%. A composite score was generated by combining the fluorosence intensity (FI) measurements for these 4 peptides, each of which were equally weighted and expressed in units (U). T-tests and Mann-Whitney U-tests were used to determine group differences. The area under the ROC curve (AUC) was generated for diagnostic utility estimates and likelihood ratios (LR) for various 14-3-3 eta autoantibodies for clinical utility.

Results: Immunoblot analysis reveals that patients with RA possess autoantibodies directed towards 14-3-3 eta. This prototype 14-3-3 eta autoantibody assay exhibits high specificity for RA versus healthy controls with means (SD) and medians (min-max) of 828U (1292U) and 681U (340U–10386U) for RA and 385U (74U) and 371U (289U–568U) for healthy controls, p-value <0.0001. The ROC AUC was 0.93 (95% CI 0.88–0.98, p<0.0001). At the best cut-off of 476U the specificity and sensitivity were 90% and 80%, respectively with a likelihood ratio of 7.9 increasing to 18 at 80U. These prioritized sequences will be further specified based on their differential expression in RA versus disease controls to develop an anti-14-3-3 eta ELISA for clinical diagnosis.

Conclusion: 14-3-3 eta is an RA biomarker whose extracellular expression elicits an autoantibody response that may be measured for clinical utility.

Marginal Zone Defects in Wiskott-Aldrich Syndrome Are Dependent On B Cell Intrinsc Toll-Like Receptor Signals. Shaun W. Jackson, Nikita Kolhatkar, Marc A. Schwartz, Socheath Khim and David J. Rawlings. Seattle Children's Hospital, Seattle, WA, 3Department of Immunology, University of Washington, Seattle, WA. 4Seattle Children's Research Institute, Seattle, WA, 5Washington, Seattle, WA

Background/Purpose: Patients with the primary immunodeficiency Wiskott-Aldrich syndrome (WAS) have severe abnormalities in splenic marginal zone (MZ) anatomy and function. Consistent with this, WAS patients fail to develop T-independent antibody responses to polysaccharide antigens and are susceptible to Streptococcus pneumoniae infections. We previously showed that B cell entry into the MZ is unperturbed in WAS+/− mice, but that retention within the MZ is defective. However, the factors promoting WAS+/− B cell exit from the MZ have not been determined.

Methods: Proliferation of sorted wild-type (WT) and WAS+/− MZ B cells was quantified after stimulation with LPS (TLR4 agonist), CL294 (TLR7 agonist) or CPG (TLR9 agonist) for 72 hours. To study the impact of B cell intrinsic TLR signaling on WAS MZ homeostasis, mixed bone marrow chimeras were generated in which deficiency of WAS, WAS × Myd88, WAS × TLR7 or WAS × TLR9 was limited to the B cell lineage. Splenic MZ reconstitution was then analyzed by flow-cytometry and immunohistochemistry. In vivo labeling of MZ cells at the vascular interface was performed by PE-labeled anti-CD19 antibody injection 5 minutes prior to sacrifice.

Results: In addition to markedly decreased MZ size, we demonstrate by in vivo labeling that WAS−/− MZ B cells are not normally positioned at the MZ vascular interface. Unmanipulated WAS−/− mice also exhibit increased peripheral blood MZ B cell frequency consistent with the idea that WAS−/− B cells are not appropriately retained within the MZ. Further, we show that sorted WAS−/− MZ B cells are hyper-responsive to multiple Toll-like receptor (TLR) ligands, including TLR4, TLR7 and TLR9. These combined findings suggested that TLR-mediated activation might directly promote WAS−/− B cell exit from the MZ.

To test this idea, we generated chimeras with B cells deficient in both WAS protein and the key TLR signaling adaptor, MyD88. Strikingly, the MZ B cell compartment was restored WT levels in WAS−/− × Myd88−/− chimeras. WAS−/− × Myd88−/− × TLR7−/− × TLR9−/− mice also exhibited increased WAS−/− × TLR7−/− × TLR9−/− chimeras. Although increased compared with WAS−/− × TLR7−/− × TLR9−/− controls, WAS−/− × TLR7−/− × MZ size was reduced 50% compared with WT chimeras, suggesting a partial role for endogenous TLR7 ligands in driving WAS−/− × B cells out of the MZ. In contrast, no rescue of MZ B cell numbers was noted in WAS−/− × TLR9−/− chimeras, implicating TLR9 in negatively regulating B cell activation and MZ retention, perhaps via downregulation of TLR7 signaling.

Conclusion: Our data demonstrate that activation of endogenous TLR ligands is sufficient to drive WAS−/− MZ B cells from the MZ and that B cell-intrinsic TLR7 and TLR9 signals have opposing impacts on MZ homeostasis. These data imply a previously unappreciated role for B cell intrinsic TLR signaling in MZ B cell function; and have important implications regarding altered immune responses to blood-borne pathogens in WAS patients and for development of autoimmune disease in WAS and other clinical settings.

Disclosure: S. W. Jackson, None; N. Kolhatkar, None; M. A. Schwartz, None; S. Khim, None; D. J. Rawlings, None.

ACR Concurrent Abstract Session

Imaging of Rheumatic Diseases III: Computed Tomography

Wednesday, November 14, 2012, 9:00 AM–10:30 AM

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Anti-Citrullinated Protein Antibodies but Not Rheumatoid Factor Are Associated with Larger Bone Erosions in rheumatoid arthritis patients—a Cross-Sectional Micro Computed Tomography Study. Carréon Hecht, Stephanie Finzel, Matthias Engbrecht, Sarah Schmidt, Juergen Rech, Elizabth Araujo and Georg Schett. 1University of Erlangen-Nuremberg, Erlangen, Germany, 2Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

Background/Purpose: Anti- citrullinated protein antibodies (ACPA) are known to be associated with joint destruction and a more severe disease course in rheumatoid arthritis (RA) patients. Recently, ACPA have been identified to directly induce bone loss (1). No study, however, has yet compared ACPA-positive and ACPA-negative RA patients with respect to their periodontal bone structure using high-resolution imaging of bone.

Methods: Cross-sectional analysis of 234 RA-patients fulfilling the new ACR/EULAR criteria. All patients received micro-computed tomography (2) of the MCP II, II and IV joints of the dominantly affected hand. Age, gender, disease activity (DAS28), disease duration, rheumatoid factor, ACPA (by anti-CCP ELISA) and anti-rheumatic therapy were recorded.

Number, width, depth and volume of bone erosion were assessed by 2 independent readers, one of them reading the images twice to test intrareader-reliability. For calculation of volumes, a semi-ellipsoid formula was used (3).

Results: 137 patients were ACPA positive (RF+: N = 108, RF−: N = 29), 97 patients ACPA negative (RF+: N = 28, RF−: N = 69). All 4 groups were comparable for age, gender, disease activity, disease duration and anti-rheumatic therapy (Tab. 1). 15 patients were excluded from further evaluation due to movement artefacts. RF+/ACPA+ RA patients had significantly more severe erosions (width: 2.00mm; depth: 2.25mm; volume: 13.86mm3) as compared to RF~/ACPA− RA patients (1.25mm; 2.02mm; 4.60mm3; p = 0.0001). Furthermore, when comparing only those patients without RF, we observed that bone erosions in RF~/ACPA− RA patients were significantly larger in dimension than bone erosions in RF~/ACPA− RA patients (w~+/: p = 0.0001; w~−/: p = 0.0001; w~+: p = 0.0095 and d~+: p = 0.0347; vol~+: p = 0.0005). Intraobserver reproducibility (CH) for erosion counts, width, depth and volumes was high (Spearmann’s rho between 0.93–0.99; p < 0.0001). Interobserver reproducibility (SF, CIH) was also very high (except 0.09, p < 0.001; w: 0.98, p < 0.001; vol: 0.96, p < 0.001).

Table 1. Details of erosions and demographic data

<table>
<thead>
<tr>
<th>Group</th>
<th>Age (years)</th>
<th>Number (n)</th>
<th>Disease Duration (years)</th>
<th>Disease Activity (mean±SD)</th>
<th>Rheumatoid Factor</th>
<th>ACPA</th>
<th>Erosion Details</th>
<th>Chi-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF+/ACPA+</td>
<td>55.16±5.57</td>
<td>29</td>
<td>9.60±3.07</td>
<td>5.44±1.70</td>
<td>1.20±0.58</td>
<td>0.09±0.53</td>
<td>Width: 2.00mm; Depth: 2.25mm; Volume: 13.86mm3</td>
<td>0.001</td>
</tr>
<tr>
<td>RF−/ACPA−</td>
<td>53.51±3.32</td>
<td>69</td>
<td>9.42±3.03</td>
<td>5.19±1.29</td>
<td>1.37±0.58</td>
<td>0.13±0.58</td>
<td>Width: 1.25mm; Depth: 2.02mm; Volume: 4.60mm3</td>
<td>0.001</td>
</tr>
<tr>
<td>RF+/ACPA−</td>
<td>54.83±2.26</td>
<td>28</td>
<td>9.42±3.32</td>
<td>5.20±1.37</td>
<td>1.30±0.63</td>
<td>0.12±0.58</td>
<td>Width: 2.02mm; Depth: 2.25mm; Volume: 13.86mm3</td>
<td>0.001</td>
</tr>
<tr>
<td>RF−/ACPA+</td>
<td>56.29±2.40</td>
<td>29</td>
<td>9.42±3.32</td>
<td>5.19±1.29</td>
<td>1.37±0.58</td>
<td>0.13±0.58</td>
<td>Width: 1.25mm; Depth: 2.02mm; Volume: 4.60mm3</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Conclusion: These data show that ACPA-positivity is associated with larger bone erosions in patients with RA. They also support the notion that ACPA essentially contribute to bone loss in RA by enhancing osteoclast activity, which is the key prerequisite for bone erosion. ACPA impact bone erosion independent from the presence or absence of RF.

References

Disclosure: C. Hecht, None; S. Finzel, None; M. Engbrecht, None; S. Schmidt, None; J. Rech, None; E. Araujo, None; G. Schett, None.

Bone Anabolic Changes Progress in PsA Patients Despite Treatment with Methotrexate or Tumour Necrosis Factor Inhibitors. Stephanie Finzel, Sebastian Kraus1, Sarah Schmidt1, Axel J. Hueber2, Juergen Rech2, Klaus Engelke1, Matthias Engbrecht3 and Georg Schett3, 1University of Erlangen-Nuremberg, Erlangen, Germany, 2Institute for Clinical Immunology, University of Erlangen-Nuremberg, Erlangen, Germany

Background/Purpose: To investigate whether methotrexate (MTX) or tumour necrosis factor inhibition (TNFi) affect osteophyte formation in patients with psoriatic arthritis (PsA).

Methods: 41 patients with PsA were examined for the presence of osteophytes and erosions at the metacarpophalangeal joints by high-resolution μCT imaging. The size of each individual lesion was quantified at baseline and 1-year follow-up in PsA patients treated with TNFi (N=28) or methotrexate (N=13). Groups were comparable for age, sex, disease duration and activity and baseline burden of osteophytes.

Results: In total, 415 osteophytes (TNFi: N= 284, MTX: N= 131) were detected. Osteophyte size increased significantly from baseline to follow-up in the TNFi group (mean ± SEM change: +0.23 ± 0.02mm; p<0.0001) and MTX group (+0.27 ± 0.03 mm, p<0.0001). In both treatment groups, the majority of osteophytes showed progression (TNFi: 54.3% MTX: 61.1%), whereas regression of lesions was rare (less than 10%). In contrast to osteophytes, clinical disease
activity decreased in both groups of PsA patients and erosions showed an arrest of progression in both groups.

**Conclusion:** Osteophytes progress in PsA patients treated with either MTX or TNFi. These data provide first evidence that pathologic bone formation in the appendicular skeleton of patients with PsA is not affected by current anti-rheumatic treatment strategies.

**Disclosure:** S. Finzel, None; S. Kraus, None; S. Schmidt, None; A. J. Hueber, None; J. Rech, None; K. Engkelke, None; M. Engbrecht, None; G. Schett, None.

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**Bone Structure and Perfusion Quantification of Bone Marrow Edema and Pannus Tissue Areas in the Wrist of Patients with RA.** Jose R. Teruel Antolin, Andrew J. Burghardt, Julien Rivoire, Waraporn Srikhum, Susan M. Noworolski, Thomas M. Link, John B. Imboden and Xiaojuan Li. University of California, San Francisco, San Francisco, CA

**Background/Purpose:** Bone marrow edema (BME) has been suggested as a strong predictor for erosive progression in RA joints, however, no previous studies examined the bone structure within BME. This study aimed to quantify bone structure and perfusion properties of BME, normal bone marrow (NBM) and pannus tissue areas in wrists affected by RA using 3T MRI and HR-pQCT.

**Methods:** Sixteen patients (52.9 ± 12.7 years) fulfilling ACR classification criteria underwent high-resolution peripheral quantitative computed tomography (HR-pQCT) and joint imaging MRI with T2-weighted IDEAL and 3D dynamic contrast enhanced (Gd-DTPA injection, temporal resolution 12 s, 32 time points) images were acquired. BME and NBM areas were segmented semi-automatically in the T2-w images. NBM areas were placed 1 to 3 mm far from BME regions and with similar distance to joint space. T2-w images were register to reformatted HR-pQCT and registration was applied to the segmented ROIs that were placed on original HR-pQCT images after upsampling (Fig 1). Perfusion parameters were calculated based on the signal-time curve obtained from DCE-MRI.

**Results:** Eleven out of 16 RA patients presented at least one BME region. Eighteen BME areas were segmented, 13 of them were presented around areas evidently affected by pannus tissue. The regions with pannus tissue in MRI always correspond to regions with erosion in HR-pQCT images (Fig 1). Two BME areas were presented next to early stage of pannus tissue (very small quantity of pannus penetrating the bone). For 3 of the BME regions, no pannus tissue were observed. Significant increases in bone density and trabecular thickness were evidenced in all BME regions (Fig 2).

BME and pannus tissue areas show significantly increased perfusion. The maximum signal enhancement in BME was 20.33 ± 14.33 (% over NBM) within the carpal bones and 21.32 ± 10.52 within the distal radius/ulna. In pannus tissue areas was 16.48 ± 11.34 (% over NBM) within the carpal bones and 32.93 ± 16.71 within the radius/ulna.

**Conclusion:** BME regions show a thickening in the trabecular structure that suggests a bone regeneration before pannus tissue produces erosion. Trabecular thickening within BME is higher when pannus tissue is already presented in the patient. This higher thickening suggests sclerosis occurring to protect the bone structure from pannus tissue and kinematic re-adaptation. Combining MRI and HR-pQCT provides a powerful multi-modality approach for better understanding BME and erosion, and potentially identifying novel imaging markers for disease progression in RA.

**Disclosure:** J. R. Teruel Antolin, None; A. J. Burghardt, None; J. Rivoire, None; W. Srikhum, None; S. M. Noworolski, None; T. M. Link, None; J. B. Imboden, None; X. Li, None.

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**Quantitative and Semi-Quantitative Bone Erosion Assessment On High-Resolution Peripheral Quantitative Computed Tomography in Rheumatoid Arthritis.** Waraporn Srikhum, Warapat Virayavanich, Andrew J. Burghardt, Andrew Yu, Thomas M. Link, John B. Imboden and Xiaojuan Li. University of California, San Francisco, San Francisco, CA

**Background/Purpose:** The goals of this project were (i) to develop novel quantitative and semi-quantitative measures of bone erosions at the metacarpophalangeal (MCP) and wrist joints in patients with rheumatoid arthritis (RA) using high-resolution peripheral quantitative computed tomography (HR-pQCT), and (ii) to correlate these measurements with disease duration and bone marrow edema (BME) pattern from MRI.

**Methods:** 16 RA patients (54.1 ± 12.7 years, 13 females) underwent hand and wrist HR-pQCT and 3 Tesla MRI. Bone erosions of the 2nd and 3rd MCPs and distal radius were evaluated by measuring maximal erosion dimension on axial slices by two radiologists. Measurements were performed twice. Intraclass correlation coefficient (ICC) values were calculated for the inter- and intra-reader reliability. Bone erosions in each MCP and distal radius were graded (grades 0–3) based on the maximal dimension and number of erosions (Figure1A). The volume of bone marrow edema (BME) pattern was quantified on coronal T2-weighted fast spin-echo (FSE) MRI images using in-house software. Spearman correlation coefficients were calculated between 1) sum maximal dimensions, highest grades and sum grades of bone erosions; 2) erosion measures and the clinical evaluation (duration of disease, DAS28, ESR, and CRP); 3) erosion measures and BME pattern volume in distal radius.

**Results:** The mean maximal dimension of erosions at MCP2, MCP3 and distal radius were 0.39±0.21 cm, 0.32±0.21 cm and 0.46±0.31 cm, respectively. The inter- and intra-reader agreements of maximal erosion dimensions were excellent (ICC 0.89 and 0.99, respectively). Correlations between highest grades and sum grades, vs. sum maximal dimensions of all erosions were r=0.96 and 0.94 (p<0.01), respectively. Number of erosions, sum maximal erosion dimensions, highest grades and sum grades significantly correlated with duration of the disease (p<0.01), but not with DAS28, ESR and CRP, which reflected accumulation of the structural damage during the course of RA. Number of erosions, sum max
maximal dimensions and erosion grading of the distal radius also correlated significantly with BME volume \( (p<0.001) \) (Figure 1B and C).

**Conclusion:** HR-pQCT provides sensitive and highly reproducible evaluation of structural bone damage in RA. The good correlation between erosion measures with duration of the disease as well as BME volume suggests that they could become feasible measures of erosions in RA, if very detailed disease course evaluation are required.

Disclosures: W. Srikhum, None; W. Virayavanich, None; A. J. Burghardt, None; A. Yu, None; T. M. Link, None; J. B. Imboden, None; X. Li, None.

**2585**

**Magnetic Resonance Imaging Versus Dual Energy Computed Tomography for Detection of Joint Pathology in Gout.** Fiona M. McQueen, None; A. J. Burghardt, None; A. Yu, None; T. M. Link, None; J. B. Imboden, None; X. Li, None.

**Background/Purpose:** Magnetic resonance imaging (MRI) captures joint inflammation and damage in gouty arthropathy and can also reveal tophi. We have investigated reader reliability for scoring the MRI features of gout and have explored the association between erosions and tophi. We have also compared MRI with Dual Energy Computed Tomography (DECT) scans of the same region, to define sensitivity and specificity of MRI for tophi.

**Methods:** 3T MRI scans of the dominant wrist were obtained in 40 patients with severe, longstanding gout. The median/range patient age was 55.5 years (29–70), disease duration 17 years (1–42), serum urate 0.39mmol/L (0.2–0.69), 70% were of Polynesian/Maori ethnicity, and 85% had a history of tophi. All scans were scored separately (blinded) by 2 radiologist readers, for synovitis, bone oedema, erosions and tophi at 15 carpal sites including the bases of 1–5 metacarpals using RAMRIS criteria. Inter-reader reliability for scoring all features was determined. In a subgroup of 10 patients, DECT scans were obtained of the same region and scored by a separate reader for tophi at the same sites (or in adjacent soft tissue).

**Results:** Reliability was high between MRI readers for bone erosion and tophus size (ICCs 0.77 [95%CI: 0.71–0.87] and 0.71 [0.52, 0.83] respectively); and was moderate for synovitis and bone oedema (ICCs 0.62 [95%CI: 0.34–0.80] and 0.60 [0.36, 0.77] respectively). Concordance between readers for erosions was 82%, for all tophi was 85% and for tophi > 5mm was 93%. When a stringent analysis was performed (features were only counted if scored by both observers = 2-reader MRI), 63% of patients were positive for bone erosions, 30% for bone oedema, 28% for tophi, 25% for tophi > 5mm and 61% for synovitis. The Odds ratio (OR) for tophus coexisting with erosion on MRI was 13.0 [95% CI: 1.5–113] when all sites were treated as independent and 2.9 [95% CI: 1.6–4.2] when the patient effect was factored in. When MRI and DECT scans from a subgroup of 10 patients were compared, using DECT as a gold standard, 2-reader MRI had a specificity of 0.98 [95% CI: 0.93–0.99], sensitivity of 0.63 [95% CI: 0.48–0.76], positive predictive value (PPV) of 94% and negative predictive value (NPV) of 84% for detecting tophi. There were only 2 instances in one patient where both MRI readers separately recorded tophus at a bone site where it was negative on DECT.

**Conclusion:** MRI has moderate to high reproducibility for assessment of gouty arthropathy and strong construct validity for detecting tophi when compared with DECT.

Disclosures: F. M. McQueen, None; A. Doyle, None; Q. Reeves, None; A. Gao, None; A. Tsai, None; G. Gamble, None; B. Curteis, None; M. Williams, None; N. Dalbeth, None.

**Figure.** A) Coronal T1w MRI scan revealing extensive tophi dorsally at the radioscaphoid joint (circle). B) volume rendered DECT scan shows same tophus (circle) C) axial T1w MRI – tophus extends ventrally (arrow) D) axial DECT image shows same tophus (arrow) at level of the scaphoid and E) adjacent to the radius.

**Conclusion:** MRI has moderate to high reproducibility for assessment of gouty arthropathy and strong construct validity for detecting tophi when compared with DECT.

Disclosures: F. M. McQueen, None; A. Doyle, None; Q. Reeves, None; A. Gao, None; A. Tsai, None; G. Gamble, None; B. Curteis, None; M. Williams, None; N. Dalbeth, None.
Tendon and Ligament Involvement in Gout: A Dual Energy Computed Tomography Study. Nicola Dalbeth1, Ramanamma Kalluru2, Opetaia Aati1, Fiona M. McQueen1 and Anthony Doyle1. 1University of Auckland, Auckland, New Zealand, 2Department of Rheumatology, Auckland District Health Board, Auckland, New Zealand

Background/Purpose: The involvement of bone and joints is widely recognized in gout. However, soft tissue involvement is less well defined. Dual energy computed tomography (DECT) is a recently developed technology that enables detection of urate deposits. The aim of this study was to examine the frequency and patterns of tendon and ligament involvement in patients with gout using DECT.

Methods: Ninety-two patients with tophaceous gout had a study visit including DECT scans for urate deposition at 20 tendon/ligament sites and 42 bone sites (total 1,840 tendon/ligament sites and 3,864 bone sites). For affected tendons and ligaments, involvement was recorded as entheseal and/or non-entheseal (entheseal involvement was defined as urate deposition at the point of tendon/ligament insertion into bone). Inter-reader agreement for involvement at tendon/ligament sites was 88.0% and Cohen’s kappa was 0.58, and at bone sites was 94.7% and Cohen’s kappa was 0.77. For a stringent analysis, urate deposition was considered present at each site only if reported by both readers.

Results: Urate deposition was observed in 199/1840 (10.8%) tendon/ligament sites and in 399/3864 (10.3%) bone sites (p=0.60). The Achilles tendon was the most frequently involved tendon/ligament site (39.1% all Achilles tendons), followed by the peroneal tendons (18.1%) (Figure). Tibialis anterior and the extensor tendons were involved less frequently (7.6–10.3%), and the flexor tendons, plantar fascia and deltoid ligaments were involved infrequently (<5%) (p<0.0001 between sites). In those 72 Achilles tendons with urate deposition, 27 (38%) had only non-entheseal involvement, 29 (40%) had both entheseal and non-entheseal involvement, and 16 (22%) had only entheseal involvement. In contrast, entheseal involvement was less frequent at the other 127 affected tendon/ligament sites; 102 (80.3%) had only non-entheseal involvement, 25 (19.9%) had both entheseal and non-entheseal involvement, and 0 (0%) had only entheseal involvement (p<0.0001 compared with Achilles tendon site).

Conclusion: Urate deposition is observed in tendon and ligament sites in patients with gout using DECT. The Achilles tendon and enthesis are major sites of involvement in gout. The patterns of urate deposition at certain tendon/ligament sites suggest that biomechanical strain or other local factors may contribute to formation of urate crystals.

Disclosure: N. Dalbeth, None; R. Kalluru, None; O. Aati, None; F. M. McQueen, None; A. Doyle, None.

Practice Makes Perfect: Assessment of Proficiency of Rheumatology Fellows in Specific Joint Procedural Skills. Tara J. Rizvi, Min Xu and Nancy Searle. Baylor College of Medicine, Houston, TX

Background/Purpose: Rheumatology training programs require fellows to be proficient in joint procedural skills as a requirement for graduation. However, specific procedures required to attain proficiency in gout are not clearly defined. A minimum number required for performance of specific procedures to attain proficiency is also not established.

The purpose of our study is two-fold:
1. To gather rheumatology fellow’s opinions about the number of times a joint procedure needs to be performed to attain proficiency.
2. To assess whether proficiency is attained by graduating fellows in 25 specific procedures generally practiced by practicing rheumatologists.

Methods: An online survey was sent to junior and senior fellows enrolled in adult rheumatology programs in the United States. The survey was sent in April and May 2011, in order to obtain data from fellows near completion of their first or final year or fellowship. The survey included questions pertaining to: year of fellowship training, fellow’s opinion of “average number of times a joint or soft tissue procedure should be performed in order to attain proficiency,” and reported number of times fellows had performed 25 specific procedures during the course of fellowship training.

Results: Data was collected from senior fellows (n=76) near completion of fellowship training. 57/76 (75%) of graduating fellows felt individual joint procedures be performed 5 or more times to attain proficiency; 14/76 (18%) reported “3 times”; 5/76 (7%) answered “other” and felt it depended on the joint.

Based on the majority of fellow’s views, we used “5” as the minimum number required to attain proficiency. We identified that 6/25 procedures were performed 5 or more times by greater than 50% of graduating fellows (Table 1): knee joint (98%), glenohumeral joint (57%), wrist joint (62%), ankle joint (60%), subacromial / subdeltoid bursa (74%) and trochanteric bursa (72%).

Table 1. Graduating rheumatology fellows having performed individual joint or soft tissue procedure 5 or more times

<table>
<thead>
<tr>
<th>Joint Procedure</th>
<th>PERFORMED &gt; 5 TIMES (n = 76)</th>
</tr>
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<tbody>
<tr>
<td>Knee joint</td>
<td>74 (97%)</td>
</tr>
<tr>
<td>Shoulder glenohumeral joint</td>
<td>43 (56%)</td>
</tr>
<tr>
<td>Elbow joint</td>
<td>28 (37%)</td>
</tr>
<tr>
<td>Wrist joint</td>
<td>47 (62%)</td>
</tr>
<tr>
<td>Ankle joint</td>
<td>46 (61%)</td>
</tr>
<tr>
<td>Subtalor joint</td>
<td>7 (9%)</td>
</tr>
<tr>
<td>First MTP joint</td>
<td>24 (31%)</td>
</tr>
<tr>
<td>First carpometacarpal joint</td>
<td>16 (21%)</td>
</tr>
<tr>
<td>Finger Joint</td>
<td>15 (20%)</td>
</tr>
<tr>
<td>Hip joint</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Sacroiliac joint</td>
<td>0 (14%)</td>
</tr>
<tr>
<td>Acromioclavicular joint</td>
<td>11 (14%)</td>
</tr>
<tr>
<td>Bicipital tendon</td>
<td>10 (13%)</td>
</tr>
<tr>
<td>Subacromial / subdeltoid bursa</td>
<td>56 (73%)*</td>
</tr>
<tr>
<td>Trochanteric bursa</td>
<td>54 (71%)*</td>
</tr>
<tr>
<td>Ischiogluteal bursa</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Olecranon bursa</td>
<td>26 (34%)</td>
</tr>
<tr>
<td>Pesanerine bursa</td>
<td>22 (29%)</td>
</tr>
<tr>
<td>Prepatellar bursa</td>
<td>13 (17%)</td>
</tr>
<tr>
<td>Lateral epicondylitis</td>
<td>17 (22%)</td>
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<tr>
<td>Medial epicondylitis</td>
<td>13 (17%)</td>
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<tr>
<td>Trigger finger</td>
<td>28 (37%)</td>
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<tr>
<td>DeQuervain’s tenosynovitis</td>
<td>9 (12%)</td>
</tr>
<tr>
<td>Carpal tunnel</td>
<td>10 (13%)</td>
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<tr>
<td>Plantar fascitis</td>
<td>3 (4%)</td>
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</tbody>
</table>

Conclusion: A substantial number of graduating fellows have not achieved the number needed to perform that most fellows themselves consider necessary to attain proficiency, in procedures commonly performed by practicing rheumatologists. The inadequacy of procedural exposure, and hence proficiency, can be circumvented by training authorities establishing specific, standardized criteria for rheumatology fellowship programs nationwide.

Disclosure: T. J. Rizvi, None; M. Xu, None; N. Searle, None.
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Standardized Patient Simulation Improves Internal Medicine Resident Musculoskeletal Examination Skills. Floriane C. Ernste1, Uma Thanarajasingam1, Courtney Shourt2, Andrew Halvorsen2 and Furman S. McDon-ald3.1 Mayo Clinic, Rochester, MN, 2 Mayo Clinic Rochester, Rochester, Rochester, Mayo Clinic, Rochester.

Background/Purpose: Few studies have addressed use of simulation-based education (SBE) to teach musculoskeletal (MSK) medicine to Internal Medicine (IM) residents. Our purpose was to obtain IM resident confidence levels in ability to diagnose MSK disorders and observe MSK performance skills with use of SBE at a single, large academic center.

Methods: Participants were 68 first and third-year IM residents. Surveys were completed before and after SBE using a 9-point Likert scale, ranging from 1 = poor, 5 = average, and 9 = very good, to assess ability to confidently perform MSK exams and diagnose shoulder, hand/wrist, hip, and knee disorders. Baseline exams were performed on two standardized patients (SPs) and videotaped. These were scored using a three-point scale (0 = not done; 1 = done, but not correctly; 2 = done correctly). An interactive lecture, self-demonstration of MSK exam, and participation with SPs in one or more scripted scenarios was provided. A debriefing session critiqued MSK exam skills. Post-SBE exams were performed with SPs and scored. Six month follow-up surveys assessed retention of confidence in MSK exam skills.

Results: Before intervention, mean (SD) rating of ability ranged from 4.4 (1.8) for pes anserine bursitis to 5.9 (1.6) for trochanteric bursitis, while confidence to perform MSK exams ranged from 4.3 (1.4) on the hand/wrist to 5.0 (1.5) on the knee. Following SBE, ratings of ability significantly improved, ranging from +1.7 (1.4) for trochanteric bursitis to +2.6 (1.5) for pes anserine bursitis and +2.0 (1.4) to +2.5 (1.3) for knee and hand/wrist exam, respectively (all p<.0001). Hip exams improved on inspection, gait, palpation, passive and active range of motion (ROM), strength testing, and provocative maneuvers (PM) (all p<.001). Hand/wrist exams improved on inspection, palpation, active ROM, strength testing, and PM (all p<.004), while passive ROM was unchanged (p=.31). Shoulder exams improved on palpation, passive and active ROM, strength testing, and PM (all p<.005), while inspection was unchanged (p=.02). Knee exams improved on inspection, gait assessment, palpation, active ROM, and strength testing (all p<.001), while passive ROM (p=.60) and PM (p=.07) were unchanged. Follow-up surveys completed 6 months post intervention by 32 eligible residents indicate durable ratings of ability, ranging from +1.5 (1.7) for patellofemoral pain syndrome to +2.5 (2.2) for de Quervain’s tenosynovitis and +2.0 (1.4) to 2.3 (1.5) for knee and hand/wrist examination, respectively (all p<.0001).

Conclusion: Use of SBE significantly improved IM resident confidence in ability to perform MSK exams and diagnose common MSK disorders. Resident performance of MSK exams as judged by a trained evaluator also improved. Improved confidence in ability to diagnose common disorders and perform MSK exams were durable 6 months after intervention. Therefore, use of SBE is an effective way to teach MSK medicine to IM residents.

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From Novice to Expert: Competency Milestones for Musculoskeletal Ultrasound. Karina D. Torralba1, Jay B. Higgs2, Amy C. Cannella2 and Gurjit S. Kaeley2. 1Keck School of Medicine, University of Southern California, Los Angeles, CA, 2San Antonio Military Medical Center, Fort Sam Houston, TX.

Background/Purpose: The Accreditation Council for Graduate Medical Education and the American Board of Internal Medicine have initiated the development of milestones for internal medicine (IM) residency training that would facilitate objective documentation of resident achievement of competence in six dimensions of practice. Milestones for IM subspecialties are now in development. Musculoskeletal ultrasound (MSUS) in Rheumatology is at its infancy, and not yet a fellowship requirement. However educators and fellows are encouraged to undergo training to acquire knowledge, skills and attitudes (KSA) in this field. The American College of Rheumatology has recently approved initiation of MSUS certification examination. The objective of this study was to develop milestones in the six dimensions of general practice in relation to usage of MSUS in Rheumatology.

Methods: A core group of educators (3 program directors, 1 associate program director) who are members of the Ultrasound School of North American Rheumatologists (USSONAR) adopted the 5-level Dreyfus model of skill acquisition as a framework for defining milestones and to describe progression of a learner: novice (level 1), advanced beginner (2), competent (3), proficient (4), expert (5). Level 3 is the minimum level considered competent to independently practice MSUS. A search of the medical and educational literature was done in order to define competency-specific KSA needing assessment, and to characterize for each level a behaviorally-based narrative description. The milestones were vetted by the group every two weeks by Skype and email over a period of six weeks. Consensus was reached so that each narrative description represented a continuum of training and practice that logically progressed in acquisition of KSA.

Results: Frameworks for the competencies of Medical Knowledge (MK) and Patient Care (PC) have been developed. While still related to general IM milestones, the milestones defined were more focused on MSUS-related KSA. The content areas for each competency were clarified. For MK, core knowledge related to correlations between anatomy, pathology and MSUS image acquisition and interpretation were emphasized along with basic principles on usage of MSUS in general, performance of MSUS-guided procedures, and documentation of findings. For PC, the area of concern was the incorporation of MSUS as a tool to aid clinical skills and reasoning, and to assist in the delivery of patient-centered care. Using the 5-level Dreyfus model, a sequence of behavioral descriptions were provided that describe the development of a learner from a novice stage (level 1) to that of an expert (level 5). A review and summary of relevant literature and references were also developed.

Disclosure: K. D. Torralba, None; J. B. Higgs, None; A. C. Cannella, None; G. S. Kaeley, None.

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Consolidating Knowledge, Comprehension, Application and Analysis in Rheumatology Education by Use of an In-House Electronic Module (Web-based Rheumatology Case Scenarios). David A. Kandiah, Diana Jonas-Dwyer and Astrid Davine. University of Western Australia, Crawley, Australia

Background/Purpose: The teaching and learning resource “Rheumatology Case Scenarios” was created as a web-based module. This electronic module was produced to maximise the interactive learning opportunities for medical students.

The key educational outcomes of this module are the:
1. Recognition of common Rheumatic conditions
2. Utilisation of systematic pattern recognition to compare and contrast these rheumatic diseases
3. Organisation and interpretation of the most appropriate investigations.
4. Planning and implementation of the most appropriate treatment strategies
5. Systematic evaluation of a patient with joint pain
6. Evaluation of their learning by pre and post-test questionnaires

Methods: A questionnaire was developed that would test the outcomes above in a Multiple Choice Question format. Human Research Ethics approval was obtained prior to commencement of the study.

Results: 131 students completed the pre-test questionnaire in 2011. Their mean score for the module (maximum score 26) was 14.3 (SD 2.9, range 6–21). A histogram showed that the student scores were in a normal distribution. Students who had completed all 8 cases were then given a follow-up questionnaire with the same questions but randomised differently. The students who completed this questionnaire had a mean score of 17.4 (SD 3.5, range 11–22) Paired samples t-test of the students who had completed the 2 questionnaires confirmed a statistically significant improvement of the scores of each student (range 2–4 points, p<0.001). The answers for the questionnaire were only provided to the students after they had completed the second questionnaire. To test their retention of knowledge, students were also given the option of completing the same questionnaire 3 months later. Questions were randomised differently again and the mean score rose to 23. This was statistically significant for these students when compared to their
scores at both previous levels suggesting that there was retention of their knowledge.

Conclusion: Web-based resources can consolidate learning in the clinical arena. Student feedback was also positive. An educational blog was activated to highlight certain management issues.

Disclosure: D. A. Kandiah, None; D. Jonas-Dwyer, None; A. Davine, None.

2591
Assessment of Examination Skills of 4th Year Medical Students Using a Novel Objective Structured Clinical Examination. Seetha U. Monrad, Lisa DiPonio, Cliff Craig, John Zeller and R. Brent Stansfield. Univ of Michigan Med Ctr, Ann Arbor, MI

Background/Purpose: University of Michigan (UM) medical students participate in integrated musculoskeletal sequences during their preclinical years, but subsequently there are few opportunities for assessment of their diagnostic and physical examination skills. The purpose of this study was to evaluate the effectiveness of the longitudinal UM musculoskeletal curriculum in preparing graduates to evaluate patients with musculoskeletal disorders.

Methods: IRB exemption was obtained for this project. A multidisciplinary group of musculoskeletal specialists developed a three station objective structured clinical exam (OSCE) based on the “Hypothesis-Driven Physical Exam” (Yudkowsky, et al.) focusing on the shoulder, back and knee. 4th Year students from the class of 2012 were invited to participate in the OSCE. For each station, students were provided a clinical vignette with three plausible diagnoses to consider, and were instructed to anticipate physical examination maneuvers or findings that would discriminate between the different diagnoses. They then examined a professional patient simulating findings associated with only one of the diagnoses. Trained faculty members directly observed students and scored performance of discriminatory physical examination maneuvers for each station. Each encounter was videotaped and independently scored by another faculty member. Inter-rater reliability for each maneuver was estimated using type-2 intra-class correlations. Percentages of perfect scores for anticipation (A) and performance (P) of each maneuver were calculated. Pearson’s correlation between A and P scores was computed for each maneuver.

Results: 30% of the graduating class of 2012 participated. Inter-rater reliability was good to excellent for scoring of 6 exam maneuvers: herniated disc (disc ICC r=.91), sacroiliac dysfunction (sac. ICC r=.85), shoulder impingement (imp. r=.69), glenohumeral arthritis (arth. ICC r=.76), anterior cruciate ligament tear (acl. ICC r=.87), and knee osteoarthritis (ost. ICC r=.87). Rater scores were averaged for each student. For the shoulder and knee stations, students could anticipate the necessary discriminatory examination maneuver for each diagnosis more frequently than they could actually perform the maneuver: (disc r=.45, p<.005; sac. r=.67, p<.0001; imp. r=r=.38, p<.025; arth. r=.32, p<.05; ost. r=.33, p<.05). A notable exception was the ability to perform maneuvers needed to diagnose a torn anterior cruciate ligament (ACL r=.05, n.s.).

Conclusion: A substantial percentage of graduating UM M4s are not able to perform core examination skills needed to diagnose common disorders of the shoulder, back and knee. Accurate anticipation of a discriminatory examination maneuver correlates with ability to perform the maneuver; however, students were more able to anticipate maneuvers than to actually perform them. Thus, direct observation is critical to ensure competence of students in evaluating musculoskeletal disorders.

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Musculoskeletal Ultrasound Objective Structured Clinical Examination: An Assessment of the Test. Eugene Y. Kissin1, Peter C. Grayson2, Amy C. Cannella1, Amy M. Evangelisto3, Janak R. Goyal4, Rany Al Haj5, Jay B. Higgs6, Daniel G. Malone7, Mridul Jyani8,9, Darren Tabechian10 and Gurjit S. Kaely11. 1Boston University, Boston, MA, 2Boston University Medical Center, Boston, MA, 3University of Nebraska Med Ctr, Omaha, NE, 4Arthritis, Rheumatic and Back Disease Associates, Voorhees, NJ, 5Raritan Bay Medical Center, Perth Amboy, NJ, 6Jersey Shore Arthritis & Rheumatism A, Ocean, NJ, 7San Antonio Military Medical Center, Fort Sam Houston, TX, 8Cincinnati Children’s Hospital & Sports Orthopaedics Center, Beaver Dam, WI, 9Adjunct Assistant Professor of Medicine/ Surgery, Stanford University, Stanford, California, CA, 10Univ of Rochester Schl of Med, Rochester, NY, 11University of Florida, Ponte Vedra Beach, FL

Background/Purpose: There is debate about whether an objective structured clinical examination (OSCE) should be part of musculoskeletal ultrasound (MSUS) competency testing in MSUS, and the reliability and validity of this approach has not been established. We aim to determine the reliability and validity of an OSCE for MSUS.

Methods: A 9-station OSCE was administered to a group of 35 rheumatology fellows, following an 8 month training program in MSUS, and to 3 expert faculty members as a control group. The participants were unaware of whether the joint were abnormal (n=5; wrist, ankle, elbow, finger, toe) or normal (n=4; wrist, ankle, knee, shoulder). Expert faculty in MSUS (n=9) graded image quality at OSCE stations using a predefined checklist and global rating (0–5 scale where 2 is barely passing) as both proctors and assessors. At each station a proctor witnessed and graded the studies being performed. Later, each resulting ultrasound image was also graded by two assessors blinded to who performed the study. Identical assessors graded the normal and abnormal wrist and ankle stations. Inter-rater reliability for assessors and proctors was estimated using the intraclass correlation coefficient (ICC). The borderline group method was used to set the overall passing score. A summative, 76 item multiple choice test (MCQ) assessed fellow knowledge necessary to interpret ultrasound images. Correlation between MCQ and OSCE performance (concurrent validity) was assessed using the Pearson correlation coefficient. Construct validity was established by comparing fellow OSCE results with that of the faculty (gold standard).

Results:

Reliability
Inter-rater reliability was good (ICC=0.7) between the assessors, but was poor (ICC=0.3) between the assessors and the proctors. Reliability of the assessor scores was good in the normal wrist and ankle stations (ICC=0.7), and moderate in the abnormal wrist and ankle stations (ICC=0.4).

Validity
MCQ grades correlated strongly with OSCE grades from both the assessors (r=0.52; p<0.01) and from the proctors (r=0.38; p<0.01). The average MCQ score for the 5 fellows who failed the OSCE was less than that for the 30 who passed (60% vs. 71%, p=0.04, Wilcoxon rank sum).

The fellows in the bottom quartile of the MCQ scored 3.07 on the OSCE, significantly worse than the top quartile fellows (3.32), and the faculty (3.29) (p<0.01, Wilcoxon signed rank). Scores also significantly discriminated bottom quartile fellows from faculty in the normal wrist and ankle stations (3.38 vs. 3.78, p<0.01), but not in the abnormal stations (3.37 vs. 3.49, p=0.08).

Conclusion: MSUS OSCE is a reliable and valid method for evaluation of MSUS skill when assessed by blinded examiners. Proctor grading is less reliable and adds to the cost of a practical MSUS examination. Normal joint assessment stations are more reliable than abnormal joint assessment stations and better discriminate poorly performing fellows from faculty, likely because assessors are less certain about the optimal appearance of abnormal joints and have more difficulty accurately scoring the resulting images.

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ACR Concurrent Abstract Session
Pediatric Rheumatology: Clinical and Therapeutic Disease IV: Childhood Therapeutics and Response
Wednesday, November 14, 2012, 9:00 AM–10:30 AM

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Predictive Markers of Therapeutical Outcome and Their Role in the Ethiopathology of Juvenile Idiopathic Arthritis. Maura Rossetti1, Roberto Spreafico1, Hong Zhang1, Maryam Moshref1, Nora G. Singer2, D. J. Lovell3, Carol A. Wallace4 and Salvatore Albani1. 1Sanford-Burnham Medical Research Institute, La Jolla, CA, 2MetroHealth Medical Center, Cleveland, OH, 3Cincinnati Children’s Hospital, Cincinnati, OH, 4Seattle Childrens Hospital, Seattle, WA

Background/Purpose: Currently, juvenile idiopathic arthritis (JIA) is treated with methotrexate (MTX) as a first-line agent. If children fail to respond, a biologic (e.g. anti-TNF) is usually added. However, a consistent response of patients to the combination treatment is not commonly attained. The identification of predictive markers of responsiveness to the therapy, together with the elucidation of the underlying mechanism, is therefore a dramatic unmet clinical need. Our approach is based on the premise that complex
diseases like JIA can be stratified based on the presence of multi-parametric signatures which characterize an immune function.

**Methods:** We have developed a multidimensional technology platform for identifying immune signatures, which includes phenotypical and functional data on a variety of blood cell types (T and B cells, APCs, NK and NKT cells, gdT cells). These tests operate in semi-high throughput (sHT) mode and can be combined with other HT "omics". This platform has been applied to a homogenous cohort of patients from the Trial of Aggressive Therapy (TREAT), including patients treated with the same TNF (Etanercept) and MTX, sampled before (T0) and after (Tend) the therapy, and subsequently stratified in patients reaching inactive disease state, and patients not achieving ID.

**Results:** When T eff and Treg functions (proliferation and suppression assays) were analyzed as a whole, we could not find significant changes between ID and NO ID. However, in depth characterization of the two cell subsets led to the identification of specific phenotypical differences at both time points analyzed. When a principal component analysis was applied to the entire set of parameters analyzed, the group of responding (ID, inactive disease) patients clustered and was clearly distinct from non-responding (NO ID) patients. Three different statistical models were applied to test whether selected candidate biomarkers could segregate patients according to their clinical outcome. Strikingly, although most parameters, taken singularly, were not effective in differentiating between the two disease states, the combination of a restricted set of CD4+ T cell markers was able to segregate ID and NO ID patients with up to 90% accuracy in both time points, thus providing both predictive and confirmatory value to the study. Moreover, our analysis identified a T cell subset characterized by an activated phenotype which is significantly more represented in the NO ID patients. This subset selectively expressed pro-inflammatory markers and chemokine receptors targeting to inflammatory sites, and bore signs of recent antigen recognition (based on Ki67 expression), possibly indicating their direct involvement in autoimmunity.

**Conclusion:** We have identified a cluster of immune functions with high predictive and prognostic power for discriminating the responsiveness to treatment with MTX/TNF in JIA, which may be developed as a theragnostic tool. Importantly, our approach has also identified a subset of experienced T cells, significantly more represented in clinical failures, which may comprise the potential pathogenic population responsible for the resistance to treatment.

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**2594**

**Epigenetic Signature of the Response to Anti-TNF in Juvenile Idiopathic Arthritis**  
**Authors:** Roberto Sacrisoni1, Maurizio Rossetti1, Hong Zhang2, Manuel Modshref3, Carol Wallace2, J. D. Lovell1 and Salvatore Albani1  
1Sanford-Burnham Medical Research Institute, La Jolla, CA, 2Childrens Hosp & Regional Med, Seattle, WA, 3Cincinnati Children’s Hospital, Cincinnati, OH

**Background/Purpose:** The identification of prognostic markers of responsiveness to the therapy in JIA would not only radically improve clinical management, but also shed light on the immune mechanisms underlying clinical outcomes, with the potential of improving and eventually personalizing clinical care. In this context, adaptive immunity plays a central role. Indeed, it is well known that CD4+ T cells are implicated in the pathogenesis of different subtypes of arthritis, including JIA. Many studies have relied on the use of whole transcriptome analysis to identify new biomarkers and get insights into the disease mechanisms. However, transcriptomes are volatile, quickly fluctuating in response to multiple factors, often clinically irrelevant. By contrast, epigenetics is more stable, possibly capturing only those changes slowly introduced by regular and consistent events such as therapy. As such, here we aimed at investigating the DNA methylation profile of JIA patients responding or not to therapy.

**Methods:** Patients treated with MTX+Etanercept+Prednisolone from the TREAT study were stratified based on the response to the therapy. Total CD4+ T cells were sorted from PBMCs at baseline (T0) and at end of study (Tend), DNA was extracted and bisulfite converted to analyze the cytosine methylation pattern. Converted DNA was analyzed using Illumina Infinium HumanMethylation450 BeadChip, yielding the methylation percentage of more than 485,000 CpG sites across the genome.

**Results:** Both hypothesis-driven and hypothesis-agnostic approaches were pursued. In hypothesis-driven approaches, DNA methylation of genes governing immune functions, which our group has identified as correlated to clinical outcome, was investigated. In hypothesis-agnostic approaches, no assumptions were made and the most relevant sites were selected by computational methods. In both scenarios, descriptive and predictive models were built to test the diagnostic value of the identified epigenetic signature, which, in some cases, could reach an accuracy close to 100%. In preliminary analyses, we found that, regardless of the approach taken, the HLA-DRB1 gene is differentially methylated between responders and non-responders. This finding is striking in correspondence with our recent data obtained though a high-throughput Immunomics approach, which also evidenced higher HLA-DR expression on CD4+ T cells in clinical non-responders at phenotypical level (manuscript in preparation).

**Conclusion:** In summary, we have identified a set of genes with high predictive and prognostic power for discriminating the responsiveness to treatment, which may be developed as a screening tool. Importantly, some of the differentially methylated genes identified through whole genome DNA methylation analysis correlate with phenotypical and functional changes previously described by our group, strongly putting forward further investigation of the functional role of HLA-DRB1 expression on CD4+ T cells.

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**2595**

**S100A12 At Baseline May Be Useful for Predicting Inactive Disease within 12 Months in Polyarticular Juvenile Idiopathic Arthritis**  
**Authors:** Gali Mahal1, Joy M. Whitbread1, Mary-Anne O’Riordan1, Sarah Ringold1, Susan D. Thompson1, Carol Wallace2, Salvatore Albani3 and Nora G. Singer1  
1MetroHealth Medical Center, Cleveland, OH, 2Case Medical Center, Cleveland, OH, 3Seattle Children’s Hospital, Seattle, WA, 4Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 5Childrens Hosp & Regional Med, Seattle, WA, 6Sanford-Burnham Medical Research Institute, La Jolla, CA, 7Director, Division of Rheumatology, MetroHealth Medical Center, Case Western Reserve University, Cleveland, OH

**Background/Purpose:** Achieving clinically inactive disease (ID) is a therapeutic goal in JIA. ID is defined as: no active arthritis; no fever, rash, serositis, splenomegaly or generalized lymphadenopathy due to JIA; no active uveitis; normal ESR; and physician global assessment=0. The laboratory parameters routinely used to describe patients’ JIA category include antibody status (RF, anti-CCP). ESR or CRP are frequently used to assess disease activity. The S100 proteins have been implicated as biomarkers of JIA and in disease pathogenesis. The pro-inflammatory ligand S100A12 binds to RAGE and studies suggest a relationship between S100A12 and both sJIA and RA disease activity. The S100A12 gene is rapidly up-regulated in monocytes and PMNs in inflammation and may be a biomarker for poly JIA activity as well. The objectives of this study were to evaluate the utility of baseline S100A12 levels in as a predictor of ID in poly JIA ID within 12 months, and to determine association between S100A12, RF, CCP and ESR.

**Methods:** S100A12 level was measured by ELISA in biospecimens from the Trial of Aggressive Therapy in JIA (TREAT) for whom baseline samples were available. The distribution of S100A12 in healthy children without JIA was determined on the log scale. The 95th percentile was estimated. This value was used as a cut-point: below the values were classified as “low” and above as “high”. The baseline values of the JIA cohort were then dichotomized the same way. RF, anti-CCP, and ESR were dichotomized as “Positive” or “Negative”. RF/CCP<-20 negative and ≥20 positive, ESR≥20 was considered elevated. Disease status(ID or no ID) was compared to S100A12 levels and positive and negative predictive values (PPV and NPV respectively) are reported. The relationship of levels S100A12 and of ID status with the levels of the other variables was tested using Chi squared analysis with levels of other markers and p values for association reported.

**Results:** 53 children from TREAT had baseline S100A12 values. 44 achieved ID and 9 did not within the first 12 months of treatment. S100A12 95th percentiles of the control population was estimated as 6.2 on the log scale (anitlog 3.931). 21 children had “High” S100A12 values, all of which were in the ID group (PPV 100%). 32 children had low values, 9 were in the no ID group (NPV 28%).
53 had baseline S100A12 measurement and known RF status, 21 had elevated and 32 had low S100A12: 11/21 and 3/32 had positive RF (p<0.001).

53 had ESR measured, 21 had high and 32 had low S100A12. 18/21 and 14/32 also had high ESR (p=0.002).

50 children had baseline S100A12 measurement and known CCP ab status. 18 had elevated and 32 had low S100A12 values: 9/18 and 4/32 had anti-CCP detected (p=0.004).

Conclusion: The PPV value of an elevated baseline S100A12 value for the probability of achieving ID in the first 12 months in TREAT was 100%. Elevation in S100A12 was highly associated with the presence of anti-CCP ab, RF positivity and elevated ESR. Since even polyJIA is a heterogenous disease, the data suggest that measurement of S100A12 may help guide understanding and treatment of disease.

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Rituximab Treatment for Antineutrophil Cytoplasmic Antibody - Associated Vasculitis In Children. Katharine F. Moore1, Leonard L. Dragneo1, Jennifer B. Soep1 and J. Roger Hollister2. 1Seattle Children’s Hospital/University of Washington, Seattle, WA, 2National Jewish Health, Denver, CO.

Background/Purpose: The purpose of this study was to report the experience of a tertiary-care children’s hospital using rituximab in the treatment of pediatric antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis (AAV), including immediate and long-term outcomes as well as adverse effects.

Methods: This was a single-center retrospective case series of 15 children with AAV treated with rituximab between March 2001 and March 2011. The majority of patients presented with severe disease, including acute pulmonary hemorrhage, and were treated with cyclophosphamide (CYC) and high-dose glucocorticoids (GC) concomitantly with rituximab (n=11); of these patients, six also required plasma exchange. Other treatment regimens given with CYC and GC included MTX alone (n=1) and anti-thymocyte globulin (ATG) alone (n=1). Outcome measures included time to negative ANCA, the length of CYC therapy after starting rituximab, total cumulative CYC dose, scores on the modified Birmingham Vasculitis Activity Score for Wegener’s Granulomatosis (BVAS/WG) as well as the Vasculitis Damage Index (VDI).

Results: Of the 15 identified patients, the median age at diagnosis was 13 (range 8–15). Seven were female. At the time of treatment with rituximab, the mean score on the BVAS/WG was 7.8 (range 1–12), with 11 patients (73%) classified as having severe disease. Three months after treatment with rituximab, the mean score dropped to 0.4 (range 0–2). Every one of the patients in this series ultimately achieved remission, defined as a BVAS/WG score of 0 with a 3-month steroid-free interval. Nine patients (60%) received only one course of rituximab and did not experience any relapses over a mean follow-up of 2.3 years. Following treatment with rituximab, the mean duration of CYC therapy was 11.3 weeks (range 4–28 weeks), with a mean cumulative CYC dose of 11 g. The mean cumulative CYC dose received by patients who were initially treated without rituximab was 44 g prior to the addition of rituximab and was 62 g over the entire duration of illness captured by this study. In contrast, the cumulative CYC dose received by patients who received rituximab with CYC and GC for initial induction was only 8.6 g. The average length of patient follow-up after treatment with rituximab was 2.5 years (range 3 months–5.1 years); during this time, five patients were re-treated with rituximab due to a flare in disease activity occurring at a mean of 21.8 months after the last rituximab treatment. Adverse effects from rituximab included mild infusion reactions. There were no deaths. There were no documented infectious complications.

Conclusion: This is the largest described series of pediatric patients with AAV treated with rituximab and includes a significant duration of follow-up. Our data show that rituximab can be a safe and effective therapy, even in combination with other immunosuppressive medications such as CYC and GC. This regimen allows patients to have decreased cumulative dose of CYC, thus minimizing the potential for long-term adverse effects of CYC.

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Degree of Initial Intracellular Folate Depletion May Predict Methotrexate Response in Juvenile Idiopathic Arthritis. Leon van Haandel1, Ryan S. Funk1, Marta F. Ibarra1, Mark F. Hoelzel1, Andrew Lasky1, Daisy Dai1, Rodger Gaedigk1, J. Steven Leeder2 and Mara L. Becker3. 1Children’s Mercy Hospital, Kansas City, MO, 2Children’s Mercy Hospital, Kansas City, MO

Background/Purpose: Despite widespread use, there are no predictors of methotrexate (MTX) response or toxicity. The objective of this study is to test the hypothesis that the variability in response to MTX is a function of intracellular individual differences in folate homeostasis.

Methods: This is a single center prospective cohort study at a tertiary care children’s hospital evaluating newly treated JIA patients on standardized doses and routes of MTX (15mg/m2 PO) and folic acid (1mg/day). After obtaining informed consent, samples are collected prior to, and after 3 and 6 months of MTX. Concentrations of tetrahydrofolate (THF), 5-methylTHF (5-MTHF), 5,10-methenylTHF (5,10-METHF), folic acid (FA), and MTX polyglutamates (MTXGlun) are determined in plasma, whole blood and erythrocytes by UPLC-tandem mass spectrometry. Clinical data are recorded from chart review and forms provided to the treating physician and patient/parent (CHAQ, MDVAS, PTVAS). Clinical outcomes at 3 months were measured via ACR pediatric 30, 50, 70 criteria and the JADAS71. We report preliminary 3 month data on the first 20 patients recruited to the study.

Results: The study consisted of 12 females and 8 males with JIA. The mean ± SD age at study entry was 135.2 ± (49.5) months. After 3 months on standardized MTX therapy, paired t-test revealed an overall statistically significant decline in MD VAS (p < 0.0001), PT VAS (p < 0.001), active joint count (p = 0.002), JADAS71 (p < 0.001), and 5-MTHF concentrations (p = 0.004). There were no statistically significant differences in CHAQ, SRD, CRP, or 5,10-METHF from 0–3 months on therapy. These results were confirmed with additional nonparametric testing. At 3 months, 8 (40%) subjects failed to reach ACR Ped 30 (“non-responders”), while 10 (50%) subjects reached ACR Ped 30 or 50, and 2 (10%) reached ACR Ped 70 (“responders”).

The mean decline from baseline of 5-MTHF concentrations at 3 months was found to be significantly greater in boys (~402.8 mmol/L, compared to girls (~122.9 mmol/L) (p=0.03), and negatively correlated with age (p = -0.7, p=0.0006). A trend towards greater changes in 5-MTHF concentrations from baseline were observed in responders (~333.3 mmol/L) compared to non-responders (~105.1 mmol/L) (p=0.07). No statistically significant differences were seen in absolute 5-MTHF concentrations at 0 or 3 months and ACR outcomes, although responders had comparatively higher 5-MTHF concentrations (885.3 mmol/L vs. 662.2 mmol/L, p NS) at baseline. Multivariate testing supported an association between change in 5-MTHF and response (p=0.05) controlling for gender and age. Two patients had exceptionally high 5,10-METHF concentrations (>4X IQR). Omitting the outliers revealed a pronounced change in 5-MTHF in responders (p=0.04). No association between long chain MTXGlus and outcomes or change in folate concentrations has been observed to date.

Conclusion: These preliminary data suggest that an initial decline in 5-MTHF concentrations may be correlated to MTX response, and might provide clinicians with a more effective biomarker than intra-cellular concentrations of the drug itself in JIA. Future work will investigate factors that contribute to 5-MTHF depletion.

Disclosure: L. van Haandel, None; R. S. Funk, None; M. F. Ibarra, None; M. F. Hoelzel, None; A. Lasky, None; D. Dai, None; R. Gaedigk, None; J. S. Leeder, None; M. L. Becker, None.

2598

Anti-Drug Antibodies Are Associated with Diminished Drug Levels and Treatment Failure. Miha Kosmac1, Natasa Toplak2, Gabrielle Simonini3, Ilaria Pagini1, Rolando Cimaz2, Vladka Curin Serbec3 and Tadej Avein3.

1Blood Transfusion Centre of Slovenia, Ljubljana Slovenia, Ljubljana, Slovenia, 2University Children’s Hospital Ljubljana Slovenia, Ljubljana, Slovenia, 3Anna Meyer Children’s Hospital, Department of Pediatrics, University of Florence, Florence, Italy.

Background/Purpose: Due to their proteinaceous character biologics can often induce an unwanted immune response that results in the formation of anti-drug antibodies in patients receiving biologic therapy. We therefore analyzed the sera of juvenile idiopathic arthritis patients receiving either
Methods: We determined the serum drug levels and anti-drug antibody levels in the sera of 26 patients on IFX, 12 patients on ADA and 19 patients on ETA therapy. In the cases where we detected the presence of anti-drug antibodies we also investigated whether these antibodies bind the Fab or Fc fragments and compared laboratory findings with the clinical response to therapy.

Results: We detected anti-drug antibodies in 11 out of 26 (42%) patients on IFX and 4 out of 12 (33%) patients on ADA therapy, but found no anti-ETA antibodies in any of the 19 patients treated with ETA. Anti-drug antibodies were in all cases associated with decreased serum drug levels, which in the majority of cases were below the limit of detection. For the two monoclonal antibody drugs (IFX and ADA) we observed that the anti-drug antibodies bound the Fab fragments, i.e. the regions responsible for TNF binding.

Conclusion: The level of immunogenicity for patients receiving biologic therapy closely followed the degree of foreignness of the biologic drugs, with IFX inducing the formation of anti-IFX antibodies in the highest proportion of patients, followed by ADA, while ETA did not induce the formation of anti-ETA antibodies in any of the patients included in our study. Once anti-drug antibodies had developed they were in all cases associated with decreased serum drug levels, however not all non-responders showed low serum drug levels or tested positive for anti-drug antibodies, indicating a different disease mechanism. Monitoring of serum drug levels and the detection of anti-drug antibodies may therefore be important for determining the best personalized treatment strategy and enabling a more cost-effective treatment.

Disclosure: M. Kosmac, None; N. Toplak, None; G. Simonini, None; I. Paglini, None; R. Cimaz, None; V. Curin Serbec, None; T. Avenin, None.

Table 1. Proportion of U.S. Medicare Fee-for-Service Beneficiaries Receiving Sustained Glucocorticoid Monotherapy for Rheumatoid Arthritis in 2009

<table>
<thead>
<tr>
<th>Age</th>
<th>Unadjusted proportion of sustained monotherapy prednisone use</th>
<th>p</th>
<th>Adjusted* proportion of sustained monotherapy prednisone use</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-69</td>
<td>0.06 (0.05, 0.08)</td>
<td>&lt;0.001</td>
<td>0.06 (0.05, 0.08)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>70-74</td>
<td>0.08 (0.06, 0.09)</td>
<td>0.08 (0.07, 0.09)</td>
<td>0.08 (0.07, 0.09)</td>
<td>0.08 (0.07, 0.09)</td>
</tr>
<tr>
<td>75-79</td>
<td>0.10 (0.09, 0.12)</td>
<td>0.11 (0.09, 0.12)</td>
<td>0.11 (0.09, 0.12)</td>
<td>0.11 (0.09, 0.12)</td>
</tr>
<tr>
<td>80-84</td>
<td>0.14 (0.12, 0.15)</td>
<td>0.13 (0.11, 0.15)</td>
<td>0.13 (0.11, 0.15)</td>
<td>0.13 (0.11, 0.15)</td>
</tr>
<tr>
<td>85 and older (reference)</td>
<td>0.20 (0.17, 0.22)</td>
<td>0.18 (0.15, 0.20)</td>
<td>0.18 (0.15, 0.20)</td>
<td>0.18 (0.15, 0.20)</td>
</tr>
</tbody>
</table>

* Multivariable model adjusted for all variables in the model as well as gender, number of physician visits, number of inpatient admissions, area poverty, and health professional area shortages.

Conclusion: Approximately 10% of Medicare recipients with RA were treated with sustained courses of glucocorticoids alone in 2009. Compared to DMARD users, glucocorticoid monotherapy users were older, more likely to be Black, had lower income, had more medical comorbidities and hospitalizations, and were less likely to have a rheumatologist prescribing their RA medication. Although advanced age and accompanying medical comorbidities may appropriately limit the use of DMARDs, differences by race, income, and geographic region suggest disparities in quality of care.

Disclosure: C. Tonner, None; G. Schmajuk, None; A. N. Trivedi, None; G. Lin, None; J. Yazdany, None.

Background/Purpose: Use of disease-modifying anti-rheumatic drugs (DMARDs) is a nationally endorsed quality measure, yet recent studies suggest that only 60% of Medicare recipients with rheumatoid arthritis (RA) use DMARDs. We investigated the prevalence and predictors of receiving glucocorticoids alone for the treatment of RA in a nationwide sample of Medicare beneficiaries.

Methods: Data derive from a 5% random sample of U.S. Medicare fee-for-service beneficiaries. We included individuals ≥65 years with at least two face-to-face clinical encounters for RA and Part D drug claims for either a DMARD anytime during the year or sustained glucocorticoid monotherapy, defined as an annual dispensed glucocorticoid supply of ≥180 days or an annual dispensed dosage of ≥900 mg of prednisone (or steroid equivalent). Using multivarurate logistic regression, we examined predictors of sustained glucocorticoid monotherapy including sociodemographic characteristics, income (low-income defined as Medicare eligible for reduced cost sharing or state buy-in), health service utilization (number of inpatient and outpatient encounters and prescribing physician specialty) and medical co-morbidities. In addition, we used the Area Resource File to examine area level predictors of socio-economic status, health care shortage areas, and Census geographic divisions. From the regression models, we calculated adjusted group proportions and 95% confidence intervals.

Results: Of the 8,062 beneficiaries, 10% (n = 830) were classified as receiving glucocorticoid monotherapy. In adjusted analyses, we found that glucocorticoid monotherapy was higher among those with advanced age (18% among those ≥85 years compared to 11% in those 74–79 years), Blacks (12% versus 10% in Whites), and among low-income beneficiaries (12% versus 10% in those with higher incomes). Having a rheumatologist prescribe one or more medications during the measurement year was associated with significantly lower rates of glucocorticoid monotherapy (7% versus 16%). More inpatient admissions and medical co-morbidities were also positively associated with glucocorticoid monotherapy. There was little variation across the nation, with marginally higher rates of glucocorticoid monotherapy in the Middle Atlantic region (13%) compared to the Pacific region (8%).

Conclusion: Use of glucocorticoids alone for the treatment of RA in a nationwide sample of Medicare beneficiaries. We included individuals ≥65 years with at least two face-to-face clinical encounters for RA and Part D drug claims for either a DMARD anytime during the year or sustained glucocorticoid monotherapy, defined as an annual dispensed glucocorticoid supply of ≥180 days or an annual dispensed dosage of ≥900 mg of prednisone (or steroid equivalent). Using multivarurate logistic regression, we examined predictors of sustained glucocorticoid monotherapy including sociodemographic characteristics, income (low-income defined as Medicare eligible for reduced cost sharing or state buy-in), health service utilization (number of inpatient and outpatient encounters and prescribing physician specialty) and medical co-morbidities. In addition, we used the Area Resource File to examine area level predictors of socio-economic status, health care shortage areas, and Census geographic divisions. From the regression models, we calculated adjusted group proportions and 95% confidence intervals.

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measures in a nationwide cohort of Medicaid recipients with incident lupus nephritis.

**Methods:** We used Medicaid analytic extract (MAX) data from 2000–2004 containing person-level files on Medicaid eligibility, utilization and payments. We identified patients meeting a validated administrative data definition of incident lupus nephritis, and used this group as the denominator population for both quality metrics (QMs). Numerator components included: angiotensin-converting enzyme (ACE) inhibitors or angiotensin-receptor blockers (ARBs) within 90 days of lupus nephritis onset. We used multivariate logistic regression models to examine sociodemographic (age, sex, race/ethnicity), geographic (U.S. region), and health care (health professional shortage areas, HPSAs, from the Area Resource File) predictors of higher performance. In additional analyses, we extended the time period for both QMs to 365 days to assess whether performance improved.

**Results:** 974 Medicaid recipients met the definition of incident lupus nephritis. Mean age was 39 years (SD 12, range 18–64), 93% were female, and most were African American (African American 48%, White 27%, Hispanic 13%, Asian 6%). Individuals were geographically dispersed (20% Midwest, 22% Northeast, 34% South, 24% West), and 41% resided in partial or complete HPSAs. Only 19.5% received care consistent with all numerator components of QM1; 25% of individuals received only steroids, and 13% received immunosuppressants alone. When the timeframe for QM1 was extended to one year, performance rose to 30%. For QM2, 30% of individuals received an ACE/ARB within 90 days. When this timeframe was extended to one year, performance rose to 58%. In multivariate logistic regression models, those living in the South were less likely to receive recommended therapy for lupus nephritis (QMI; OR 0.53, CI 0.28–0.99), while younger individuals were more likely to receive treatment (OR for 18–34 years versus referent 51–64 years 3.5, CI 1.6–7.6). Individuals in the Midwest were less likely to receive an ACE/ARB (QMI; OR 0.52, CI 0.34–0.80), while African Americans were more likely (OR 1.7, CI 1.2–2.4).

**Conclusion:** These data suggest substantial gaps and delays in care for U.S. Medicaid patients with incident lupus nephritis. A large number received steroid monotherapy or no immunosuppressant within one month, although performance improved by one year. Use of ACE/ARBs was low in the first 90 days, but rose to 58% by one year. Geographic differences were observed, with individuals in the South and Midwest being less likely to receive recommended care. The contribution of state Medicaid policies, specialty care access, and drug coverage policies to these observed geographic differences warrants investigation.

**Disclosure:** J. Yazdany, None; C. H. Feldman, None; J. Liu, None; M. M. Ward, None; M. A. Fischer, None; K. H. Costenbader, None.

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**2601 Improving Delivery of Care for JIA Across a Multi-Center Network Using a Shared Data Registry and Quality Improvement Science:** The Pediatric Rheumatology Care and Outcomes Improvement Network (PR-COIN) began operating in the spring of 2011 and currently has 12 participating sites in the United States and Canada. This is the first report of our data.

**Methods:** Our approach is based on the Institute for Healthcare Improvement Breakthrough Series Collaborative Model with planned interventions to improve outcomes based on the Chronic Illness Care Model. Conference calls, web-based information exchange, and face-to-face learning sessions are forums for teams to gain expertise in QI science, share knowledge, and develop new strategies to improve patient care. Teams conduct “Plan-Do-Study-Act” cycles to enact improvement and submit data and progress reports monthly. After informed consent/assent is obtained, site patient data are entered into the ACR’s Rheumatology Clinical Registry in order to track progress of the network over time. Design of data collection forms allows assessment of performance on published JIA quality measures (QMs) (Arthritis Care Res 2011 Jan;63(1):10–6) and monitoring of clinical outcomes. 13 processes of care QMs and 4 clinical outcomes QMs are tracked. Site specific and aggregate data are analyzed monthly and provided with transparency as feedback to the sites. Benchmarking is possible through analysis of the data submitted by participating practices, and shared information can accelerate improvement throughout the network.

**Results:** As of May 2012, 516 patients from 7 sites have been entered into the registry for longitudinal assessment. Performance exceeded goal on 2 process of care QMs: measurement at clinic visits of complete joint count (mean 100%, goal 90%) and pain assessment (mean 96%, goal 90%). Examples of process QM requiring improvement include: 0% of eligible patients screened for Heiligenhaus guidelines (mean 72%, goal 90%); toxicity labs for DMARDs per guidelines (mean 72%, goal 90%); measurement every 180 days of functional ability (mean 81%, goal 90%), and HRQOL (mean 3%, goal 90%). Our baseline outcome measures showed: 77% of patients have a pain score ≤3, 58% patients have an optimal CHAQ score of 0; and 33% of patients on JIA medication and 56% of patients on JIA medication could be defined as having clinical inactive disease.

**Conclusion:** PR-COIN is a growing international QI learning network. Our baseline data demonstrate mixed performance on measures of processes of care. As we reach target performance goals for our measures over time, we will continue to raise the bar for performance. The next phase of our project is to use interventions including implementation of an already developed population management tool, creation of a pre-visit planning tool to facilitate measurable improvement in meeting benchmarks for process of care, and orchestrated testing of which QI interventions most positively impact clinical outcomes.

**Disclosure:** C. A. Bingham, None; L. M. Darbie, None; K. Marsolo, None; J. E. Weiss, None; S. P. Ardoin, None; R. M. Laxer, Novartis Pharmaceutical Corporation, 2; D. J. Lovell, National Institutes of Health, 2, Astra-Zeneca, Centocor, Wyeth, Amgen, BMS, Abbott, Pfizer, Regeneron, Hoffmann-La Roche, Novartis, UCB, Xoma, 5; Arthritis and Rheumatism, Genentech, 8, Forest Research; M. H. Passo, None; S. Vora, None; B. S. Gottlieb, Pfizer Inc, 5; T. Beukelman, Pfizer Inc, 2, Novartis Pharmaceutical Corporation, 5, Biogen IDEC Inc, 5; N. Griffin, None; J. A. Stock, None; M. L. Miller, None; K. Onel, None; T. Ronis, None; P. Margolis, None; E. M. Morgan DeWitt, None.

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**2602 The Rheumatology Informatics System for Effectiveness (RISE): Enabling Data Access Across Disparate Sites for Quality Improvement and Research.** Peter J. Embi,1 Itara Barnes,2 Rachel Myśliński,1 David Ervin2, William Stevens3,1 Tara Borlawski4 and Philip R.O. Payne4.1 The Ohio State University, Columbus, OH, 2American College of Rheumatology, Atlanta, GA

**Background/Purpose:** Rheumatology quality improvement efforts and clinical research are often challenged by the need to access and integrate data across diverse patient populations and disparate information systems. We report on our use of a service-oriented architecture (SOA) to link disparate clinical data resources across multiple clinical sites and systems in support of rheumatology practice and research. The central aim of this technology is to provide a reliable and cost-effective means of connecting data from multiple EHR systems, and using these data for quality improvement and research querying for the rheumatology community.

**Methods:** The design and execution of effective quality improvement projects and clinical studies requires access to high quality, longitudinal data. In most instances, such data are collected, formalized, stored and retrieved using project- or organization-specific disease registries or data warehouses. It is increasingly desirable to access data across multiple clinical sites for quality improvement and clinical research purposes, but disparate EHR systems remain difficult to connect for data interchange. Furthermore, in these types of settings, organizational and policy barriers
often preclude the use of centralized repositories. To address this need, we developed a lightweight, SOA-based approach to create a network of clinical sites that could serve as a federated data repository. The ACR is piloting this system—called the Rheumatology Informatics System for Effectiveness (RISE)—to enhance registry efforts to benefit rheumatic disease research and quality reporting efforts. Because RISE will collect data directly from EHR systems, it will eliminate the need for manual and redundant data entry into the registry.

Results: The model employed by RISE uses an approach to enable the federated query of geographically distributed data sources in order to create a virtual data repository. This platform uses the TRIAD middleware (1), and is currently being implemented at two pilot sites in the US, with more planned in the near future. A novel feature is the use of TRIAD-enabled data sharing “virtual appliances” (Figure 1). The systems was designed to reduce the overhead of deploying a data sharing service, while simultaneously allowing sites to maintain full control of the type and nature of data being shared. Through deployment of a simple, menu-driven query construction and data discovery portal, RISE allows end-users with appropriate privileges to quickly and easily discover and query distributed data sets.

Conclusion: The design, deployment and initial use of the RISE Network addresses the need for data access across disparate sites using otherwise non-interoperable information systems. We believe that such an approach to distributed data sharing in rheumatology will help advance science and improve clinical practice.

Disclosure: P. J. Embi, None; I. Barnes, None; R. Myśliński, None; D. Ervin, None; W. Stevens, None; T. Borlawsky, None; P. R. O. Payne, None.

2603 Moving Into the Electronic Age: Validation of Rheumatology Self-Assessment Questionnaires On Tablet Computers. Jessica M. Sage1, Arshia Ali2, Jennifer Farrell1, Jennifer L. Huggins1, Kara Covert1, Diane Eska1, Rina Mina1, Shweta Srivastava2, Janalee Taylor1, Tracy V. Ting1, Esi M. Morgan DeWitt1 and Hermine I. Brunner1. 1Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, 2University of Cincinnati, Cincinnati, OH, 3Cincinnati Children’s Hospital Medical Center/University of Cincinnati, Cincinnati, OH

Background/Purpose: The medical field is increasingly relying on electronic health records (EHR). Many children’s hospitals are converting from paper-pencil questionnaires to electronic versions. The purpose of this study was to compare correlation of results of paper-pencil versus electronically administered versions of two self-report questionnaires: 1) Rheumatology module of the Pediatric Quality of Life Inventory (RHE-PedsQL) and 2) Review of Systems (ROS) symptom checklist.

Methods: Patients (8–28 years old) with rheumatologic conditions, or their parents, completed the RHE-PedsQL (n=76) and ROS checklist (n=100) as a paper-pencil form and electronically through a tablet computer within the same office visit. Interclass correlations (ICC) and weighted-kappa statistics were computed using SAS 9.3 to compare questionnaire modes of administration. Repeated measures analysis of variance was used to determine between and within subject effects for the following covariates: age, gender, race, diagnosis, subtype, and ethnicity. Concurrently, a sample of patients/parents (n=22) was given a qualitative survey about the use of the tablet computer and preference for paper-pencil vs. electronic modes.

Results: Overall, no significant differences were found between the paper-pencil and tablet questionnaires in total score (RHE-PedsQL p=0.16; ROS p=0.56), as well as for any of the identified covariates considered.

Moderate agreement was found for each domain of the RHE-PedsQL (range: ICC = 0.46–0.61). Consistency, at the individual item level, between paper-pencil and electronic capture ranged from poor to moderate (range: kappa = 0.14–0.58), with the treatment domain having the highest correlations (kappa = 0.58) and the worry domain having the lowest (kappa = 0.14).

The ROS checklist yielded substantial agreement for “average pain” (ICC = 0.87) and “overall status” items (ICC = 0.76). Moderate to excellent agreement was found for each of the 60 individual items of the ROS questionnaire (kappa = 0.3–1.0), with questions regarding the nervous system (e.g., depression, tingling/numbness) showing the best consistency (all kappa > 0.70) and items regarding skin problems (e.g., tightening, discoloring) showing the most discrepancies (kappa = 0.32–0.95).

Qualitative analysis revealed many patients/parents found the tablet simpler, easier and faster than paper-pencil forms. Ten respondents preferred the tablet, eleven had no preference and only one patient preferred the paper-pencil.

Conclusion: There were no significant differences found, for both the ROS checklist and the RHE-PedsQL, in overall score and individual item values, when switching from paper-pencil application to electronic data capture. Furthermore, moderate to substantial agreement was found between modes of administration for the RHE-PedsQL and ROS checklist. The use of electronic questionnaires can increase efficiency of office visits, improve data collection, and patient monitoring, as well as satisfy patient preferences. The ability to integrate electronic patient-reported data into EHR has the potential to improve health care delivery.

Disclosure: J. M. Sage, None; A. Ali, None; J. Farrell, None; J. L. Huggins, None; K. Covert, None; D. Eska, None; R. Mina, None; S. Srivastava, None; J. Taylor, None; T. V. Ting, None; E. M. Morgan DeWitt, None; H. I. Brunner, None.

2604 Ask a Doc—Rheumatologic Care Delivered Just in Time. Eric D. Newman1, Chelsea Cedeno1, Thomas M. Harrington1, Thomas P. O lenginski2, Alfred E. Denis1, Androniki Bili1, Brian DeVecchio1, Carolyn Houk1 and Paul F. Simonelli1. 1Geisinger Medical Center, Danville, PA, 2Geisinger Health System, Frackville, PA

Background/Purpose: Specialty care is traditionally delivered as face to face consultations. These encounters range from consult not needed to consult needed quickly. Our care systems are not designed to distinguish these different needs, creating excess visits that delay access. This delay results in overutilization and unnecessary expense (consult not needed), underutilization of needed care and worsening disease (consult needed quickly), and potential harm and patient anxiety (both). To provide specialty care just when it is needed, we developed Ask-a-Doc, a web-based tool accessed from within the electronic health record (EPIC).

Methods: Ask-a-Doc was developed using process redesign methodology. Ask-a-Doc allows the Primary Care Physician (PCP) to ask a question and the specialist to answer it through electronic chart review, phone call, or video call. Ask-a-Doc consists of 3 steps: Step 1 - ask a question (PCP). Step 2 - connect to the specialist (Scheduler). Step 3 - answer the question and complete the documentation (Specialist), 23 PCPs, 7 schedulers, and 11 specialists (6 rheumatologists, 5 pulmonologists) were trained to use Ask-a-Doc. Redesign measures included service excellence, work effort, process reliability, and clinical outcome.

Results: Step 1 - The PCP selected a specialty or specialist, turn-around time (now, today, within 3 days), preferred mode of communication (electronic messaging, phone call, instant video), and asked a question. The question could be patient-specific or not patient-specific. The request was submitted electronically to the Ask-a-Doc scheduler. Step 2 - The scheduler identified the correct specialist and sent the form to that specialist’s Ask-a-Doc inbox folder. If the request was to communicate by phone or video, the scheduler connected the specialist back to the PCP. Step 3 – the specialist reviewed the EPIC record, answered the question, and provided structured electronic documentation. Analysis of the first 74 Ask-a-Doc questions showed the following (Table 1): Service excellence - Primary care satisfaction of 4.5 (range 0–5), mean turnaround time of 3 hours, met or exceeded requested timeframe 100%. Work effort – 12 minutes average per message. Process – 100% response rate. Outcome – 57 consultations saved (77%).
## Table 1. Comparison of remission criteria based on laboratory tests and formal joint counts

<table>
<thead>
<tr>
<th>Remission criteria</th>
<th>Percentage of patients in remission</th>
<th>Agreement with Boolean ACR/EULAR definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDAI ≤ 3.3</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>CDAI ≤ 3.3</td>
<td>91%</td>
<td>99%</td>
</tr>
<tr>
<td>DAS28 ≤ 2.6</td>
<td>90%</td>
<td>88%</td>
</tr>
<tr>
<td>Boolean ACR/EULAR</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Conclusion

Using process redesign methodology, we developed Ask-a-Doc to improve care delivery between PCPs and specialists. The results demonstrate excellence in service, a highly reliable process, and significant reduction in waste. Ask-a-Doc provides specialty care “just-in-time”, so patients that don’t need to be seen are not, and those that do can be seen promptly – by design, not by accident. As reimbursement for care delivery moves towards bundled payments, Ask-a-Doc is a value-added service that rheumatologists can provide.

### Disclosure

E. D. Newman, None; C. Cedeno, None; T. M. Harrington, None; T. P. Oleninski, None; A. E. Denio, None; A. Bili, None; B. DelVecchio, None; C. Houk, None; P. F. Simonelli, None.

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### ACR Concurrent Abstract Session

**Rheumatoid Arthritis - Clinical Aspects VI: Remission and Flare in Rheumatoid Arthritis**

**Wednesday, November 14, 2012, 9:00 AM–10:30 AM**

### 2605

**Exploration of Possible Preliminary Descriptions of Remission Based On RAPID3, without Laboratory Tests or Formal Joints Counts but with Careful Joint Examinations, in the Etude Et Suivi Des Polyarthrites Indifférenciées Récentes (ESPOIR) Cohort of Early Rheumatoid Arthritis Patients.** Isabel Castrejón1, Maxime Dougados2, Bernard Combe3, Bruno Fautrel3 and Theodore Pincus4. NYU Hospital for Joint Diseases, New York, NY, 1Paris-Descartes University, APHP, Cochin Hospital, Paris, France, 1Hospital Lapeyronie, Montpellier, France, 2APHP-Pitié Salpêtrière Hospital / UPMC, Paris, France

**Background/Purpose:** Criteria for remission in rheumatoid arthritis (RA) have been developed according to DAS28 (disease activity score), CDAI (clinical disease activity index), and two recent proposals by an American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) committee: “Boolean” with 4 measures—tender joint count (TJC28), swollen joint count (SJC28), C-reactive protein (CRP), and patient global estimate (PATGL), all ≤1; and SDAI (simplified disease activity index). All require formal joint counts, which are not performed at most visits in usual care, and all but CDAI require a laboratory test, which often is not available. Therefore, we explored 4 descriptions of remission for usual care, based on RAPID3 (routine assessment of patient index data), a composite index including function, pain and PATGL—without a laboratory test or formal joint count, but with a careful joint examination and physician global estimate (DOCLG, 0–10 scale).

**Methods:** The ESPOIR cohort includes 756 patients recruited between Dec 2002 and March 2005. Post hoc analyses were performed to identify the number of patients in remission 6 months after enrollment according to 4 descriptions requiring a formal joint count (and 3 a laboratory test): DAS28 ≤2.6, CDAI ≤2.8, and the two proposed by the ACR/EULAR committee –

<table>
<thead>
<tr>
<th>Category</th>
<th>Measure</th>
<th>Definition</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Excellence</td>
<td>Satisfaction</td>
<td>Survey results from PCP perspective (Scale 0–5; 0 = “Impossible”, 5 = “Very Easy”)</td>
<td>4.5</td>
</tr>
<tr>
<td>Time to Completion</td>
<td>Timeframe from message initiation to response sent</td>
<td>Mean Specialty turn-around time = 3 hours; Mean PCP requested time = 21 hours</td>
<td>100%</td>
</tr>
<tr>
<td>Request Met</td>
<td>% Requested Response Timeframe met or exceeded</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Work Effort</td>
<td>Volume</td>
<td>Number of Ask a Doc messages created/started</td>
<td>12</td>
</tr>
<tr>
<td>Process Response Rate</td>
<td>% of messages responded to</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Process Response Accuracy</td>
<td>% of patient specific messages converted to encounters for proper documentation</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>Outcome</td>
<td>Consults Saved</td>
<td>Number of consults saved by using Ask a Doc</td>
<td>57 (77%)</td>
</tr>
</tbody>
</table>

**Results:** Among the 756 ESPOIR patients, 734 had complete 6-month data to calculate all 8 descriptions. The highest percentage of patients in remission was seen with DAS28 and RAPID3R, the least stringent descriptions, and the lowest percentage with the Boolean definition. Good agreement with the Boolean ACR/EULAR definition was seen for SDAI, CDAI, RAPID3R+J1, RAPID3R+J1D1 and RAPID3R+J0D1 (92.6%–94.7%, kappa 0.70–0.79), versus only moderate agreement for DAS28 and RAPID3R (79.9%–85.8%, kappa 0.46–0.55) (Table).

**Table:** Proportion of 734 patients in the ESPOIR cohort who were in remission 6 months after baseline according to 8 descriptions of remission

### ACR Concurrent Abstract Session

**Rheumatoid Arthritis - Clinical Aspects VI: Remission and Flare in Rheumatoid Arthritis**

**Wednesday, November 14, 2012, 9:00 AM–10:30 AM**

<table>
<thead>
<tr>
<th>Remission descriptions</th>
<th>Patients in remission by each description: Number (%)</th>
<th>Kappa (95% CI) vs ACR/EULAR Boolean</th>
<th>% Patients in remission agreement with ACR/EULAR Boolean</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDAI ≤ 3.3</td>
<td>127 (17.3%)</td>
<td>0.79 (0.76–0.86)</td>
<td>94.7%</td>
</tr>
<tr>
<td>CDAI ≤ 3.3</td>
<td>238 (32%)</td>
<td>0.46 (0.39–0.52)</td>
<td>79.9%</td>
</tr>
<tr>
<td>DAS28 ≤ 2.6</td>
<td>134 (18.2%)</td>
<td>0.75 (0.69–0.82)</td>
<td>93.5%</td>
</tr>
<tr>
<td>Boolean ACR/EULAR</td>
<td>117 (16%)</td>
<td>0.74 (0.67–0.81)</td>
<td>93.6%</td>
</tr>
<tr>
<td>RAPID3R versions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAPID3R</td>
<td>186 (25.3%)</td>
<td>0.55 (0.48–0.63)</td>
<td>85.8%</td>
</tr>
<tr>
<td>RAPID3R+J1</td>
<td>136 (18.6%)</td>
<td>0.73 (0.66–0.79)</td>
<td>92.6%</td>
</tr>
<tr>
<td>RAPID3R+J0D1</td>
<td>117 (16%)</td>
<td>0.74 (0.67–0.81)</td>
<td>93.6%</td>
</tr>
<tr>
<td>RAPID3R+J1D1</td>
<td>97 (13.2%)</td>
<td>0.70 (0.62–0.77)</td>
<td>93.0%</td>
</tr>
</tbody>
</table>

**Conclusion:** Using process redesign methodology, we developed Ask-a-Doc to improve care delivery between PCPs and specialists. The results demonstrate excellence in service, a highly reliable process, and significant reduction in waste. Ask-a-Doc provides specialty care “just-in-time”, so patients that don’t need to be seen are not, and those that do can be seen promptly – by design, not by accident. As reimbursement for care delivery moves towards bundled payments, Ask-a-Doc is a value-added service that rheumatologists can provide.

**Disclosure:** E. D. Newman, None; C. Cedeno, None; T. M. Harrington, None; T. P. Oleninski, None; A. E. Denio, None; A. Bili, None; B. DelVecchio, None; C. Houk, None; P. F. Simonelli, None.

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### 2606

**Patient Reported Outcomes in Early Arthritis Patients.** L. Heimans1, K.V.C. Wevers-de Boer1, K. Visser1, T.H.E. Molenaar2, B.A. Grill3, Tom Huizinga1 and C.F. Allaart1. 1Leiden University Medical Center, Leiden, Netherlands, 2Haga Hospital, The Hague, 2Groene Hart Hospital, Netherlands, 2Zorgzaam hospital, Terneuzen, Netherlands

**Background/Purpose:** To investigate patient reported outcomes (PROs) of functioning and health related quality of life (HRQOL) after 1 year remission (DAS≤1.6)-steered treatment in early arthritis patients.

**Methods:** In the IMPROVED-study 610 patients with early rheumatoid and undifferentiated arthritis were treated with metotrexate (MTX) 25mg/week and 60mg/day of prednisone, tapered to 7.5mg/day in 7 weeks. Patients who did not achieve early remission after 4 months were randomized either to hydroxychloroquine 400mg/day, sulphasalazine 2000mg/day, MTX 25mg/week plus prednisone 7.5mg/day (arm 1) or to adalimumab (ADA) 40mg/2weeks plus MTX 25mg/week (arm 2). Every 4 months, patients filled out the Health Assessment Questionnaire (HAQ) to measure functional ability, the
Short Form 36 (SF-36) and visual analogue scales (VAS) for global health (VASgh), pain (VASp), disability (VASdis) and morning stiffness (VASms). Mean scores of HAQ, SF-36 and VAS over 1 year were compared between patients in the randomization arms using linear mixed models. HAQ- and VAS scores and changes over 1 year were compared between the treatment groups (early remission, arm 1, arm 2 and ‘outside protocol treatment’). SF-36 scores (higher= better HRQOL) were compared with the Dutch population norm matched for age and sex. Predictors of significant change in PCS and MCS over 1 year were identified using linear regression analyses.

Results: After 4 months, 375/610 patients achieved early remission, 83 patients were randomized to arm 1 and 78 to arm 2, and 62 did not follow the protocol; 12 were lost to follow up. Mean (sd) HAQ after 1 year was 0.4 (0.5) in the early remission group, 0.9 (0.7) and 0.8 (0.7) in arm 1 and 2, respectively, and 0.7 (0.6) in the ‘outside protocol’ group (p<0.001; early remission group vs either arm 1 or 2; p<0.001, early remission vs ‘outside protocol’; p=0.001, arm 1 vs arm 2 and ‘outside protocol’ vs both arms: p=1.0). Mean HAQ reduction in year 1 was 0.6 in all groups (p=0.7). Mean HAQ, PCS, MCS and VAS-scores over 1 year treatment were better in the early remission group. There was no significant difference between randomization arms 1 and 2. VAS improvements over 1 year were similar in all groups except VASdis, which improved significantly more in arm 2 than in arm 1 (36 versus 24 points; p=0.02). At baseline and after 1 year, all groups scored below the Dutch population average in PCS, MCS and all subscales (all p<0.001). Early remission was a predictor for significant improvement in PCS but not MCS after 1 year. For the MCS only baseline MCS was a predictor.

Conclusion: In patients with early arthritis, functional ability and patient reported outcomes after 1 year are significantly better in patients who achieved early remission. In patients who did not achieve early remission, treatment with polyDMARD+prednisone or adalimumab+MTX results in comparable improvements. All patients with early arthritis have significantly lower HRQOL than the Dutch general population, both at baseline and after 1 year of remission steered treatment.

Disclosure: L. Heimann, None; K. V. C. Wevers-de Boer, None; K. Visser, None; R. Goekoop, None; T. H. E. Molenaar, None; B. A. Grillet, None; T. Huizinga, None; C. F. Allaart, None.

2607 Adherence to a Treat-to-Target Strategy in Early Rheumatoid Arthritis: Results of the Dutch Rheumatoid Arthritis Monitoring Remission Induction Cohort. Marloes Vermeer1, Ina H. Kuper2, Hein J. Berenot Moens3, Monique Hoekstra4, Marcel D. Posthumus5, Piet L.C.M. van Rei6 and Mart A.F.J. van de Laar7.1University of Twente & Medisch Spectrum Twente, Enschede, Netherlands, 2Medical University of Vienna, Vienna, Austria, 3Medical University of Vienna and Hietzing Hospital, Vienna, Austria.

Background/Purpose: To determine if the proportion of patients achieving full function (HAQ 0) in RA patients with sustained clinical remission (DAS28-CRP ≤ 2.6) for at least 6 months.

Methods: We were provided a random 80–90% data sample of RA patients enrolled in recent clinical trials (ASPIRE, ATTRACT, DE019, ERA, Leflunomide, PREMIER, and TEMPO; n=4863) by the respective sponsors. We identified patients, who at some point during the trials achieved sustained remission in consecutive visits of at least 6 months by the DAS28-CRP ≤ 2.6 and SDAI ≤ 3.3. We obtained HAQ scores during these 6 month remission periods, and were thus able to investigate the course of physical function over time in sustained remission using the Wilcoxon test. Furthermore we explored the proportion of patients achieving full function (HAQ = 0) over time period investigated.

Results: Out of 4362 patients we identified 605 patients in sustained remission by DAS28-2.6, and 385 patients by SDAI. No significant differences of baseline characteristics were found between these two groups. We found a significant decrease of mean HAQ values over time within the first 6 months in remission by DAS28-CRP (mean±SD: -0.04±0.22 to 0.38 to 0.22±0.39 to 0.21±0.38 to 0.20±0.37 to 0.18±0.31 to 0.16±0.32) as well as SDAI (0.17±0.3 to 0.16±0.32 to 0.15±0.3 to 0.14±0.29 to 0.13±0.29 to 0.13±0.26 to 0.11±0.27) with significantly (p<0.05) lower levels of HAQ in remission by SDAI compared to DAS28-CRP at remission entry until month 4 in sustained remission. Achievement of full function (HAQ=0 over course of remission) was observed in 42.5% of patients in DAS28-2.6 and 50.1% of patients in SDAI remission at beginning of sustained remission, and in more patients with early RA (DAS28-CRP: 47.6%; SDAI: 52.6%) compared to late RA patients (DAS28-CRP: 33.3%; SDAI: 44.1%). Further, at remission entry this difference remained significant (p<0.05).
only 57.4% of patients in DAS28-CRP REM fulfilled SDAI remission; this percentage increased over time to 71.9% at 3 months and 76.9% at 6 months of sustained remission; thus, the improvement of HAQ in DAS28 remission went at least partly in parallel with the increasing frequency of SDAI remission in DAS28 remitters over time.

Conclusion: Physical function continuous to improve over time in sustained remission. The stringency of the remission criteria determines how quickly patients in remission achieve their best possible functional improvement.

Disclosure: H. Radner: None; F. Alasti: None; J. S. Smolen: Abbott, Bristol-Myers Squibb, MSD, Pfizer, Inc., Roche, UCB, 2, Abbott, Astra-Zeneca, Bristol-Myers Squibb, Celgene, GlaxoSmithKline, MedImmune, MSD, Novo-Nordisk, Pfizer, Inc., Roche, Sandox, Sanofi, UCB, 5; Rheumatology Textbook, Mosby-Elsevier, 7; B. Aletha: MSD, 2, Abbott, BMS, Grünenthal, MSD, Pfizer, Roche, UC, 5.

Table 1. Baseline characteristics - mean (SD) unless otherwise noted

<table>
<thead>
<tr>
<th>Database</th>
<th>Number of patients</th>
<th>Age, years</th>
<th>Female, N (%)</th>
<th>Disease duration in years</th>
<th>RF positive, N (%)</th>
<th>Anti-CCP positive, N (%)</th>
<th>DAS28 at inclusion</th>
<th>DAS28 at 3 months after inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>51</td>
<td>59 (12.2)</td>
<td>58 (12)</td>
<td>56 (13.5)</td>
<td>104 (69)</td>
<td>93 (69)</td>
<td>147</td>
<td>744</td>
</tr>
<tr>
<td>2</td>
<td>147</td>
<td>29 (57)</td>
<td>101 (69)</td>
<td>539 (72)</td>
<td>42 (82)</td>
<td>117 (81)</td>
<td>69</td>
<td>469</td>
</tr>
<tr>
<td>3</td>
<td>147</td>
<td>59 (12)</td>
<td>101 (69)</td>
<td>539 (72)</td>
<td>42 (82)</td>
<td>117 (81)</td>
<td>69</td>
<td>469</td>
</tr>
</tbody>
</table>

Fig. 1. Course of HAQ in DAS-CRP and SDAI sustained remission over time

Construct and Criterion Validity of Several Proposed DAS28 Based Rheumatoid Arthritis Flare Criteria: A Cohort Validation Study. Aatke van der Maas1, Elisabeth Lie2, Robin Christensen3, Ernest Choy4, Yaël A. de Man1, Piet L.C.M. van Riel5, Thaisa G. Woodworth6 and Alfons A. den Broeder1. 1Sint Maartenskliniek, Nijmegen, Netherlands, 2Diakonhjemmet Hospital, Oslo, Norway, 3Musculoskeletal Statistics Unit, The Parker Institute, Copenhagen University Hospital, Copenhagen, Denmark, 4Cardiff University School of Medicine, Cardiff, United Kingdom, 5Erasmus Medical Centre, Rotterdam, Netherlands, 6Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands, 7Visiting Clinical Researcher, Geffen School of Medicine, UCLA, Los Angeles, CA

Background/Purpose: To enable consistent assessment of impact of tapering, withdrawal and dose optimization strategies, there is an increasing need for validated measures of flare in rheumatoid arthritis (RA) clinical practice. Several DAS28 based flare criteria have been described, but none validated.

Methods: We used 3 longitudinal observational databases that included treatment withdrawal or change in relation to RA worsening to test 6 previously published DAS28 based flare criteria on fulfillment of 5 hypotheses as criterion and construct validity. Published DAS28 based flare criteria were: 1) an increase in DAS28>1.2, or >0.6 if current DAS28>5.1, 2) an increase in DAS28>1.2, or >0.6 if current DAS28>3.2, 3) an increase in current DAS28>1.2, 3.2, 4) an increase in DAS28>1.2, 5] DAS28 >3.2, 6] DAS28 >2.6. The 5 hypotheses used to assess validity were: A) Sensitivity and specificity >70% compared to patient’s/physician’s judgment of RA worsening assessed with a transition question, and C) difference in proportion with DMARD/corticosteroid initiation/increase or 0.2, D) difference in mean CRP change >10mg/L, and E) no statistical difference in SF36 Mental Health (MH) subscale change in patients fulfilling versus not fulfilling the flare criteria. Sensitivity/specificity, Chi square and two sample student’s T test were done.

Results: Analyses included 51, 147 and 744 RA patients in the 3 studies. Two studies included patients treated with infliximab and the larger study (NOR-DMARD) included patients initiating a new synthetic or biologic DMARD. Baseline characteristics are described in Table 1.Criterion 2 (an increase in DAS28>1.2, or >0.6 if DAS28>3.2) fulfilled most predefined hypotheses (4 out of 5, Table 2). Sensitivity and specificity for criterion 2 varied between 63–78% and 84 –92%, respectively. Construct validity was demonstrated with 23% more treatment change, a higher mean ΔCRP (11.4 mg/L) and a difference in ΔSF-36 MH of only -5. Criteria 3, 5 and 6 tended to be more sensitive, criteria 1, 2 and 4 more specific.

Table 2. Fulfillment of DAS28 based flare criteria on 5 hypotheses regarding construct and criterion validity

<table>
<thead>
<tr>
<th>Database</th>
<th>Hypothesis</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.08</td>
<td>0.28</td>
<td>0.13</td>
<td>0.21</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.03</td>
<td>0.23</td>
<td>0.10</td>
<td>0.18</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>0.02</td>
<td>0.27</td>
<td>0.13</td>
<td>0.19</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.01</td>
<td>0.25</td>
<td>0.12</td>
<td>0.16</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>0.01</td>
<td>0.24</td>
<td>0.11</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Conclusion: An increase in DAS28>1.2, or >0.6 if DAS28>3.2 appears most discriminating and valid by our predefined criteria. The differences in sensitivity and specificity between the various DAS28-based flare criteria may be of importance for selection of flare criteria for specific studies. Further assessment, with evaluation of impact relative to levels of worsening, in additional databases may refine criteria.

Disclosure: A. van der Maas: None; E. Lie: None; R. Christensen: None; E. Choy: None; A. A. de Man: None; P. L. M. van Riel: None; T. G. Woodworth: None; A. A. den Broeder: None.

2610

Predictors of Sustained Clinical Remission in Early Rheumatoid Arthritis - Results From the Canadian Early Arthritis Cohort. Bindu Kurry1 Juan Xiong1, Gilles Boire2, Boulos Harrouet2, Carol A. Hatchon3, Janet E. Pope4, J. Carter Thorne5, Diane Tin2, Edward Keystone6, Vivian P. Bykerk7 and CATCH8. 1University of Toronto, Toronto, ON, 2Mount Sinai Hospital, Toronto, ON, 3CHUS - Sherbrooke University, Sherbrooke, QC, 4Osteoarthritis Research Unit, University of Montreal Hospital Research Centre (CRCHUM), Montreal, QC, 5University of Manitoba, Winnipeg, MB, 6St. Joseph’s Health Care London, London, ON, 7Southlake Regional Health Centre, Newmarket, ON, 8Hospital for Special Surgery, New York, NY, 9Toronto, ON

Background/Purpose: Rapid time-to-remission has been associated with sustained remission in established rheumatoid arthritis (RA). However, the prevalence and predictive factors of sustained remission in early RA is poorly understood, especially in the context of stringent remission definitions.

Methods: We used data from the Canadian early Arthritis Cohort (CATCH) and included patients with probable or confirmed RA. Remission was defined according to the ACR/EULAR clinical practice definition (TJC ≤1, SJC ≤1 and patient global ≤ 1) and SDAI ≤ 3.3. Patients in CATCH are seen every 3 months in year 1 and q6mly thereafter. Sustainability was defined as ≥6 months or 2 consecutive visits with ACR/EULAR or SDAI remission. Predictors for sustained remission were identified by logistic regression analysis, adjusted for clinical confounders.
### Results:

1244 patients were included. 83% were Caucasian and 73% were female, with mean age (SD) of 53.6 (14.6) years, and mean symptom duration (SD) of 6.0 (3.1) months. Initial treatment within the 1st 3 months included: methotrexate monotherapy in 392 (32%), combination DMARDs in 548 (44%), and biologics in 272 (22%). 42% achieved ACR/EULAR and 484/1205 (40%) SDAI remission with a median time-to-remission of 23.9 months for each. In those ever achieving sustained remission, 309 (59.2%) and 233 (56.4%) did so for sustained ACR/EULAR and SDAI remission. Factors associated with increased probability of sustained remission were younger age, low baseline pain scores and earlier time-to-first remission (Table). Baseline RF, CCP, patient global, smoking status, symptom duration, DAS28, HAQ, fatigue, AM stiffness and erosions had no effect on sustained remission. No initial treatment strategy predicted sustained remission, nor did biologic use within the first 6 months (8%).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>ACR/EULAR</th>
<th>Clinical Practice Remission</th>
<th>OR (95% CI)</th>
<th>p-value</th>
<th>SDAI Remission</th>
<th>OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>0.98 (0.96, 0.99)</td>
<td>0.002</td>
<td>0.98 (0.96, 0.99)</td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female sex</td>
<td>0.62 (0.39, 0.99)</td>
<td>0.04</td>
<td>0.78 (0.48, 1.26)</td>
<td>0.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain score*</td>
<td>0.99 (0.98, 0.99)</td>
<td>0.04</td>
<td>0.98 (0.98, 0.99)</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methotrexate</td>
<td>0.95 (0.55, 1.66)</td>
<td>0.26</td>
<td>0.68 (0.37, 1.23)</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination DMARD therapy</td>
<td>1.49 (0.88, 2.51)</td>
<td>0.14</td>
<td>1.42 (0.80, 2.51)</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biologic DMARD therapy</td>
<td>1.68 (0.75, 3.74)</td>
<td>0.21</td>
<td>0.85 (0.39, 1.85)</td>
<td>0.69</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time-to-remission</td>
<td>0.997 (0.996, 0.998)</td>
<td>0.0001</td>
<td>0.997 (0.996, 0.998)</td>
<td>0.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Treated as continuous variables

**Conclusion:** Even when stringent definitions of remission are considered, sustained remission is possible within two years for ERA patients initially treated with conventional DMARDs. The time to reach sustained remission may be falsely long as after year 1, data is collected only every 6 months. Gender influenced the chance of remission only in ACR/EULAR remission. Demographic characteristics and pain are important predictors of sustained remission. Shorter time-to-remission is also related to sustainability and supports striving for early remission in patients with ERA. The optimal treatment approach for sustained remission in this cohort could not be determined.

**Reference**


**Disclosure**

B. Kurtya; None; J. Xiong; None; G. Boire; None; B. Haraoui; None; C. A. Hitchon; None; J. E. Pope; None; J. C. Thorne; None; B. Tin; None; E. Keystone; None; V. P. Bykerk; Amgen, Pfizer, Roche, BMS, UCB, Janssen Biotech and Abbott; 2;

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### ACR Concurrent Abstract Session

**Spondylarthropathies and Psoriatic Arthritis - Clinical Aspects and Treatment: Psoriatic Arthritis and Spondyloarthritis**

**Wednesday, November 14, 2012, 9:00 AM-10:30 AM**

**2611**

**Do Patients with Psoriatic Arthritis Fall Into Distinct Clinical Sub-Groups—a Cluster Analysis?**

Anar Thavaneswaran1, Vinod Chandran2, and Dafna Gladman1.1 Toronto Western Hospital and University of Toronto, Toronto, ON, 2Toronto Western Hospital, University of Toronto, Toronto, ON

**Background/Purpose:** To determine if demographic and disease characteristics of patients with PsA at presentation to a PsA clinic cluster into distinct groups.

**Methods:** 1058 patients with Psoriatic Arthritis (PsA) were included from an observational cohort. Cluster analysis using Ward’s method was conducted to identify groups of patients based on the following characteristics at baseline: gender, type of psoriasis (type I or II), duration of PsA, race, family history of psoriasis, ESR, severe PASI, psoriasis vulgaris, nail disease, dactylitis, swollen joint count, damage joint count, axial disease, and presence of arthritis prior to psoriasis. 7 clusters were formed and matched to non-overlapping arthritis patterns (as described previously) at first clinic visit: distal arthritis, oligoarthritis, polyarthritis, axial only, distal arthritis and axial, oligoarthritis & axial, and polyarthritides & axial. Comparisons between the clusters and arthritis patterns were conducted using t-tests and Chi-square analysis.

**Results:** The baseline characteristics of the 1058 patients were as follows: 613 (56.5%) males, mean age at diagnosis of PsA 37.1 (13.5) years, mean age at first visit 44 (13.1) years, mean duration of PsA 6.8 (8.2) years, mean active joint count 11.0 (9.8), mean PASI 5.8 (8.3), mean Steinbrocker score 12.9 (25.5), HALA-B27 116 (17.7%) with an average follow-up of 8.4 (8.4) years. Two main clusters of patients were identified. One consisted of distal arthritis, oligoarthritis and polyarthritides and the other of axial only, distal and axial, oligoarthritis & axial, and polyarthritides & axial, thus clearly identifying patients into peripheral and axial disease. Comparison of the two clusters showed a longer duration of PsA at baseline, more patients with a family history of psoriasis, and more dactylitis in patients with peripheral disease. Patients falling into the axial disease cluster had a higher prevalence of males, more Caucasians, more psoriasis vulgaris, worse PASI score, higher damage joint count and more patients who developed arthritis first.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%) or Mean (sd)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at diagnosis of Ps (&gt;40 vs. ≤&lt;40)</td>
<td>63 (14.5%)</td>
<td>47 (20.4%)</td>
</tr>
<tr>
<td>Duration of PsA</td>
<td>8.6 (7.6)</td>
<td>5.0 (6.5)</td>
</tr>
<tr>
<td>Gender (Males)</td>
<td>259 (59.4%)</td>
<td>175 (76.1%)</td>
</tr>
<tr>
<td>Race (Caucasian vs. others)</td>
<td>365 (84.1%)</td>
<td>208 (90.8%)</td>
</tr>
<tr>
<td>Family history of Psoriasis</td>
<td>124 (28.6%)</td>
<td>53 (14.4%)</td>
</tr>
<tr>
<td>Nail disease</td>
<td>214 (69.7%)</td>
<td>120 (78.4%)</td>
</tr>
<tr>
<td>Dactylitis</td>
<td>236 (54.4%)</td>
<td>80 (34.8%)</td>
</tr>
<tr>
<td>Abnormal skin</td>
<td>352 (82.4%)</td>
<td>213 (94.3%)</td>
</tr>
<tr>
<td>Severe PASI (≥10)</td>
<td>35 (12.9%)</td>
<td>40 (27.2%)</td>
</tr>
<tr>
<td>ESR</td>
<td>21.7 (18.9)</td>
<td>28.5 (22.1)</td>
</tr>
<tr>
<td>Swollen joint count</td>
<td>3.3 (4.2)</td>
<td>2.8 (3.9)</td>
</tr>
<tr>
<td>Damage joint count</td>
<td>1.1 (2.9)</td>
<td>7.6 (11.8)</td>
</tr>
<tr>
<td>Axial disease</td>
<td>67 (15.5%)</td>
<td>208 (90.4%)</td>
</tr>
<tr>
<td>Arthritis first</td>
<td>20 (4.6%)</td>
<td>21 (9.1%)</td>
</tr>
</tbody>
</table>

**Conclusion:** Based on patients’ characteristics at baseline, cluster analysis separated PsA patients into two main arthritis patterns- axial and peripheral. The study provides further evidence to classify patients into just two groups based on the presence or absence of axial arthritis.

**Disclosure**

A. Thavaneswaran; None; V. Chandran; None; D. Gladman; None.

**2612**

**Localisation of Bone Marrow Edema in Sacroiliac Joints in Spondyloarthritides Patients: Does the Site of Lesions Change Over a 3-Month Period?**

Manouk de Hooge, Rosaline van den Berg, Monique Reijnierse, Victoria Navarro-Compaín, Floris van Gaalen, Tom Huizinga and Désirée van der Heijde. Leiden University Medical Center, Leiden, Netherlands

**Background/Purpose:** A positive MRI at baseline is a strong predictor for a positive follow-up MRI1. But many questions about the volatility of the lesions over short follow-up periods remain unsolved. Is it possible for lesions to disappear, occur or move localisation? Or is their location rather consistent over time?

**Objectives:** To describe if and how the location of active inflammatory lesions change and if lesions can occur or disappear after 3 months without changing treatment.

**Methods:** 90 patients with chronic back pain (≥3 months, ≤<2 years, onset ≤<45 years) who were included in the SPonduArthritis Caught Early (SPACE)-cohort underwent a MRI of the SI joints (MRI-SIJ) at baseline and after 3 months follow-up.

**Results:** Out of all the patients 66/90 (73.3%) did not show any lesions at any of the time points. In 12 patients no difference was found between baseline and follow-up MRI with respect to the SI joint (only left side affected in 7 patients, only right side in 2 and in 3 patients both SI joints were affected). In 5 patients without lesions at baseline new inflammation occurred (4 times only in the right SI and once in both SIs). In 4 patients with inflammation at baseline the inflammation was no longer present at follow-up. In 3 out of 6 patients with inflammation in both SIJ at baseline, the inflammation was only present in the left SIJ after 3 months. The other 3 patients presented...
inflammation in both SIJ at baseline as well as follow-up. 24/90 (26.7%) patients had a positive MRI at baseline or follow-up, or both. The quadrant in which the lesion was present did not change over time in 6 patients. Lesions disappeared from quadrants in 9 patients (lesion disappeared in only 1 quadrant in 7 patients and in 3 quadrants in 2 patients) and occurred in 7 patients (MRI changed from negative to positive in 5 and remained positive in 2 patients). The lesions moved between quadrants in 2 patients. In these 2 patients, lesions disappeared from one quadrant and occurred in another. In 20/24 patients the medication between baseline MRI and follow-up did not change (18 patients used NSAIDs and 2 of them did not use any medication) and 4 patients changed medication (2 patients switched NSAI type and the other 2 started NSAID treatment in that period). Out of the patients that changed from a negative to positive MRI (n=5) or visa versa (n=4), only 1 patient also changed medication, by switching to another NSAID.

Table: Baseline No lesions 3-month follow-up

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Baseline</th>
<th>3-month follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No lesions</td>
<td>Only left</td>
</tr>
<tr>
<td>Only left</td>
<td>66</td>
<td>0</td>
</tr>
<tr>
<td>Only right</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Both sides</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Conclusion: BME lesions on MRI occur or disappear at SIJ level in 9% of the patients with chronic back pain after 3 months. From all patients with a positive MRI at baseline, lesions did not change location in 50% of them at SIJ level while, at quadrant level, less than 30% of the patients showed stability in the location of lesions. So, there is quite some volatility of lesions over a short follow-up period of 3 months only.

Disclosure: M. de Hooge, None; R. van den Berg, None; M. Reijnierse, None; V. Navarro-Cómpán, None; F. van Gaalen, None; T. Huizinga, None; D. van der Heijde, None.

2613

Effect of Certolizumab Pegol On Signs and Symptoms in Patients with Psoriatic Arthritis with and without Prior Anti-TNF Exposure: 24 Week Results of a Phase 3 Double-Blind Randomized Placebo-Controlled Study

Methods: A total of 409 pts were randomized. Baseline (BL) demographics were similar between groups. 19.1% and 19.8% of PBO and CZP (combined dose) pts received prior anti-TNF. ACR20 response at Wk12 was significantly higher in the CZP 200 mg Q2W and CZP 400 mg Q4W arms vs. PBO (58.0% and 51.9% vs. 24.3% [p<0.001 for both]) and was observed as early as Wk1 (21.6% [p<0.001] and 23.0% [p<0.001] vs. 7.4%). 1 PASI70 response at Wk12 was 62.2% with CZP 200 mg Q2W and 60.5% with CZP 400 mg Q4W vs 15.1% PBO (p<0.001 for both). In pts with BL enthesitis (64.3% RS) LEI change from BL at Wk24 was −2.0 with CZP 200 mg Q2W (p<0.001) and −1.8 with CZP 400 mg Q4W (p=0.03) vs −1.1 PBO. For pts with BL nail disease (73.3% RS) mNAPSI change from BL at Wk24 was −1.6 with CZP 200 mg Q2W and −2.0 with CZP 400 mg Q4W vs −1.1 PBO. No differences in LDI change from BL were observed in pts with BL dactylitis. At Wk24, ACR response rates were similar between CZP arms and greater vs. PBO irrespective of prior anti-TNF exposure (Figures). Adverse events (AEs) occurred in 62% vs 68% and SAEs in 7% vs. 4% in CZP vs PBO pts (combined dose), respectively. Two deaths occurred up to Wk24, one sudden death of unknown cause (CZP 400 mg Q4W) and one myocardial infarct (CZP 200 mg Q2W). No new safety signals were observed.

Disclosure: P. Mease, UCB Pharma, 5, UCB Pharma, 8; R. M. Fleischmann, UCB Pharma, 2, UCB Pharma, 5; J. Wollenhaupt, UCB Pharma, 5, UCB Pharma, 8; A. A. Deodhar, UCB Pharma, 2, UCB Pharma, 5; D. Kielar, UCB Pharma, 1, UCB Pharma, 3; F. Woltering, UCB Pharma, 1, UCB Pharma, 3; C. Stach, UCB Pharma, 3; B. Hoepken, UCB Pharma, 3; T. Arledge, UCB Pharma, 3; D. van der Heijde, UCB Pharma, 3, UCB Pharma, 2; UCB Pharma, 8.

2614

The Risk of Diabetes in Psoriatic Arthritis and Rheumatoid Arthritis

The Risk of Diabetes in Psoriatic Arthritis and Rheumatoid Arthritis.

Background/Purpose: To evaluate the risk of incident diabetes in PsA in a population-based cohort, and compare it to RA and osteoarthritis (OA) patients.

Methods: We conducted a cohort study using data from the National Arthritis Data Bank (NADB) and the National Arthritis Foundation (NAF) database. We included patients with PsA, RA, and OA from 1985 to 2010. The follow-up period was 10 years. We calculated the incidence rates of diabetes and the hazard ratio (HR) of diabetes in PsA compared to RA and OA, using Cox proportional hazards models adjusted for age, sex, and body mass index (BMI).

Results: In the NADB, there were 1,271,954 patients, of whom 21,521 had PsA, 1,310,122 had RA, and 40,521 had OA. The incidence rates of diabetes were 13.2 per 1,000 person-years in PsA, 12.3 per 1,000 person-years in RA, and 11.1 per 1,000 person-years in OA. The HR of diabetes in PsA compared to RA was 1.10 (95% CI 1.03-1.17), and the HR of diabetes in PsA compared to OA was 1.08 (95% CI 1.01-1.15).

Conclusion: The risk of diabetes in PsA is similar to that in RA and OA. Further studies are needed to investigate the underlying mechanisms and potential therapeutic targets for the prevention of diabetes in PsA.
compared cohorts. After adjustment for BMI, smoking, and alcohol use, these HRs were attenuated substantially (1.43, 1.24, and 1.00, respectively). With further adjustment for glucocorticoid use and comorbidity index, the HRs were 1.33 (1.21 to 1.47), 1.00 (referent), and 1.00 (0.99 to 1.01), respectively. The independent association of VICM with 2-year radiographic progression, defined as mSASSS change $\geq$ 0 or the development of a new syndesmophyte, was analyzed by multivariate regression adjusting for baseline mSASSS.

Results: Both RA and AS had significantly higher levels of VICM than controls ($p<0.001$). AS patients with the highest level of VICM had the largest burden of disease (i.e. highest mSASSS score and disease activity (BASDAI) ($p<0.001$). VICM correlated significantly with SPARC MRI Spine 23D-VFU score ($p = 0.046$). VICM was significantly and independently associated with radiographic progression after 2 years ($\beta = 0.69, p = 0.0005$). Patients with both high VICM and a high baseline mSASSS had the highest risk for radiographic progression (OR for mSASSS change $\geq 13$, new syndesmophyte $= 32$) and 67% of these had progression (figure).

Table 1. Baseline Characteristics of the Study Populations.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>55.9</td>
</tr>
<tr>
<td>Sex (female)</td>
<td>59.5</td>
</tr>
<tr>
<td>Current smoker</td>
<td>38.8</td>
</tr>
<tr>
<td>Past smoker</td>
<td>18.4</td>
</tr>
<tr>
<td>Unknown smoker</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Table 2. Incidence Rates and Hazard Ratios for Diabetes among Psoriatic Arthritis (PsA), Psoriasis, Rheumatoid Arthritis (RA), and Comparison Cohorts.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>55.9</td>
</tr>
<tr>
<td>Sex (female)</td>
<td>59.5</td>
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</tr>
<tr>
<td>Past smoker</td>
<td>18.4</td>
</tr>
<tr>
<td>Unknown smoker</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Conclusion: This large general population study suggests that the overall rate of risk for diabetes is increased in PsA, which can be substantially explained by increased adiposity, lifestyle factors, and other covariates. In contrast, risk of diabetes with RA is lower than that of the general population, which may reflect the elevated risk of diabetes reported among psoriatic arthritis patients.

Disclosure: A. C. Bay-Jensen, None; M. A. Karstad, Nordic Bioscience Diagnostic, 4; E. Vassiliadis, None; S. Wichuk, None; Z. Zhao, None; R. G. Lambert, None; R. Lories, None; C. Christiansen, Nordic, Bioscience A/S, CCBR/Synarc., Roche, Eli Lilly, Novartis, Novo Nordisk, Proctor and Gamble, Groupe Fournier, Besins Eco-Vesco, Merck Sharp and Dohme, Chiesi, Boehringer Mannheim, Pfizer, GlaxoSmithKline, Amgen., 5; W. P. Maksymowych, None.

2616

The Transition From Psoriasis (Ps) to Psoriatic Arthritis (PsA) Is Associated with Elevated Circulating Osteoclast Precursors (OCP) and Increased Expression of DC-STAMP. Ya-Hui Chiu1,2, Edward M. Stenson3,4, Dafna Gladman5,6, Shawn Moorehead 5, Michelle Smith1,2, Rick Barrett1,2 and Christopher T. Ritchlin2,3, University of Rochester, Rochester, NY, 2Toronto Western Hospital and University of Toronto, Toronto, ON, 3University of Rochester Medical Center, Rochester, NY

Background/Purpose: Approximately 20% of psoriasis (Ps) patients (pts) develop psoriatic arthritis (PsA). Early diagnosis and therapy of PsA can limit bone and joint damage; however, biomarkers to detect subclinical joint inflammation are not available. Osteoclasts (OC) are specialized cells circulating in the blood and responsible for bone erosion in erosive arthritis. We previously showed that osteoclast precursors (OCP) are elevated in a subset of Ps pts and that DC-STAMP (Dendritic Cell-Specific Transmembrane protein), a protein expressed on the surface of monocytes, is a reliable OCP marker. To examine if the transition from Ps to PsA is associated with a change in OCP frequency and the percentage of monocytes that express DC-STAMP, we monitored these 2 parameters on Ps patients before and after the onset of arthritis.

Methods: We follow over 132 Ps patients at the Rochester site in the International Psoriatic Arthritis Research Team (IPART) registry. Ps was confirmed by a dermatologist and PsA was diagnosed by a rheumatologist based on the CASPAR criteria. Blood samples were collected at baseline and after Ps pts developed PsA. To analyze DC-STAMP expression, cells were purified from blood by Ficoll gradient, stained with anti-DC-STAMP and anti-CD14 antibodies, and analyzed by flow cytometry. To enumerate OCP cells were cultured in OC-promoting media and TRAP-stained. Cells with $\geq 3$ nuclei were counted as OC.
Results: Over the past year, 6 ps pts at our site developed PsA. The average Ps duration was 28.7±17.9, Tender Joint Counts were 8.3±6.7 (prior) and 16±15 (after), Swollen Joint Counts were 3.9±4.1 (prior) and 7.1±9.6 (after), PASI scores were 4.7 ± 3.5 (prior) and 2.0 ± 1.1 (after). Of the 6 pts who developed PsA, 5 had scalp psoriasis, 4 had nail disease, 4 had a family history of psoriatic disease and a history of prior trauma. Two of these patients had baseline radiographic erosions. A significant increase in the frequency of OCP was observed at the time of arthritis onset in all patients (Fig 1), whereas an increase in the percentage of DC-STAMP+ monocytes was detected in 4 of 6 pts (Fig 2).

Figure 1. The frequency of circulating OC increases after Ps to PsA transition.
Figure 2. The frequency of circulating DCSTAMP+ monocytes increases after Ps to PsA transition.

Conclusion: The progression of Ps to PsA was associated with a dramatic increase in circulating OCP numbers accompanied with an elevated DC-STAMP+CD14+ monocyte frequency. Collectively, our results suggest that the OCP numbers as well as the frequency of circulating DC-STAMP+ monocytes in the blood are potential arthritis susceptible biomarkers in Ps patients.

Disclosure: Y. H. Chiu, None; E. M. Schwarz, None; D. Gladman, None; S. Moorehead, None; M. Smith, None; R. Barrett, None; C. T. Ritchlin, None.

ACR Concurrent Abstract Session
Systemic Lupus Erythematosus - Clinical Aspects and Treatment IV: Therapeutics
Wednesday, November 14, 2012, 9:00 AM–10:30 AM

2617
Outcomes Associated with Belimumab in Black/African American Patients with Systemic Lupus Erythematosus in Clinical Practice Settings in the United States.
Christopher E. Collins1, Siva Narayanan2, Maria Dall’Era2, Greg Dennis2, Alan Oglesby3, Mark B. McGuire4, Ramesh Pappu2, Charles T. Molta5 and Greg Keenan5. 1Washington Hospital Ctr, Washington, DC; 2Human Genome Sciences, Inc., Rockville, MD; 3University of California, San Francisco, San Francisco, CA; 4GlaxoSmithKline, Research Triangle Park, NC; 5Medical Data Analytics, Parsippany, NJ; 6GlaxoSmithKline, USA, Philadelphia, PA; 7GlaxoSmithKline, Philadelphia, PA

Background/Purpose: Effectiveness of belimumab in black/African American (AA) patients (pts) with Systemic Lupus Erythematosus (SLE) is yet to be adequately demonstrated. The objective of this analysis is to describe the clinical outcomes associated with belimumab therapy in black/AA SLE pts in community practice settings in the United States (US).

Methods: This is a multi-center cohort study adult SLE pts in the U.S. recruited by a nationally representative random sample of rheumatologists who were treating ≥10 SLE pts annually and had ≥5 yrs of practice experience. Physicians are randomly identifying SLE pts in their practices who had received at least 8 infusions of belimumab as part of usual care and assessed the following data corresponding to the 6 months prior to belimumab initiation (baseline: BL) and the first 6 months after belimumab initiation: demographics, comorbidities, SLE disease characteristics, clinical outcomes and resource utilization (including medications). The percentage change in disease manifestations was assessed in pts based on physician judgment at 6 months post belimumab initiation in comparison to baseline. Black/AA pts were included in this interim subset analysis.

Results: Analysis included 58 black/AA SLE pts (from 31 rheumatologists from 18 states) with available data; mean pt age was 40.3 years; 93% female; and 50% diagnosed with SLE for ≥5 yrs. At BL, 76% had high anti-dsDNA, 59% had low C3 or C4, and 2%, 71% and 28% had mild, moderate and severe disease respectively. The top 3 reasons for initiating belimumab (10mg/kg) were ineffective previous treatment regimens, decrease the use of steroids (stopping) and worsening patient condition; 83%, 69% and 67% of pts concomitantly used oral steroids, antimalarials and immunosuppressants respectively. After 6 months of belimumab therapy, 90%, 41% and 14% of pts had an overall clinical improvement of ≥20%, ≥50%, and ≥80% respectively. Changes in manifestations by organ system (top-5) are shown in the table. The mean reduction in steroid dose was 14.2 mg/day; 10% discontinued steroids and among those still taking steroids, 93% decreased their doses.

Conclusion: In this analysis of black/AA pts receiving at least 6 months of belimumab therapy in clinical practices, clinical improvements were observed in a majority of pts with SLE across multiple manifestations. Steroid sparing effects were observed in most of the pts. Additional studies assessing belimumab effectiveness in black/AA pts with SLE are warranted.

Disclosure: C. E. Collins, Human Genome Sciences, Inc., 5; S. Narayanan, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; M. Dall’Era, Human Genome Sciences, Inc., 5; G. Dennis, Human Genome Sciences, Inc., 1, Human Genome Sciences, Inc., 3; A. Oglesby, GlaxoSmithKline, 1, GlaxoSmithKline, 3; M. B. McGuire, Human Genome Sciences, Inc., 2, R. Pappu, GlaxoSmithKline, 1, GlaxoSmithKline, 3; C. T. Molta, GlaxoSmithKline, 1, GlaxoSmithKline, 3; G. Keenan, HGS, 1, HGS, 3.

2618
Lupus Disease Activity Severely Impairs Pandemic Influenza A/H1N1 Vaccine Immune Response in Patients without Therapy.
Eduardo F. Borba1, Sandra G. Pasoto1, Ana L. Calhe1, Ricardo Fuller1, Vilma S.T. Viana1, Margaretre Vendramini1, Joao Miraglia1, Maria A. Ishida2 and Eloiska Bonfa4. 1University of Sao Paulo, Sao Paulo, Brazil, 2Fundacao Butantan, Sao Paulo, Brazil, 3Adolfo Lutz Institute, Sao Paulo, Brazil, 4University of Sao Paulo, Sao Paulo, Brazil

Background/Purpose: To determine the influence of disease activity without the effect of drugs in pandemic 2009 influenza A/H1N1 vaccine immunity response in untreated systemic lupus erythematosus (SLE).

Methods: SLE patients without therapy [n=75] and healthy controls [n=170] were vaccinated with a single dose of a nonadjuvanted A/Caliifornia/7/2009/H1N1 vaccine. Clinical and laboratorial data, including disease activity scores (SLEDAI), were monitored prevaccination and 21 days postvaccination. Anti-H1N1 titres, percentages of seroprotection (SP), and seroconversion (SC) were evaluated.

Results: After immunisation, untreated patients with SLEDAI=0 [n=22] had comparable SP (86.4%; 95%CI 72.0–100.7; p=1.0) and SC (86.4%; 95%CI 72.0–100.7; p=0.57) to controls whereas untreated patients with any level of disease activity (SLEDAI>0) [n=53] had lower SP (69.8%; 95%CI 57.4–84.4 vs. 84.1%; 95%CI 78.6–89.6; p=0.028) and SC rates (66.0%; 95%CI 53.2–78.7 vs. 80.0%; 95%CI 74.0–86.0; p=0.041) compared to controls. Reinforcing this finding, a significant lower SP (37.5%; 95%CI 13.8–61.2 vs. 77.9%; 95%CI 67.3–88.5; p=0.016) were observed in untreated SLE patients with SLEDAI=6 [n=16] compared with those with SLEDAI<6 [n=59], in spite of a similar mean lymphocyte count (1,260 ± 625 vs. 1,480 ± 840/mm³; p=0.33). Untreated SLE patients with low lymphocytes (<1,000/mm³) [n=21] had similar SP (61.9%; 95%CI 41.1–81.2 vs. 72.2%; 95%CI 60.2–84.1; p=0.41) and SC rates (57.1%; 95%CI 35.9–78.3 vs. 72.2%; 95%CI 60.2–84.1; p=0.27) compared to untreated SLE patients with levels within normal range (>1,000/mm³) [n=54]. SLE patients with anti-dsDNA+ [n=42] had lower postvaccine SP (59.5%; 95% CI 44.6

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to 74.3 vs. 81.8%; 95% CI 68.6 to 94.9; p = 0.046) and SC rates (57.1%; 95% CI 42.1 to 72.1 vs. 81.8%; 95% CI 68.6 to 94.9; p = 0.027) compared to SLE patients without this antibody (anti-dsDNA-) [n = 33].

Conclusion: This study provides clear evidence that SLE disease activity severely impairs pandemic influenza H1N1 vaccine immune response independent of lymphocyte counts or drugs.

Disclosure: E. F. Borba, None; S. G. Pasoto, None; A. L. Calich, None; R. Fuller, None; V. S. T. Viana, None; M. Vendramini, None; J. Miraglia, None; M. A. I shida, None; E. Bonila, None.

2619

A Double-Blind Randomized Placebo-Controlled Trial of the Effect of Vitamin D3 On the Interferon Signature in Patients with Systemic Lupus Erythematosus

Cynthia Aranow1, Maria Dall’Era2, Elena M. Massarotti3, Megan C. Mackay4, Andreea Coca5, Fotios Koumpouras6, Marc C. Levesque7, W. Winn Chatham8, Megan E. B. Close9, Lisa G. Criscione-Schraiber8, Sherry Callahan10, Ellen A. Goldmuntz10, Lynette Keyes-Ellstein11, Betty Diamond12 and Diane L. Kamen13. 1Feinstein Institute for Medical Research, Manhasset, NY, 2University of California, San Francisco, San Francisco, CA, 3Brigham and Women’s Hospital, Harvard Medical School, Boston, MA, 4The Feinstein Institute, Manhasset, NY, 5University of Rochester, Rochester, NY, 6West Penn Hospital, Pittsburgh, PA, 7University of Pittsburgh, Pittsburgh, PA, 8University of Alabama at Birmingham, Birmingham, AL, 9Duke University Medical Center, Durham, NC, 10NIH/NIDR Rm 6807, Bethesda, MD, 11Rho Federal Systems, Inc., Chapel Hill, NC, 12Feinstein Institute Med Rsch, Manhasset, NY, 13Arthritis & Clinical Immunology Program, Oklahoma Medical Research Foundation, Charleston, SC.

Background/Purpose: Exposure of normal PBMCs to 1,25 OH vitamin D reverses the stimulatory effects of activating SLE sera on the interferon signature. Given that IFN is made by activated plasmacytoid dendritic cells (pDCs), vitamin D maintains pDC quiescence, and vitamin D deficiency has a high prevalence in SLE, we investigated the effect of vitamin D supplementation on the IFN signature in SLE patients. Secondary aims included determination of the effect of vitamin D on disease activity and the safety/tolerability of vitamin D in deficient SLE patients.

Methods: 57 anti-dsDNA antibody positive SLE patients from 8 centers with stable, inactive (SLEDAI ≤4) disease, serum 25-OH vitamin D ≤20 pg/mL and an IFN signature were randomized (1:1:1) into a 12 week double-blind placebo controlled trial of daily oral vitamin D3. An IFN signature was defined to be present if expression of 1 of 3 IFN responsive genes (MX1, IFIT1, or IFIH1) determined using RT-PCR of whole blood mRNA was expressed at a level ≥ 4 SD above the mean of normal controls, or if ≥ 2 of the 3 genes were expressed ≥10 SD above the mean of normal controls. Immunosuppressive medications were required to be stable at baseline with no expectation of change during the 12 week treatment period. Subjects received 0, 2000 or 4000 IU vitamin D3 daily. An IFN signature response was defined as a 50% reduction in the expression of 1 gene or 25% decrease in ≥ 2 genes compared to baseline provided that expression of the remaining genes did not increase >25%. Measures of disease activity, safety, tolerability and endocrine effects (PTH, urinary calcium/creatinine) were collected.

Results: Baseline characteristics of the 3 treatment groups were similar. Mean (SD) 25 OH D levels (ng/mL) were comparable across treatment groups at entry: 14.5 (4.65), 12.6 (3.76) and 15.3 (3.08) for placebo, low dose and high dose, respectively. No subjects receiving placebo achieved levels associated with bone health (>30 ng/mL) while 11 of 18 subjects receiving 4000 IU daily and 5 of 15 receiving 2000 IU daily exceeded that threshold. The percent of subjects with an IFN signature response was not significantly different among treatment groups at Week 12 (36.8, 23.5, 27.8; placebo, 2000 IU/day dose, 4000 IU/day dose respectively). At Week 12, 36% of deficient subjects and 31% of subjects with 25 OH D values ≥30 ng/mL had an IFN signature response (NS). Furthermore, there was no significant difference in 25 OH D levels between subjects with and without an IFN signature response. Results did not differ significantly whether analyzed per protocol or by intent-to-treat. Vitamin D3 was well tolerated with no safety concerns and no treatment related serious adverse events.

Conclusion: These results suggest that vitamin D3 at doses up to 4000 IU daily was safe and well-tolerated in SLE patients. However, daily doses of vitamin D3 for 12 weeks failed to diminish the IFN’s signature in vitamin D deficient SLE patients, although repletion of 25 OH D to levels associated with bone health (>30 ng/mL) was only achieved in a minority of trial participants. Higher levels of 25 OH D sustained for longer duration may be required for achieving the anticipated immunological outcomes.

Disclosure: C. Aranow, None; M. Dall’Era, None; E. M. Massarotti, None; M. C. Mackay, None; A. Coca, None; F. Koumpouras, None; M. C. Levesque, None; W. W. Chatham, None; M. E. B. Close, None; L. G. Criscione-Schraiber, None; S. Callahan, None; E. A. Goldmuntz, None; L. Keyes-Ellstein, None; B. Diamond, None; D. L. Kamen, None.

2620

Randomized, Double-Blind, Placebo-Controlled Studies of P140 Peptide in Mannitol (Lupuzor) and Trehalose (Forigerimod) in Patients with SLE

Robert Zimmer1, Daniel J. Wallace2 and Sylviane Muller3. 1ImmuPharma France, Mulhouse, France, 2Cedars-Sinai Medical Center, Los Angeles, CA, 3CNRS, Strasbourg, France.

Background/Purpose: Advances in the understanding of autoimmune diseases pathogenesis have led to the development of peptide-based therapies that aim to potentially reinstate tolerance to self without the need for immunosuppression. P140 peptide is a 21-mer linear peptide (sequence 131-151) that is issued from the small nuclear ribonucleoprotein U1-70K and that is phosphorylated at the Ser140 position. Following a promising open phase IIa clinical trial in patients with SLE, two Phase IIb clinical trials were undertaken to evaluate the effect of peptide P140 administered either in mannitol (Lupuzor) or in trehalose (Forigerimod) as exipient. Data obtained independently with Benlysta are used for comparison (Furie et al. 2011 Arthritis Rheum. 63, 3918-30).

Methods: Two multicenter, randomized, placebo-controlled phase IIb studies were run separately with similar “standard” protocols: 200μg P140/month/initial in standard of care, inclusion of patients with clinical SLEDAI-2K scores >6 and no Bilag A score. The demographic characteristics of the study populations were similar in all three studies as well as in each treatment group. Drop-out rates were recorded irrespective of their reason and considered as treatment failure. Efficacy was evaluated using the SRI score.

Results: Clinical studies results:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Duration of treatment</th>
<th>Number of patients × arms</th>
<th>SAE/active/placebo</th>
<th>Drop-out rate active</th>
<th>Drop-out rate placebo</th>
<th>Responder rate active</th>
<th>Responder rate placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>P140 mannitol</td>
<td>3 months</td>
<td>50 × 3</td>
<td>6%</td>
<td>5%</td>
<td>16%</td>
<td>62%</td>
<td>37%</td>
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<tr>
<td>P140 trehalose</td>
<td>6 months</td>
<td>92 × 2</td>
<td>10%</td>
<td>22%</td>
<td>23%</td>
<td>34%</td>
<td>40%</td>
</tr>
<tr>
<td>Benlysta (BLISS-76)</td>
<td>12 months</td>
<td>273 × 3</td>
<td>19%</td>
<td>20%</td>
<td>25%</td>
<td>43%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Conclusion: Lupuzor (P140 in mannitol) is safe and met its primary efficacy end point in lupus patients. Data suggest that P140 may restore tolerance by acting as an altered peptide ligand of the T cell receptor. P140 also reduces autophagic process, which has been shown recently to be abnormally enhanced in T lymphocytes from lupus mice and patients. The potential reduction by Lupuzor of the enhanced autophagy process (as seen in mouse models) led to a very short onset of action, which is supported by the efficacy data. Trehalose is a known inducer of autophagy and as anticipated, it interferes with the beneficial effect of P140. Its use together with P140 peptide is therefore inappropriate in the treatment of lupus patients.

Disclosure: R. Zimmer, ImmuPharma, 1; D. J. Wallace, None; S. Muller, ImmuPharma, 2.

2621

Sustained Disease Improvement and Safety Profile Over 1745 Patient-Year Experience (7 years) with Belimumab in Systemic Lupus Erythematosus Patients

Joan T. Merrill1, Richard A. Furie1, Daniel J. Wallace2, William Stohl3, W. Winn Chatham4, Arthur Weinstein5, James D. McKay, Ellen M. Ginzel6, Z. John Zhong7, William W. Freimuth8 and Michelle A. Petri9. 1Oklahoma Medical Research Foundation, Oklahoma City, OK, 2North Shore-LIJ Health System, Lake Success, NY, 3Cedars-Sinai Medical Center, Los Angeles, CA, 4University of Southern California Keck School of Medicine, Los Angeles, CA, 5University of Alabama at Birmingham, Birmingham, AL, 6Washington Hospital Center, Washington, DC, 7SUNY-Downstate Medical Center, Brooklyn, NY, 8University of Alabama at Birmingham, Birmingham, AL, 9University of California, San Francisco, San Francisco, CA.

Background/Purpose: To update belimumab safety and efficacy data over 7 years in patients with active SLE.

Sponsored by NIAID Autoimmunity Centers of Excellence: NCT00710021
Methods: 449 SLE patients with SELENA-SLEDAI scores ≥4 were enrolled in a phase 2 study of belimumab 1, 4, or 10 mg/kg vs placebo, plus standard therapy, for 52 wk (NCT00071487). At wk 56, placebo patients switched to belimumab 10 mg/kg and belimumab-treated patients maintained their dose or switched to 10 mg/kg. From wk 80, all patients entering a continuation study received belimumab 10 mg/kg (NCT00583362). AEIs were assessed at each study visit. Analyses of disease activity included SLE Responder Index (SRI); post-hoc analyses of fibrinogen and biomarkers were assessed.

Results: Of the original 449 patients, 296 (66%) entered the continuation study. At the end of 7 y, 190 patients remained. Total belimumab exposure was 1,745 patient-y. Belimumab was well tolerated, with AEIs 107 patient-y. The frequency of 1 new BILAG A or 2 new B flares with belimumab (all treatment arms combined) was 38% at 1 y (vs 44% with placebo), decreasing to 7.7% at 7 y. The frequency of all SFI was 84% (severe 17%) at 1 y (vs 85% [19%] with placebo), decreasing to 40.4% (2% at 7 y. During the study, many patients with anti-double–stranded DNA at baseline became negative (45.8% at 7 y) and normalized complement (C3 66.0%; C4 71.4%).

Conclusion: Belimumab plus standard SLE therapy was well tolerated in SLE patients for 7 y in an open-label study. Seven patients died; no cause predominated. Autoantibody-positive patients tolerated belimumab with sustained improvement in disease activity and decreased flares over 7 y, accompanied by reductions in autoantibody levels and corticosteroid requirements.

Disclosure: J. T. Merrill, HGS, GSK, 5; R. A. Faria, HGS, GSK, 2, HGS, GSK, 5; HGS, GSK, 8; I. D. Wallace, HGS, GSK, 2; HGS, GSK, 5; HGS, GSK, 8; W. Stohl, HGS, GSK, 2; W. W. Chatham, HGS, GSK, 2; G. W. Weisman, HGS, GSK, 2; W. P. Kennedy, MedImmune, 5, Genentech, Inc., 2; J. D. McKay, Roche Pharmaceuticals, 1; E. Park, Roche Pharmaceuticals, 1; Genentech, Inc., 3; J. Li, Roche Pharmaceuticals, 1; Genentech, Inc., 3; X. Wei, Genentech, Inc., 3; Roche Pharmaceuticals, 1; A. Morimoto, Roche Pharmaceuticals, 1; Genentech, Inc., 3; R. Boismenu, Roche Pharmaceuticals, 1; Genentech, Inc., 3; J. C. Davis Jr., Roche Pharmaceuticals, 1; Genentech, Inc., 3; W. P. Kennedy, merck co, 1; Roche Pharmaceuticals, 1; Genentech, Inc., 3.
(including dysphagia). Raynaud’s phenomenon, and exercises for the face, hands, arms and legs. Participants logged on to a password-protected website and proceeded through the modules and learning activities at their own pace over 10 weeks. Participants were encouraged to log on to the discussion board, an interactive component of the website, and respond to questions posted for each module. Participants completed pre and post intervention questionnaires on perceived self efficacy (CDSES), health efficacy (heQ), ability (PAM), functional disability (HAQ-Di), depression (CES-D), and pain and fatigue VAS’s. T-tests analyzed differences in scores between the pre and post intervention questionnaires. Participants also completed an 8 question evaluation form about their satisfaction with the website, program content, discussion boards and learning activities.

**Results:** Twenty one participants, recruited from the National Scleroderma Foundation website and a state chapter, completed baseline measures. Thirteen participants completed the study and completed post intervention measures. There were no demographic differences between people who participated vs. did not participate in the internet program. Of the participants who completed the program, the mean age was 52 years with mean disease duration of 7 years and mean education level of 16 years. Eighty four percent were female, 92% Caucasian, and 77% were married. Significant improvements were seen in mean scores for self-efficacy (t = 2.3; p = .039), ability to manage care (t = 2.82; p = .016), and health efficacy (t = 2.28; p = .042). Scores for pain and fatigue, functional ability and depression improved but not significantly. The evaluation of the program revealed mean scores ranging from 4.1 (action plans contributed to learning) to 4.9 (information presented clearly) on a 5 point scale.

**Conclusion:** The preliminary findings suggest that a self-management program delivered using an internet format can lead to statistically significant improvements in self efficacy, health efficacy, and ability to manage care. These results need to be confirmed with a larger randomized controlled trial with a longer follow-up period.

**Disclosure:** J. L. Poole, None; D. Khanna, Savient Pharmaceuticals, URL, 2, Ardea Biosciences, Takeda Pharmaceuticals, Savient Pharmaceuticals, 5, Savient Pharmaceuticals, 8; B. Skipper, None; C. F. Mendelson, None.

**2624**

**Changes in Leisure Participation in Persons with Systemic Sclerosis.** Cindy F. Mendelson, Jessica Greaves and Janet L. Poole. University of New Mexico, Albuquerque, NM

**Background/Purpose:** Little attention has been devoted to understanding the difficulties and limitations people with systemic sclerosis (SSc) experience with leisure participation. A qualitative interview study was conducted to understand the barriers people with SSc experience participating in and selecting leisure activities.

**Methods:** Twenty-five people with SSc who met inclusion criteria were selected based on self-reported difficulty with leisure and willingness to participate in the study interview.

Interviews were conducted over the telephone and followed a semi-structured format. Interview questions focused on the meaning of SSc, leisure activities and the importance of those activities, the influence of SSc on leisure activities, and adaptations used to engage in leisure activities.

Interviews were transcribed verbatim. The major interview questions were used as a framework to guide the analysis. A research journal was used to track and identify thematic concepts as they emerged from the data set. An additional document was created to manage the quotes that immediately drew the attention of the analyst in order to prevent initial bias in forming core themes. After analyzing the major questions separately, the overarching concepts were compared for redundancy or outliers. Attending to rigor was an important consideration. One analyst (JG) analyzed the data set and the research team members then reviewed the themes for clarity, redundancy, and that it was representative of the participants’ voices. In order to avoid common pitfalls, qualitative analysis hazards such as premature closure, misinterpreting frequency, over-inscription of self, and capitalizing on outliers, were closely attended to.

**Results:** The participants were 92% female, 88% were white, mean age was 54 years, mean disease duration was 12 years, mean education level was 16 years, 100% of the participants reported Raynaud’s Phenomenon, 73% had digital ulcers, and 96% reported GI involvement.

Three themes emerged from the analysis. *Barriers to Leisure Participation* describes the barriers people with SSc experience when selecting and participating in leisure activities. *Decrease in Leisure Participation,* reflected a change in the amount of time spent participating in leisure activities. *Experience of Losing a Valued Leisure Activity,* showed the impact that loss of leisure activities had on some participants’ mental health and social engagement.

**Conclusion:** Our study found that the barriers to leisure participation reported by participants with SSc were similar to those reported in the literature by people with RA, except people with SSc experienced an additional barrier of Raynaud’s phenomenon. In conclusion, SSc disease symptoms affect the amount and types of leisure activities in which people with SSc participate.

**Disclosure:** C. F. Mendelson, None; J. Greaves, None; J. L. Poole, None.

**2625**

**The Impact of Sexual Difficulties in Women with Scleroderma and Interpersonal Relationships.** Tanaka Ngcozana1, Louise Parker1, Christopher P. Denton2 and Voon Ong3. 1UCL Medical School and Royal Free Hosp, London, United Kingdom, 2UCL, London, United Kingdom, 3UCL Medical School, London, England

**Background/Purpose:** Sexual problems are common in women with systemic sclerosis (SSc). SSc is a complicated condition linked to a number of complications including sexual dysfunction. Sexuality is a vital part of life and it is a subject not usually broached. The aims of this study were to determine the prevalence of sexual problems in a large cohort of women with SSc, to evaluate the effects on sexual relationship, sexual activities and the difficulties faced by the women.

**Methods:** A total of 100 women with either limited (lcSSc) or diffuse (dcSSc) systemic sclerosis were invited to participate in a questionnaire survey. Each participant completed the validated Female Sexual Function Index (FSFI) questionnaire that assesses six domains: desire, arousal, lubrication, orgasm, satisfaction and pain. Additional psychological questions were included to examine sexual difficulties faced by the women in their interpersonal relationships.

**Results:** 50 women with SSc responded to the questionnaire. Mean age of the cohort was (mean ±SD, years) 56 ±14.1. 52% of the women who responded had diffuse subset while 48% had been diagnosed with the limited disease. The mean disease duration is similar for both subsets with (mean ±SD, years) 12±2.8.5% of the patients developed sexual difficulties after their diagnosis and the mean duration from SSc diagnosis to first sexual complaint was (mean, ±SD, years) 4.0±5.8.84% of the patients reported significant sexual problems in the overall FSFI domains. The pain domain fared the worst with 56% and 46% of the respondents did not have any sexual activity due to lack of lubrication. 60% of the patients revealed that their sexual complications had caused a significant strain in their relationships. 30% of the respondents admitted to not discussing their problems with their partners due to embarrassment, nonetheless 46% of the women reported to discussing the difficulties. Among those who discussed their problems with their partners 32 (64%) reassuringly stated that their partners understood the problems. 76% of the subjects reported that they had never been asked about sexual functioning by a health professional. However 52% revealed that they would have discussed their sexual problems if they were concerned, 38% would approach the nurse with their problem while 36% would discuss with their medical practitioners. Interestingly 72% of these women admitted to not raising any concern about their sexual problems.

**Conclusion:** Sexual functioning is an essential aspect of life for women with SSc. Our study revealed that most of the respondents had some form of significant sexual problems. It also showed that sexual impairment can have a significant negative impact for the affected women and their partners. Sexual health is a subject that is usually neglected by both patients and doctors yet it has been associated with psychological difficulties such as depressive symptoms. It is a subject worth exploring and actively enquiring in order to provide holistic care and improve our patients’ quality of life.

**Disclosure:** T. Ngcozana, None; L. Parker, None; C. P. Denton, Actelion Pharmaceuticals US, 5, GlaxoSmithKline, 5, Pfizer Inc, 5, United Therapeutics, 5; V. Ong, None.

**2626**

**The Utility of the Patient Health Questionnaire-9 to Assess Suicide Risk in Patients with Systemic Sclerosis.** Ilya Razykov1, Marie Hudson2, Murray Baron3 and Brett D. Thombs4. McGill University, Montreal, QC, 1Jewish General Hospital, Montreal, QC

**Background/Purpose:** Depression is common in rheumatic diseases, including systemic sclerosis (SSc). In the general population, depression is
associated with suicidal ideation, attempts and completion. The Patient Health Questionnaire-9 (PHQ-9) is a self-administered and easily scored measure of depression symptoms that is increasingly used in medical settings. Item 9 of the PHQ-9 has been used in several studies, including with arthritis patients, to assess the prevalence of suicidal ideation. Item 9 asks patients “How often have you been bothered by thoughts that you would be better off dead or of hurting yourself in some way?” The item is ambiguous, however, because it includes both passive thoughts of death and more active ideas of self-harm. As a result, some researchers have advocated using the PHQ-8, which does not include Item 9. Thus, the objectives of this study were (1) to determine the proportion of SSC patients who responded anything other than “never” to Item 9 who endorsed active suicidal ideation in response to more direct questions during a structured clinical interview and (2) to assess the association between the PHQ-9 and the PHQ-8, which does not include Item 9.

Methods: Canadian Scleroderma Research Groups Registry patients were administered the PHQ-9 and the Composite International Diagnostic Interview (CIDI) depression module in a phone interview. Item 9 responses were compared to suicidal ideation and intent in the last year based on the CIDI. PHQ-8 scores were calculated by subtracting Item 9 scores. The association between the PHQ-9 and the PHQ-8 was computed using the Pearson correlation coefficient.

Results: Of 313 patients in the study, 30 (6.9%) screened positive for suicidal ideation on the Item 9. Of those, only 1 (3.3%) had thought about suicide in some detail as assessed by the CIDI at any time in the past year. No patients had an active suicide plan at the time of the interview. Correlation between PHQ-9 and PHQ-8 scores was r = 0.998.

Conclusion: Item 9 does not appear to be an effective suicide screen.

Table 1. Characteristics of the identified patient-reported outcome instruments

<table>
<thead>
<tr>
<th>Abbrev.</th>
<th>Content</th>
<th>Items</th>
<th>Response options</th>
<th>Time frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI-II</td>
<td>Beck Depression Inventory-II</td>
<td>Depression</td>
<td>21</td>
<td>4 statements: increasing severity</td>
</tr>
<tr>
<td>ESST</td>
<td>SF-36 Health Survey Questionnaire Recent</td>
<td>Extent of social support</td>
<td>7</td>
<td>Question 6 (none, a little, some, most, or all of the time), Question 7 (yes/no)</td>
</tr>
<tr>
<td>HADS</td>
<td>Hospital Anxiety and Depression Scale</td>
<td>Anxiety, depression</td>
<td>14</td>
<td>Frequency: 4-point Likert scale (0 = not at all, 4 = definitely)</td>
</tr>
<tr>
<td>IBQ-32</td>
<td>Inflammatory Bowel Disease Questionnaire</td>
<td>Health related quality of life</td>
<td>37</td>
<td>7-point Likert scale (1 = significant impairment, 7 = no impairment)</td>
</tr>
<tr>
<td>PSQ-R</td>
<td>Perceived Stress Questionnaire Recent</td>
<td>Perceived stress</td>
<td>30</td>
<td>4-point scale on frequency (1 = almost never, 4 = usually)</td>
</tr>
<tr>
<td>RFIPC</td>
<td>Rating form of Inflammatory Bowel Disease Patient Concerns</td>
<td>Worries, concerns regarding IBD</td>
<td>25</td>
<td>Visual analogue scale (0 = Not at all, 100 = A great deal)</td>
</tr>
<tr>
<td>SF-36</td>
<td>Short Form 36</td>
<td>Health related quality of life</td>
<td>36</td>
<td>Different response scales</td>
</tr>
<tr>
<td>SIBDQ</td>
<td>Short Inflammatory Bowel Disease Questionnaire</td>
<td>Quality of life</td>
<td>10</td>
<td>7-point Likert scale on frequency (1 = all of the time, 7 = none of the time)</td>
</tr>
<tr>
<td>STAI</td>
<td>State-Trait Anxiety Inventory</td>
<td>Anxiety about an event, and trait anxiety</td>
<td>40</td>
<td>Intensity 4-point Likert scale (1 = not at all, 4 = very)</td>
</tr>
</tbody>
</table>

Table 2. Coverage of the linked concepts by patient-reported outcome tools

<table>
<thead>
<tr>
<th>Concepts of health and well-being</th>
<th>ICF Codes</th>
<th>ICF Title</th>
<th>Abbrev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coping</td>
<td>d248</td>
<td>+</td>
<td>BDI-II</td>
</tr>
<tr>
<td>Participation (societal)</td>
<td>d9</td>
<td>+</td>
<td>ESST</td>
</tr>
<tr>
<td>Reflecting about one's life in an supportive way</td>
<td>b126</td>
<td>+</td>
<td>HADS</td>
</tr>
<tr>
<td>Resilience</td>
<td>b1265</td>
<td>+</td>
<td>IBQ-32</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>b1261</td>
<td>+</td>
<td>PSQ-R</td>
</tr>
<tr>
<td>Social acceptance</td>
<td>a4</td>
<td>+</td>
<td>RFIPC</td>
</tr>
<tr>
<td>Social support</td>
<td>a3</td>
<td>+</td>
<td>SIBDQ</td>
</tr>
</tbody>
</table>

Conclusion: This is the first study elaborating the coverage of patient’s perspective by commonly used patient-reported outcome instruments. The use of the perceived stress questionnaire – recent is recommended because it covered most concepts, as well as the use of inflammatory bowel disease self-efficacy scale due to the importance of self-efficacy for people with CD. Social support, self-efficacy and gender differences at several concepts should get more attention in clinical daily routine and in the research of people living with CD.

Disclosure: M. Dirr, None; M. Coenen, None; J. S. Smolen, None; C. Dejac, None; T. A. Stamm, None.

2628

The Lumbo-Pelvic Muscles and Axial Spondyloarthritides: A Pilot Observational Study, Janet Millner, Julie A. Hides, Patricia Lewis and Jane Zochling. Royal Hobart Hospital, Hobart, Australia, Australian Catholic University, Brisbane, Australia, Menzies Research Institute Tasmania, Hobart, Australia.

Background/Purpose: The importance of a physical approach in the management of axial spondyloarthritides (SpA) has been recognised for many years. It is supported by level 1a evidence including the 2008 Cochrane review into the effectiveness of physiotherapy in ankylosing spondylitis (AS), and by expert panel recommendations such as those of the Assessment of Spondyloarthritides group. The benefits of exercise have been shown to be still relevant even in patients who are stabilised with TNF blocking medication, and both subjective and measurable benefits can be much larger than that seen for other types of arthritis, and also non-inflammatory back pain. Despite this, there is a paucity of information about why exercise can be so beneficial, and about the specifics of exercise prescription. The aim of this study was therefore to provide pilot morphological data regarding any changes in lumbo-pelvic muscles, which may inform exercise prescription, and indicate further areas for research.
Methods: Twenty-three subjects with confirmed SpA or AS underwent an MRI scan of the lumbar spine and pelvis. The protocol aligned the transverse imaging plane with inferior aspect of the body of the 4th lumbar vertebra, in order to obtain measures of the cross sectional area (CSA) of specific lumbopelvic muscles. The digitised images were analysed by computer software to determine muscle size, symmetry and ratio of contrac- tile to non-contractile tissue, using previously validated methods.

Results: Non-contractile tissue was observed within the fascial bound- aries of the paraspinal muscles to some degree in all subjects. These changes were graded according to a previously validated five point scale as follows:

<table>
<thead>
<tr>
<th>Spinal Levels</th>
<th>Lumbar Multidis</th>
<th>Lumbar Erector Spinae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects ≥ Grade 2</td>
<td>Subjects ≥ Grade 2</td>
<td>Subjects ≥ Grade 2</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

The prevalence of non-contractile tissue was not associated with measures such as body mass or ethnicity indices, but was inversely associated with self-reported physical activity levels (p). Additional measures of lumbar multifidis CSA at L5/S1 level demonstrated a mean functional to total muscle CSA of only 61% (range 18–88%).

Conclusion: This study provides new information on the morphology of the lumbopelvic muscles in SpA, and also confirms the applicability of this methodology in inflammatory back pain. The association of reduced func- tional muscle area with lower activity levels supports the concept of a specifically designed exercise intervention. Similar findings have been noted in non-inflammatory back pain, but points of difference are highlighted that need exploring. The study has therefore revealed some research gaps regarding muscle changes in SpA, which may be either secondary to the disease or part of the process.

Disclosure: J. Millner, None; J. A. Hides, None; P. Lewis, None; J. Zochling, None.

ARHP Concurrent Abstract Session
Clinical and Rehabilitative Aspects of Osteoarthritis
Wednesday, November 14, 2012, 9:00 AM–11:00 AM

2629

Associations of Current and Early-Life Socioeconomic Positions with Risk of Self-Reported Doctor-Diagnosed Arthritis in a Family-Medicine Cohort of North Carolinians
Antoine A. Baldassari1, Rebecca J. Cleve- land2, J. Zochling1

Background/Purpose: Socioeconomic position (SEP) across the life- course has been convincingly identified as a determinant of health. In particular, mounting evidence suggests that low current and childhood SEP are associated with higher risks of cardiovascular disease and autoimmune disorders. In contrast, relatively few studies have investi- gated the relationship between SEP and arthritis, with childhood SEP being particularly untested as a potential risk factor for the disease. The purpose of this study is to determine the associations of childhood and current SEP with the presence of arthritis.

Methods: Our data came from the North Carolina Family Medicine Research Network (NC-FM-RN), a practice-based research network of 22 family medicine practices selected to represent the geographic and racial/ ethnic diversity of North Carolina. In 2006, the Individual and Commu- nity Social Determinants of Arthritis Outcomes study invited NC-FM-RN participants to complete a phone survey assessing demographics, health status, chronic health conditions, health attitudes and beliefs, and percep- tions of neighborhood environment. Participants who provided complete sociodemographic and relevant health information were retained in our sample (n = 1302). We created three-levels (high[referent], medium, low) summary measures for current and childhood SEP accounting for educa- tion, homeownership and occupational class, using parental SEP as a proxy for participants’ childhood SEP. Logistic regression models were carried out to assess the associations between arthritis status and SEP variables separately and together, adjusting for known covariates.

Results: Our sample included 929 females (70.65%) and 210 males (29.35%). The mean age was 56.94 years old (23–94), and 782 respondents had self-reported doctor-diagnosed arthritis. 485 (37.25%) participants received a high current SEP summary score, while 578 (44.39%) had a medium current SEP and 239 (18.36%) a low current SEP. Summary scores were linked to the childhood SEP summary score: 195 (14.98%) had a high childhood SEP level, 447 (34.33%) did in the medium level, and 660 (50.69%) had a low childhood SEP. Arthritis was more likely in participants with medium current SEP. OR = 1.41 (95% CI = [1.06, 1.88]), and low current SEP. OR = 1.96 (95% CI = [1.32, 2.90]) and somewhat more likely in respondents with low childhood SEP. OR = 1.32 (95% CI = [1.02, 1.71]). Childhood SEP was not associated with arthritis in the model including both current and childhood SEP as explanatory variables, while current SEP remained significantly associated with arthritis at both the medium and low levels.

Conclusion: Our results suggest that while there was a robust association between current SEP and arthritis susceptibility in our sample, the association of childhood SEP with arthritis was relatively weak. Studies should investiga- te whether our results consistently appear in larger populations with clinically documented arthritis. Additionally, further research could focus on arthritis-type specific associations with SEP, considering the broad range of joint disease encompassed by arthritis.

Disclosure: A. A. Baldassari, None; R. J. Cleveland, None; L. F. Callahan, None.

2630

Rheumatoid Arthritis and Osteoarthritis in the Population: How Different Is the Impact? Christina H. Chan1, Mayilee Canizares1 and E.M. Badley1, 2

Background/Purpose: It is a common perception that rheumatoid arthritis (RA) is a more severe and debilitating disease than osteoarthritis (OA); however, there have been many recent advancements in treatment for RA including development of biologics, while treatment of OA remains largely focused on joint replacement surgeries which are only appropriate for end-stage OA. A recent national survey of a representative sample of Canadians reporting arthritis provided an opportunity to compare individuals reporting OA who see a rheumatologist and individuals reporting RA. Our objective was to describe and compare the arthritis-related characteristics and healthcare use of individuals reporting RA and OA.

Methods: Data were obtained from the 2009 Survey on Living with Chronic Diseases in Canada which included detailed information on a sample self-reporting arthritis as a long term chronic health condition (n = 4,565). Data were obtained on demographic characteristics, lifestyle (smoking, physical activity), type of arthritis, number and site of painful joints (16 sites), pain and fatigue (severity on 1–10 scale and frequency), limitations in 5 areas of daily activities, general health, health care use (health profes- sionals seen in the past year, use of medication, assistive devices and receipt of information and other support services), and self-management of arthritis. Two groups were examined: individuals who reported RA and have seen a rheumatologist in the past year (RA, N=462), and individuals who reported OA: N=4,103. Individuals with RA and OA were more likely to have symmetrical arthritis than those with OA. The two groups were similar in demographic and lifestyle characteristics, and there were no significant differences in the number of joint sites affected (RA: 5.1 vs OA: 4.9), severity of pain or fatigue, frequency of fatigue, or having any activity limitations. Compared to RA, the OA group reported better self-rated health but more frequent joint pain. A higher proportion of the RA group reported seeing primary care physicians, orthopedic surgeons, physiotherapists, pharmacists and mental health professionals compared to the OA group. Those with RA were more likely to report taking prescription medication (RA: 83%; OA: 40%), using assistive devices, and receiving information on how to manage their arthritis. Individuals with RA were less likely to exercise or control weight for arthritis.

Conclusion: Overall, the impact of RA among those who reported seeing a rheumatologist was comparable to the impact of OA in this representative sample of Canadians. This similarity is surprising given that RA is often perceived as a more severe form of arthritis. The findings could be a reflection of the benefits of specialist care and hence pharmacotherapy and access to

Disclosure: A. A. Baldassari, None; R. J. Cleveland, None; L. F. Callahan, None.
other support for disease management for RA, and the lack of effective treatment for OA. The similar joint site count for RA and OA also suggests that further attention should be paid to OA as a polyarticular disease.

Disclosures: C. H. Chan, None; M. Canizares, None; E. M. Badley, None.

2631

Radiographic Osteoarthritis Severity Is Associated with an Increased Risk of Developing Knee Pain: Findings From the Osteoarthritis Initiative. Jingbo Niu, David T. Felson, Tuaha Neogi and Yuqing Zhang. Boston Univ School of Medicine, Boston, MA

Background/Purpose: While knee pain is a major complaint from subjects with knee osteoarthritis (OA), most epidemiologic studies have found only weak to moderate associations between knee radiographic OA (ROA) and presence of knee pain. These findings may be partly due to confounding by variation of pain sensitivity and tolerance between subjects. In addition, few studies have prospectively assessed the relation of severity of ROA to the occurrence of knee pain. To avoid across person differences in pain reporting, we performed a within-person knee-matched cohort study to examine the relation of Kellgren/Lawrence (KL) grade and joint space narrowing (JSN) to the risk of developing knee pain among participants of the Osteoarthritis Initiative (OAI).

Methods: The OAI is a multi-center longitudinal study focusing primarily on risk factors for the onset and progression of knee OA. Subjects aged between 45–79 years were recruited at four centers across the US. At baseline and yearly follow-up visits knee-specific pain was assessed, including a question about presence of knee pain, aching or stiffness in more than half of the past 30 days (“frequent knee pain”). KL grade (0–4) and JSN (0–3 using the OARSI atlas) were scored on PA view knee radiographs by experienced readers blinded to the time sequence. Included were subjects who had no frequent knee pain in either knee and who had unequal KL grade at the 12-month visit in their two knees. They were considered as having incident frequent knee pain if it occurred in any of the last annual follow-up visits. Within each subject we compared risk of incident frequent knee pain in the knee with higher KL grade vs. that in the contralateral knee with lower KL grade. The two knees within a subject formed a matched set. We examined the association between KL grade and incident frequent knee pain using a Cox proportional hazards regression model adjusting for history of knee injury. We took the same approach to assess the relation of maximal JSN score to risk of the incident frequent knee pain.

Results: Included were 1093 subjects who had no frequent knee pain and whose KL grades differed between two knees (mean age: 63.0, 52.4% women), and 712 subjects who had no frequent knee pain and whose JSN score differed between two knees (mean age: 63.8, 52.4% women) at 12-month visit. Higher KL grade was associated with an increased risk of incident frequent knee pain. Compared with knees with KL grade 0, the risk ratios of incident frequent knee pain were 1.2 (95% CI: 0.9, 1.5), 1.4 (1.2, 1.7), 2.6 (1.9, 3.8), and 3.3 (2.2, 5.0) for each increase grade of KL grade, respectively (p for trend <0.001). Similar association was observed for JSN (Table).

| Table 1. Severity of knee ROA and incidence of frequent knee pain incidence (%) of frequent knee pain among knees with more severe/less severe ROA, N of eligible subjects |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Knee with higher KL grade (more severe ROA) | Knee with lower KL grade (less severe ROA) | Adjusted RR (95% CI) | p-value |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0 | N/A | N/A | N/A | N/A | 1.0 |
| 1 | 27.0 / 21.5, 270 | N/A | N/A | N/A | 1.2 (0.9, 1.5) | 0.118 |
| 2 | 26.8 / 20.1, 190 | 35.0 / 30.0, 247 | N/A | N/A | 1.4 (1.1, 1.9) | 0.020 |
| 3 | 27.3 / 7.6, 66 | 61.7 / 31.7, 60 | 99.4 / 27.6, 156 | N/A | 2.3 (1.8, 5.4) | <0.001 |
| 4 | 66.7 / 18.0, 30 | 44.4 / 22.4, 14 | 96.7 / 40.5, 27 | 72.4 / 37.9, 29.3 | 3.3 (1.5, 5.5) | <0.001 |

Conclusion: The radiographic severity of OA is strongly associated with an increased risk of frequent knee pain. Contrary to the so-called structure symptom discordance, there is a dose-responsive relationship between structure and symptoms when between-person confounding is appropriately accounted for.

Disclosure: J. Niu, None; D. T. Felson, None; T. Neogi, None; Y. Zhang, None.

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Doing Is Believing: Health Beliefs Before and After an Exercised-Based Rehabilitation Programme for Chronic Knee Pain. Mike Hurley1 and Dr Nicola E. Walsh. 1 St George’s University of London, London, United Kingdom, 2University of the West of England Bristol, Bristol, United Kingdom

Background/Purpose: An integrated exercise-based rehabilitation programme, Enabling Self-management and Coping with Arthritis knee Pain through Exercise (ESCAPE-knee pain), improves pain and physical disability of people with chronic knee pain. Qualitative interviews were used to understand how and why ESCAPE-knee pain works.

Methods: 29 people involved in the quantitative study evaluating the ESCAPE-knee pain programme, were interviewed before and after participation on the programme. Semi-structured interviews were used to explore participants’ experiences of living with knee pain, their understanding and beliefs about their condition, and management strategies adopted. The same participants were re-interviewed after completing the programme to explore their experiences of the programme, its impact on their beliefs about knee pain and their views about the management of their condition. A thematic analysis was conducted. Interviews were audio taped, transcribed verbatim, read several times by two researchers independently to familiarise themselves with the data, met to identifying themes and agree a coding scheme and resolve differences in coding and interpretation.

Results: Initially people had poor understanding and negative, fatalistic beliefs about the management or prognosis for knee pain. Following the programme the majority of participants had positive experiences, improvement in pain, physical and psychosocial functioning, greater knowledge and understanding of their condition and treatment options, and in their ability to use exercise to control symptoms. Beliefs about the causation and prognosis of knee pain were unchanged, but concerns about possible dangers of exercise decreased. They appreciated how exercise could reduce symptoms (treatment beliefs) and their confidence in their ability to use exercise to control symptoms (exercise self-efficacy) increased. These improvements were attributed to the content and structure of the programme, and the care and guidance of the physiotherapist.

Conclusion: ESCAPE-knee pain improves physical and psychosocial functioning of people with chronic knee pain by increasing people’s treatment belief in safety, the utility of exercise to control symptoms and exercise self-efficacy, rather than alteration in their beliefs about causation or prognosis.

Disclosure: M. Hurley, None; D. E. N. Walsh, None.

2633

Independence At Home: Real or Perceived. Hazel L. Brelend. Medical University of South Carolina, Charleston, SC

Background/Purpose: Rheumatic conditions are more prevalent among women than men and increase with age. Over 4 million African Americans affected are by rheumatic conditions and yet disparities and underrepresentation of this group exist in research studies. The burden of physical disability confronting older African American women can affect their ability to engage in everyday activities. Thus, performance-based data are needed in the home environment where effective patient management and aging in place occurs. However, differences exist between self-report and performance-based data. Therefore, the purpose of this descriptive, non-intervention study uses mixed methods to identify the degree of concordance between self-reported performance capabilities and real-time performance of criterion-referenced task situations within the home environment.

Methods: Eighteen community-dwelling African American females with rheumatic conditions (age 64.7, widowed = 38.9%, living with family = 50%, self-reported quality of life = “good”) participated in brief qualitative interviews on the perception of participation in daily activities and home safety. During the in-home assessment, participants completed demographic questionnaires, the PASS-SR (self-report of performance capabilities, what they “could” do compared to what they “routinely do”, and the PASS-Home (observational data of real-time performance of 26 criterion-referenced, standardized task situations). The PASS-Home includes 4 domains: basic ADL (dressing), physical and cognitive instrumental ADL (IADL—physical: sweeping a small area, IADL—cognitive: managing home safety), and functional mobility (indoor walking). The interviews were audio-recorded and transcribed verbatim. Content analysis was used for initial codes and summary statements were generated for each code. Based on summary statements data were

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aggregated into eight key themes. Data from the interviews, PASS-SR, and PASS-Home were integrated. Concordance was defined as the percent agreement between self-reported capability (PASS-SR) and performance-based (PASS-Home) data of task situations.

**Results:** Generally, participants reported that physical factors of rheumatic conditions negatively affected their lives with regard to symptoms triggers, physical problems, limitations on their activity, and safety concerns. Changes in daily living, and movement were the most prominent symptomatic triggers. The primary safety concerns included falling, difficulty using hands, and lack of proper safety equipment. Percent agreement between self-reported capability on the PASS-SR and performance-based data of the task situations (PASS-Home) ranged from 22.2% (4 of 18) for functional mobility-stair use to 94.4% (17 of 18) for IADL (current event) obtaining critical audio information from the media and IADL (money management) checkbook balancing. There were 9 of 26 task situations with less than 50% concordance.

**Conclusion:** Using mixed methods, we were able to examine real and perceived performance patterns among older African American women with rheumatic conditions. Participant perceptions of their independence were typically underestimated for functional mobility and physical IADL.

**Disclosure:** H. L. Bredland; None.

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**2634**

**Physical Disability, Perceived Dependence and Depression in Older Women with Osteoarthritis.** Kisoo Park1, Monique A. Gignac2 and E. M. Badley2,1. 1Gyeongsang National University, Jinju, South Korea, 2Arthritis Community Research and Evaluation Unit, Toronto Western Research Institute and University of Toronto, Toronto, ON, 3Division of Health Care and Outcomes Research,Toronto Western Research Institute; Dalla Lana School of Public Health, University of Toronto, Toronto, ON

**Background/Purpose:** Older women with osteoarthritis (OA) often report difficulty with tasks and needing to rely on others for assistance. In addition, depressed mood has been observed among individuals with arthritis. However, there is little research examining relationship physical disability and the perception of dependence with depression among women with arthritis. This study assessed whether both physical disability and perceived dependence relate to depression or whether perceived dependence in personal care activities, household activities, community mobility and valued activities is an intermediate step in the relationship between physical disability and depressive symptoms.

**Methods:** Data come from a cross-sectional survey of 209 women, aged 55 or older, with osteoarthritis (OA). Physical disabilities were examined in four domains: personal care, household activities, community mobility and valued activities. Perceived dependence was asked in each domain using the question “Thinking about these activities, to what extent do you feel dependent?” Responses were on a 5-point scale from 0 = “not at all” to 4 = “a great deal”. Depression was assessed using the Center for Epidemiological Studies—Depression Scale (CES-D). Mediation analyses occurred in four step and included regression analyses as outlined by Baron and Kenny.

**Results:** On average, participants reported mild or moderate disability and perceived dependence. 28.7% of participants reported a depression score ≥ 16, which indicates depressive symptomatology. The results from step 1 show that, greater difficulty with each domain of physical disabilities was significantly related to greater perceived dependence. In step 2, greater perceived dependence was significantly associated with greater depressive symptoms in all domains. Step 3 analyses showed that greater physical disabilities in each domain were significantly associated with depression. The final step testing mediation indicated that personal care activities, household activities and community mobility were fully mediated by perceived dependence. That is, once dependence was taken into account, the relationship between physical disabilities and depression was no longer significant. Partial mediation was found for dependence and valued activity limitations. Both were significantly related to depression.

**Conclusion:** It is important to take into account the experience of perceived dependence as a mediator in understanding the relationship between disability and depression in the domains of personal care, household, and community mobility. However, for valued activities, both disability and perceived dependence are important in understanding depression. This may be because valued activities are discretionary and reflect a person’s identity (i.e., what’s important to them). Also, they are not always activities where others can provide assistance, making perceptions of depression less relevant. To conclude, these findings point to the importance of taking into account an individual’s reaction to their disability rather than just focusing on the severity of disability.

**Disclosure:** K. Park; None; M. A. Gignac; None; E. M. Badley; None.

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**2635**

**Exploring the Influence of Patient Perceptions On Medication Escalation in Daily Practice.** Jos Hendriks, Wietse Kievit, Jaap Fransen and Piet L.C.M. van Riel. Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

**Background/Purpose:** In rheumatoid arthritis (RA), patients' and physicians' perceptions of disease can differ and patients who are satisfied with their health do not tend to agree with escalation of drug therapy, even if disease activity is not low. It is hypothesized that patient acceptable symptom state, as well as perceived and expected change, influence patients' willingness to alter therapy, in addition to disease activity state.

**Objective:** To investigate the influence of patient perceptions and disease activity on escalation of drug therapy in RA patients.

**Methods:** Consecutive RA patients attending the outpatient rheumatology clinic received standard clinical assessment including the DAS28 and medication changes. In addition, patients were asked 4 items regarding: perceived health state transition, satisfaction with their health state, willingness to change therapy and expected health state transition until the next visit. To investigate explanatory factors, logistic models predicting actual escalation of medication in daily practice and predicting patients' self-reported willingness to escalate therapy were fitted by means of forward selection. Predictors for the models were: sex, age, rheumatoid factor, disease duration, DAS28 response since last visit, attained DAS28 level and the above mentioned patient perception items. Escalation of DMARD or biologic medication was defined as an increase in frequency and/or dose of medication, or starting a new one, between the current and next visit.

**Results:** In total 422 RA patients; 63.3% female, 67.1% rheumatoid factor positive were included in the analysis. Mean (SD) DAS28 at visit, age and disease duration were 3.09 (1.24), 58.6 (12.95), 9.72 (9.25), respectively. In total 185 (43.8%) patients had a DAS28<2.3, of whom 96 (59.1%) were satisfied with their health status if this would not change until the next visit, and a majority of patients 132 (71.4%) did not want to change their medication. Table 1 shows the final model for therapy escalation with a clear independent relationship of patient reported willingness to escalate therapy. Table 2 shows the model with willingness to escalate therapy as the outcome. All patient perception measures exhibited significant independent associations, of which patient satisfaction was strongest. Figure 1 shows a model of medication escalation in daily practice.

**Conclusion:** Patients’ willingness to escalate therapy is strongly associated with actual escalation of therapy in daily practice, independent of clinical parameters. In turn, patients’ willingness to escalate therapy is primarily associated with patients’ satisfaction with their health state, perceived change and expected change. Treat to target interventions should address patients’ perceptions of their disease, and the related health goals patients aim to achieve, next to the level of disease activity attained.

**Disclosure:** J. Hendriks; None; W. Kievit; None; J. Fransen; None; P. L. C. M. van Riel; None.
Background/Purpose: Treat-to-target (T2T) refers to a set of decision strategies widely advocated for the optimal management of rheumatoid arthritis (RA). Despite considerable evidence that this approach leads to improved outcomes, T2T strategies are not consistently adopted. We hypothesize that patients' experience of illness complicates the decision to adjust treatment when indicated by recommended thresholds. While disease activity thresholds assess a single reference point (current level of disease activity), patients' appraisal of their illness depends on multiple reference points. Therefore, in addition to current experience, we also examine past and future reference points, i.e., how current illness compares with recalled past experience and the difference between current and expected future health states.

Methods: We conducted a prospective, repeated measures study in which 142 RA patients (mean age: 59, 86% female) were interviewed at baseline, 2, 4, and 6 months. Disease activity was measured using the RAPID-4. Patients' current experience was measured using current (8-Self-Brief Illness Perception Questionnaire), past (recent change in illness severity measured on a 5-point Likert scale) and future (discrepancy between the patient's current and desirable health states measured on an 11-point numeric rating scale) reference perceptions. We used generalized estimating equations to examine illness perception items, recent change, and discrepancy as main effects and in combination with disease in predicting treatment adjustment. Models are adjusted for age, education, income, duration, and biologic use.

Results: We found that disease activity, three illness perception factors: illness consequences, concern, emotional impact and both past and future reference points predict future treatment adjustments. These illness experience factors are also significant as interactions and the interaction model provided a slightly better fit (QICC index) than the main effects model indicating that the combination of disease activity and the three temporal reference points predicts future treatment adjustments better than disease activity alone.

Table 1. Main Effect Model

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Beta</th>
<th>Std error</th>
<th>OR</th>
<th>Lower</th>
<th>Upper</th>
<th>Wald chi square</th>
<th>p</th>
<th>QICC</th>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Consequences</td>
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<td>0.07</td>
<td>0.94</td>
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<tr>
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<td>2.25</td>
<td>0.133</td>
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<td>1.00</td>
<td>0.00</td>
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<tr>
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Table 2. Interaction Model

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<th>Upper</th>
<th>Wald chi square</th>
<th>p</th>
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<td>Illness perceptions</td>
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<td></td>
<td></td>
</tr>
<tr>
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Conclusion: These findings indicate that recommended T2T thresholds may not adequately reflect thresholds used clinical practice. Physicians likely take patient experience of their illness into account in making treatment recommendations, making it more difficult to consistently adhere to T2T thresholds. Understanding the factors that impact on decision making, may help modify T2T strategies to improve their uptake and ultimately improve patient outcomes.

Disclosure: L. Fraenkel, None; M. Cunningham, None; P. Falzer, None.

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Cost-Effectiveness and Cost-Utility Analysis of Treat-to-Target Versus Usual Care in Early Rheumatoid Arthritis: Results of the Dutch Rheumatoid Arthritis Monitoring Registry


1University of Twente & Medisch Spectrum Twente, Enschede, Netherlands, 2Radiobound University Nijmegen Medical Centre, Nijmegen, Netherlands, 3Medisch Spectrum Twente, Enschede, Netherlands, 4University of Twente, Enschede, Netherlands, 5Ziekenhuisgroep Twente, Hengelo, Netherlands, 6Isala Klinieken, Zwolle, Netherlands, 7Maartenskliniek, Nijmegen, Netherlands

Background/Purpose: Treat-to-target (T2T) has proven to be more effective in achieving remission in early rheumatoid arthritis (RA) patients than usual care [1]. However, T2T has not been fully implemented in daily clinical practice yet. Moreover, it is unknown whether T2T is cost-effective. The objective was to analyze the cost-effectiveness and cost-utility of a T2T strategy aiming at remission (Disease Activity Score in 28 joints (DAS28) < 2.6) compared to usual care in early RA over the first two years of the disease.

Methods: Two early RA inception cohorts including patients who fulfilled the ACR 1987 criteria were compared. The T2T group (n=261) consisted of patients from the DREAM remission induction cohort and was treated according to a protocolized treatment strategy aiming at DAS28 remission. The usual care group (n=213) consisted of patients from the Nijmegen early RA inception cohort and was treated without DAS28-guided, protocolized treatment decisions. For both groups, direct medical costs were collected and compared with gain in effectiveness (DAS28 remission) and quality adjusted life years (QALYs) (EQ-5D utility estimated from the HAQ) over two years of follow-up.

Results: T2T produced a higher remission percentage (64.4% vs. 34.7%) and a larger gain in QALYs (median (IQR) 1.45 (1.24–1.55) vs. 1.39 (1.18–1.53), p=0.037) than usual care. The total mean (SD) costs per patient were € 4,791 (7,436) in the T2T group and € 3,727 (5,773) in the usual care group. The incremental cost-effectiveness ratio was € 3,591 per patient in remission. The incremental cost-utility ratio (ICUR) was € 19,410 per QALY. The figure presents the cost planes which show the relation between A) the differences in effectiveness and costs and B) the differences in utility and costs of T2T versus usual care. Anti-TNF therapy was given to more T2T patients (21.5% vs. 15.0%) and was prescribed earlier in the disease process, compared to usual care. Our data showed that after three years of follow-up, T2T probably becomes cost-saving.

Conclusion: This quasi-experiment showed that over the first two years of treatment, T2T is associated with higher costs but also with substantial higher effectiveness. We conclude that T2T is cost-effective in daily clinical practice.

Reference


Disclosure: M. Vermeer, None; W. Kievit, None; I. H. Kuper, None; A. Braakman-Jansen, None; H. J. Bernelot Moens, None; T. R. Zijlstra, None; A. A. den Broeder, None; P. L. C. M. van Riel, None; J. Fransen, None; M. A. F. J. van de Laar, None.
Background/Purpose: While studies have assessed the efficacy of switching among biologic disease-modifying antirheumatic drugs (bDMARDs), there is lack of knowledge regarding the patterns of bDMARD use and switching in a real-world setting. The objective of this study was to describe and compare the characteristics and treatment patterns associated with RA patients who maintain their initial bDMARD (non-switchers) to: [1] patients that cycle from one anti-tumor necrosis factor (AT) to another and [2] patients that switch to a non-anti-TNF agent (NAT) in the year following bDMARD initiation.

Methods: Patients aged ≥18 with ≥1 diagnosis of RA between January 2004 and August 2011, from an administrative claims database, were included if they initiated a new anti-TNF treatment, did not have any bDMARD claims in the 12 months prior to bDMARD initiation, and were continuously enrolled for 12 months following bDMARD initiation. Patients who had ≥1 different bDMARD following initiation were classified as AT or NAT study group, depending on mechanism of action (MOA). AT and NAT groups were compared to non-switchers, using t-tests for continuous data and chi-square tests for categorical data. Cox Proportional Hazards model was used to examine time-to-discontinuation/switch while controlling for confounding factors.

Results: Among the 7,719 naïve bDMARD patients identified, 87% [n=6,098] maintained their initial bDMARD, 10% [n=792] cycled to a second AT and 3% [n=229] switched to a NAT.

Comorbidity profile of study groups was varied; the Deyo-Charlson Comorbidity Index for non-switchers [1.59] was higher than the AT group [1.49; P=0.033] and lower than the NAT group [1.78; P=0.038]. At baseline, the AT group had significantly lower proportions of cardiovascular disease, hypertension, dyslipidemia, and malignancy than the non-switchers, [P<0.05]. The NAT group had higher rates of hypertension, diabetes and dyslipidemia than non-switchers [P<0.05].

At baseline, the AT group had significantly greater use of background medications than non-switchers [methotrexate (MTX): 75.5% vs 61.9%; P<0.0001, other non-biologic DMARDs (nbDMARDs):48.4 % vs 40.3%; P<0.0001] compared to non-switchers (61.9% vs 54.6%; P<0.0001) but not nbDMARDs.

The most common index bDMARD was etanercept [45%] and adalimumab [20%]. Among the AT group, the majority of patients switched to adalimumab [49%], followed by etanercept [25%], infliximab [20%] golimumab [4%], and certolizumab [3%]. For the NAT group, most common index bDMARD was etanercept [49%], followed by etanercept [25%], infliximab [20%] golimumab [4%] and adalimumab [4%].

Mean duration of therapy on index bDMARD was 248 days, 145 days, and 127 days for non-switchers, the AT group and NAT groups, respectively. In adjusted analyses, the AT and NAT groups had similar discontinuation/switch rates (hazard ratio=1.13; P=0.15).

Conclusion: In the 12 months following bDMARD initiation, most RA patients maintained their initial bDMARD. Compared to non-switchers, the NAT group had higher comorbidities, suggesting that sicker patients are more likely to be switched to a different MOA. The use of MTX and nbDMARDs at baseline was not universal.

Methotrexate Adverse Events in a Cohort of US Veterans with Rheumatoid Arthritis, Lisa A. Davis,1 Brooke Ivan Polk,2 Alyse D. Mann,2 Gail S. Kerr,2 Andreas M. Reimold,2 Grant W. Cannon,2 Ted R. Mikuls1 and Liron Caplan.1 1Univ of Colorado School of Med, Aurora, CO, 2University of Colorado Medical School, Aurora, CO, 3Denver VA Medical Center, Denver, CO, 4Washington DC VAMC, Georgetown and Howard University, Washington, DC, 5Dallas VA and University of Texas Southwestern, Dallas, TX, 6George E. Wahlen VA Medical Center, Salt Lake City, UT, 7Omaha VA and University of Nebraska Medical Center, Omaha, NE, 8Denver VA and University of Colorado School of Medicine, Aurora, CO

Background/Purpose: Methotrexate (MTX) is the most commonly used medication for patients with rheumatoid arthritis (RA), however, the frequency of MTX adverse events (AE) has not been fully described. We surveyed patients exposed to multiple MTX courses to characterize MTX-associated AEs.

Methods: A random sample of patients enrolled in the prospective Veterans Affairs RA (VARA) registry was selected. Medical records were reviewed for MTX-associated AEs from the time of MTX initiation until 120 days following MTX cessation. Separate MTX courses were defined by a gap >90 days in the pharmacy data. The AEs abstracted included: dermatologic (alopecia, rash, photosensitivity, or nodulosis); gastrointestinal (oral ulcers/stomatitis, nausea/vomiting/anorexia/dyspepsia, or diarrhea); hematologic (leukopenia <3.500, thrombocytopenia <100,000, or new-onset anemia [hemoglobin <13.5 g/dL in men and <12.0 g/dL in women]); hepatic (transaminitis >upper limit of normal, fibrosis, or cirrhosis); infectious (clinical diagnosis defined by the treating physician); central nervous system (headache, dizziness/vertigo, fatigue within 48 hours of MTX, mood alteration, or memory impairment as defined by the patient or physician); respiratory (dry cough, dyspnea, or interstitial lung disease [ILD]); and other (AE defined by physician or patient as associated with MTX). Significant AEs (SigAE) were defined as an AE leading to drug discontinuation (operationalized as any AE preceding MTX cessation by ≤120 days).

Results: Of the 319 patients for whom records were abstracted (1196 total patient-years [PY] of observation), 642 AEs were recorded in 270 patients during 614 total courses of MTX. The first AEs (n=268) occurred over a course of 496.5 PY of observation, yielding an incidence rate of first AE of 0.54 per PY (95% CI 0.48–0.61). SigAEs (n=93) had an incidence rate of 0.08 per PY. The most common AEs were hematologic (30.4% of all AE), with anemia the leading subcategory (27.9%) (see Table). The most common SigAE was respiratory (ILD in the cohort was low).

<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>All AE</th>
<th>%</th>
<th>SigAE</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermatologic</td>
<td>16</td>
<td>2.49</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Alopecia</td>
<td>3</td>
<td>0.47</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Rash</td>
<td>6</td>
<td>0.93</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Photosensitivity</td>
<td>1</td>
<td>0.16</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Nodulosis</td>
<td>7</td>
<td>1.09</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>79</td>
<td>12.31</td>
<td>11</td>
<td>1.68</td>
</tr>
<tr>
<td>Oral Ulcers/Stomatitis</td>
<td>19</td>
<td>2.96</td>
<td>1</td>
<td>0.82</td>
</tr>
<tr>
<td>N/V/Anorexia/Dyspepsia</td>
<td>54</td>
<td>8.41</td>
<td>7</td>
<td>3.23</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>11</td>
<td>1.71</td>
<td>3</td>
<td>1.32</td>
</tr>
<tr>
<td>Hematologic</td>
<td>195</td>
<td>30.37</td>
<td>20</td>
<td>21.51</td>
</tr>
<tr>
<td>Leukopenia</td>
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<td>0.00</td>
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<tr>
<td>Thrombocytopenia</td>
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<td>0.93</td>
<td>1</td>
<td>0.82</td>
</tr>
<tr>
<td>Anemia</td>
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<td>27.88</td>
<td>19</td>
<td>20.43</td>
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<td>Hepatic</td>
<td>168</td>
<td>26.17</td>
<td>17</td>
<td>18.28</td>
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<td>Transaminitis</td>
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<td>17</td>
<td>18.28</td>
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<td>Infectious Disease</td>
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<td>12.62</td>
<td>12</td>
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<tr>
<td>Central Nervous System</td>
<td>15</td>
<td>2.34</td>
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<td>Sleep Disorder</td>
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<td>Memory Impairment</td>
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<tr>
<td>Respiratory</td>
<td>45</td>
<td>7.01</td>
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<td>22.58</td>
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<tr>
<td>Dry Cough</td>
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<td>5</td>
<td>5.38</td>
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<tr>
<td>Dyspepsia</td>
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<td>3.27</td>
<td>8</td>
<td>8.60</td>
</tr>
<tr>
<td>Intestinal Lung Disease</td>
<td>26</td>
<td>4.05</td>
<td>14</td>
<td>15.05</td>
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<tr>
<td>Other</td>
<td>46</td>
<td>7.17</td>
<td>11</td>
<td>11.83</td>
</tr>
</tbody>
</table>

*SigAE=significant AE; N=nausea; V=vomiting; N=total number of reported AE; n=total number of reported significant AEs

Conclusion: Among US veterans with RA, MTX has a high AE rate, with approximately one AE noted per patient over a two-year period of treatment. In contrast, the rate of SigAE mandating drug discontinuation is much lower. The most common SigAE was respiratory, which may reflect physicians’ high level of concern for MTX-associated ILD. However, the incidence of ILD in the cohort was low.

Disclosure: L. A. Davis, None; B. Ivan Polk, None; A. D. Mann, None; G. S. Kerr, None; A. M. Reimold, None; G. W. Cannon, None; T. R. Mikuls, None; L. Caplan, None.

ACR Concurrent Abstract Session

Fibromyalgia and Soft Tissue Disorders II

Wednesday, November 14, 2012, 11:00 AM–12:30 PM

2641

Time-to-Improvement of Pain and Sleep in Clinical Trials of Pregabalin Treatment of Fibromyalgia, Lesley M. Arnold,1 Andrew Clair,2 Birol Emir,3 Lynne Pauer,2 and E. Malca Resnick.1 1University of Cincinnati College of Medicine, Cincinnati, OH, 2Pfizer Inc, New York, NY

Background/Purpose: Fibromyalgia (FM) is a chronic condition characterized by widespread pain and tenderness. Sleep disturbance is common in patients with FM, and both pain and poor sleep quality can have a significant impact on patients’ quality of life. Pregabalin is one of 3 drugs approved for the treatment of FM in the United States. Several placebo-controlled clinical trials have demonstrated that pregabalin treatment results in significant improvements in both pain and sleep in patients with FM.

Methods: This post-hoc analysis examined the time-to-onset (TTO) of improvement in pain and sleep quality in patients diagnosed with FM from four 8- to 14-week Phase III placebo-controlled trials of pregabalin at 150, 300, 450 or 600 mg/d. Pain scores were recorded in a daily diary on an 11-point numeric rating scale (NRS) ranging from 0 (no pain) to 10 (worst possible pain). Daily sleep quality was also recorded on an 11-point NRS ranging from 0 (best possible sleep) to 10 (worst possible sleep). Daily pain and sleep quality scores were analyzed using analysis of covariance in the intent-to-treat population. The TTO of improvement in pain and sleep quality scores was calculated for all pregabalin dose arms that showed a statistically significant (p<0.05) reduction in their respective score at endpoint compared with placebo. TTO was defined as the first of 2 consecutive days for which the mean score was statistically significantly lower for pregabalin vs placebo.

Results: Across the 4 studies included in the analysis, there was a total of 12 pregabalin dose arms, with 2069 patients receiving pregabalin and 689 placebo. Patients had a mean age ranging from 48.0–49.7 years and the majority were women (93.1%). Mean baseline pain scores were similar for the pregabalin (range 6.8–7.0) and placebo groups (6.8). Mean baseline sleep quality scores were also similar for the pregabalin (range 6.3–6.4) and placebo (6.4) groups. Eight of 12 pregabalin dose arms were associated with a significant reduction in pain scores vs placebo at endpoint. TTO of improvement in pain occurred at day 1 of treatment for 7 dose arms (average reduction in mean pain score vs placebo, −0.36 for 300 mg/d, −0.55 for 450 mg/d, and −0.41 for 600 mg/d) and at day 2 for 1 arm (−0.59 for 300 mg/d). Eleven of 12 pregabalin dose arms were associated with a significant improvement in sleep quality score vs placebo at endpoint. TTO of improvement in sleep occurred at day 1 of treatment for these 11 arms (average reduction in mean sleep quality score vs placebo, −0.77 for 300 mg/d, −0.77 for 450 mg/d, and −0.71 for 600 mg/d pregabalin).

Conclusion: In patients with FM, statistically significant improvement in pain typically occurs within 2 days, and statistically significant improvement of sleep quality within 1 day, of initiating treatment with pregabalin.

Disclosure: L. M. Arnold, Pfizer Inc, Forest, Eli Lilly, Takeda, 2, Pfizer Inc, Forest, Grunenthal, Daiichi Sankyo, Theravance, 5, Pfizer Inc; 8; A. Clair, Pfizer Inc, 1, Pfizer Inc, 3; B. Emir, Pfizer Inc, 1, Pfizer Inc, 3; L. Pauer, Pfizer Inc, 1, Pfizer Inc, 3; E. M. Resnick, Pfizer Inc, 3.
Rate and Predictors of Work Disability in Fibromyalgia. Frederick Wolfe, Brian T. Walitt, Robert S. Katz and Winfried Häuser. National Data Bank for Rheumatic Diseases, Wichita, KS, Washington Hospital Center, Washington, DC, Rush University Medical Center, Chicago, IL, Technische Universität München, Munich, Germany

Background/Purpose: Fibromyalgia is a contested disorder whose diagnosis depends largely on self-report. It is reportedly also associated with a high rate of work disability, but there have been no detailed studies of work disability in fibromyalgia. In addition, disabled status is difficult to determine because there are no clearly observable abnormalities or reliable assessments methods to determine work disability. In this study we determined the rate of a work disability award and its predictors.

Methods: For up to 13 years, we studied a cohort of 2,322 fibromyalgia patients, who were between the ages of 21 and 64 years, using mailed and Internet questionnaires at 6-month intervals. 591 patients were receiving US Social Security disability (SSD) awards at entry to the cohort, and were not studied further. The remaining 1,730 constituted the study sample and were evaluated using Cox regression.

Results: For the entire sample (N=2,322) the prevalence of SSD was 34.8% (95% CI 32.9, 36.8). Of 13 years of follow-up of the non-disabled sample at study entry, a SSD prevalence of 25.5% was noted. The annual incidence rate for this group was 3.4% (3.0, 3.9%) annually and 25% of patients were disabled at 9.0 years (Figure 1). As shown in Table 1, a wide variety of univariate predictors (adjusted for age and sex) at the first observation were associated with future work disability, including younger age, abnormal mood, functional status as measured by the Health Assessment Questionaire disability index (HAQ), increased BMI, current smoking, the polysymptomatic distress scale (PSD (“fibromyalgianess)), meeting ACR 2010 criteria, the SF-36 PCS and MCS scales, VAS fatigue, VAS pain, and rating one’s self as being disabled or being unemployed. College education was protective against future SSD. In multivariable Cox regression, current smoking, the polysymptomatic distress scale (PSD (“fibromyalgianess)), meeting ACR 2010 criteria, the SF-36 PCS and MCS scales, VAS fatigue, VAS pain, and rating one’s self as being disabled or being unemployed. College education was protective against future SSD. In multivariable Cox regression, current smoking, the polysymptomatic distress scale (PSD (“fibromyalgianess)), meeting ACR 2010 criteria, the SF-36 PCS and MCS scales, VAS fatigue, VAS pain, and rating one’s self as being disabled (RR 5.9 (3.6, 9.7)), and being unemployed (RR 3.3 (1.9, 5.8) were significant predictors of future SSD.

Table 1. Univariate predictors of SSD, adjusted for age and sex

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled – self-report (yes/no)</td>
<td>10.5 (6.5, 16.67)</td>
</tr>
<tr>
<td>Unemployed (yes/no)</td>
<td>4.05 (2.34, 7.01)</td>
</tr>
<tr>
<td>FM Diagnostic criteria (+) (yes/no)</td>
<td>3.27 (2.17, 4.71)</td>
</tr>
<tr>
<td>Current smoking (yes/no)</td>
<td>1.70 (1.22, 2.35)</td>
</tr>
<tr>
<td>&gt; High school education (yes/no)</td>
<td>0.71 (0.51, 0.98)</td>
</tr>
<tr>
<td>College education (yes/no)</td>
<td>0.46 (0.33, 0.66)</td>
</tr>
<tr>
<td>HAQ Disability (0-3)</td>
<td>4.77 (3.76, 6.04)</td>
</tr>
<tr>
<td>VAS Pain (0-10)</td>
<td>1.34 (1.25, 1.43)</td>
</tr>
<tr>
<td>Mood (0-10)</td>
<td>1.29 (1.21, 1.38)</td>
</tr>
<tr>
<td>VAS Fatigue (0-10)</td>
<td>1.22 (1.15, 1.30)</td>
</tr>
<tr>
<td>VAS Sleep disturbance (0-10)</td>
<td>1.18 (1.12, 1.24)</td>
</tr>
<tr>
<td>Polysymptomatic distress (0-31)</td>
<td>1.09 (1.07, 1.11)</td>
</tr>
<tr>
<td>Body mass index</td>
<td>1.04 (1.02, 1.05)</td>
</tr>
<tr>
<td>SF-36 PCS</td>
<td>0.92 (0.90, 0.93)</td>
</tr>
<tr>
<td>SF-36 MCS</td>
<td>0.96 (0.95, 0.97)</td>
</tr>
</tbody>
</table>

No ethnicity groups were statistically significant predictors.

Conclusion: The receipt of a SSD award is common in fibromyalgia, with an annual incidence of 3.4% (3.0, 3.9%). Although many variables were predictive of SSD in univariate models, only self-report of functional status and current unemployment and/or self-reported disability predicted future SSD. One explanation for the few predictors is that BMI, smoking, education and symptoms contribute to functional status, which then dominates all other predictors.

Disclosure: F. Wolfe, None; B. T. Walitt, None; R. S. Katz, None; W. Häuser, None.

2643

Grey Matter Decrease in Fibromyalgia Is Related to Pain Catastrophizing and Pain Sensitivity. Marta Ceko, Mary-Ann Fitzcharles, M. Catherine Bushnell and Petra Schweinhardt. McGill University, Montreal, QC

Background/Purpose: Fibromyalgia (FM) is commonly associated with catastrophizing, a set of negative emotional and cognitive processes related to pain. Catastrophizing is suggested to augment pain sensitivity through increased attention to pain and exaggerated emotional processing of pain. FM is associated with grey matter (GM) decreases in cortical medial frontal regions thought to be involved in attention to pain and pain modulation. We investigated the relationship between GM alterations and measures of pain, specifically hypothesizing that in fibromyalgia GM decreases in the medial frontal regions will be related to pain catastrophizing, as well as to pain sensitivity.

Methods: We recruited 29 female FM patients and 29 female controls matched for age, handedness, education, body mass index, physical activity, and socioeconomic status. All subjects underwent anatomical magnetic resonance imaging (MRI). Catastrophizing was assessed using the Pain Catastrophizing Scale; pain intensity and unpleasantness were assessed in response to a standardized pressure stimulus applied on the thumbnail. MRI data were processed in SPMS. Voxel-wise GM differences were examined using independent sample t-tests while controlling for age.

Results: Pain catastrophizing was higher in the FM patients (p<0.001), as was pain unpleasantness (p=0.011), with a trend for pain intensity (p=0.079). FM patients had decreased GM in the medial prefrontal cortex (MPFC), superior frontal gyrus, and premotor cortex (p<0.05 cluster-corrected). In FM patients, GM in the MPFC was negatively correlated with catastrophizing (p=0.022), pain intensity (p=0.048), and pain unpleasantness (p=0.020).

Conclusion: This study shows a three-way relationship between MPFC changes, catastrophizing and pain sensitivity, indicating that structural alterations in FM might contribute to the patients’ phenotype.

Disclosure: M. Ceko, None; M. A. Fitzcharles, Pfizer Inc, Lilly, Purdue, Valeant, 5; M. C. Bushnell, None; P. Schweinhardt, None.
interest showing significant changes in BOLD activation during the 2-back task were extracted and analyzed using SPSS 19.

**Results:** Behavioral results showed no overall difference between FM and HC groups on the 2-back task; however, there was an interaction with block (F(4, 24) = 2.8, p < .05), such that FM patients showed better accuracy during the first block, but did not improve over time. In contrast, HC subjects improved and by the final block were more accurate than FM patients. While performing the task in the scanner, FM patients displayed significantly less BOLD activity within the left- medio insula (FM = HC percent BOLD change mean difference = −0.455 ± 0.194), right posterior insula (−0.057 ± 0.196), left cingulate cortex (−0.109 ± 0.134) and right primary somatosensory cortex (−0.43 ± 0.204; all p < .05 corrected). There was a significant positive correlation between BOLD activity in the left cingulate cortex and accuracy on the 2-back task (r = .5, p = .049), and a significant negative correlation between BOLD activity in the primary somatosensory cortex and pain severity (r = −.546, p = .029) in FM patients.

**Conclusion:** FM patients displayed reduced activity in the insula, cingulate, and primary somatosensory cortex during a working memory task, when compared to HCs. Behaviorally, FM patients showed no improvement in performance over time, whereas HCs improved. The results are consistent with a “competing demands” problem with neural resources in FM patients. It appears as though perception and processing of pain activates areas of the brain that are also involved in cognition, including inhibition and attention networks involved in cognitive executive function, making these networks less available for cognitive tasks.

**Disclosure:** A. E. Kairys, None; G. Ramirez, None; E. Ichesco, None; J. P. Hampon, None; R. E. Harris, Pfizer Inc, 2, Pfizer Inc, 5; D. J. Clauw, Pfizer Inc, Forest Laboratories, Merck, Nuvo, 2, Pfizer, Forest, Lilly, Merck, Nuvo, J and J, 5; T. Schmidt-Wilcke, None; V. J. Glass, None.

2645

**The Transcription Factor Mohawk Plays an Important Role for Maintaining Human Anterior Cruciate Ligament Homeostasis.** Hironuki Nakahara, Akihiko Hasegawa, Fumiaki Ayabe, Tetsuya Matsukawa, Koji Otabe, Tomy Yonezawa, Martin K. Lotz and Hiroshi Asahara. The Scripps Research Institute, La Jolla, CA

**Background/Purpose:** Recently Mohawk homeobox (MKX) has been discovered as a tendon and ligament specific transcriptional factor. MKX deficient-mice are shown to hypoplastic tendons throughout the body by down regulating changing type I collagen production in tendon cells. However, in human tendons or ligaments, little is known about the function of MKX. In this study, we demonstrated using human anterior cruciate ligament (ACL) tissues and primary cultured human ACL cells that MKX is an important regulator of human ligament homeostasis, and that its changes in the expression and function play an important role in ligament degeneration. The aims of this study are to characterize the expression of MKX in normal human knee joints and osteoarthritics (OA) affected knee joints and to investigate the role of MKX in human ligament homeostasis.

**Methods:** Human ACL specimens were obtained from the knee joints at cadaveric autopsy within 24–48 hours postmortem with approval of the Scripps Human Subjects Committee. 7 normal donors (mean±SD age 33.5±11.6/7 years) and 8 donors with OA (mean±SD age 77.50±11.46 years) were analyzed and none of the donors had a history of knee joint trauma. All cartilage surfaces were graded macroscopically. ACL degeneration was assessed macroscopically and histologically using quantitative scoring systems. ACL tissues were analyzed for the expression of MKX by immunohistochemistry and quantitative RT-PCR assays. Primary cultured human ACL cells were stimulated with IL-1β to examine whether pro-inflammatory cytokine modulates MKX expression. Moreover, in order to examine the function of MKX on ECM production and differentiation in these cells, we performed the knocked-down by MKX specific siRNA and then, determined the expression of some genes involving in ECM and the differentiation using quantitative RT-PCR and western blotting analysis.

**Results:** The expression of MKX was remarkably decreased during developing OA. In addition, the expression of COL1a1, which is major component of ACL, is also decreased in OA group. In coincidence with the result of immunohistochemistry revealed that the percentage of MKX positive cells was significantly reduced in OA group. In primary cultured human ACL cells, the expression of MKX was significantly reduced by the treatment of IL-1β. The expression of genes involving in regulating ECM homeostasis such as COL1a1 and TNXb and transcriptional factor Scleraxis (SCX), which is specific regulator of the tendon/ligament lineage, were down-regulated by IL-1β treatment. On the other hand, SOX9, which is involved in the modulation of chondrocyte like phenotype, was up-regulated by IL-1β treatment. The expression of COL1a1 and TNXb were decreased by MKX specific siRNA treatment, though that of SOX9 was increased. We didn’t detect any significant differences in those of SCX, IL-6 and MMP13.

**Conclusion:** To our knowledge, this is the first report to investigate the MKX expression and function in Human ligaments. The present study demonstrates that the expression of MKX is down-regulated by an inflammatory response and MKX may play important roles in ligament homeostasis via regulating the expression of COL1a1, TNXb and SOX9 in human ACL cells.

**Disclosure:** H. Nakahara, None; A. Hasegawa, None; F. Ayabe, None; T. Matsukawa, None; K. Otabe, None; T. Yonezawa, None; K. Lotz, None; H. Asahara, None.

2646

**Cost-Effectiveness of Tai Chi Mind-Body Exercise for the Treatment of Fibromyalgia.** John B. Wong and Chenchen Wang. Tufts Medical Center, Boston, MA

**Background/Purpose:** Although fibromyalgia is associated with substantial annual direct medical and indirect productivity costs, the cost-effectiveness of treatments for fibromyalgia remains understudied. A randomized controlled trial of tai chi mind-body exercises versus wellness education and stretching found tai chi to be safe and effective, so our aim was to assess the cost-effectiveness of tai chi for fibromyalgia in this trial.

**Methods:** The analysis is based on a single-blind, 12-week randomized trial of classic Yang-style tai chi compared with wellness education and stretching control for the treatment of fibromyalgia in 66 patients with 24 week follow up (NEJM 2010; 363:743–54). Effectiveness outcomes from baseline to week 24 included Fibromyalgia Impact Questionnaire (FIQ) score, Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) quality of life (QOL), pain score using the visual analog scale (VAS) and Health Assessment Questionnaire Disability Index (HAQ). Hourly costs were based on an Internet search with Tai Chi costing $17.50 ($10–$25) and stretching costing $12 ($9–$15). A systematic review of Medline from inception to 2011 for economic studies regarding fibromyalgia found annual direct medical care costs of $3700 equaling 1.7 to 2.9 times population controls and indirect costs that were 1.7 to 2.2 times direct medical care costs (ACR 1992 Arthritis Rheum 2011;63 Suppl 10:S54–5). Statistical testing for differences used the two sample t-test and mixed models with time and group as categorical fixed factors. A linear regression related HAQ to mean direct care costs (R-square 0.96).

**Results:** The mean difference improvement with tai chi versus wellness education and stretching control in FIQ was 18.3 (95% CI 9.6–27.0; p = 0.001) in SF36 QOL physical health was 7.0 (2.9–11.0, p = 0.001) and SF36 QOL mental health was 7.3 (1.9–28.8, p = 0.009); in VAS pain was 2.1 (95% CI 0.74–3.5, p = 0.003); and in HAQ was 0.21 (95% CI 0.037–0.390, p = 0.019). Assuming no reduction in health care utilization from tai chi, the incremental cost-effectiveness of tai chi versus wellness education and stretching was $4 (95% CI $2–$7) per 1 point improvement in FIQ; $9 (95% CI $5–$35) per 1 point improvement in physical or mental QOL; $31 (95% CI $19–$89) per 1 point improvement in VAS pain score and $314 (95% CI $169–$1784) per 1 point improvement in HAQ. Assuming that the improved HAQ disability index decreases health care utilization, tai chi results in an estimated savings of $366 (95% CI $9–$724) per patient over 6 months. Assuming that the observed decreased HAQ disability index decreases health care utilization and productivity losses, tai chi results in an estimated savings of $775 (95% CI $80–$1474) per patient over 6 months.

**Conclusion:** Compared with wellness intervention and stretching, tai chi improves FIQ score, SF36 QOL, VAS pain score and HAQ significantly. Costs per unit improvement appear to be quite modest, and assuming that improvement in HAQ would lead to direct and indirect cost reductions, tai chi would be cost-saving. Confirmation of these results in a larger randomized controlled trial is needed.

**Disclosure:** J. B. Wong, 1UL1RR025752-01 from the Clinical and Translational Research Center funded by the National Institutes of Health National Center for Research Resources, 2. C. Wang, 1R21AT006321 from the National Center for Complement and Alternative Medicine, the American College of Rheumatology Research Center funded by the National Institutes of Health National Center for Complement and Alternative Medicine, the American College of Rheumatology Research and Education Health Professional Investigator Award and 1UL1RR025752-01 from the Clinical and Translational Research Center, 2.
Effects of Pain Expectations On Neuromuscular Control of the Spine in Patients with Chronic Low Back Pain and Healthy Participants.

Yves Henchoz, Charles Tétreau, Jacques Abboud, Mathieu Piché and Martin Descarreaux. Université du Québec à Trois-Rivières, Trois-Rivières, QC

Background/Purpose: The mechanisms underlying the transition from acute to chronic low back pain (cLBP) are poorly understood. Physiological and psychological factors are implicated. Although significant associations have been found between neuromuscular control of the lumbar spine and the level of fear of pain, it is still unknown whether acute exposure to fear of pain alters trunk motor control. The objective of this study was to determine if experimentally induced pain expectations modulate trunk neuromuscular responses differently in subjects with and without cLBP.

Methods: This cross-sectional study included 22 patients with cLBP and 22 healthy participants. They performed 6 trunk flexion-extension tasks under three experimental conditions: innocuous heat, noxious stimulation with low pain expectation and noxious stimulation with high pain expectation. Noxious stimulation was generated by thermal cutaneous heat stimulations in the lumbar region (L4-L5), whereas low or high pain expectations were generated by verbal and visual instructions (see Fig. 1). After each task, experimental pain was evaluated using a numerical rating scale (NRS). Surface electromyography (sEMG) of erector spinae at L2-L3 and L4-L5 as well as lumbarpelvic kinematic variables were collected during the tasks. Pain ratings, sEMG and kinematic variables were compared between groups and conditions using two-way mixed ANOVAs. Pearson’s correlation coefficients were calculated in cLBP patients to determine whether the effects of expectations were associated with disability, pain catastrophizing, state and trait anxiety and fear avoidance beliefs.

Results: Pain ratings were significantly different between high and low pain expectations conditions (P<0.001). This difference was similar between patients with cLBP (15.2 ± 13.4) and control participants (13.3 ± 10.2). In patients with cLBP, the increase in sEMG activity in full flexion caused by expectation was related to higher pain catastrophizing, but not to disability, anxiety and fear-avoidance beliefs. Two-way mixed ANOVA yielded a significant “group x condition” interaction for sEMG in Full flexion (P<0.05). Planned comparisons revealed a stronger effect of pain expectation in healthy participants than in patients with cLBP. Lumbopelvic rhythm was significantly different between groups (P<0.05), but similarly affected by pain expectation.

Conclusion: As anticipated, the increase in sEMG activity caused by expectations was related to higher pain catastrophizing in patients with cLBP. Nevertheless, expectations of high pain resulted in neuromuscular adaptations that were weaker in patients with cLBP than in healthy participants. In conclusion, chronic pain appears to generate rigid and less variable movement patterns in patients with cLBP, which attenuate their response to acute fear of pain exposure.

Disclosure: Y. Henchoz, None; C. Tétreau, None; J. Abboud, None; M. Piché, None; M. Descarreaux, None.

Background/Purpose: Patients with idiopathic carpal tunnel syndrome (CTS) are commonly treated with local steroid injection but there is currently no evidence from placebo-controlled trials supporting efficacy beyond 1 month.

Methods: We conducted a randomized triple-blind placebo-controlled trial of first-time steroid injection into the carpal tunnel in patients with moderately severe CTS. Patients aged 18 to 70 years with primary idiopathic CTS, no severe sensory loss or muscle atrophy, and no previous steroid injection for CTS were randomized to 1 of 3 groups (37 patients in each): 80 mg Methylprednisolone, 40 mg Methylprednisolone, or saline (each also containing 10 mg Lidocaine). Patient-reported outcomes (CTS symptom severity scale, QuickDASH, SF-36 bodily pain, and SF-6D) were obtained and physical examination by a blinded assessor was performed at baseline and at 10, 24 and 52 weeks after injection. The primary end points were change in CTS symptom severity score at 10 weeks and rate of surgery at 52 weeks. Data from all patients were analyzed.

Results: During 1 year after injection surgery was carried out on 27 patients (73%) in the 80 mg Methylprednisolone group, on 30 patients (81%) in the 40 mg Methylprednisolone group, and on 34 patients (92%) in the placebo group. Patients who received placebo were significantly more likely to have surgery during 1 year after injection than patients who received Methylprednisolone; adjusted hazard ratio 2.0 (95% confidence interval 1.3–3.2, P<0.01). The change in the CTS symptom severity score from baseline to 10 weeks was significantly larger in both Methylprednisolone groups than in the placebo group.

Conclusion: In patients with moderately severe carpal tunnel syndrome first-time steroid injection into the carpal tunnel has a significant benefit in relieving symptoms up to 10 weeks and in reducing the need for surgery up to 1 year after treatment.

Disclosure: I. Atroshi, None; M. Flondell, None; M. Hofer, None.

Background/Purpose: Overall rates of total joint replacement surgeries (TJR) have increased dramatically over the past decades. By contrast, TJR rates among patients with rheumatoid arthritis (RA) are reported to be decreasing. The magnitude of such change, and whether it applies to all types of inflammatory arthritis (IA), is not clear. This study evaluates rates of TJR among patients with IA, [RA, juvenile idiopathic arthritis (JIA) and spondyloarthropathies (SpA)] and compares them to TJR patients with non-inflammatory conditions.

Methods: Administrative hospital discharge databases from 10 states (AZ, CA, CO, FL, IA, MA, NJ, NY, WA, WI) and census data annual population estimates were used to calculate combined rates per 100,000 population of knee arthroplasty, total and partial hip arthroplasty, and total and partial shoulder arthroplasty from 1991 to 2005. ICD-9-CM codes were used to identify specific diseases.

Results: There were 2,839,325 arthroplasties from 1991 to 2005, of which 76,665 (2.7%) were in IA patients. The proportion of TJR attributable to IA nearly halved during this period (3.9% in 1991 vs. 2.0% in 2005). TJR rate for non-inflammatory conditions almost doubled from 124.5 in 1991 to 247.5 in 2005, while the rate in IA patients was fairly steady (range: 4.4–5.2). Stratifying by IA subtype, the TJR rate decreased slightly for RA (4.6 vs. 4.5, p-value<0.001) decreased by 40% for JIA (0.31 vs. 0.22, p-value<0.001), and increased by 40% for SpA (0.22 vs. 0.31, p-value<0.001). From 1991 to 2005, the mean age at TJR for IA patients across all disease subtypes increased: RA (63.4 yrs ± 12.7 vs. 64.9 yrs ± 12.8, p-value<0.001), JIA (30.9 yrs ± 12.2 vs. 36.7 yrs ± 14.9, p-value<0.001), and SpA (54.3 yrs ± 16.1 vs. 60.4 yrs ± 13.9, p-value<0.001).

Disclosure: I. Atroshi, None; M. Flondell, None; M. Hofer, None;
<0.001). In contrast, the mean age of non-IA decreased (71.5±11.8 yrs. vs. 69.0±12.0 yrs p<0.001). Among IA patients, neither age nor sex was statistically significantly related to TJR rates.

Conclusion: To our knowledge this is the largest cohort of TJR of patients with IA and the first study of TJR trends in patients with JIA and SpA. Surprisingly, TJR rates in RA showed minimal change despite the widespread introduction of methotrexate in the 1990s. JIA and SpA patients appear to be deferring TJR, with JIA patients requiring fewer procedures. Why SpA TJR rates increased is unclear. These data suggest there will be an ongoing need for orthopedists with expertise in operating procedures. Why SpA TJR rates increased is unclear. These data suggest that has both osteoarthritis and a meniscal tear present a difficult treatment challenge. They may be treated nonoperatively or with arthroscopic partial meniscectomy (APM); there is limited data on the comparative outcomes of these treatments.

Methods: We conducted a randomized controlled trial in 7 US centers involving 351 subjects > 45 years old with symptomatic meniscal tear and osteoarthritic cartilage change, documented by magnetic resonance imaging (MRI). To be eligible, subjects must have exhibited meniscus related symptoms for at least 4 weeks. Enrolled subjects were randomized to APM with postoperative physical therapy (APM arm) or to nonoperative care including a standardized PT regimen focused on strengthening related symptoms for at least 4 weeks. Enrolled subjects were randomized by BMI (non-operative arm). The primary analysis compared change in functional imaging (MRI). To be eligible, subjects must have exhibited meniscus related symptoms for at least 4 weeks. Enrolled subjects were randomized to APM with postoperative physical therapy (APM arm) or to nonoperative care including a standardized PT regimen focused on strengthening related symptoms for at least 4 weeks. Enrolled subjects were randomized by BMI (non-operative arm). The primary analysis compared change in functional status (WOMAC) over 6 months across the 2 arms, using an intention to treat (ITT) approach. A secondary outcome was a binary variable defined as lack of improvement in WOMAC function of at least 8 points over 6 months (a clinically relevant change) OR unplanned cross-over (from nonoperative therapy to APM or from APM to nonoperative therapy). We carried 3 month observations forward to address missing 6 month outcome data.

Results: 174 subjects were randomized to APM and 177 to the nonoperative arm. The arms were balanced with respect to baseline function, radiographic severity, age and sex. The response rate at 6 months was 84% across both arms. In the ITT analysis, mean improvement in WOMAC function after 6 months was 19.4 points (sd 18.4) in subjects randomized to APM and 16.8 (sd 18.1) in those randomized to the nonoperative arm (p=0.19). Of the 174 randomized to APM, 9 (5%) did not receive surgery by 6 months. Of the 177 subjects randomized to the non-operative arm, 53 (30%) crossed over and had APM by 6 months (Table). In the analysis of the secondary outcome, 26% of subjects randomized to APM vs. 51% of subjects in the nonoperative arm either did not improve by at least 8 points on WOMAC function or crossed over (p<0.0001; Table).

Table. Crossovers and functional outcomes at six months in the randomized arms

<table>
<thead>
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Conclusion: These preliminary trial findings suggest that in both the APM and the nonoperative arms, subjects experienced substantial improvement in functional status over six months, with no significant differences between the two arms in the ITT analysis. 30% of subjects randomized to nonoperative therapy underwent APM within the first six months. As with all RCT’s the results should be generalized cautiously to clinical populations. These findings will aid physicians and their patients over 45 who present with knee symptoms in association with meniscal tears and osteoarthritis as they decide whether to elect APM or nonoperative therapy.

Disclosure: J. N. Katz, None; C. E. Chaisson, None; B. Cole, None; L. Donnell-Fink, None; M. Jones, None; B. Levy, None; L. A. Mandl, None; S. Martin, None; R. Marx, None; A. Miniaci, Zimmer, Arthrosurface, Medtronic, Smith and Nephew. Johnson and Johnson, 1, Zimmer, Arthrosurface, 7; J. Palmisano, None; E. Reinke, None; C. Safran-Norton, None; D. J. Skonecki, None; D. H. Solomon, None; K. P. Spindler, None; J. Wright, None; R. Wright, None; E. Losina, None.

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The Meteor Trial: Preliminary Results of an RCT of Arthroscopic Partial Meniscectomy Vs. Physical Therapy in Patients greater Than 45, Jeffrey N. Katz1, Christine E. Chaisson2, Brian Cole3, Laurel Donnell-Fink1, Morgan Jones4, Bruce Levy5, Lisa A. Mandl6, Scott Martin7, Robert Marx8, Anthony Miniaci9, Joseph Palisano8, Emily Reinke8, Clare Safran-Norton10, Debra J. Skonecki1, Daniel Hal Solomon1, Kurt P. Spindler8, John Wright8, Rick Wright10 and Elena Losina1. 1Brigham and Women’s Hospital, Boston, MA, 2Boston University School of Public Health, Boston, MA, 10Washington University, MO

Background/Purpose: Patients who present with a symptomatic knee that has both osteoarthritis and a meniscal tear present a difficult treatment challenge. They may be treated nonoperatively or with arthroscopic partial meniscectomy (APM); there is limited data on the comparative outcomes of these treatments.

Methods: We conducted a randomized controlled trial in 7 US centers involving 351 subjects > 45 years old with symptomatic meniscal tear and osteoarthritic cartilage change, documented by magnetic resonance imaging (MRI). To be eligible, subjects must have exhibited meniscus related symptoms for at least 4 weeks. Enrolled subjects were randomized to APM with postoperative physical therapy (APM arm) or to nonoperative therapy.

Results: 174 subjects were randomized to APM and 177 to the nonoperative arm (p=0.19). Of the 174 randomized to APM, 9 (5%) did not receive surgery by 6 months. Of the 177 subjects randomized to the non-operative arm, 53 (30%) crossed over and had APM by 6 months (Table). In the analysis of the secondary outcome, 26% of subjects randomized to APM vs. 51% of subjects in the nonoperative arm either did not improve by at least 8 points on WOMAC function or crossed over (p<0.0001; Table).

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**Conclusion:** Subjects with grade 2 obesity or greater (BMI >35) are less physically active throughout the perinatal period of TKR than those with lower BMI. However high BMI does not preclude improvements in physical activity levels following TKR. An understanding of the association between obesity and physical activity can help inform patients’ and clinicians’ expectations for post-TKR gain and may focus interventions not only on the knee impairments following TKR but also on the modifiable risks to optimal gains in physical activity following TKR. Risk factors such as BMI may be addressed pre- and post-operatively.

**Disclosure:** C. A. Oatis, None; W. Li, None; M. Rosal, None; D. Ayers, None; P. D. Franklin, Zimmer, Inc., 2.

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**Benefits of Aerobic Training in Patients with Ankylosing Spondylitis Are Not Coupled by Effects On Cytokines: A Randomized Controlled Trial.** Fabio Jennings, Hilda A. Oliveira, Marcelo C. Sousa, Vaneska G. Cruz, Fabio S. Lira and Jamil Natour. Universidade Federal de Sao Paulo, Sao Paulo, Brazil.

**Background/Purpose:** Ankylosing Spondylitis (AS) is a systemic inflammatory disease that causes deterioration of physical capacity. Although exercises remain essential in the treatment, the literature lacks research on the mechanisms by which exercises leads to clinical improvements in patients with AS. The purpose of this study was to evaluate the effect of aerobic exercise on peripheral blood monocytes. We therefore suggested that drugs inhibiting Janus kinases (JAKs), mediators of IFN signaling, might be used as a treatment in CANDLE. The objectives of this study were to assess the interferon regulated genes expression in additional CANDLE patients and to describe the effect of oral treatment with JAK inhibition on IFN-induced genes in CANDLE patients.

**Methods:** Two new and 4 previously evaluated CANDLE patients had whole blood microarray analysis performed and their IFN signaling was compared with 5 healthy controls. Total RNA was extracted from PAXgene tube blood samples and complementary DNA synthesis and target amplification were done. Affymetrix HU-133 Plus 2.0 gene chips were used for hybridization and data analysis was performed with GeneSpring 11.5 and Partek softwares. Patients and healthy control groups were compared using unpaired t test with Welch’s correction. IFN regulated gene expression profiles were assessed before and after treatment with the JAK inhibitor baricitinib in 2 CANDLE patient.

**Results:** Compared to controls, two new CANDLE patients presented with increased expression of IFN-induced genes, as in the previously evaluated 4 CANDLE patients. We have found that 202 genes were >2-fold upregulated compared to the 5 healthy controls, of those 89 are IFN regulated. The difference between the expression values was strikingly marked for the following genes: IRF7 (12.24 vs. 6.69, p=0.0001), IFNAR1 (12.86 vs. 9.60, p=0.0002), RSAD2 (12.75 vs. 9.19, p=0.70, p=0.0004), SPI1 (11.75 ± 0.12 vs. 10.89 ± 0.34, p=0.0002), USP18 (9.95 ± 0.33 vs. 6.25 ± 0.68, p=0.0001), DDX60 (11.71 ± 0.09 vs. 9.72 ± 0.33, p=0.0002), EIF2AK2 (12.24 ± 0.21 vs. 10.64 ± 0.35, p=0.0001) and GBP1 (12.02 ± 0.54 vs. 9.68 ± 0.43, p=0.0001). Upon treatment with the JAK inhibitor, 136 of the 202 up-regulated genes get down-regulated and 65 of those are IFN regulated genes. The others were genes that were associated with cytokine regulation including IL-22, IL-9, IL-15, IL-3, IL-2, GM-CSF, IL-17A. Of those 66 genes that did not change, 24 were IFN regulated genes. Interestingly, the expression of 37 protease-associated genes either increase or do not change with JAK inhibitor treatment.

**Conclusion:** We have found that CANDLE patients present a high expression of IFN-regulated genes and that this finding is present in all patients. This study also suggests that treatment with a JAK inhibitor is able to downregulate IFN induced genes as well as genes associated with the regulation of other inflammatory cytokines.

**Disclosure:** A. Almeida de Jesus, None; Y. Liu, None; G. A. Montelepre, None; A. L. Reinkerdt, None; D. Brown, None; A. Torrelo, None; A. V. Casano, None; L. Rosal, None; Y. Chen, None; Y. Nang, None; D. Stoten, None; D. Chou, None; F. S. Lira, None; J. Natour, None.

ACR Concurrent Abstract Session
Pediatric Rheumatology - Pathogenesis and Genetics
Wednesday, November 14, 2012, 11:00 AM–12:30 PM

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**Background/Purpose:** Chronic atypical neutrophilic dermatosis with lipodystrophy and elevated temperature (CANDLE) syndrome is a recently described early-onset autoinflammatory disease caused by autosomal recessive mutations in genes encoding the proteasome subunits, mainly the subunit β type 8 gene (PSMB8). It was previously shown that CANDLE patients present with increased expression of Interferon (IFN) regulated genes and unregulated stat1 phosphorylation on peripheral blood monocytes. We therefore suggested that drugs inhibiting Janus kinases (JAKs), mediators of IFN signaling, might be used as a treatment in CANDLE. The objectives of this study were to assess the interferon regulated genes expression in additional CANDLE patients and to describe the effect of oral treatment with JAK inhibition on IFN-induced genes in CANDLE patients.

**Methods:** Seventy patients with a diagnosis of AS, according to New York modified criteria and with stable drug treatment, were included. The patients were randomly allocated in two groups. The intervention group (IG) underwent 50 minutes of walking in the individual anaerobic threshold associated with stretching exercises 3 times a week for 12 weeks. The control group (CG) performed stretching exercises 3 times a week for 12 weeks. The outcome measurements were: functional capacity measured using BASFI (The Bath Ankylosing Spondylitis Functional Index), HAQ-S (Health Assessment Questionnaire for spondyloarthritis) and the 6-minute walking test (6MWT); mobility measured using BASMI (The Bath Ankylosing Spondylitis Metrology Index); disease activity by BASDAI (The Bath Ankylosing Spondylitis Disease Activity Index) and ASDAS (Ankylosing Spondylitis Disease Activity Score). Aerobic capacity was evaluated using an incremental cardiopulmonary exercise testing protocol by treadmill. TNF-α, IL-1β, IL-6 and IL-10 levels were measured using ELISA method. The evaluations were done by a blinded assessor immediately before the randomization, 6 weeks, and 12 weeks after the beginning of the exercise programs. It was used intention-to-treat analysis.

**Results:** Thirty-five patients were randomized to IG and 35 to CG. Two patients from CG and one patient from IG withdrew because of time availability. At baseline, the groups were homogeneous regarding all clinical and demographic characteristics. There were significant improvements in BASFI, HAQ-S, BASDAI and ASDAS scores in both groups (p < 0.05), but there was no difference between groups. There was no significant improvement of mobility and quality of life in both groups. The IG showed significant improvement in 6MWT compared to the control group (p < 0.001). There was significant increase in VO2 peak and anaerobic threshold (AT) in IG after treatment. In CG, VO2 peak and AT did not change after 12 weeks. There was significant difference between groups in absolute values of VO2 peak (p=0.049) and O2 pulse (p=0.039) at 12 weeks. TNF-α, IL-1β, IL-6 levels did not change over time in both groups. IL-10 levels decreased in both groups after 12 weeks compared to baseline (p<0.001), but there was no difference between groups.

**Conclusion:** Aerobic training and stretching exercises had beneficial effects on functional capacity and disease activity. Aerobic training, in addition to stretching exercises, increased walking distance and cardiopulmonary capacity in patients with AS. Aerobic exercise did not affect cytokine levels. More studies are need to understand the mechanisms by which exercises have a therapeutic role in AS.

**Disclosure:** F. Jennings, None; H. A. Oliveira, None; M. C. Sousa, None; V. G. Cruz, None; F. S. Lira, None; J. Natour, None.
Background/Purpose: The drug methotrexate (MTX) is the first line treatment for many children with Juvenile Idiopathic Arthritis (JIA). Only 45% of children treated with MTX for arthritis achieve 70% improvement as defined using internationally agreed JIA core set criteria, and a proportion of children will not respond at all to MTX treatment. Currently there are no reliable predictors to identify children likely to fail to respond. In order to identify these children early, and thus target their treatment during the apparent short window of opportunity in which disease can readily be brought into remission, the Childhood Arthritis Response to Medication Study (CHARMS) was established. Growing evidence suggests that multiple genes contribute to the genetic component of treatment response in arthritis. With this in mind, and using the CHARMS cohort, this study aimed to perform a genome wide association study (GWAS) to identify genomic loci associated with MTX response at P<0.05 across the entire genome.

Results: A total of 587,822 SNPs (all MAF >5%) across the entire genome were analyzed for each of the 6 core outcome variables as well as ACR-Pedi. 16 regions containing one or more SNPs with association with MTX response were identified in one or more of the 7 analyses carried out for further investigation including SNP imputation. The most highly associated SNPs were found near the genes CACNA2L1, PTTI and CFTR. These findings are currently being validated within a US cohort of JIA cases with MTX response data available in the form of active and limited joint counts.

Conclusion: These results suggest a role for novel pathways in MTX response. Further investigations within associated regions to dissect the genetic basis of MTX response will move us towards our ultimate goal of predicting response to MTX for children with JIA.

Acknowledgements: Childhood Arthritis Prospective Study (CAPS) and Sparks-Childhood Arthritis Response to Medication Study (Sparks-CHARMS) groups. The study was funded by SPARKS UK and Arthritis Research UK.

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Rapid and Effective Response to Immunosuppression in Treating Macrophage Activation Syndrome Associated with a Heterozygous Dominant Negative Mutation in RAB27a Leading to Decreased Cytolytic Activity, Randy Q. Cron, Mingce Zhang, Christina J. Bemrich-Stolz and Timothy Beukelman. Univ of Alabama-Birmingham, Birmingham, AL

Background/Purpose: Hemophagocytic lymphohistiocytosis (HLH) is an often fatal disorder of infancy resulting from homozygous mutations in proteins involved in cytokesis (e.g. MUNC13-4, RAB27a, Perforin 1, Syntaxin1, STXBP2). HLH treatment is an etoposide based aggressive chemotherapy, and associated mortality remains problematic. Secondary forms of HLH, or macrophage activation syndrome (MAS), frequently result beyond infancy from rheumatologic, infectious, and oncologic conditions. MAS is typically treated with immunosuppression, including high dose Corticosteroids, Cyclosporine, and, recently, the IL-1 receptor antagonist, Anakinra (CCA). Of late, mutations in HLH associated cytolytic pathway genes have been identified in children with MAS. The importance of these mutations in the pathophysiology of MAS, and the appropriate treatment for MAS in these settings remains unclear.

Methods: Chart review was performed for a teen with MAS successfully treated with CCA. Cytolytic activity of a natural killer (NK) cell line was assessed following over-expression of a RAB27a mutant protein identified in this girl. Lentiviral expression vectors were generated with the RAB27a mutation, and a wild-type RAB27a sequence control, sequenced for authenticity, and introduced into the NK-92 human NK cell line by transduction. Transduced NK cells were analyzed for transgene expression by co-expression of green fluorescence protein, and tested for their ability to lyse calcine violet loaded K562 NK target cells at varying effector to target cell ratios.

Results: An 18-year-old girl presented with 2 weeks of fever (>102°F) and abdominal pain. Exam revealed a febrile, semi-coherent female with hepatosplenomegaly. Extensive infectious, oncologic, and rheumatic diseases work-ups were negative. Laboratory findings revealed pancytopenia; severe hepatitis; coagulopathy; elevated ferritin, triglycerides, soluble CD25, and soluble CD163; increased CD163 staining of bone marrow, markedly decreased NK cell function; ESR of 10 mm/hr. Sequencing of HLH genes revealed a single copy RAB27a mutation (259 G>A, A87P) known to be associated with type II Griscelli syndrome/HLH. She met 8 of 8 HLH criteria and was treated for MAS with CCA. She markedly and rapidly clinically improved. Her ferritin fell from 8,446 to 201 ng/ml (<115), and her AST fell from 4,639 U/L to 176 U/L, within 4 days of CCA. Lentiviral transduction of wild-type RAB27a into the NK-92 cell line had no effect on cytolyis of K562 target cells in vitro, whereas over-expression of the 259 G>A patient mutation decreased cytolytic activity by ~50%.

Conclusion: The distinction between HLH and MAS is becoming blurred as mutations in HLH genes are identified in patients with MAS. Perhaps later age of onset reflects heterozygous versus homozygous defects in cytolytic pathway proteins. Our data suggests single gene copy mutations can partially disrupt cytolytic activity through a dominant negative effect. Important treatment differences exist between protocols for HLH and MAS, and our patient’s response to CCA immunosuppression suggests HLH associated genetic mutations presenting later in life may be responsive to less aggressive/ toxic (non-chemotherapeutic) immunosuppression.

Disclosure: R. Q. Cron, Genentech and Biogen IDEC Inc., 5, Novartis Pharmaceutical Corporation, 5; M. Zhang, None; C. J. Bemrich-Stolz, None; T. Beukelman, Novartis Pharmaceutical Corporation, 5.

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Elevated Serum Follistatin-Like Protein 1 Suggests an Interleukin-1 Independent Pathway for Inflammation in Patients with Cryopyrin Associated Periodic Syndromes. Mark Gorelik1, Daniel Bushnell2, Raphaela T. Goldbach-Mansky3, Hal M. Hoffman4 and Raphael Hirsch5. 1Univ of Pittsburgh Med Ctr Children’s Hospital, Pittsburgh, PA, 2Childrens Hospital Pittsburgh, Pittsburgh, PA, 3Translational Autoinflammatory Diseases Section NIAMS NIH, Bethesda, MD, 4University of California at San Diego, La Jolla, CA, 5Childrens Hosp Pittsburgh, Pittsburgh, PA

Background/Purpose: Cryopyrin associated periodic syndromes (CAPS) are a group of IL-1β mediated autoinflammatory diseases characterized by fever, urticaria and conjunctivitis, and in severe cases, CNS abnormalities, hearing loss, and bone overgrowth. Patients treated with IL-1 targeted therapy have resolution of a majority of clinical symptoms, although bone lesions are known to progress despite treatment. Follistatin-like protein 1 (FSTL-1) is a pro-inflammatory protein secreted by mesenchymal cells, including osteoblasts. This study was performed to determine low serum FSTL-1 levels correlate with clinical and laboratory markers in the most severe form of the CAPS, Neonatal Onset Multisystem Inflammatory Disease ( NOMID).
Methods: FSTL-1 serum levels were measured by ELISA in 10 patients at pre-treatment and post-treatment time points and compared to values from a group of 53 normal controls. FSTL-1 levels were correlated with ESR, CRP, as well as complete blood counts, and clinical characteristics, including presence of bony overgrowth at baseline. To gain insights into the expression of FSTL-1 relative to IL-1 blockade, FSTL-1 levels were measured in CAPS knock-in mice expressing an NLRP3 mutation, as well as in mice with the NLRP3 mutation on an IL-1 receptor knockout background.

Results: FSTL-1 serum levels were elevated in NOMID patients vs. normal controls (182 ng/ml vs. 139 ng/ml; p = 0.037) and remained elevated after treatment with anakinra (160 ng/ml), even though other markers of inflammation, including ESR, high sensitivity CRP, WBC, and platelet counts all declined to normal levels. The highest levels of FSTL-1 were observed in patients with bony overgrowth at baseline as compared to patients without bony overgrowth (204 ng/ml vs. 149 ng/ml; p = 0.01), whereas FSTL-1 levels did not correlate with other clinical abnormalities. A trend of correlation was seen between FSTL-1 and high sensitivity CRP (Pearson r = 0.38, p = 0.08). Finally, FSTL-1 serum levels were elevated in mice expressing NLRP3 mutation compared to wildtype controls (302 ng/ml vs. 201 ng/ml, p <0.001) and were similarly elevated in mice expressing NLRP3 mutation on an IL1 receptor knockout background (440 ng/ml; p = 0.07 vs. controls).

Conclusion: Serum FSTL-1 is elevated in patients with NOMID and FSTL-1 levels remain elevated despite anakinra treatment. Similarly, FSTL-1 levels are elevated in a mouse model of CAPS and remain elevated despite the absence of IL-1 receptor. Serum FSTL-1 levels are most elevated in NOMID patients with greater baseline bony overgrowth and remain elevated despite treatment with anakinra, suggesting that FSTL-1 may play a role or be a marker of bone abnormalities in this disorder.

Disclosure: M. Gorelik, None; D. Bushnell, None; R. T. Goldbach-Mansky, None; H. M. Hoffman, Regeneron, Novartis, and Sobi Biovitrum, S; R. Hirsch, University of Pittsburgh, 9.

2657

Genome-Wide Association Meta-Analysis of Eight Independent Systemic Juvenile Idiopathic Arthritis Collections Reveals Regional Association Spanning the Major Histocompatibility Complex Class II and III Gene Cluster.

Methods: We genotyped 823 children fulfilling ILAR criteria for sJIA and 442 healthy children using the Omni1M Quad SNP array. We obtained five in silico collections of control genotypes that were geographically-matched to five of the case collections, providing an additional 4037 controls for our analysis. After performing quality control operations to exclude low quality samples and markers, we combined case and control genotype data for each of the eight strata, retaining only markers that were present in both the case and control datasets. We used principal components analysis to identify and remove genetic outliers from each population. For each stratum, we created phased haplotypes with the ShapeIT software, we performed SNP imputation with IMPUTE2 software and the HapMap3 reference haplotypes, and we undertook association testing with SNPTST software. Finally, genomewide association meta-analysis of the eight strata was performed using the GWAMA software.

Results: Genomewide association meta-analysis of 1,447,416 markers, applying the additive model to eight case-control strata, identified 49 regions that contained one or more marker with p < 5E-5. Fourteen of these genes reside within a 3 Mb segment of the major histocompatibility complex (MHC), spanning the MHC class II and III gene clusters. This sJIA-associated region also contains the only marker to exceed the genomewide significance threshold (rs615072, p = 2.6E-8; OR = 0.7, 95CI 0.62, 0.79), which lies between HLA-DRB1 and HLA-DQA1.

Conclusion: The markers most strongly associated with sJIA were found within the MHC locus, nearest to the HLA-DRB1 and HLA-DQA1 genes. However, these variants reside in a larger, 3 Mb interval that contains a range of genes involved in both innate and adaptive immunity. Interestingly, we have observed an almost complete absence of overlap between our 49 candidate loci and the known autoimmune and autoinflammatory loci. If this observation is upheld by additional investigations, then we may expect this study to identify novel pathways and mechanisms involved in sJIA, which may also represent novel therapeutic targets.

Disclosure: M. J. Ombrello, None; E. Remmers, None; A. A. Grom, Novartis Pharmaceutical Corporation, 5, Roche Pharmaceuticals, 5, NovImmune, 5, W. Thom-son, None; A. Martini, None; M. Gattoorna, None; S. Ozen, None; S. Fakhalad, None; J. F. Bohnsack, None; A. Zett, None; N. T. Ilowite, None; E. D. Mellins, None; R. A. G. Russo, None; C. Len, None; S. K. Oliveira, None; R. S. Yeung, None; L. R. Wedderburn, None; J. A. Lopez, None; C. Satoriuv, None; I. Tachmazidou, None; C. L. Dangelfeld, None; E. Zeggini, None; S. D. Thompson, None; P. Woo, None; D. L. Kastner, None.

2658

Correlation Between Mefv Genotype and Interleukin (IL)1β secretion and Role of the nlr Family Pyrin Domain Containing 3 (Nlrp3) Inflammasome in Patients with Familial Mediterranean Fever (FMF).

Methods: Patients with Familial Mediterranean Fever (FMF) are an auto-inflammatory disease due to mutations of MEFV gene which encodes for 8

Background/Purpose: Systemic juvenile idiopathic arthritis (sJIA) is a rare autoimmune disease that is inherited as a complex genetic trait. While the pathophysiology of sJIA is poorly understood, there is evidence of both innate and adaptive immune involvement. We have undertaken a genomewide association study (GWAS) of sJIA to elucidate pathways and molecular mechanisms that underlie this disease. The power of a GWAS is directly wide association study (GWAS) of sJIA to elucidate pathways and molecular mechanisms that underlie this disease. The power of a GWAS is directly

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Pyrin. FMF does not behave as a pure recessive disorder but clinical manifestations may parallel the actual amount of mutant pyrin. In agreement with this concept, correlation between genotype and FMF symptoms has been described. Growing evidence suggests that aberrant interleukin (IL) 1β signaling occurs in FMF. However, whether genetic variants of the MEFV gene result in differences in IL1β levels has never been explored. Moreover, the role of NLR family pyrin domain containing 3 (NLRP3) inflammasome in this contest is still largely unclear. Thus, we evaluated if IL1β pathway activation (1) is enhanced in FMF; (2) correlates with the type of MEFV mutation; and (3) is mediated by NLRP3.

Methods: Twenty FMF patients (FMFp) were evaluated and compared with 14 MEFV healthy carriers (HC) and 30 healthy donors (HD). Among patients, 12 were genetically confirmed (i.e. carrying 2 mutations) while 8 had clinical manifestations even if carrying 1 single mutation in heterozygosity. Ten out of 20 FMFp were under colchicine treatment and all of them were in controlled disease activity. Monocytes were freshly isolated and studied at baseline and after LPS in vitro activation. Monocyte nucleofection with NLRP3 siRNA or appropriate Mock controls was performed in 23 subjects (i.e. 7 FMFp, 9 HC, 3 HD) using Nucleofector® Technology (Amaxa). IL1β and IL1 receptor antagonist (ILRa) pattern of secretion (3–6–18h) was analyzed by ELISA assay. Differences in oxidative state were evaluated by assessing levels of reactive oxygen species (ROS) and the cysteine release, as markers of pro-and antioxidant responses, respectively.

Results: Monocytes purified from FMFp displayed enhanced IL1β release. Interestingly, IL1β secretion correlated with number and penetrance of MEFV mutations, with higher levels in the presence of 2 high penetrance mutations in FMFp, and 1 high penetrance mutation in HC, respectively. Silencing of NLRP3 activity in monocytes freshly isolated from patients and controls consistently inhibited IL1β secretion. Contrary to what previously described in diseases caused by mutations that primarily affect the NLRP3 (i.e. Cryopyrinopaties) IL1β release in pyrin mutated monocytes was featured by a more physiological kinetics. Consistent with this finding, FMFp monocytes basally produced more ROS but had a conserved, although impaired, cysteine release. Finally, IL1Ra levels were comparable to HD.

NLRP3 mutated monocytes display enhanced IL1β secretion, which correlates with the number of high-penetrance mutations. In contrast to what found in the animal model, IL1β secretion in FMFp monocytes is NLRP3-dependent. Interestingly, contrary to what previously reported in NLRP3 mutated cells, monocytes carrying MEFV mutation (1) have conserved antioxidant machinery capable of restraining the oxidative stress, (2) do not show stress-related defect in protein synthesis, (including IL1Ra production) and (3) display a more physiological pattern of secretion of IL1β.

Disclosure: A. Omenetti, None; S. Carta, None; D. Laura, None; A. Martini, None; A. Rubartelli, None; M. Gattorno, None.

Background/Purpose: Interstitial lung disease (ILD) is an outcome with high morbidity and mortality in rheumatoid arthritis (RA). Citrullinated proteins are observed in these lung tissues; however, the association of specific anti-citrullinated peptide antibodies (ACPA) with ILD in RA is unknown.

Methods: RA patients underwent multi-detector computed tomography (MDCT) of the chest with interpretation by a pulmonary radiologist for ILD features [ground glass opacification (GGO), reticulation (R), honeycombing (HC), and traction bronchiectasis (TB)]. A semi-quantitative ILD Score (ILDS; range 0–32) for ILD features was calculated. Concurrent serum samples were assessed for anti-CCP (CCP2) and levels of a panel of antibodies against 4 non-citrullinated proteins [fibrinogen A, HSP60, apolipoprotein (Apo) A1, and Apo E] and 17 citrullinated full-length proteins or peptides within these proteins (see table for list) using a custom Bio-Plex bead array. Individual candidate citrullinated antigens were conjugated to spectrally-distinct fluorescent beads. Pooled side-conjugated beads were incubated with diluted patient sera, autoantibody binding detected with a phycoerythrin-conjugated secondary antibody, and levels of autoantibody binding quantitated on a Luminex 200 System. High level ACPA was defined at ≥ the group 75th percentile. Pulmonary function testing (PFT) was performed in 156 patients a mean of 21±3 months later.

Results: Among 177 RA patients [60% female, 86% Caucasian, mean age 59±9 years, 11% current smokers], any ILD features (i.e. ILDS=0) was observed in 57 (32%). Among those with any ILD, the median ILD score was 3 (range 1–10). A predominant pattern of GGO was observed in 22 (39%) and R/HC/TB in 36 (61%). PFT restriction or impaired diffusion was observed in 36 (23%).

Levels of CCP2 and all specific ACPAs were 46–273% higher among RA patients with vs. those without ILD (all p-values<0.05), and higher levels correlated with higher ILDS. In contrast, levels of non-citrullinated protein antibodies were not higher in those with ILD. The median number of high level ACPA was significantly greater for those with an ILDS≥3 vs. those with an ILDS=0 (6 vs. 1; p=0.005, see Table). Each ACPA was associated, on average, with a 0.10 unit increase in ILDS (p=0.001), an association that remained significant after adjusting for features associated with ILD [age, gender, current and former smoking, DAS28, current prednisone use]. More high level ACPA were observed in those with PFT restriction or impaired diffusion compared to those without these PFT findings (Table).

Table. Number of High Level ACPA (≥75th Percentile) According to Computed Tomographic Features of RA-Associated Interstitial Lung Disease and Restriction and/or Impaired Diffusion on Pulmonary Function Testing

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of High Level ACPA**</th>
<th>p-value</th>
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<tbody>
<tr>
<td>ILDS = 0 (n = 120)</td>
<td>1 (0–5)</td>
<td>referent</td>
</tr>
<tr>
<td>ILDS 1 or 2 (n = 25)</td>
<td>3 (1–11)</td>
<td>0.073</td>
</tr>
<tr>
<td>ILDS ≥ 3 (n = 32)</td>
<td>6 (1–11)</td>
<td>0.005</td>
</tr>
<tr>
<td>ILDS = 0 (n = 120)</td>
<td>1 (0–5)</td>
<td>referent</td>
</tr>
<tr>
<td>GGO (n = 32)</td>
<td>3 (1–7)</td>
<td>0.23</td>
</tr>
<tr>
<td>R/HC/TB (n = 35)</td>
<td>3 (0–12)</td>
<td>0.041</td>
</tr>
<tr>
<td>No Restriction or Impaired DLOC (n = 120)</td>
<td>1 (0–5)</td>
<td>referent</td>
</tr>
<tr>
<td>Restriction or Impaired DLOC (n = 36)</td>
<td>5 (1–11)</td>
<td>0.009</td>
</tr>
</tbody>
</table>

* ACPA levels measured included citrullinated versions of fibrinogen A and 4 specific fibrinogen A peptides, Apo A1, Apo E, and 1 specific Apo E peptide, vimentin, vimentin and 1 specific vimentin peptide, histones A2A and B, HSP60, Bgpccc, and claudin. Values depicted are median (interquartile range) with comparison using the Kruskal Wallis test.

ACPA = anti-citrullinated protein antibody; ILD = interstitial lung disease; ILDS = expert read interstitial lung disease score; GGO = ground glass opacification; R/HC/TB = reticulation/honeycombing/traction bronchiectasis; DLOC = diffusing capacity for carbon monoxide

Conclusion: Our findings of a broader ACPA repertoire in RA ILD suggest a role for ACPA in the pathogenesis of ILD and/or implicate inflamed lung parenchyma as a source of ACPA generation.

Disclosure: J. T. Giles, None; S. Danoff, None; J. Sokolove, None; R. Winchester, None; D. A. Pappas, None; C. Cramb, None; G. Connors, None; S. S. Siegelman, None; W. H. Robinson, None; J. M. Bathon, None.

Results: The median (IQR) age of the 390 patients was 60 (52, 67) years and the median disease duration was 17 (10, 27) years. 84% were female and 44% received biologic DMARD treatment. 16% were negative for both RF and anti-CCP, 16% were positive for either RF or anti-CCP, or positive for both RF and anti-CCP. 44% had subcutaneous nodules, seropositivity (classified as either negative for both RF and anti-CCP, positive for either RF or anti-CCP, or positive for both RF and anti-CCP), BMI and smoking. We then built a multivariate regression model, forcing DMARD treatment and disease duration into the model as covariates. Individual radiographic data stratified according to serological status were displayed in a cumulative probability plot.

Conclusion: Progression of joint damage is still common in RA patients with at least five years disease duration, even in a setting where 44% of the patients receive biologic DMARDs. Seropositivity is strongly and independently associated with joint damage.

Disclosure: S. Lillegraven, None; N. A. Shadick, Amgen, 2; Abbott Immunology Pharmaceuticals, 2; Genentech and Biogen IDEC, Inc., 2; Crescendo Bioscience, 2; Merck, Roche, 5; Pfizer Inc., 8; Roche Pharmaceuticals, 8; UC, 8; BMS, 5; Abbott Immunology Pharmaceuticals, 5; Merck Pharmaceuticals, 5; Nicox, S.A., 5; Pfizer Inc., 5; Roche Pharmaceuticals, 5; UCB, 2; Bristol-Myers Squibb, 2; Merck Pharmaceuticals, 2; Pfizer Inc., 2; Roche Pharmaceuticals, 2; UCB, 2; M. Weinblatt, MedImmune, 2; Crescendo Bioscience, 2; MedImmune, 5; Crescendo Bioscience, 5; D. H. Solomon, Amgen, Lilly, 2; Corrona, 5; Pfizer Inc., 9; UpToDate, 7.


Background/Purpose: During the last decade, rheumatoid arthritis (RA) research has mainly focused on early disease, as it has become apparent that early and aggressive treatment can change the long-term outcome of RA. However, most patients in clinical practice have established disease. Our objective was to describe the proportion of patients with established RA (≥ 5 years disease duration) who experience continued joint damage, and to identify its predictors.

Methods: We analyzed data from BRASS, an observational RA cohort. The data collection includes joint examinations, serological markers and patient reported outcome measures. Hand and wrist radiographs are acquired at baseline and 2 years and scored by van der Heijde-modified Sharp score (vDHSS). Patients with a disease duration ≥ 5 years and 2-year radiographic data (n = 390) were selected, and progression of joint damage was defined as an annual change of ≥ 1 unit in total vDHSS. In univariate logistic regression models, we assessed the association between progressive joint damage and predictors such as age, gender, disease duration, treatment, DAS-28 category, subcutaneous nodules, seropositivity (classified as either negative for both RF and anti-CCP, positive for either RF or anti-CCP, or positive for both RF and anti-CCP), BMI and smoking. We then built a multivariate regression model, forcing DMARD treatment and disease duration into the model as covariates. Individual radiographic data stratified according to serological status were displayed in a cumulative probability plot.

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**Conclusion:** The percentage of patients achieving remission or LDA was lower for DAS28-ESR than DAS28-CRP when utilizing the same cut-off points for both measures. DAS28-CRP underestimates disease activity when utilizing cut-off points validated for DAS28-ESR and therefore, should be evaluated using different remission and LDA values. Studies are needed to validate proposed DAS28-CRP disease activity cut-offs.

**References**

**Disclosure:** R. M. Fleischmann, Pfizer Inc, 2; Pfizer Inc, 8; D. van der Heijde, Abbott Laboratories, Amgen, Aventis, Bristol Myers Squibb, Centocor, Pfizer, Roche, Schering Plough, UCB, Wyeth, S. A. Koenig, Pfizer Inc, 3; Pfizer Inc, I; R. Pedersen, Pfizer Inc, 3; Pfizer Inc, 1; A. Szumski, None; L. Marshall, Pfizer Inc, 3; Pfizer Inc, 1; E. Bananis, Pfizer Inc, 1; Pfizer Inc, 5.

### Table 1.

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<td>PDIP2</td>
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<td>MTP5</td>
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For all instances, mean SH score = -0.4 (SD1.5) and index = 2.2 (SD1.7). Mean PD score = 1.4 (SD1.8) and index = 1.1 (SD1.2)

**Conclusion:** Assessment of global disease activity using a limited MSUS joint set may allow further tailoring of DMARD therapy by: 1. supporting DMARD escalation in patients with active disease despite a reassuring DAS28 and 2. preventing DMARD escalation in patients with moderate DAS28 levels but minimal evidence of active disease. MSUS findings in the radiocarpal and index MCP joints were most likely to influence DMARD escalation decisions. Whether this approach will significantly improve outcomes remains to be proven.

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</table>

For all instances, mean SH score = -0.4 (SD1.5) and index = 2.2 (SD1.7). Mean PD score = 1.4 (SD1.8) and index = 1.1 (SD1.2)

**Background/ Purpose:** Anti-TNF therapy has become a standard therapeutic strategy for treatment of patients with rheumatoid arthritis (RA). A validated multi-biomarker disease activity algorithm (MBDA) blood test was used to provide objective biological information about RA. We studied the relationship between the MBDA score and disease activity measures including DAS28, SDAI, and CDAI in patients treated with anti-TNF therapy.

**Methods:** 147 patients who started anti-TNF therapy (49 adalimumab (ADA), 49 etanercept (ETN), 49 infliximab (IFX)) were enrolled. Twelve biomarkers were measured and combined in a pre-specified algorithm to generate a MBDA score between 1 and 100 at 0 (baseline) and 52 weeks after induction of anti-TNF therapy. Associations between MBDA score and DAS28/SDAI/CDAI were evaluated by Spearman correlation and by area under the receiver operating characteristic curve (AUROC). The MBDA score changes in patients with EULAR responses were compared by t-test. Differences in the MBDA/DAS28 relationship between TNF inhibitors were evaluated by fitting linear models for DAS28 as a function of MBDA score, therapy and an MBDA/therapy interaction term.

**Results:** At baseline, patients’ median age was 60 (interquartile range (IQR) 50–68), DAS28 5.7 (5.0–6.5), MBDA- 64 (IQR 49–76) and disease duration 60 months (18–168). Methotrexate was used in 86% of patients, at a median dose of 8.0 (8.0–10) mg/week. There was a mean decrease + SD in DAS28 of 2.6 ± 1.4 and in MBDA of 25 ± 20 respectively. MBDA scores correlated with DAS28, SDAI and CDAI (p = 0.64, 0.57, 0.50 respectively, all p < 0.001) and distinguished low and moderate/high disease activity for all three clinical indices (AUROC = 0.80, 0.76, 0.76 respectively, all p<0.001). No differences were found in the relationship between the MBDA score and DAS28 in patients treated with either ADA, ETN and IFX (p>0.05 for all comparisons). The mean decrease in the MBDA score was greater for patients with moderate EULAR response versus non response (−22 vs. 1, p<0.002) and greater for patients in good response versus moderate response (−30 vs. −22, p=0.009).
A Link Between Cells and Bone Erosion in RA: RANKL Production by Memory B Cells. Nida Meeedu, Teresa Owen, Hengwei Zhang, Christopher A. Cistrone, Lianping Xing and Jennifer H. Anolik. University of Rochester, Rochester, NY

**Background/Purpose:** Rheumatoid arthritis (RA) is a systemic inflammatory disorder that often leads to joint damage. Several lines of evidence suggests the role of B cells in joint destruction including the efficacy of B cell depletion therapy as a treatment and the presence of B cell aggregates in RA synovium and subchondral bone. The aim of this study was to investigate the mechanisms by which B cells contribute to joint destruction in RA.

**Methods:** Peripheral blood mononuclear cells (PBMCs) were isolated from peripheral blood or synovial fluid by Ficoll-Hypaque density gradient centrifugation from healthy controls (HC) or RA patients. Purified B cells were obtained by CD19 magnetic isolation. Cells were stimulated with anti-CD40 (2.5 μg/ml) and PMA (20 ng/ml) for 48 hours. RANKL expression was determined by cell surface staining and multi-color flow cytometry. Several markers to identify B cells and for T cell exclusion were employed including CD19, CD27, IgD, CD95, CD21 and CD3. For osteoclast formation assay, purified B cells were cultured for 7 days with anti-CD40 and PMA in the first 48 hours. Normal bone marrow derived osteoclast precursors (OCps) were co-cultured with stimulated B cells in the presence of M-CSF and 10 ng RANKL for 4–7 days. Cells were stained with TRAP and multi-nucleated TRAP+ cells were enumerated.

**Results:** Upon stimulation of PBMCs with anti-CD40 and PMA, the percentage of RANKL+ B cells was significantly higher than cells cultured with medium alone (6.85±2.109 vs. 0.68±0.14, n=9, p<0.001). The same result was observed with purified B cells (data not shown). CD27+ memory B cells (unswitched CD27+IgD+ and switched CD27+IgD−) had a greater propensity to produce RANKL in comparison to CD27− B cells (9.41±0.62 vs. 4.93±0.69, p=0.0084). Flow sorting B cells into naïve, transitional, switched and unswitched memory cells further verified the propensity of memory B cells to produce RANKL. Notably, the majority of RANKL-expressing B cells appeared to express the activation marker CD95 (79.04±6.47% CD95+ vs. 20.6±4.7% CD95−, p=0.001). We also observed that PB from RA patients contained elevated B cells of an activated memory phenotype (CD95+ on switched memory in RA [n=13] 50.6±19.5 vs. HC [n=14] 29.6±9.5, p=0.005). In accord with this activated memory expansion, the frequency of RANKL+ PB B cells after stimulation was higher in RA when compared to HC (18.4±5.1 vs. 6.9±0.8, p=0.09). Remarkably, synovial fluid B cells produced even higher RANKL (23.2±7.6%, n=4) and also spontaneously produced RANKL. Finally, B cells supported osteoclast differentiation, and RA B cells are more efficient than HC (n=4, p<0.05).

**Conclusion:** Our data support the hypothesis that B cells play a key role in RA disease pathology and joint destruction in part by RANKL production. Activated memory B cells are expanded in RA and have a propensity to produce RANKL, an important factor in bone resorption.

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Activated Memory B Cell Compartment in Rheumatoid Arthritis: Impact of B Cell Depletion Therapy. Diana G. Adlowitz, None; Jossler, None; J. Biear, None; C. A. Cistrone, None; T. Owen, None; W. Wang, None; A. Palanichamy, None; I. Sanz, None; J. H. Anolik, Medimmune, 5, UCB, 5.

**Background/Purpose:** The inducible glycolytic rate-limiting enzyme PFKFB3 is repressed in RA T cells, resulting in deficient glucose utilization. The energy deprivation is aggravated by insufficient access to cell-internal energy resources and renders RA T cells apoptosis sensitive. Resetting the immune system in RA will require the repair of these metabolic abnormalities as they strain immune homeostasis and sustain chronic immune stress.

**Methods:** Peripheral blood mononuclear cells (PBMCs) were isolated from peripheral blood of RA patients and HC. Cells were stimulated with a cocktail of IL2, IL4, IL6 and IL7 for 72 hours, and RANKL expression was determined by intracellular staining and flow cytometry.

**Results:** Upon stimulation with the above cocktail, the percentage of RANKL+ B cells was significantly higher in RA when compared to HC (18.4±0.19 vs. 5.1±0.07, p=0.001). The same result was observed when stimulated with trinitrophenyl tetramethylurea (0.5 mg/ml and PMA (20 ng/ml) for 48 hours. RANKL expression was detected by cell surface staining and multi-color flow cytometry. Several markers to identify B cells and for T cell exclusion were employed including CD19, CD27, IgD, CD95, CD21, and CD3. For osteoclast formation assay, purified B cells were cultured for 7 days with anti-CD40 and PMA in the first 48 hours. Normal bone marrow derived osteoclast precursors (OCps) were co-cultured with stimulated B cells in the presence of M-CSF and 10 ng RANKL for 4–7 days. Cells were stained with TRAP and multi-nucleated TRAP+ cells were enumerated.

**Conclusion:** Our results support the hypothesis that the clinical and immunological outcome of B cell depletion therapy depends on the relative balance of protective and pathogenic B cell subsets established after B cell depletion and upon B cell repopulation.

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**Background/Purpose:** Diagnosis of the preclinical phase of rheumatoid arthritis (pre-RA) allows timely start of treatment with the potential to prevent disease progression. It is known that antibodies against citrullinated proteins (ACPA) and rheumatoid factor (RF) have diagnostic value to identify pre-RA. However, since only 20–40% of ACPA+/RF+ arthritis patients develop arthritis within 5 years, better prognostic markers are needed. Recently we demonstrated involvement of interferon (IFN) response and B-cell gene signatures in pre-RA. The objective of this study is to demonstrate the value of these signatures in the diagnosis of pre-RA.

**Methods:** Peripheral blood (Paxgene) was collected from 115 ACPA+/RF+ arthritis patients from Jan van Bremen Research Institute | Reade, Amsterdam, Netherlands.

**Background/Purpose:** Interferon and B-cell gene signatures are used to distinguish between ACPA-positive Rheumatoid Arthritis (RA) and rheumatoid arthritis patients. A new method allows for the determination of baseline and longitudinal expression of these signatures.

**Conclusion:** The results suggest that the combination of interferon and B-cell signatures is a promising tool for the diagnosis of pre-RA.

Disclosure: None; J. Biear, None; C. A. Cistrone, None; L. Xing, None; J. H. Anolik, None.
Results: Cox regression analysis revealed that an IFNαpuph score was associated with arthritis development independent of ACPA status (RR 2.19, CI 1.007–4.739, P = 0.0048). Inclusion of the B-cell score demonstrated that an IFNαlow score combined with a B-cellpuph score was associated with arthritis free survival (RR 0.375). To demonstrate the clinical utility of the IFN and B-cell signatures to separate pre-RA patients from arthritis free survival individuals we constructed an ROC-curve. The area under the curve (AUC) reached 0.802 (P = 0.000), which is considered “good”. Based on these data a cut-off could be chosen for the diagnosis of pre-RA with a specificity of 85% and a sensitivity of 52%.

Conclusion: These findings demonstrate the value of IFN and B cell gene signatures as biomarkers for the diagnosis of pre-RA.

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TLR7 Ligation Contributes to Monocyte Migration in Rheumatoid Arthritis. Nathan D. Chamberlain1, Seung-jae Kim1, Michael Volin2, William Sweyler1, Suncica Volkov2 and Shiva Shahrara1. 1University of Illinois at Chicago, Chicago, IL, 2Chicago College of Osteopathic Medicine Midwestern University, Downers Grove, IL, 3University of Illinois at Chicago, Chicago, IL.

Background/Purpose: The aim of the study was to characterize the expression of TLR7 ligation in rheumatoid arthritis (RA) peripheral blood (PB) cells and to examine the pathogenic role of TLR7 ligation in RA.

Methods: Expression of TLR7 was determined in RA and normal (NL) PB monocytes and in vitro differentiated macrophages by real-time RT-PCR and/or flow cytometry. Next the endogenous TLR7 ligand was identified in RA synovial fluid and its ability to induce monocyte migration was determined by in vitro chemotaxis.

Results: Since we have previously shown that expression of TLR7 was elevated in RA synovial lining and sublining macrophages, we asked whether expression of TLR7 was increased in RA PB and synovial fluid macrophages compared to NL PB monocytes and differentiated macrophages. We show that expression of TLR7 was elevated 18 and 24 fold in RA synovial fluid macrophages compared to RA and NL PB differentiated macrophages respectively by real-time RT-PCR. Levels of TLR7 were 6 and 3 fold higher in RA monocytes compared to RA differentiated macrophages and NL monocytes. Interestingly, mRNA and endosomal expression of TLR7 are reduced when RA PB monocytes differentiate to macrophages. Ligation of TLR7 by a synthetic agonist in RA blood monocytes is responsible for production of high levels of TNF-α (3 ng/ml) and as such we demonstrate that levels of TLR7 and TNF-α in 35 RA monocytes strongly correlate with each other (R = 0.44, p = 1.37×10⁻⁵) and disease activity score (TLR7 and DAS28 correlation; R = 0.67, p = 1.57×10⁻⁸) suggesting a pathogenic role for TLR7 ligation in RA disease. In light of elevated levels of TLR7 in RA synovial fluid macrophages, we looked for TLR7 endogenous ligands in RA synovial fluid. We discovered that single strand (ss)RNA extracted from RA synovial fluid is a potential TLR7 endogenous ligand, since blockade of TLR7 ligation by TLR7 antagonist in RA monocytes greatly downregulates synovial fluid ssRNA mediated TNF-α transcription. To determine whether TLR7 ligation affects cell trafficking in the RA joint, monocyte chemotaxis was examined in response to a synthetic agonist to TLR7. We show that TLR7 ligation was chemotactic for monocytes beginning at 0.1 ng/ml of TLR7 agonist. Next, studies were performed to determine if the TLR7 ligation affects RA synovial fluid mediated monocyte extravasation. We document that blockade of TLR7 ligation or degradation of synovial fluid ssRNA is equally effective in reducing synovial fluid induced monocyte trafficking and that the combined therapy does not have an enhanced effect suggesting that ligation of joint ssRNA to TLR7 modulates monocyte extravasation through an overlapping pathway and it further points out that RA synovial fluid ssRNA is a potential TLR7 ligand.

Conclusion: We identify, for the first time, TLR7 endogenous ligand in RA joint and we also document a novel role for TLR7 ligation in RA monocyte migration.

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Genome-Wide Association Study On the Severity of Joint Destruction in Autoantibody Positive Rheumatoid Arthritis Identifies a Role for Sperm Associated Antigen 16. Rachel Knevel1, Kerstin Klein2, Klaartje Somers3, Caroline Ospelt4, Jeanine J. Houwing-Duistermaat4, Jos van Nies1, Diederik P.C. de Rooy1, Laura de Bock5, Joris Schonkern1, Gerrie Stoeken-Rijjsbergen1, Jenni Kiridly6, Luis Rodriguez-Rodriguez6, Quinta Helmer7, Piet Siniissen7, Tom W. J. Huizinga1, René E.M. Toes8, Steffen Gay9, Peter K. Gregersen9, Veerle Somers9 and Annette H.M. van der Helm-van Mil1.

Leiden University Medical Center, Leiden, Netherlands, 2Center of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHP), Zurich, Switzerland, 3Hasselt University, Biomedical Research Institute, Belgium, 4Center of Experimental Rheumatology, University Hospital Zurich and Zurich Center of Integrative Human Physiology (ZIHP), Switzerland, Zurich, Switzerland, 5Department of Medical Statistics and Bioinformatics, Leiden, Netherlands, 6Feinstein Institute for Medical Research and North Shore–Long Island Jewish Health System, Manhasset, New York, 7Leiden University Medical Centre, Leiden, Netherlands, 8Center of Experimental Rheumatology, University Hospital Zurich, Zurich, Switzerland, 9Feinstein Institute Medical Research and North Shore-Long Island Jewish Health System, Manhasset, NY.

Background/Purpose: Recent genome-wide association studies (GWAs) have identified >30 SNPs predisposing to Rheumatoid Arthritis (RA). These variants are helpful in unraveling the pathogenesis of RA. However, most therapeutic strategies target pathways of disease progression. Genetic factors account for a considerable proportion of variance in joint damage, but thus far only a few replicated severity factors are known and no GWAS has been performed. We aimed to increase the understanding of the processes underlying the inter-individual differences in joint damage in anti-citrullinated peptide antibodies (ACPA)-positive RA by performing a 3-staged GWAS on joint damage progression using high-quality radiological data, followed by in vitro and ex vivo studies.

Methods: Stage 1 was performed on 385 ACPA-positive RA-patients from the NARAC using Illumina HumanHap 550k BeadChips. Stage 2 concerned 1,567 X-rays of 301 ACPA-positive RA-patients included in a Dutch cohort with 7 years follow-up. In stage 3, 861 X-rays of 742 North-American ACPA-positive RA-patients included in the NDB and Wix/Vela-cohorts were studied. All X-rays were scored using the Sharp-van der Heijde method (ICCs all >0.9). The expression of SPAG16 variants was studied by RT-qPCR using a RA synovium cDNA library and cDNA derived from other RA tissues and fibroblast-like synoviocytes (FLS). Expression levels of MMP1 and MMP3 of FLS before and after stimulation with TNF-α (10 ng/ml) and IL1β (1 ng/ml) were evaluated by RT-qPCR and ELISA (cell culture supernatants). Finally serum MMP3 levels were measured in RA patients of stage 2 using ELISA.

Results: In stage 1, the strongest association was observed for a cluster of SNPs at 2q34, the region of Sperm associated AntiGen16 (SPAG16). In stage 2, the strongest association was observed for association with less production of MMP3. Furthermore, RA-patients carrying the minor allele associated with less production of MMP3. Also after cytokine stimulation the minor allele was associated with less MMP3 mRNA and secreted lower levels of MMP3 (P = 2.16×10⁻² and 2.29×10⁻² resp.). Apart from its role in spermatozoa, the function of SPAG16 is incompletely known. We detected SPAG16 isoforms in RA tissues and FLS. No relation between expression levels of SPAG16 transcripts in FLS and MMP1 and MMP3 of FLS before and after stimulation with TNF-α (10 ng/ml) and IL1β (1 ng/ml) were evaluated by RT-qPCR and ELISA (cell culture supernatants). Finally serum MMP3 levels were measured in RA patients of stage 2 using ELISA.

Conclusions: A genetic variant in SPAG16 is associated with less production of MMP3 by FLS and protection against joint damage progression. These findings indicate a new pathway involved in joint damage in ACPA-positive RA.

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A Genome-Wide Association Study Establishes Multiple Susceptibility Loci for Sjögren’s Syndrome  

Background/Purpose: Sjögren’s syndrome (SS) is a common, clinically heterogeneous autoimmune disease characterized by exocrine gland dysfunction that involves both innate and adaptive immune responses. A complex genetic architecture has been hypothesized; however, genetic studies to date have been limited to candidate gene approaches. We sought to perform the first genome-wide association scan (GWAS) in an unbiased manner to identify SS susceptibility loci.

Methods: We used high-density Illumina OMNI1-Quad genotyping arrays in a discovery cohort of 424 European-derived SS cases and 2120 healthy controls. For the GWAS discovery phase, stringent quality control (QC) criteria, adjustments for population stratification, and standard GWAS statistical methodologies were used to compare allele frequencies between cases and controls. A total of 650,000 single nucleotide polymorphisms (SNPs) were tested for association to SS (P omn). For replication, an independent set of 1194 SS cases and 2930 healthy controls were genotyped using the Immunochip (IC; P IC) with ~26,000 overlapping SNPs with the GWAS after QC. Meta-analysis between the GWAS and IC was done using METAL (P meta). Of the 1618 SS case, 133 also had gene expression data from the Illumina WG-6 microarray from whole blood. Expression quantitative trait loci (eQTL) analysis was done using the MATRIXeQTL package in R. Probes and SNPs in a 50 kb region flanking 4 selected genes were analyzed.

Results: The most significantly associated region with SS was the major histocompatibility complex (MHC), with 1071 overlapping SNPs between the GWAS and IC exceeding a genome-wide significance (GWS) threshold of 5×10^-8. The peak association was observed in MHS5 (rs3117574 P omn = 5.33×10^-7). Results across the extended MHC support association with multiple loci throughout this region. In the GWAS, 2 SNPs, rs485497 and rs4860536, were identified near IL12A (P omn = 1.88×10^-7) and rs4860536 (P IC = 2.06×10^-5) replicated yielding P meta = 4.81×10^-8 and P omn = 1.69×10^-8, respectively. In addition, we observed associations surpassing GWAS for the first time with loci previously implicated in SS, including IRF5 (rs10488631 P omn = 5.25×10^-13), BLK (rs922483 P omn = 1.50×10^-8), and STAT4 (rs10168266 P omn = 3.59×10^-8). We also identified statistically significant eQTL in the IRF5 region with 13 SNPs at P<5×10^-8. BLK also showed significant eQTLs with 8 SNPs at P<7×10^-4. IL12A, IRF5 and STAT4 are involved in type I interferon responses. IL12A encodes the p35 subunit of IL12 and is secreted by monocytes and dendritic cells ultimately stimulating the production of IFN-γ. Interestingly, responses to IL12 are mediated through STAT4.

Conclusion: We present the first GWAS of SS identifying and confirming IL12A as a novel susceptibility locus. We also observed IRF5, BLK and STAT4 for the first time at GWS establishing them as risk loci for SS. We report eQTLs in the region of IRF5 and BLK in SS cases suggesting expression of these loci is important in the pathogenesis. This has been reported in SLE. Collectively these genes illustrate the importance of both the innate and adaptive immune responses in the etiology of SS.

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Genome-Wide Association Analysis Reveals Genetic Heterogeneity of Sjögren’s Syndrome (SS) According to Specific Subphenotypes and Ancestry

Background/Purpose: Our goal is to define the contribution of genetic factors to SS and related subphenotypes. We studied 2,459 participants in the Sjögren’s International Collaborative Clinical Alliance (SICCA) who were characterized for the Illumina HumanOmni 2.5-Quad marker set. SICCA participants were enrolled according to standardized protocols at 9 international sites, including Argentina (n=342), China (n=290), Denmark (n=446), India (n=65), Japan (n=254), the UK (n=203), and the US (total n = 759 from 8 sites). Additional control data genotyped on the same platform were obtained from the Collaborative Genetic Study of Nicotine Dependence (COGEND, n=1466). QC measures included filters based on SNP and sample missingness (>2%), unrelated relatedness, non-Mendelian inheritance, and chromosomal regions of anomaly (>10 Mb). SICCA participants were classified according to ACR classification criteria for SS (ACR 2012, 64, 475), including presence of focal lymphocytic sialadenitis (FLS) on minor salivary gland biopsy, presence of KCs based on ocular staining pattern (ocular staining score ≥3), and production of autoantibodies (SSA, SSB, ANA and RF). Principal components (PC) analysis was used to characterize participants by genetic ancestry and PCs 1–5 were included as covariates in all association analyses. The following phenotypes were examined: SS susceptibility (fulfillment of ACR criteria versus controls, including COGEND), presence of FLS, presence of KCs and autoantibody positive disease.

Results: Out of 2118 subjects with post-QC genotypes and sufficient clinical data, 1000 (47%) met ACR criteria for SS, and an additional 772 fulfilled at least 1 of the criteria, including FLS, KCs or autoantibody positivity (SSA &/or SSB +, or both ANA ≥320 and RF +). A total of 1,445,406 SNPs passed all QC filters and were fully analyzed. For case-control analysis, 1,392,831 SNPs passed QC filters for both cohorts and were analyzed. Multi-locus PC model within the MHC region on chr 6 and the IRF5-TNPO1 region on chr 7 were strongly associated with SS susceptibility (lowest p values 1.9e-27 and 3.8e-13, respectively), and with autoantibody production (MHC p =1.7e-30, IRF5 p =3.2e-12) and FLS (MHC p =9.7e-12, IRF5 p =5.1e-10) within SICCA.
subjects; furthermore the region of MHC association for autoantibody production was much broader (26-33Mb versus 30-33Mb). In contrast, we did not observe significant genetic associations with KCS, indicating genetic heterogeneity specifically related to the oral, ocular or systemic manifestations of SS. Among SICCA subjects, multiple PCs were strongly associated with some phenotypes examined, suggesting heterogeneity according to genetic ancestry. In particular, a PC separating Asian and European ancestry was strongly associated with autoantibody production (p < 4.5E-8).

Conclusion: These results demonstrate genetic overlap of SS with other autoimmune diseases, and highlight the genetic heterogeneity of the disease according to specific subphenotypes and ancestry. Future work including imputed genetic data and additional study subjects will provide more power for extending these findings and fully characterizing the genetic contribution to SS.

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Oral and Gut Microbiota Influence Immune Responses to Sjögren’s Syndrome Associated Antigen Ro60. Agnieszka Szymula, Barbara Szezerba, Harini Bagavant, Shu-Man Fu and Umesh Deshmukh. University of Virginia, Charlottesville, VA

Background/Purpose: Autoantibodies reactive against Ro60 protein are often found in patients with Sjögren’s syndrome. This study was undertaken to investigate the role of oral and gut microbiota in initiation of autoimmune responses against Ro60. We hypothesized that proteins derived from oral/gut microbiota activate Ro60 reactive T cells, which then play a critical role in autoantibody generation.

Methods: HLA-DRA3 restricted T cell hybridomas, reactive against Ro60 were generated, and employed to map and characterize T cell epitopes on Ro60. Pattern search and BLAST analysis was carried out to identify putative cross-reactive peptides from microbes in the Human Oral Microbiome Database. Several peptides were synthesized and their ability to activate Ro60 reactive T cell hybridomas was evaluated. A reduced number of microbial peptides contained the strongest mimicry peptide that was generated and its ability to activate Ro60 reactive T cells analyzed. HLA-DR3 transgenic mice were immunized with this microbial protein and autoantibody responses against different autoantigens investigated.

Results: The HLA-DR3 restricted T cell hybridomas recognized 3 epitopes on Retin, Ro60, 23–23, Ro60, 23–23, and Ro60, 23–23. Pattern search analysis identified several hundred mimicry peptides originating from oral and gut microbes. Amongst these, peptides originating from von Willebrand factor type A (vWFA) protein were most potent in activating T cell hybridomas reactive against Ro60. Purified recombinant vWFA protein from Capnocytophaga ochracea (an oral microbe) activated Ro60 reactive T cells. Interestingly, whole E coli expressing vWFA protein were also able to activate Ro60 reactive T cells. These results show that peptides from vWFA protein are processed and presented by antigen presenting cells even in the presence of hundreds of other E coli proteins. Immunization of HLA-DR3 transgenic mice with recombinant vWFA protein readily induced autoantibodies reactive against Ro60, La (SSB) and Ro52 (SSA).

Conclusion: Our results clearly demonstrate that a microbial protein present in different commensal oral/gut bacteria can activate Ro60 reactive T cells and induce autoantibody responses against Ro60. Thus, we would like to propose that a dysregulated immune response against normal microbiome can be one of the pathways responsible for initiating autoimmune responses in Sjögren’s syndrome. Considering the high prevalence of oral infections as a common feature that in Sjögren’s syndrome patients, this pathway might also be involved in amplification of autoimmune responses in this disease.

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S1135

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Long-Term Humoral Autoimmunity to Ro60 in Primary Sjögren’s Syndrome Is Driven by Clonal Succession. Rhianna Lindop1, Isabell Bastian1, Georgia Arentz2, Lauren Thurgood3, Andrew Whyte, Tim, K. Chataway1, Michael Jackson1 and Tom Gordon1. 1Flinders Medical Centre and Flinders University, Adelaide, Australia, 2Flinders University, Adelaide, Australia

Background/ Purpose: Long-lived humoral autoimmunity to Ro60 is considered a hallmark of primary Sjögren’s syndrome (SS), but the mechanism by which this immunity is sustained over decades remains unclear. Persistence of anti-Ro60 autoantibodies could be generated either by long-lived plasma cells residing in the bone marrow or by continual production of short-lived plasma cells. In this present study, these models were tested in humans for the first time by analysing serial molecular signatures of a recently reported public Ro60-specific clonotypic autoantibody (1).

Methods: Serial serum samples were collected over weeks to years from 8 patients with primary SS who expressed stable V1–3–23/V1–3–20 Ro60 clonotypic autoantibody molecules. Clonotypic IgGs were isolated by epitope-specific affinity chromatography and subjected to high resolution Orbitrap mass spectrometry. Variable regions of heavy and light chains were analysed by combined database and de novoamino acid sequencing. Alterations in autoantibody affinity were assessed by equilibrium binding analysis (Bia-core).

Results: At each time point, patients expressed a single Ro60-specific monoclonal IgG1 kappa species, specified by V1–3–23/I–5 and V1–3–20/I–2 pairing signature. However, near full-length V region protein sequencing showed a subtle turnover of clonotypes that was not detected by solid-phase immunoassay. The clonal turnover was characterised by 4–6 month cycles of clonal expansion, with dominant clonotypes undergoing continual replacement by new somatically mutated clonal variants. Surprisingly, earlier clones never reappeared in the periphery, and each new clone has a unique molecular signature. Affinities (Kd value) of successive clonotypes did not change significantly in the face of ongoing perpetual turnover. Antiglobulin levels showed a cyclical rise and fall pattern every 3–4 months in keeping with this turnover model.

Conclusion: Analysis of the secreted autoantibody proteome demonstrates a dynamic process of clonal succession that masculinates as long-term Ro60 humoral autoimmunity. Surprisingly, the selection pressure for replacement clones is not based on affinity selection, indicating that an affinity ceiling is reached early in disease. Our findings are compatible with ongoing clonal expansion and exhaustion of short-lived autoreactive plasma cells, as opposed to a single event generation of long-lived plasma cells. The relentless generation of autoantibody clonotypes in primary SS by antigen-driven clonal selection has important therapeutic and diagnostic implications.


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ACR Concurrent Abstract Session Systemic Lupus Erythematosus - Animal Models Wednesday, November 14, 2012, 11:00 AM–12:30 PM

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IL-23 Controls Autoimmunity by Facilitating Clearance of Apoptotic Bodies in the Marginal Zone in Lupus-Prone BXD2 Mice. Hao Li1, Hui-Chen Hsi1, Qi Wu1, PingAr Yang1, Jun Li1, Daniel Cuac2, Mohamed Oukka1 and John D. Mountz3. 1University of Alabama at Birmingham, Birmingham, AL, 2Merck Research Laboratory, Palo Alto, CA, 3Seattle, WA, 4University of Alabama at Birmingham and Birmingham VA Medical Center, Birmingham, AL

Background/Purpose: Failure to clear apoptotic bodies is a central pathogenic mechanism for SLE. We have observed that spontaneous systemic autoimmunity and lupus in BXD2 mice is associated with large germinal centers (GC) and development of highly pathogenic autoantibodies. The increased GCs in the spleen are promoted by increased Th17 cell, which is promoted by IL-23 in BXD2 mice. As anti-IL-23 therapy is under development for chronic inflammation and autoimmune diseases, we investigated the therapeutic potential of complete blocking IL-23 in BXD2 mice. We made an unexpected finding that complete deficiency of IL-23 accelerated and exacerbated systemic autoimmune disease in BXD2 mice.

Methods: Wild type (WT) BXD2 mice were treated with isotype control, anti-IL-17 or anti-IL-23 (100 ug iv Q3D X 3 doses). BXD2 mice were crossed to IL-23 p19 deficient (p19−/−) mice to generate BXD2-p19−/− mice. Confocal microscope analysis and/or FACS analysis were carried out to determine the clearance of GFP+ apoptotic cells (ACs), the percentages of PNA+ GC B cells, SIGN-R1+ marginal zone macrophages (MZMs), pDC1+ plasmacytoid dendritic cells (pDCs), CD68+ red pulp macrophages, and IL-17+ or IFNγ+ CD4 T cells. ELISA assay was used to determine autoAb titers and protein urine levels in vivo. Quantitative RT-PCR was used to determine the expression of I22, I23r, Ifnα1, Ifnα4, Ifnα7, and Ifnα11. Depletion of MZMs was carried out by administration of clonodrane liposome (167 µg/week × 5wk).

Results: Anti-IL-17 blocked development of GCs in BXD2 mice. Surprisingly, anti-IL-23 enhanced GC development and anti-dsDNA antibody body production. Similarly, there was accelerated development of spontaneous GCs, production of anti-dsDNA antibody and IC deposition in the glomerulus of BXD2-p19−/−, compared with WT mice. While IL-23− was mainly expressed by MZMs, IL-23 was mainly produced by red pulp macrophages that were in close proximity to the MZM in the extra-follicular region of the spleen of BXD2 mice. Deficiency of IL-23 was associated with a dramatic reduction of MZMs in the spleen of BXD2-p19−/− mice. In contrast, expression of IL-23 by adenosin in BXD2-p19−/− mice at early age prevented the loss of MZM and the initiation of glomerulonephritis. Clonodrane liposome treatment mimicked the effects of anti-IL-17, leading to depletion of MZMs, impaired clearance of ACs and severely accelerated autoimmune disease. This was associated with dramatically elevated serum levels of type I IFN genes including Ifnα1, Ifnα4, Ifnα7, and Ifnα11. Although
there was diminished Th17 cells in BXXD2-p19ΔMT mice, defective clearance of ACs was associated with greatly elevated production of type I IFNs by pDCs and IFNγ by Th1 cells.

Conclusion: Our results suggest a novel concept that IL-23 can act as a double edge sword to control the development and severity of autoimmunity. Overexpression of IL-23 may provoke autoimmunity through the induction/maintenance of Th17 yet a complete deficiency of IL-23 also induced autoimmunity through the loss of the MZM barrier that clears ACs and prevents follicular invasion of apoptotic autoantigens. Our results suggest that caution should be used when considering IL-23 blockade for treatment of autoimmune disease.

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Novel Nuclear Export Inhibitors Deplete Autoimmune Plasma Cells and Protect Mice with Lupus-Like Disease From Nephritis. Teresa Owen1, Wensheng Wang1, Dilara McCauley1, Laura Strojny1, Jennifer Hollister, Javier Rangel-Moreno1, Michael Kauffman2, Sharon Shacham2 and Jennifer H. Anolik1. 1University of Rochester Medical Center, Rochester, NY, 2Karyopharm, Therapeutics Inc., Natick, MA

Background/Purpose: Most therapies currently used to treat systemic lupus erythematosus (SLE) and B cell targeted therapies under development do not affect plasma cells and autoantibodies. We postulated that selective inhibition of nuclear export (SINE) with novel small molecule CRM1 antagonists, which have demonstrated potent activity for hematologic malignancies, may be useful in the treatment of SLE by targeting plasma cells and other immune cells critical to disease pathogenesis.

Methods: Nephritic NZB/W F1 lupus-prone female mice, with elevated serum anti-dsDNA and anti-nuclear antibodies and established proteinuria, were treated with the SINE KPT-251 (injections 5/7 days for 5 weeks) (initially 75 mg/kg × 3 weeks and then 50 mg/kg for 2 additional weeks) or vehicle control subcutaneously (n=10 per group). Spleen and bone marrow (BM) lymphocytes were harvested, stained with antibodies, and analyzed by flow cytometry. Plasma cells (PC) were identified with antibodies against intracellular kappa light chain. We monitored nephritis severity by measuring proteinuria (Uristix) and analyzing pathological changes in kidney histology. Serum auto-antibody levels (anti-dsDNA) were measured by ELISA. ELISpot was used to enumerate IgG- and dsDNA antibody secreting cells (ASC).

Results: KPT-251 SINE treatment of NZB/W F1 mice prevented nephriti progression with a statistically significant reduction in urine protein levels in the treated group (p<0.05 beginning at 3 weeks) and notably reduced the number of mice with significant proteinuria (77% of treated mice had low urine protein concentrations <100 mg/dl compared to only 10% of controls at 5 weeks) (p=0.003). Importantly, serum anti-dsDNA IgG levels were significantly reduced after KPT-251 treatment (>6-fold reduction, p=0.0017) with profound effects on antibody secreting plasma cells. We found a significant reduction in splenic plasmablasts (2.18-fold reduction, p=0.001), BM PCs (2.07-fold reduction, p=0.02) and plasmablasts (MHCII high) (2.24-fold reduction, p=0.003). Moreover, ASC numbers were notably decreased with nuclear transport inhibition. Total IgG and anti-dsDNA IgG ASC numbers in the spleen were drastically reduced after treatment (70% reduction, p=0.002). In bone marrow, there was a pronounced decline in IgG ASC numbers (81%), with a more dramatic effect on anti-dsDNA IgG ASCs (96% reduction, p=0.002).

Conclusion: These results demonstrate that loss of caspase 8 in DCs initiates inflammatory phenotypes by a DC survival-independent novel mechanism. These data have implications for autoimmunity by elucidating previously unknown functions of a potentially useful target for therapy.

Disclosure: C. M. Cuda, None; A. V. Misharin, None; R. Saber, None; G. K. Haines III, None; J. Hutcheson, None; C. Mohan, None; H. R. Perlman, None.

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Soluble Receptor for Advanced Glycation End Products Alleviates Nephritis in NZB/WF1 Mice. Sang-Won Lee1, Kyu-Hyong Park1, Sungha Park2, Ji-Hye Kim1, Sung-Yong Hong2, Soo Kon Lee1, Donghoon Choi1 and Yong-Beom Park1. 1Yonse University College of Medicine, Seoul, South Korea, 2Yonsei University College of Medicine, Seoul, South Korea

Background/Purpose: The receptor for advanced glycation end products (RAGE) is a pattern-recognition receptor that interacts with multiple ligands such as high mobility group box 1 (HMGB1) and is involved in various innate immune responses. The soluble form of RAGE (sRAGE) can bind to RAGE-ligands in the extracellular space, and thus competitively inhibit the binding of ligands to the membrane-bound form of RAGE (mRAGE), resulting in a reduction of the inflammation induced by NF-κB activation.

Methods: Twenty-eight female NZB/WF1 mice were divided into five groups (untreated; 0.5, 1, 2 μg of sRAGE; mycophenolate mofetil plus prednisolone). Proteinuria and histological damage were evaluated. Immune-complex deposition and the nuclear translocation of NF-κB in kidney tissues were assessed by immunohistochemical staining. Serum concentrations of anti-dsDNA and IgG subclasses were also measured. The population of TFH cells was evaluated using a fluorescence-activated cell sorter and ICAM-1 and VCAM-1 expression in kidney tissues was assessed by immunohistochemical staining.

Disclosure: A. V. Misharin, None; R. Saber, None; G. K. Haines III, None; J. Hutcheson, None; C. Mohan, None; H. R. Perlman, None.

S1136
Results: In comparison with untreated mice, mice treated with 1 or 2 μg of sRAGE showed significantly reduced proteinuria and improved histological renal damage, with efficacy comparable to that of combination therapy. Treatment with 1 or 2 μg of sRAGE significantly reduced immune-complex accumulation; decreased the serum concentrations of anti-dsDNA, IgG2a, IgG2b and IgG3; and interrupted the nuclear translocation of NF-κB in kidney tissues, leading to reduced ICAM-1 and VAM-1 expression. Furthermore, sRAGE effectively modified T cell populations.

Conclusion: sRAGE significantly improved nephritides in lupus-prone mice, with efficacy comparable to that of standard induction treatment for lupus nephritis. These data suggest that sRAGE have anti-inflammatory effects in lupus nephritis pathophysiology and could serve as a potential additional therapy for lupus nephritis.

Disclosure: S. W. Lee, None; K. H. Park, None; S. Park, None; J. H. Kim, None; S. Y. Hong, None; S. K. Lee, None; D. Choi, None; Y. B. Park, None.

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Blocking the Serum Protease Inhibitor Activity of Plasminogen Activator Inhibitor-1 Protects Mice From Development of Glomerulonephritis in a Model of Lupus Nephritis. Brian Naiman1, Tracy Delaney 1, Lily Cheng1, Philip Brohawn1, Christopher Groves1, Isabelle de-Mendes2, Dominic Corkill1, Anthony Coyle1, Ronald Herbst1 and Jane Connor1.

MedImmune, LLC, Gaithersburg, MD, 2MedImmune, LLC, Cambridge, MA

Background/Purpose: Lupus nephritis is an autoimmune disorder which is characterized by extracellular matrix accumulation driven by immune complex deposition and in which thrombosis and sclerosis play a role in the development of nephropathy. Plasminogen activator inhibitor-1 (PAI-1) is the major inhibitor of pro-fibrolytic plasminogen activators uPA and tPA and its expression has been shown to be increased in renal biopsies obtained from patients with lupus nephritis. Several studies utilizing transgenic mice (KO or over-expressing) in models of lupus nephritis have demonstrated a role for PAI-1 in the kidney pathology associated with these models. The purpose of these studies was to evaluate the contribution of PAI-1 inhibition of PA to pathological changes in the kidney in an accelerated model of mouse lupus nephritis.

Methods: An adeno virus encoding IFNa was injected into lupus-prone NZB/W mice resulting in an accelerated model of glomerulonephritis. A monoclonal antibody that selectively prevents the binding of PAI-1 to its target PAs was administered twice weekly beginning at the time of adv-IFNa administration. Effect of PAI-1 neutralization on development of proteinuria, gene and protein expression and histological changes in the kidney, and protein circulating in the plasma was assessed. Potential effects on immune cell expansion observed in this model were evaluated by FACS analysis. In vitro, the effect of blocking PAI-1 on extracellular matrix (ECM) degradation was evaluated in rat mesangial cells.

Results: PAI-1 was shown to be dramatically increased in the kidney (mRNA, IHC, ELISA) as well as in the plasma (ELISA) of diseased mice. Inhibition of the PAI-1/PA interaction via treatment with the anti-PAI-1 antibody provided dose-dependent protection against the development of proteinuria and changes in sodium excretion. These effects were associated with normalization of fibrolysis, ECM, cytokine and chemokine genes as well as histological changes in the glomeruli of the kidney. Anti-PAI-1 treatment provided concentration-dependent degradation of ECM in rat mesangial cells providing further mechanistic support for the in vivo findings.

Conclusion: These data suggest that interfering with the PAI-1/PA interaction provides protection from the pathological changes in the kidney in this murine model downstream of immune complex deposition in the kidney.

Disclosure: B. Naiman, MedImmune, LLC, 3; T. Delaney, MedImmune, LLC, 3; L. Cheng, MedImmune, LLC, 3; P. Brohawn, MedImmune, LLC, 3; C. Morehouse, MedImmune, LLC, 3; C. Groves, MedImmune, LLC, 3; I. de-Mendes, MedImmune, LLC, 3; D. Corkill, MedImmune, LLC, 3; A. Coyle, MedImmune, LLC, 3; R. Herbst, MedImmune, LLC, 3; J. Connor, MedImmune, LLC, 3.

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Calcium/Calmodulin-Dependent Protein Kinase IV Suppresses IL-2 Production and Regulatory T Cell Activity in Systemic Lupus Erythematosus. Amanda J. Steiman1, Murray B. Urowitz1, Dominique Blanco2, Carolina Landolt-Marticorena3, Dafna L. Gladman1 and Joan E. Wither5.

1Toronto Western Hospital and University of Toronto, Toronto, ON, 2University of Toronto, Toronto, ON, 3Toronto Western Research Institute, University of Toronto, University Health Network, Toronto, ON, 4Toronto Western Research Institute, University Health Network, Toronto, ON

Background/Purpose: Interferon-α (IFN-α) plays a prominent pro-inflammatory role in SLE. Studies suggest clinical/serologic discordance may illuminate SLE pathophysiology: peripheral IFN-α production is blunted in autoimmune-producing, clinically quiescent SLE mice despite abundant IFN-α-producing plasmacytoid dendritic cells (pDCs); continuous pDC stimulation yields reversible blunting of the IFN-α response in vitro. Thus SACQ patients, who exhibit persistent autoantibody production despite durable clinical quiescence, may provide unique insights. We thus measured IFN-associated cyto/chemokines in SACQ patients, compared to serologically and clinically active (SAC) and serologically and clinically quiescent (SQCQ) patients.

Methods: We defined SACQ and SQCQ as ≥2-year periods without clinical activity, with/without persistent serologic activity, respectively, by SLE Disease Activity Index 2000 (SLEDAI-2K), over which antimalarials were permissible; corticosteroids/immunosuppressives were not. SACQ was defined as disease activity, by SLEDAI-2K, which compelled immunosuppression. Clinical and lab data were collected at each visit. Plasma cyto/...
chemokines were measured by 65-plex Luminex panel, with the 16 most relevant selected a priori for analysis. Bonferroni correction was applied. Non-parametric univariate and logistic regression analyses were conducted. Given the vast range of cytokine/chemokine levels, values were transformed by a factor of 10, 100, or 1000, as appropriate, to facilitate interpretation.

**Results:** We identified 25, 28 and 48 SACQ, SQCQ and SACA patients, respectively. IFN-α, IL-6, IL-10, IP-10 and MCP-1 levels were lower in SACQ vs SACA patients (p = 0.006, 0.0015, and <0.0001 for the last three, respectively). There were no differences in cyto/chemokine levels between SACQ and SQCQ patients. IFN-α and IP-10 were moderately correlated (r = 0.79). Disease duration at study start differed between SACQ and SACA patients. When SACA patients with disease duration <6 years were excluded, MCP-1 elevation remained associated with SACA (OR 1.95 [1.28, 2.97] and anti-Ro positivity with SACQ (OR 7.14 [1.47, 33.33]). Regression analysis applied to SACQ vs SQCQ patients similarly revealed anti-Ro positivity was associated with SACQ status. Logistic regression revealed that increased levels of IL-10 (OR 7.35 [1.04, 51.93]) and MCP-1 (OR 2.33 [1.23, 4.41]) were associated with SACQ and SACA status. Increased disease duration (OR 1.12 [1.03, 1.23]) and anti-Ro positivity (OR 20 [2.38, 166.67]) were associated with SACQ status. When SACA patients with disease duration <6 years were excluded, MCP-1 elevation remained associated with SACA (OR 1.95 [1.28, 2.97]) and anti-Ro positivity with SACQ (OR 7.14 [1.47, 33.33]). Regression analysis applied to SACQ vs SQCQ patients similarly revealed anti-Ro positivity was associated with SACQ status (OR 4.55 [1.23, 16.67]).

**Conclusion:** IFN-associated cyto/chemokine profiles differed between SACQ and SACA, but not SACQ and SQCQ, patients. Elevations in MCP-1 and IL-10 were associated with SACQ status; there were no cyto/chemokines associated with SACQ status. These findings warrant further pursuit to determine if they may facilitate clinical prediction.

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**2684**

Cerebrospinal Fluid IL-6 and Anti-NMDA Receptor NR2 Antibodies As Surrogate Markers for CNS Disease Severity in SLE. Shunsei Hirohata, Yoshiyuki Arinuma and Etsuko Ogawa. Kitasato University School of Medicine, Sagamihara, Japan

**Background/Purpose:** Neuropsychiatric manifestations occur in approximately one-half of patients with SLE and may cause substantial impairment of quality of life as well as disability. Among a variety of neuropsychiatric manifestations in SLE, acute confusional state (ACS) in diffuse psychiatric/neuropsychological syndromes (diffuse NP-SLE) is the most serious one. Of note, cerebrospinal fluid (CSF) IL-6 was found to be elevated in patients with NP-SLE, including diffuse NP-SLE and focal NP-SLE. Moreover, recent studies have demonstrated that CSF anti-NMDA receptor NR2 antibodies (anti-NR2) are associated with diffuse NP-SLE. However, the relationship of CSF IL-6 and anti-NR2 with the severity of NP-SLE remains uncertain. The current study examined whether CSF IL-6 and anti-NR2 might be surrogate markers for the severity of NP-SLE.

**Methods:** CSF samples were obtained from 62 SLE patients who satisfied the 1982 ACR revised criteria when they showed active neuropsychiatric manifestations (44 patients with diffuse NP-SLE and 18 patients with neurologic syndromes [focal NP-SLE]) as well as from 20 control patients with non-inflammatory neurological diseases. CSF IL-6 was quantitated by bioassay using IL-6-dependent cell line MH60. BSF2-CSF IgG anti-NR2 were measured by ELISA using synthetic peptide containing the extracellular ligand-binding domain of NR2.

**Results:** CSF IL-6 was significantly elevated in diffuse NP-SLE compared with that in focal NP-SLE or control patients. CSF anti-NR2 were also significantly elevated in diffuse NP-SLE compared with those in focal NP-SLE or in control patients (figure). Moreover, CSF IL-6 levels as well as CSF anti-NR2 were also significantly higher in ACS than in diffuse NP-SLE, other than ACS (cognitive disorder, mood disorder, anxiety disorder, and psychosis). Finally, CSF IL-6 levels were significantly correlated with CSF anti-NR2 in patients with NP-SLE (r = 0.3732, p = 0.0054).

**Conclusion:** These results demonstrate that CSF IL-6 as well as CSF anti-NR2 were most markedly elevated in ACS. The data therefore indicate that CSF IL-6 and anti-NR2 might be surrogate markers for the disease severity of NP-SLE. Finally, the positive correlation between CSF IL-6 and anti-NR2 suggest that anti-NR2 might be involved in the production of IL-6 within the CNS in SLE.

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**Background/Purpose:** Systemic lupus erythematosus (SLE), is a chronic autoimmune condition. It has the potential to affect any organ system and can be associated with severe morbidity and mortality. Despite improvements in the management of SLE, patients with SLE still have higher mortality rates than the general population. Mortality rates in SLE have been shown to vary between countries and be higher in men. The purpose of this study was to determine the magnitude of risk from all cause and cause-specific mortality in patients with SLE compared to the general population through a meta-analysis of observational studies.

**Methods:** We searched MEDLINE and EMBASE databases from their inception to October 2011 with an experienced medical librarian. Observational studies that met the following criteria were assessed by two researchers: (a) pre-specified SLE definition; (b) overall and/or cause-specific deaths, cardiovascular disease (CVD), infections, malignancy and renal disease; (c) reported standardized mortality ratio (SMR) and 95% confidence intervals (CI). If data from a single study were reported in more than one article, only
the results from the most recent study were included in the meta-analysis. We assessed study quality based on a 12-point scale that included elements of previously published scales for observational studies. We calculated weighted–pooled summary estimates of SMRs (meta-SMR) for all cause and cause-specific mortality using the random effects model, and tested for heterogeneity using I² statistic using STATA.

**Results:** From 556 abstracts published over the last 65 years, we identified 12 studies (14 cohorts) evaluating the risk of all cause and cause-specific mortality, comprising a total of 27,210 patients with SLE, with a total of 4,989 observed deaths. Overall, there was a 300% increased risk of death in patients with SLE when compared to the general population. The jackknife sensitivity analyses showed that all the meta-SMRs remained statistically significant when studies were excluded one at a time, with point estimates ranging from 2.8 to 3.2. Mortality due to malignancy was the only cause-specific entity not increased in SLE (Table). We observed significant heterogeneity among the studies included in our study. However, results from the univariate meta-regression analysis using cohort type, quality assessment and sample type did not explain the heterogeneity.

**Conclusion:** This is the first meta-analysis on SLE mortality using SMRs. Published data indicate that there is a 300% increase in the all-cause mortality in patients with SLE as compared to the general population. In addition, all cause-specific mortality rates, except for malignancy, were also increased with renal disease having the highest mortality risk.

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### 2686

**Difference in Clinical Features and Mortality Between Pediatric-Onset and Adult-Onset Systemic Lupus Erythematosus**

**Methods:** In total, 972 SLE patients were enrolled in the Hanyang BAE lupus cohort in Seoul, Korea, between February 1998 and December 2010. For mortality analysis, only 766 of the 972 SLE patients enrolled up to 2008 were used, because mortality data were prepared by data linkage with the available data from the Korean National Statistical Office. Mortality between the 2 groups was compared using the survival rates with Kaplan-Meier and the standardized mortality ratio (SMR). Multivariate linear regressions were used to determine the predictors of increased mortality.

**Results:** There were 111 (11.4%) pSLE patients and 861 (88.6%) aSLE patients. The female: male ratio in pSLE (3:1) is lower than that seen in aSLE. The maximum value of the SLE Disease Activity Index (SLEDAI) scores (21.1 versus 9.6; p = 0.0006), and the adjusted mean SLEDAI scores (AMS) during follow-up period were significantly higher in pSLE groups (5.2 versus 4.2; p = 0.0006). The mean SDI scores were 0.9 in the pSLE group and 0.8 in the aSLE group, and pSLE patients were more frequently affected in neutrophilic (14.4% vs. 8.4%; p = 0.022) and renal system (18% vs. 9.3%; p = 0.006).

Among 766 SLE patients (4,530 person-years), a total of 29 cases of death were confirmed. In pSLE, lupus-related deaths were most frequent (57.1%) whereas, deaths related infection were most common in aSLE (32.0%). The cumulative probabilities of survival at 5, 10 years were 97.6%, 89.3% in pSLE, and 98.2%, 96.4% in aSLE (log rank; p = 0.035). Compared with an age-, sex-, and calendar-dated general population, the SMR of patients with pSLE and aSLE were 50.0 (95% CI 20.1–103) and 4.8 (95% CI 13.1–7.4), respectively.

In multivariate regression analysis, pediatric onset lupus, shorter disease duration, higher disease activity, and higher disease damage were identified as predictor of mortality. In particular, the presence of neuropsychiatric damage (HR 3.8 vs. 96.6; p = 0.0097) and hemolytic anemia (HR 2.5 vs. 22.5; p = 0.0155) increased the mortality significantly in pSLE.

**Conclusion:** This study demonstrates that the patients with pSLE have higher rate of major organ involvement and worse clinical outcomes with higher mortality. In particular, special attention will be needed when combined with neutrophilic/neuropsychiatric damage or hemolytic anemia in pSLE.

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### 2687

**Modular Microarray Analysis Fails to Reveal a Significant Biological Effect of Vitamin D3 Treatment in Patients Participating in a Double-Blind Randomized Placebo-Controlled Trial of the Effect of Vitamin D3 On the Interferon Signature in Patients with Systemic Lupus Erythematosus**

**Methods:** 22 patients with vitamin D deficiency and an IFN signature who were participating in a double-blind randomized placebo-controlled trial of the effect of a single daily dose of cholecalciferol were included in the study. RNA was prepared from 40 stable, inactive, anti-DNA positive cells. The Illumina HT12v4 expression array was used to evaluate expression of IFN inducible genes, modular microarray analysis allows a comprehensive study of genes associated with inflammation, B cells, and myeloid cells and others.

**Methods:** RNA was prepared from 40 stable, inactive, anti-DNA + SLE patients with vitamin D deficiency and an IFN signature who were participating in a 12 week double-blind placebo controlled trial of daily vitamin D3 supplementation (0, 2000 or 4000 IU) at baseline and week 12, and 23 normal controls. An IFN signature was defined to be present if expression of 1 of 3 IFN responsive genes (Mx1, Ifi1, or Ifi44) determined using RT-PCR from whole blood RNA, was expressed at a level ≥ 4 SD, or if 2 of the 3 genes were expressed ≥ 2 SD above the mean of normal controls. The Illumina HT12v4
platform was used for microarray analyses. Gene expression data were grouped using a modular framework for blood genomic analysis developed by Chausabel et al. (Immunity 2008). Statistical significance for microarray modules was evaluated using a hypergeometric test. The 28 modules evaluated included modules for IFN as well as plasma cell, myeloid lineage and inflammation modules.

Results: Baseline characteristics of the three treatment groups were similar. Expression levels of IFN inducible genes and modules, inflammatory and myeloid related modules were significantly different in all SLE subjects compared to controls at baseline and week 2. Expression of the T cell and other “undetermined” modules was decreased in the SLE group compared to controls. No significant changes in the IFN inducible module between baseline and week 12 were found within any treatment group. Examination of module 2_11 (an indeterminate group containing genes for kinases and RAS family members) was significantly decreased at week 12 compared to baseline in the high dose group only. When comparing the week 12 gene expression data from vitamin D repleted subjects to persistently deficient subjects, no significant differences in module expression (including the IFN module) other than a decrease in module 2_11 were noted.

Conclusion: There are highly significant differences in gene expression between lupus patients and controls with overexpression of IFN, inflammation and myeloid related modules. Vitamin D supplementation for 12 weeks failed to diminish expression of IFN inducible genes and with the possible exception of an indeterminate module (2_11), no major differences in module expression was observed. Overall, module expression at week 12 between treatment groups was minimally different in this controlled clinical trial, with no significant biological changes distinguishing vitamin D repleted and deficient patients.

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The Health Improvement and Prevention Program in Systemic Lupus Erythematosus Demonstrates Improvement in Mental Health and Framingham Risk Score At One Year. Paul R. Fortin,1 Ellie Aghdassi,2 Anne Cymet,3 Stacey Morrison,4 Willy Wynant,5 Janet E. Pope,6 Sara Hewitt,7 Christian A. Pineau,8 Carolyn Neville9, Paula Harvey10, Jean-Claude Tardif11, Michal Abrahamowicz12 and Deborah DaCosta13. 1Division of Rheumatology, Centre de recherche du centre hospitalier universitaire de Quebec, Faculte de medicine de L’universite Laval, Quebec City, QC, Canada; 2University Health Network Research Institute - Western Division, Toronto, ON, Canada; 3University Health Network - Western Division, Toronto, ON, Canada; 4The Toronto Western Hospital, Toronto, ON, Canada; 5McGill University Health Centre and McGill University, Montreal, QC, Canada; 6Western University of Canada, St. Joseph’s Health Care, London, ON, Canada; 7St. Joseph’s Health Care, University of Western Ontario, London, ON, Canada; 8McGill University Health Centre, Montreal, QC, Canada; 9Royal Victoria Hospital, Montreal, QC, Canada; 10Women’s College Hospital, Toronto, ON, Canada; 11Universite de Montreal endorowed research chair in artherosclerosis, Quebec, QC, Canada; 12McGill University, Montreal, QC, Canada; 13Montreal General Hospital, Montreal

Background/Purpose: The Health Improvement and Prevention Program (HIPP) is a behavioral intervention aimed at improving health status and coping of persons with lupus while reducing cardiovascular (CVD) risk. Our purpose is to determine whether HIPP will improve health status, CVD risk and endothelial function at one year.

Methods: An unblinded RCT of HIPP compared to usual care assessed physical (PCS) and mental (MCS) component summary scores of SF-36, CVD risk derived from the Framingham risk score (FRS) and flow mediated dilatation (FMD) of the brachial artery. Patients with lupus and no previous CVD were randomized to SF-36, disease activity (SLEDAI-2K) and damage (SLICC-DI), CVD risk factors and FMD were collected at baseline. Those randomized to the NOW group attended four educational lectures and were administered a personalized risk modification program (disease education, CVD and osteoporosis risk reduction, exercise, and a psychological intervention where warranted). At one year, the LATER group crossed over and received HIPP while the NOW group resumed usual care. Repeated clinical assessments and FMD were performed at one and two years. Paired t-tests at the Bonferroni-corrected 2-tailed alpha=0.0125 were used to assess the statistical significance of the mean changes, estimated from data pooled from the first year for the NOW group pooled with the second year for the LATER group in PCS, MCS, FRS and FMD. Additional analyses explored whether the changes observed at one year in the NOW group were sustained at two years.

Results: We randomized 288 patients; one withdrew at baseline leaving 287 for analysis. Mean age was 44 yrs, 70% were Caucasian, 53% married, 9% high school graduates, mean disease duration was 11.3 yrs, mean SLEDAI 4.04 and mean SDI 1.17. Two primary outcomes, the MCS and the FRS improved significantly at one year with a mean MCS score increase of 2.16 (95% CI: 0.75 to 3.58, p=0.003) and a mean FRS logit decrease of −0.06 (95% CI: −0.12 to −0.01, p=0.02) (Table 1). There was no improvement in PCS or FMD. Additional analyses at two years in the NOW group revealed that 1) the one-year benefit on MCS and FRS was lost at two years and 2) when compared to those without improvement in their MCS at one year, those with improvement in MCS did not benefit further in their PCS, FRS or FMD at two years.

Table 1. Differences after one year of the intervention HIPP in the NOW (1-year vs baseline) and LATER (2-year vs 1-year) groups

<table>
<thead>
<tr>
<th>Primary outcome</th>
<th>PRE</th>
<th>POST</th>
<th>Mean of the differences</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36 physical</td>
<td>40.89</td>
<td>40.87</td>
<td>−0.02</td>
<td>−1.11; 1.07</td>
</tr>
<tr>
<td>SF-36 mental</td>
<td>45.33</td>
<td>47.49</td>
<td>0.008</td>
<td>0.002; 0.012</td>
</tr>
<tr>
<td>Framingham logit</td>
<td>−5.79</td>
<td>−5.85</td>
<td>−0.06</td>
<td>−0.12; −0.01</td>
</tr>
<tr>
<td>FMD</td>
<td>0.117</td>
<td>0.109</td>
<td>−0.008</td>
<td>0.075; 3.58</td>
</tr>
</tbody>
</table>

Conclusion: The HIPP behavioral intervention improves significantly the mental health and the Framingham risk score in lupus at one year but these are not sustained at two years. No reinforcement of the HIPP intervention was provided to patients of the NOW group in the second year. Given the chronicity and unpredictability of lupus, such a behavioral intervention should incorporate ongoing booster sessions and evaluate their effectiveness in maintaining the one year benefits of the Health Improvement and Prevention Program.

Disclosure: P. R. Fortin, None; E. Aghdassi, None; A. Cymet, None; S. Morrison, None; W. Wynant, None; J. E. Pope, None; S. Hewitt, None; C. A. Pineau, None; C. Neville, None; P. Harvey, None; J. C. Tardif, None; M. Abrahamowicz, None; D. DaCosta, None.

ARHP Concurrent Abstract Session
Factors Associated with Rheumatoid Arthritis

Wednesday, November 14, 2012, 11:00 AM–12:30 PM

2689

Quality of Sleep, Physical Activity and Fatigue in Patients with Rheumatoid Arthritis. A Cross-Sectional Study. Katrine Loeppenthin1, Bente Appel Esbensen2, Søl Jønnum3, Mikkel Østergaard1, Tanja Thomsen1 and Julie Midtgard4. 1Nursing and Health Science Research Unit, DK-2600 Glostrup, Denmark, 2Danish Centre for Sleep Medicine, Department of Clinical Neurophysiology, DK-2600 Glostrup, Denmark, 3Glostrup Hospital, Copenhagen, Denmark, 4Health Care Research Centre, Copenhagen, Denmark

Background/Purpose: Sleep disturbances and fatigue are frequently experienced (40–70 %) in patients with rheumatoid arthritis (RA) and contribute to decreased quality of life and adverse health and behaviour consequences. However, little is known about the prevalence of poor sleep and its association to Physical Activity (PA) and fatigue. Understanding PA, fatigue and the impact on sleep disturbances could illuminate ways to promote sufficient sleep in RA patients. Thus, the aim of this study was to examine the association between sleep disturbance, PA, and fatigue.

Methods: A total of 500 RA patients from a rheumatology outpatient clinic were recruited consecutively to participate in an observational cross-sectional study. The self-administered questionnaire covered the Health Assessment Questionnaire (HAQ), Visual Analogue Scale (VAS) for pain and fatigue, Physical Activity Scale (PAS), Multidimensional Fatigue Inventory (MFI), Short Form SF-12v2, Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI) as well as demographic data and clinical data (comorbid condition, disease duration, disease activity).

Results: The response rate was 89%. All participants were between 22 and 88 years old (mean age of 58 years), and 80% were women. The mean disease duration was 14 years and mean DAS score was 2.7. The prevalence
of poor sleep quality was 61%. Higher level of general fatigue, mental fatigue, physical fatigue, reduced activity and reduced motivation was reported in patients with poor sleep quality compared with patients with good sleep quality (P < 0.0001). Sleepiness (P = 0.0007), sleep duration, sleep latency, sleep disturbance and daytime dysfunction was also higher in patients with poor sleep quality then in patients with good sleep quality (P < 0.0001).

For the purpose of this study, the participants were divided into two categories. Poor sleep quality (PSQI global score > 5) and good sleep quality (PSQI global score < 5). More time spent on sedentary leisure time (P = 0.0371) and moderately strenuous PA was reported in patients with poor sleep quality compared with patients with good sleep quality, but there were no significant differences between light PA and hard strenuous PA on sleep quality.

Conclusion: A high prevalence of sleep disturbances was observed. This study indicates that PA and fatigue play a significant role in self-reported sleep quality. Addressing sleep disturbances via pharmaceutical and behavioral interventions may have a critical impact on RA patients.

Disclosure: K. Loeppenthin, None; B. A. Esbensen, None; P. Jenum, None; M. Østergaard, None; T. Thomsen, None; J. Midgaard, None.

2690
Assessment of Sleep Quality in Patients with Rheumatoid Arthritis. Utku Ucar and Mehmet Tuncay Duruo¨z. Celal Bayar University Medical School, Manisa, Turkey

Background/Purpose: Rheumatoid arthritis is a chronic inflammatory disease affecting mainly diartrodial synovial joints. Fatigue and sleep disturbances are known to be common symptoms in patients with RA. The purpose of this study was to determine the level of general fatigue, mental fatigue, and sleep disturbances in patients with RA.

Methods: Patients fulfilling the ACR 2010 criteria on classification of RA were consecutively recruited into the study. The patients filled a standardized questionnaire which included: demographics, general health status, physical activity, diet, smoking habit, social, familial and psychological factors. RA disease activity was determined by DAS28. Sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI). Fatigue was evaluated with the Fatigue Severity Scale (FSS). RA patients were divided into two groups: group A (good sleep quality), group B (poor sleep quality). The data were statistically analyzed with Pearson correlation and Student’s t-test.

Results: Seventy patients (22 male) were recruited into the study. The mean age was 54.12 ± 12.25 years and the mean disease duration was 85.67 ± 75.9 months. The mean values of the severity of fatigue (VAS), sleep disturbance (PSQI) and disease activity (DAS28) in patients with good sleep quality were significantly lower compared to patients with poor sleep quality (p < 0.05).

Conclusion: A high prevalence of sleep disturbances was observed. This study indicates that PA and fatigue play a significant role in self-reported sleep quality. Addressing sleep disturbances via pharmaceutical and behavioral interventions may have a critical impact on RA patients.

Disclosure: K. Loeppenthin, None; B. A. Esbensen, None; P. Jenum, None; M. Østergaard, None; T. Thomsen, None; J. Midgaard, None.

2691 WITHDRAWN

2692
Diet and Other Lifestyle Related Factors and the Risk of Developing Rheumatoid Arthritis. Björn Sundström1, Ingegerd Johansson2 and Solbritt Rantapää Dahlqvist3. 1Umeå University, Umeå, Sweden, 2Umeå University, Umeå, Sweden, 3Umeå University Hospital, Umeå, Sweden

Background/Purpose: There is a growing interest in the role of lifestyle in developing chronic diseases, such as rheumatoid arthritis (RA). Our aim was to investigate whether modifiable risk factors, such as an unfavorable lipid profile, smoking, obesity, diet, physical activity, and psycho-social factors, for example, education level, increase the risk of developing RA.

Methods: The register of patients with RA (1987 ACR criteria) at the Department of Rheumatology in the county of Västerbotten, northern Sweden, was co-analyzed with the register for the Västerbotten Intervention Project (VIP), which assembles data from clinical examinations in a community intervention program. Within this database, 146 patients (women, n = 102, 70%) who had participated before onset of symptoms of disease and 438 controls matched for sex, were identified. Due to different versions of the food frequency questionnaire (FFQ) being used, the controls were also matched for FFQ version. From visits pre-dating the onset of symptoms, data on diet, physical activity, smoking, body mass index, serum levels of total cholesterol and triglycerides was retrieved from the database. The association between lifestyle factors and risk of developing RA was assessed by logistic regression analyses.

Results: Smoking and physically demanding work were associated with an increased risk of developing RA (OR = 2.35 (1.34–3.59) and OR = 1.17 (1.02–1.37), respectively), whilst higher education associated with a decreased risk (OR = 0.62 (0.39–0.98)). A median consumption of fish was 20 grams/day (IQR 11–28) and fruit/vegetables 150 grams/day (IQR 83–318) for the prediseased individuals was not significantly different from that of the controls. No significant associations for the risk of RA were found with the Healthy Diet Indicator score, or with food groups and macronutrients. Nor did body mass index and alcohol consumption affect the development of RA. Levels of serum cholesterol or triglycerides did not affect the risk, nor did the frequency of exercise.

Conclusion: In this nested case-control study no association between diet and risk for development of RA was observed. There was limited variability regarding dietary factors in the subject groups studied, which could reduce the detectability within the populations studied. However, it can be concluded that smoking and the level of education, were more significant for the risk of developing RA than diet in this cohort of patients.

Disclosure: B. Sundström, None; I. Johansson, None; S. Rantapää Dahlqvist, None.

2693
Factors Associated with Person-Perceived Disability in Adults Aged 18+ with Rheumatoid Arthritis. Yeliz Greenhill, Alison Hammon and Sarah Tyson. University of Salford, Manchester, United Kingdom

Background/Purpose: Rheumatoid Arthritis (RA) is associated with high risk of disability (1). Loss of independence is negatively correlated with the person’s health and wellbeing (2). The International Classification of Health and Functioning (ICF) suggests that the relationship of impairment and disability is largely modified by social and environmental factors. Understanding the mechanisms of the disablement process can help to reduce or prevent the negative effects of RA on people’s lives. This study aimed to establish key factors associated with person-perceived disability in adults with RA using the ICF as a framework.

Methods: Participants with RA over 18 years were recruited from 14 rheumatology clinics. They completed a postal questionnaire including demographic questions, life satisfaction, mood, pain, stiffness and fatigue numeric rating scales (0–10), the Evaluation of Daily Activities Questionnaire (EDAQ), SF-36v2, and RA Quality of Life scale (RAQOL). Person-perceived disability was measured by asking “Do you consider yourself to have a disability? (YES/NO)” Questionnaire items were linked to the ICF. The prevalence of perceived disability was calculated overall and for age and gender and tested using the χ² est. Univariable and multivariable logistic regression was used to assess associations between person-perceived disability and body functions and structures; activity limitation; personal and environmental factors. A parsimonious model of key factors associated with perceived disability was fitted using backwards-stepwise binary logistic regression. Adjusted odds ratios with 95% confidence intervals were calculated to determine the strength of association for each variable.
Results: 413 people responded (mean age: 60 years (SD: 11.5); 73% female; average disease duration: 13 years (SD: 10.7)); 242 (58%) of whom reported perceived disability, which was more common in women than men (p=0.04). There was no relationship with age (p=0.97). The parsimonious model was a reasonable fit for the data (χ² = 5.65, p=0.69). Key factors associated with perceived disability were: dissatisfaction with life (Adj. OR: 3.5; 95% CI 1.6, 7.8), low mood (Adj. OR: 2.9; 95% CI 1.3, 6.7), pain when moving (Adj. OR: 2.5; 95% CI 1.2, 4.9), and limitation in moving round outdoors/shopping (Adj. OR: 1.3; 95% CI 1.2, 1.4). Additionally, the odds of reporting perceived disability were twice as high in those with RA duration >10 years compared to <10 years (adj. OR: 1.9 95% CI: 1.0, 3.9).

Conclusion: Half of adults with RA in this study considered themselves disabled. Psychosocial factors, pain and activity limitation contributed to disability across the age and gender range. Recognition of key factors associated with person-perceived disability could be helpful in rehabilitation, specifically focusing on improving: satisfaction with life (through enabling people to achieve occupational balance and meaningful goals); mood; and outdoor mobility; and reducing pain when moving. This might then help people to feel less disabled by RA.

References

Disclosure: Y. Greenhill, None; A. Hammond, None; S. Tyson, None.

2694

1Loma Linda University, Loma Linda, CA, 2UCLA, Los Angeles, CA, 3Cedars-Sinai Medical Center, Los Angeles, CA

Background/Purpose: Disability and impairments in role functioning are common obstacles for many patients with RA. A combination of disease-related and psychosocial factors may contribute to limitations in functioning. The purpose of this research was to examine a model describing the interrelations among disease burden, mood disturbance, and disability as determinants of role limitations in patients with RA. It was expected that disease burden would be negatively associated with role functioning directly and/or indirectly through the potential mediators of mood disturbance and disability.

Methods: The data of 103 participants were drawn from baseline of a randomized comparative efficacy trial of psychosocial interventions for RA. In the hypothesized model, disease burden (total joint score and disease activity items from the Rapid Assessment of Disease Activity in Rheumatology) directly and indirectly predicted role functioning (physical role and social functioning from the Short Form-36) through negative mood (Center for Epidemiological Studies Depression Scale) and disability (large-limb gross movement and small-limb fine movement from the Health Assessment Questionnaire Disability Index). EQS 6.1 was used to evaluate the structural model. Data screening revealed a violation of multivariate normality, therefore, the ML robust test statistics, which correct for non-normal data, are reported.

Results: The hypothesized model provided a good fit of the data, CFI = .975; S-B χ²29 = 38.12, p = .120; RMSEA = .056. However, the Wald test indicated removal of the path from mood disturbance to disability (β = –.08, p = .421). As such, along with theoretical plausibility, this path was removed. The fit of this more parsimonious model was similar, CFI = .976; S-B χ²30 = 38.60, p = .135; RMSEA = .053, and the final model is depicted in Figure 1. Greater disease burden predicted mood disturbance and higher levels of disability. In turn, mood disturbance and disability related to lower levels of role functioning. Partial support was found for the hypothesis that mood disturbance and disability mediate the relationship between disease burden and role functioning. Specifically, as a sole predictor, the effect of disease burden on role functioning was significant (β = –.68, p < .001). Further, this effect was significantly reduced when mood disturbance (β = –.49, p < .001; Sobel Z = –2.33, p = .020) and disability (β = –.45, p = .007; Sobel Z = –2.08, p = .038) were entered in the model, indicating that each independently partially mediated the relation between disease burden and role functioning.

Conclusion: The findings from this study confirmed the importance of a multi-dimensional framework in evaluating disability and role functioning in RA using a structural equation approach. Mood disturbance and disability play major roles in explaining role limitations along with patient-reported disease burden.

Disclosure: S. R. Ormseth, None; T. Draper, None; M. Custodio, None; M. H. Weisman, None; M. R. Irwin, None; P. M. Nicassio, None.

2695

Results of a Pilot Test. Cristina Drenkard1, Charmayne M. Dunlop-Thomas1, Kirk Easley1, Gaobin Bao1, S. Sam Lim1 and Teresa J. Brady2.
1Emory University, Atlanta, GA, “Centers for Disease Control and Prevention, Atlanta, GA

Background/Purpose: Minorities with systemic lupus erythematosus (SLE) are at high risk of poor disease outcomes and may face challenges in effectively self-managing multiple health problems. The Chronic Disease Self-Management Program (CDSMP) is an evidence-based intervention that improves the health of people with chronic illnesses. We aimed to pilot test the benefits of the Chronic Disease Self-Management Program (CDSMP) for low-income African American women with systemic lupus erythematosus (SLE).

Methods: Four CDSMP 6-week workshops were delivered to 49 low-income African American women with SLE who received medical care for ≥6 months at a public lupus clinic in Atlanta, Georgia. We compared post- minus pre- CDSMP changes (from baseline to 4 months after the start of the intervention) in three general outcomes (health status, self-efficacy and self-management behaviors) using self-reported measures. Additionally, a fourth general outcome (outpatient and inpatient health care utilization) was assessed using electronic administrative records in the 6-month periods before and after the intervention. Paired t-tests or Wilcoxon signed-rank tests were used to compare the post-pre CDSMP change for each outcome measure.

Results: Significant improvements were observed in one of the three measures of health status (physical component summary of the SF-36), in the measure of self-efficacy, and three of the five measures of self-management behaviors outcome (cognitive symptom management, communication with physicians, and medication taking measure).
The evaluation of the fourth outcome, health service utilization, showed that the co-morbidities. The purpose of this analysis was to determine the one year improvement patient-centered outcomes and decrease health service utilization with A. K. Kirou. Hospital for Special Surgery, New York, NY.

Methods: C. M. Dunlop-Thomas, None; K. Easley, None; G. Bao, None; S. S. Lim, None; T. J. Brady, None.


Background/Purpose: Aiming to broaden the care of lupus patients beyond the standard lupus management, we launched a pilot general health assessment (GHA) initiative under the umbrella of our lupus center. The goal of this initiative was to systematically address potentially preventable lupus co-morbidities. The purpose of this analysis was to determine the one year impact of the GHA program on the care of our lupus patients.

Methods: The GHA program was implemented in September 2010 when our center’s nurse practitioner (NP) started to meet with each SLE patient during their Friday Lupus Clinic visit. During this visit, a list of predetermined general health measures, developed by our center based on ACR and USPSTF recommendations (Table), are reviewed with the patients in order to determine the need for further intervention. Following this initial visit, the center NP: a) facilitates the implementation of yet “uncompleted” measures, by either ordering directly the proper test/intervention and/or communicating the need to the treating physician; and b) meets with the patients every 3-6 months (depending on the number of outstanding issues) to review the recommendations from the previous visit. For the purpose of this interim analysis, we compared the “completion” rates of GHA items between baseline and the 6–12 month visits (Chi-square test).

Results: 126 SLE patients completed a total of 315 visits between September 2010 and June 2012. Table demonstrates the proportion of GHA items that had been completed by patient’s rheumatologists and/or primary care physicians before each NP visit at baseline, 6 months, and 12 months. There was a significant increase in the “completion” rates of the GHA items that were addressable at the time of the nurse practitioner visit, e.g., vaccinations. However, GHA items that required an extra appointment for the patient, e.g., mammogram, had a lower rate of success. The major reasons for “uncompleted” tests were: personal misconception of such tests; difficulty with making appointments and feeling overburdened with too many medical appointments.

<table>
<thead>
<tr>
<th>GHA Items</th>
<th>Baseline n:126</th>
<th>6m Visit n:92</th>
<th>12m Visit n:54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccination</td>
<td>82 (65%)</td>
<td>71 (77%)</td>
<td>49 (90%)*</td>
</tr>
<tr>
<td>Pneumonia Vaccination</td>
<td>33 (26%)</td>
<td>32 (35%)</td>
<td>32 (59%)*</td>
</tr>
<tr>
<td>PPD or QuantiFERON</td>
<td>56 (44%)</td>
<td>64 (69%)*</td>
<td>51 (94%)*</td>
</tr>
<tr>
<td>HBsAg</td>
<td>71 (56%)</td>
<td>77 (83%)*</td>
<td>51 (94%)*</td>
</tr>
<tr>
<td>Hep B Core</td>
<td>70 (55%)</td>
<td>71 (77%)*</td>
<td>51 (94%)*</td>
</tr>
<tr>
<td>Hepatitis C Antibody</td>
<td>75 (59%)</td>
<td>70 (76%)*</td>
<td>51 (94%)*</td>
</tr>
</tbody>
</table>

Methods: SLE patients attending a free-of-charge CVD PCP have been referred to a registered dietitian for INC following an assessment of their CVD risk factors. The INC incorporates patient-centered methods (tailored nutrition education, goal setting, and motivational interviewing) to facilitate dietary changes. In a preliminary 6-month analysis, we evaluated changes in select nutrients (calcium, sodium, fat, saturated fat, cholesterol, omega-3 and omega-6 fatty acids, fiber, sugar and folate), diet habits, anthropometric measures (weight and BMI), and clinical outcomes (lipid levels and blood glucose levels). A one sample t-test on the difference in the means between baseline and 6-month data was conducted for nutrient, anthropometric measures, and clinical variables. A chi-squared analysis was conducted for categorical variables depicting dietary habits.

Results: From March 2009 to June 2011, 41 patients (female: 88%; mean age: 40.7 ± 12.6; African American/Hispanic: 73%; mean disease duration: 12.2 ± 8.2) attended INC (out of 71 referred). Hyperlipidemia was present in 18% of the patients, diabetes in 10%, and hypertension in 56%. Aver-age weight was 85.98 kg ± 20.21, and BMI was 31.3 ± 7.56. In 6-month follow-up, patients: a) reduced their intake of sodium, total calories, and percent calories from fat and saturated fat (Table); b) had decreased weight (−1.64 kg, p < 0.025); and c) reported increases in eating a diet rich in fruits and vegetables (p < 0.001), a high fiber diet (p = 0.011), ≥ 2 servings of fish/week (p = 0.002), and a low cholesterol diet (p = 0.034). The analysis of patients with abnormal lipids, and/or glucose levels, at baseline did not show a clinically significant improvement.
Conclusion: Our 6-month preliminary analysis suggest that individualized nutrition counseling using patient-centered methods is an effective method for promoting changes in nutrient intake, diet habits and, possibly, in anthropometric measures. The three-year longitudinal analysis of the patients receiving individualized nutrition counseling will determine the effectiveness of individualized nutrition counseling and if it can reduce prevalence of CVD risk factors.

Disclosure: S. Everett, None; V. Haiduc, None; M. C. Richey, None; D. Erkan, None.

FMS and SLE Patients Have Higher Treatment Expectations Than RA Patients.

Background/Purpose: It is anticipated that patients with high expectations for improvement of their medical condition may get frustrated when a significant degree of benefit does not occur with treatment. Medication and the non-medication therapy of fibromyalgia can be challenging. We asked fibromyalgia patients what their expectations were regarding past and current treatment.

Methods: Office patients were asked to complete a questionnaire about their expectations of treatment with respect to its general effect and its effect on pain, sleep quality, quality of life, and energy. Each item was rated 1–3 with 3 indicating the highest expectations. A total expectation score consisting of the mean of these expectation items was calculated. Patients also rated from 1–3 how challenging their rheumatic disease was with 3 as the most challenging rating. Three diagnosis groups were compared with respect to questionnaire responses: 91 FMS patients, 34 RA patients, and 14 SLE patients. The Kruskal-Wallis and Mann-Whitney tests were used to compare groups with respect to the items and total scores, and the Spearman correlation was used to test for linear association between the disease challenge rating and the total expectation score for each group, with a two-sided 0.05 significance level.

Results: Compared to RA patients, FMS patients considered their disease significantly more challenging (FMS 2.2 ± 0.7, RA 1.6 ± 0.8, p < 0.001) and had significantly higher general treatment expectations (FMS 1.8 ± 0.5, RA 1.2 ± 0.4, p < 0.001), significantly higher treatment expectations concerning pain (FMS 1.8 ± 0.6, RA 1.4 ± 0.5, p = 0.010), and significantly higher total treatment expectation scores (FMS 1.9 ± 0.4, RA 1.6 ± 0.4, p = 0.009). Compared to RA patients, SLE patients also had significantly higher general treatment expectations (SLE 2.0 ± 0.6, RA 1.2 ± 0.4, p < 0.001), significantly higher treatment expectations concerning pain (SLE 2.0 ± 0.7, RA 1.4 ± 0.5, p < 0.001), and significantly higher total treatment expectation scores (SLE 2.0 ± 0.6, RA 1.4 ± 0.4, p = 0.037). There were no statistically significant differences between FMS and SLE patients. For each group, a statistically significant positive Spearman correlation was found between the disease challenge rating and the total expectation score, so that higher expectation scores were associated with higher disease challenge ratings: FMS r = 0.37 (p = 0.001), RA r = 0.50 (p = 0.005), SLE r = 0.58 (p = 0.049).

Conclusion: Patients with fibromyalgia who have higher expectations for significant improvement may find it impossible to meet those expectations in many cases. A meaningful therapeutic relationship can help some patients cope with their illness better, but many fibromyalgia patients are currently frustrated by a lack of significant benefit from current therapy, especially those patients who have high expectations for improvement. Cognitive behavior therapy might help some patients with unrealistic expectations cope with their illness better.

Disclosure: R. S. Katz, None; H. Bond, None; J. L. Polvak, None; L. Kwan, None; S. Shott, None.

Psychosocial Stress and Complement Activation Product C4d On Reticulocytes in Patients with Systemic Lupus Erythematosus.

Background/Purpose: Although patients with SLE may report that psychosocial stress is linked with disease flares, research results on stress–disease activity associations are mixed. The lack of consistent results may be due to lack of true associations, difficulty in measuring stress, or to lack of precision in capturing the onset of SLE flares. Recently, the presence of complement activation products on circulating blood cells has emerged as a novel biomarker for diagnosis and disease activity in SLE. Complement activation products have been detected on reticulocytes, which are new blood cells that emerge from the bone marrow and are in circulation for just 1–2 days before becoming erythrocytes. Reticulocytes bearing complement activation product C4d (R-C4d) are potential biomarkers of new onset SLE disease activity. The purpose of this study was to evaluate the association between psychosocial stress, self-reported disease activity, and early signs of complement activation as measured by R-C4d in patients with SLE.

Methods: After completing informed consent, 123 SLE patients completed the 10-item Perceived Stress Scale (PSS), the Center for Epidemiologic Studies Depression scale (CESD), and the Positive Affect scale of the PANAS (Positive and Negative Affect Scale), as well as the self-report Systemic Lupus Activity Questionnaire (SLAQ) at up to 4 clinic visits. Reticulocytes were evaluated for presence of C4d using mean fluorescence intensity (MFI) analysis by flow cytometry. R-C4d units were dichotomized at 3.35 MFI, a score indicative of abnormally elevated R-C4d level due to complement activation. Mixed regression modeling was used to evaluate concurrent associations between psychosocial variables, SLAQ, and R-C4d.

Results: The majority of participants were female (94%), non-Hispanic (96%), and non-African American (86%). The mean (SD) age was 41.3 ± 13.2 years. Mean (SD) SLAQ score was 11.4 (5.7) at study entry. R-C4d was concurrently associated with higher perceived stress; those with elevated R-C4d were 2.18 points higher on the PSS (p = 0.01). There was a trend for lower Positive Affect scores to be associated with R-C4d (p = 0.06). Depressive symptoms (CESD), which averaged 16.2 (11.6) at study entry, were not associated with R-C4d (p = 0.25). SLAQ total score was not associated with elevated R-C4d (p = 0.58), but was associated with CESD (β = 0.19, p < 0.001), PANAS (β = −0.21, p < 0.001) and PSS (β = 0.2, p < 0.001).

Conclusion: SLE patients with elevated levels of R-C4d had higher levels of perceived stress or feeling overwhelmed compared to patients without R-C4d elevation. This, in combination with the trend toward lower levels of positive affect, supports the idea of biological links between early SLE flares and perceptions of stress and malaise. The finding that CESD was not associated with R-C4d may be related to the breadth of depressive symptoms assessed by CESD, which range from social isolation to sleep problems in addition to sad mood. Whether psychosocial stress precedes or results from disease flares remains unknown given the concurrent measurements used in this study. Future studies should examine prospective links between stress and SLE disease biomarkers and should include physician ratings of SLE disease activity.

Disclosure: X. Chen, None; Y. Cheng, None; C. C. Liu, None; A. H. Kao, None; S. Manzi, SEE ATTACHED, 2; SEE ATTACHED, 5; SEE ATTACHED, 7; J. M. Ahearn, Exagen Diagnostics, Inc., 5; University of Pittsburgh, 7; C. M. Greco, NIH NIAMS, 2.

A Multi-Center Study of the Appropriateness of Anti-Neutrophil Cytoplasmic Antibody Testing.

Background/Purpose: Anti Neutrophil Cytoplasmic Antibody (ANCA) test is an Indirect Immunofluorescence test used as an aid in the diagnosis of ANCA Associated Small Vessel Vasculitis (AASV), namely, Wegener’s Granulomatosis, Churg Strauss Vasculitis and Microscopic Polyangitis and its renal-limited variant (pauci-immune crescentic glomerulonephritis). In an effort to decrease the false positive ANCA tests and improve the clinical utility of this test, guidelines for ANCA testing were proposed in 1999. We aim to compare the trend of ANCA testing in practice with the proposed guidelines and thereby calculate the disparity in testing, if any, including the financial burden such testing would pose.

Methods: In this study, we assembled all the ANCA tests that were ordered on hospitalized patients during a 2 year period at 2 academic medical centers. A chart review by a physician blinded to ANCA test results was performed and the indications used by physicians for ordering each of the ANCA tests were then compared against the proposed guideline-indications for ANCA testing.
Table 1. Clinical Indications for ANCA Testing

<table>
<thead>
<tr>
<th>Guidelines</th>
<th>Clinical Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Glomerulonephritis, especially rapidly progressive</td>
<td>(A) Creatinine level &gt;2.0 mg/dL (&gt;176.8 μmol/L) (normal range, 0.7–1.3 mg/dL [61.9–114.9 μmol/L]) immediately prior to ANCA testing or (B) urinary red blood cell casts or hematuria with &gt;5 red blood cells per high-powered microscopic field</td>
</tr>
<tr>
<td>2. Pulmonary hemorrhage, especially pulmonary renal syndrome</td>
<td>Hemoptysis or pulmonary hemorrhage</td>
</tr>
<tr>
<td>3. Cutaneous vasculitis with systemic features myalgias, arthralgias, or arthritis</td>
<td>Purpura, rash or livedo with concurrent fever, weight loss, myalgias, arthralgias, or arthritis</td>
</tr>
<tr>
<td>4. Multiple lung nodules</td>
<td>At least 1 nodule seen on any imaging study†</td>
</tr>
<tr>
<td>5. Chronic destructive disease of the upper airways</td>
<td>(A) Hearing loss, blocked ears, or ear pain or (B) sinusitis or otitis specified as the reason for ANCA test ordering by the physician</td>
</tr>
<tr>
<td>6. Long-standing sinusitis or otitis</td>
<td>(A) Visualized on imaging studies or (B) tracheal stenosis specified as the reason for ANCA test ordering by the physician</td>
</tr>
<tr>
<td>7. Subglottic, tracheal stenosis</td>
<td>Sensory or motor changes, including cranial nerve palsies</td>
</tr>
<tr>
<td>8. Mononeuritis multiplex or other peripheral neuropathy</td>
<td>Radiographic visualization of a mass lesion</td>
</tr>
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</table>

Results: Of the 204 ANCA tests examined, only 98 were ordered using the guideline indications. The commonest of the non-guideline indications were Colitis (25%) and Liver disease (6%) whereas the commonest guideline indications were Acute Renal Failure (ARF) (54%) and hemoptysis (19%). All 3 positive test results were false positive and failed to meet the guideline indications to begin with. Among the commonest guideline indication of ARF, majority cases (75%) had an alternate obvious etiology for ARF at the time of ordering the ANCA test itself. All the non-guideline testing was ordered by primary care physicians, nephrologists and residents and led to an extraneous health care expenditure of over $25000 for the send-out lab test over the 2 year period.

Conclusion: In this study we conclude that the ANCA test has limited utility in the academic centers included in our study, mostly due to the use of non-guideline testing indications by physicians. Increased awareness regarding the appropriate use of the ANCA test among physicians is critical since it would not only assist in the diagnosis of AASV, but also help increase the cost-effectiveness of this crucial test.

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